

Organised by IUCN and  
Sponsored by FAO, UNESCO, and the National Research Council of Thailand  
Proceedings of  
the Conference on Conservation  
of Nature and Natural Resources in Tropical South East Asia

Conservation  
in  
Tropical South East Asia

Bangkok, Thailand

November 29 – December 4, 1965



*Published with the assistance of UNESCO and of the van Tienhoven Foundation*

International Union  
for Conservation of Nature and Natural Resources  
Morges, Switzerland, 1968

The International Union for Conservation of Nature and Natural Resources (IUCN) was founded in 1948 and has its headquarters in Morges, Switzerland; it is an independent international body whose membership comprises states, irrespective of their political and social systems, government departments and private institutions as well as international organisations. It represents those who are concerned at man's modification of the natural environment through the rapidity of urban and industrial development and the excessive exploitation of the earth's natural resources, upon which rest the foundations of his survival. IUCN's main purpose is to promote or support action which will ensure the perpetuation of wild nature and natural resources on a world-wide basis, not only for their intrinsic cultural or scientific values but also for the long-term economic and social welfare of mankind.

This objective can be achieved through active conservation programmes for the wise use of natural resources in areas where the flora and fauna are of particular importance and where the landscape is especially beautiful or striking, or of historical, cultural or scientific significance. IUCN believes that its aims can be achieved most effectively by international effort in co-operation with other international agencies such as UNESCO and FAO.

The World Wildlife Fund (WWF) is an international charitable foundation for saving the world's wildlife and wild places. It was established in 1961 under Swiss law and shares joint headquarters with the International Union for Conservation of Nature and Natural Resources (IUCN). Its aim is to support the conservation of nature in all its forms (landscape, soil, water, flora and fauna) by raising funds and allocating them to projects, by publicity and by education of the general public and young people in particular. For all these activities it takes scientific and technical advice from IUCN.

Although WWF may occasionally conduct its own field operations, it tries as much as possible to work through competent specialists or local organisations.

Among WWF projects financial support for IUCN and for the International Council for Bird Preservation (ICBP) have highest priority, in order to enable these bodies to build up the vital scientific and technical basis for world conservation and specific projects. Other projects cover a very wide range from education, ecological studies and surveys, to the establishment and management of areas as national parks and reserves and emergency programmes for the safeguarding of animal and plant species threatened with extinction.

WWF fund-raising and publicity activities are mainly carried out by National Appeals in a number of countries, and its international governing body is made up of prominent personalities in many fields.



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# conservation in tropical south east asia

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*Edited by*

Lee M. Talbot and Martha H. Talbot

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# **Declaration of the Government of Thailand on the Conservation of Natural Resources**

Natural resources are essential to any nation's survival; they are a necessary foundation to economic and social development; and they are a heritage beyond value for the future.

Thailand is proud of her rich natural resources – her mountains with their rich forest cover; the watersheds so essential for all life; her fertile lands; her wildlife and the beautiful lands in which they live.

The Government of Thailand, fully appreciating the vital importance of these natural resources, pledges itself to their conservation to secure a better life for its people, their children, and their children's grandchildren.

However, conservation requires specialists, training, and facilities that may not be available within Thailand at the present time. Since conservation is of international concern, we strongly hope that other nations and the international agencies will co-operate with and assist us in honoring this solemn pledge.

Field Marshal Thanom Kittikachorn  
Prime Minister

Presented at the Opening Plenary Session, November 29, 1965.



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## Preface

The resounding success of the Conference on Conservation of Nature and Natural Resources in Tropical South East Asia was in a large measure due to the interest and enthusiasm of the 192 participants from 23 countries, and the inspiring leadership of the officials of the Government of Thailand, the National Research Council of Thailand, and the sponsoring international agencies. The Prime Minister's declaration on the Conservation of Natural Resources on behalf of the Government of Thailand established a pledge which could be applicable to other governments of South East Asia faced with similar problems, and clearly opened the door for needed technical assistance from other countries, as well as from international agencies in the area of maintaining natural resources as a 'priceless future heritage.'

Those who attended the Conference carried home with them much information and many new concepts set forth in the papers of the meeting, as well as profiting from the discussions in the various sessions. In addition, a wide range of valuable resolutions were developed and unanimously adopted in order to assist governments and international organizations to focus upon special situations demanding implementation and action by appropriate authorities. It is hoped that when possible this will be encouraged by those who attended the Conference, as well as the members of the UNESCO Regional Working Group on the Conservation of Nature and Natural Resources in Tropical South East Asia.

This Conference has been vividly described, with outstanding illustrations, in a splendid special issue of the Association for the Conservation of Wildlife's publication, *Conservation News* (No. 7, 1966). The publication, which was edited by Dr. Boonsong Lekagul, also included color reproductions of winning paintings in the Thai school competition describing the role of IUCN in South East Asia. It was widely disseminated not only throughout South East Asia, but also among participants in the Eleventh Pacific Science Congress in Tokyo, Japan, in August 1966. The Bangkok conservation resolutions were incorporated into a resolution of the Tokyo Congress, thereby giving them added strength and significance to the governments concerned.

It is gratifying that both UNESCO and FAO have taken measures to implement some of the Conference resolutions, as have a number of Asian governments, including Thailand. It is the hope of the International Union for Conservation of Nature and Natural Resources that the publication of these Proceedings will further strengthen the hand of all who are working to carry out the Conference objectives in the years ahead, and encourage the holding of future regional international conservation meetings.

Special mention should be made here of IUCN's gratitude not only to those individuals and organizations referred to in Resolution No. 36, but also to Dr. and Mrs. Lee M. Talbot who played such a major role in organizing the Conference and in editing its Proceedings for IUCN publication.

HAROLD J. COOLIDGE  
General Chairman of the Conference  
President of the International Union for  
Conservation of Nature and Natural Resources

25 September 1967

# Editors' Introduction

## BACKGROUND

Each region of the world has its own cultural and ecological setting, and there has been an increasing recognition that solutions to each region's conservation problems must be sought within that region's particular setting. Until recently most international attention to conservation has been focused on Africa, America, and Europe. But there has been growing interest, awareness and concern with the increasingly urgent conservation problems in the countries of Tropical South East Asia. In recognition of this situation the International Union for Conservation of Nature and Natural Resources (IUCN) approved a South East Asia Project on the occasion of their Eighth General Assembly, held in 1963 at Nairobi, Kenya.

This Conference on Conservation of Nature and Natural Resources in Tropical South East Asia was planned as a central part of the project. Its theme, *Conservation Spotlight on Tropical South East Asia*, expresses the growing national and international concern with conservation in this region.

For the purposes of this conference, on the basis of ecological similarities and community of conservation problems, and after consultation with authorities from the countries of the area, the IUCN defined 'Tropical South East Asia' as including Brunei, Burma, Cambodia, Indonesia, Laos, Malaysia (Malaya, Sabah, and Sarawak), Philippines, Singapore, Thailand, South Vietnam, and tropical Australia (Australian New Guinea).

The conference was held in Bangkok at the Kasetsart University and the adjacent National Research Council of Thailand, from 29 November through 4 December, 1965. The conference was sponsored and organized by the IUCN and co-sponsored by the Food and Agriculture Organization of the United Nations (FAO) and the United Nations Educational, Scientific, and Cultural Organization (UNESCO). It was held in Bangkok, in response to the invitation by the Government of Thailand, and the National Research Council of Thailand was the host organization.

## OBJECTIVES OF THE CONFERENCE

The conference was an international scientific and technical meeting. Its long range aim was to further conservation within Tropical South East Asia. Its principal, immediate objectives were to bring together those concerned with and knowledgeable about the various aspects of conservation in the region; to provide the opportunity for and to facilitate exchange of information, ideas, and experience between those present; and to collect, compile, and make available for consideration at the conference and for later reference a body of authoritative background information on the subject.

## PARTICIPATION

Since the conference was non-governmental, invitations to attend were sent to individuals and organizations who were particularly concerned with, or knowledgeable about the subjects to be discussed. A principal objective was to assure that the papers presented would provide as comprehensive a body of information about conservation in the region as possible. Accordingly the invitations specified in some detail the topics requested for the papers, and most invitations went to persons within the tropical South East Asia region. Where persons outside the region had specialized data or experience bearing on conservation problems within it, they too were invited.

Although there were various economic, political, and even military problems in parts of the region, the response to the invitations was overwhelming, and there were 192 registered participants representing 23 countries and 5 international organizations.

## **THE PAPERS**

In addition to the papers which were specifically invited for the panels, a series of additional background papers were contributed. Among others these included a set from the UNESCO Regional Working Group on Conservation which presented a comprehensive survey of the status of conservation in each country. Excluding opening and closing addresses, a total of 124 papers were received. Taken together these papers provide a remarkably comprehensive and complete coverage of the subjects of the conference. At the same time, because of their sheer volume, from the editors' standpoint they constitute an embarrassment of riches.

Because of limitations of space in order to include them all it has been necessary in some cases to condense papers slightly. In such cases great care has been taken to avoid changes detrimental to the author's style or content, and we hope that the results are satisfactory to all concerned.

## **ORGANIZATION OF PAPERS IN THE PROCEEDINGS**

The conference was organized into Opening and Closing Plenary Sessions, and five main Technical Sessions, covering major aspects of conservation in the region. The proceedings adhere to this organization as follows:

Opening Plenary Session: Addresses of welcome by officials of the host and sponsoring organizations; addresses by representatives of the international agencies participating in the conference, keynoting the problems and importance of conservation in South East Asia and the special relationship and concern of their respective organizations with conservation in the region.

Technical Session I: International Biological Program – plans and proposals for national programs in conservation for the IBP.

Technical Session II: Ecology – ecological aspects of conservation in the region, emphasizing comprehensive, integrated planning for the use of land and water resources.

Technical Session III: Conservation Education and Training – 1) education in schools; 2) training for careers in conservation; 3) public conservation education.

Technical Session IV: Threatened Species – species of fauna and flora that are rare or threatened with extinction, factors involved, and conservation.

Technical Session V: National Parks – the importance and development of national parks, reserves and natural areas in the region.

Closing Plenary Session: Conference Resolutions; addresses on 'Looking Ahead'; and closing remarks.

Background Papers: The UNESCO papers on the status of conservation within each country of the region. These provide a valuable reference by themselves.

## **APPENDICES AND INDEX**

The appendices present the program; officers and conference organization; alphabetical list of participants; and the list of participants by country. The proceedings close with an index of authors. In listing participants' names in the index and the alphabetical list of participants, we have tried to adhere to common usage in South East Asia. With names of Chinese, Indonesian, Laotian and Thai derivation the 'family name' which is used for alphabetical listing is usually the first name. Thus Dr. Pradisth Cheosakul is listed under P. In most other cases the 'first name' used for alphabetical listing is the last name. When in doubt about a name, cross reference can be made to the list of participants by country.

The objective in the Technical Sessions was to achieve the maximum possible discussion. Consequently all papers that were received in time were duplicated and distributed in advance so that only summaries were presented as a basis for discussion in the actual sessions. The discussions were active and extremely successful, with varying points

of view and many penetrating questions put forward. The lists of chairmen, summarizers, speakers, etc., are presented in Appendix A. In the chapters that follow, each Technical Session chapter is started with a brief summary of the session. This is followed by the papers, organized by subjects to provide a logical and comprehensive treatment of each topic. Except for the papers on the status of conservation by country, (which appear in the Background Chapter), contributed background papers have been inserted in the Technical Session chapter to which they are most relevant.

## ACKNOWLEDGEMENTS

In acknowledging assistance received in the preparation of these proceedings we must first mention the authors of the papers and addresses. Their participation and the high standard of their contributions were essential to the success of the conference and the solid value of these proceedings. We must also acknowledge the work of the recorders and summarizers of the Technical Sessions, and that of Mrs. Lenore Smith and Mr. Myron Sutton who also assisted with the records.

The preparation of these proceedings has been made possible through the support of Professor S. Dillon Ripley and the Smithsonian Institution which we gratefully acknowledge. We are particularly indebted to Mrs. Lois Houghton of the Smithsonian for invaluable assistance with editing and condensing; and we wish to express our gratitude to Mrs. Lenore Smith for many forms of help with the manuscript, Mrs. Constance Young for long hours of typing, and Dr. Marie-Helene Sachet for welcome assistance with the final translations. A special thanks is due to Mrs. Beth Dasmann for the delightful illustrations which augment and enliven the text. And of course, particularly grateful acknowledgement is due to Mr. Harold Coolidge, who first conceived of this conference and the proceedings and whose encouragement and assistance has been a major factor in every step of their development.

## CONCLUDING

There is an immense amount of information in this book both for the technical and the non-technical reader. Some may wish to read it straight through, others may wish to pursue specific subjects, and some will use it as a reference volume as the need arises. We have endeavored to facilitate all these uses through the method of organization, presentation, and indexing. What we have not been able to include, although some of the addresses and papers reflect it, is the earnest enthusiasm that the participants brought to this happy conference. Thanks to their work this book stands as a unique and comprehensive reference; a guidebook to conservation in Tropical South East Asia. We hope that this volume may help maintain and further stimulate that enthusiasm and the effective conservation efforts it underlies.

LEE M. TALBOT

MARTHA H. TALBOT

Office of Ecology  
Smithsonian Institution  
Washington, D. C.

October 1, 1967

## **Opening Plenary Session**

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### **PART 1:**

**Opening and Addresses of Welcome by Officials of  
the Host and Sponsoring Organizations**

# Call to Order

by

MR. HAROLD J. COOLIDGE

*General Chairman of the Conference;  
Chairman, IUCN International Commission on National Parks;  
Executive Director of the Pacific Science Board, National  
Academy of Sciences – National Research Council, Washington  
D.C., U.S.A.*

Your Royal Highness, Your Excellencies, ladies and gentlemen: It is my privilege to introduce this first plenary session of the Conference on Conservation of Nature and Natural Resources in Tropical South East Asia. The International Union for Conservation of Nature has been concerned with the conservation problems of Asia, as well as other parts of the world, ever since its establishment 17 years ago. We welcomed the offer of the National Research Council of Thailand to host this our first regional meeting in Asia, and are particularly pleased by the response to our invitation as indicated by your presence here.

The purpose of this international scientific and technical conference is to bring together those concerned with the various aspects of conservation in this region; to provide the opportunity for exchange of information, ideas, and experience; to collect a body of authoritative background information on the subject; to emphasize in our meetings the ecological aspects of conservation and the approach to it through education, training, and the exchange of information.

It now gives me great pleasure to turn this session over to our Honorary Chairman and distinguished President of the IUCN, Professor Bourliere of France, for the official opening of the meeting.

# Formal Opening of the Conference and Address of Welcome

by

H.E. FIELD MARSHAL THANOM KITTIKACHORN  
*Prime Minister of Thailand*

presented by

H. R. H., MAJOR GENERAL PRINCE WAN WAITHYAKON  
*Deputy Prime Minister of Thailand*

Mr. Chairman, Distinguished Delegates, Ladies and Gentlemen:

It gives me very great pleasure to welcome our distinguished visitors, the participants of this Conference, the first international Conference on Conservation of Nature and Natural Resources in Tropical South East Asia.

The natural resources of a nation are vital to its survival and development. Natural resources provide both the foundation upon which man can build a nation; and the essential building blocks with which man can develop it.

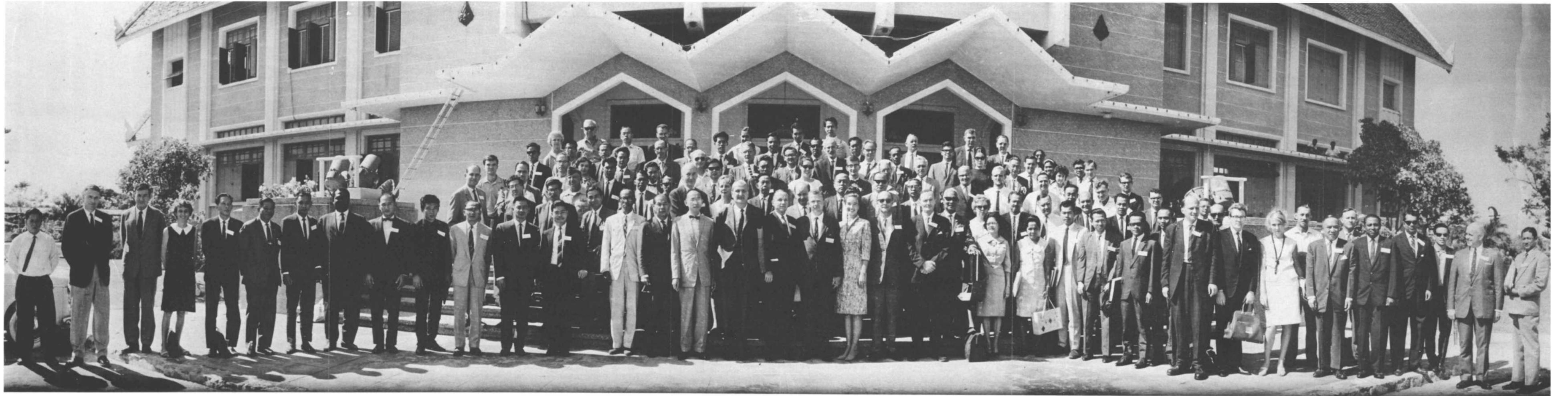
Conservation is the wise use of these resources, to obtain for man the maximum balanced yield of their values now and through the future.

Conservation of natural resources is a duty and obligation of every government; equally, it is the duty and obligation of a people to support their government in its conservation work.

Thailand is rich in natural resources. We have great mountain ranges; tall forests; fertile soils; abundant waters supplied by the forested mountain watersheds that catch the rain and supply it to the lands below; fish in the sea and in our fresh waters; beautiful wild birds and animals, and lovely natural scenery. Thailand is proud of her natural resources. However, the very richness of Thailand's natural resources actually provides one of the obstacles to their proper conservation. Because of our richness, there is a belief that our natural resources are inexhaustible, and that our problem is not conservation of them but finding ways of more rapid exploitation of them. This attitude is natural in as rich a land as this.

This richness, however, is the product of a natural balance between the climate, the soils, and the flora and fauna. It is a delicate balance easily upset. If we respect the balance and apply the principles of conservation, our people can receive the benefits of these resources now and in the future. If we mis-use these resources, we can lose them; now and in the future.

South East Asia does not have the well-known and spectacular examples of resources wasted by man's mis-use such as are provided by parts of the Sahara Desert in Africa, deserts of the Middle East, and the Dust Bowl of America. However, if one looks around in South East Asia there are large and increasing numbers of examples to be seen where mis-use of the land and its resources has resulted in loss of forests, loss of the vegetation cover, erosion of the soil, loss of the watersheds with resultant floods in the wet season and droughts in the dry; and loss of wildlife, scenery, and other



resources, all of which result in a direct and long term loss to man. This is a loss no nation should tolerate, and one no nation can afford, particularly in view of the increasing demands upon natural resources made by the increasing human population, their increasing standards of living, and the requirements for social and economic development.

In nature and natural resources, as in so many other fields, there are South East Asian problems and situations which require South East Asian approaches and answers. There have been international conferences on nature and natural resources in Africa, Europe, and the Americas. The Government of Thailand is particularly pleased to serve as host to the first such international conference to consider conservation of nature and natural resources in tropical South East Asia.

In addition to the host-sponsorship of the Government of Thailand, through its National Research Council, this conference is sponsored by the International Union for Conservation of Nature and Natural Resources, the United Nations Educational, Scientific, and Cultural Organization, and the Food and Agricultural Organization of the United Nations. This sponsorship is symbolic of the approach to conservation that has been found most fruitful and successful – co-operation between nations' governments and the international agencies and specialists. It is hoped that this sponsorship augurs well for future co-operation on conservation that may grow out of this conference. This co-operation is extremely important in South East Asia, since conservation requires specialist training and assistance that often is not available within this region.

We hope that this conference marks a turning point in tropical South East Asia: first, in the awareness of conservation needs; and second, in the realization of sound conservation action both at national and international level.

Therefore, it is both with pleasure, and with high hopes, that I now declare this conference opened.

## Welcoming Address

on behalf of

### The International Union for Conservation of Nature and Natural Resources (IUCN)

by

PROFESSOR FRANÇOIS BOURLIÈRE

*President, International Union for Conservation of Nature and Natural Resources (IUCN) Paris, France*

Your Royal Highness, Excellencies, ladies and gentlemen:

First of all, I would like to thank your Royal Highness, on behalf of all of us here, for doing us the great honor of opening this Conference, and for the wise and encouraging things you have just said.

It has long been an objective of IUCN that as many as possible of those with a knowledge of, and responsibility for, the wonderful natural resources of South East Asia should meet together to discuss and clarify the many problems involved in their conservation, and be joined in this discussion by representatives of UNESCO, FAO, and other organizations able, I hope, to make some helpful contribution to the solution of these problems. That this objective reaches its fulfilment today, is largely due to the foresight, encouragement, and the hospitality of the Government of Thailand, a Member State of the IUCN, and it is a privilege to express the debt of gratitude which we feel, and to ask your Royal Highness to convey this expression of gratitude to the Government you represent.

We are particularly pleased by the Declaration of the Government you have just read. This is a good omen for our meeting.

I would like now to say a few words on the subject to which your Royal Highness referred in your opening address, namely the conception of conservation as wise use of natural resources by and on behalf of mankind. By no means must conservation be equated now with conservatism. We must now look forward, not backward. Modern conservation is indeed no more than applied ecology, a policy of wise use of natural resources on a sustained yield basis, for the benefit of man. That does not mean that we are no longer interested in the preservation of scarce species of plants and animals; quite on the contrary, and a whole section will be devoted to that very problem. But we are as much interested in the conservation of soils and of vegetation cover, and in land use methods.

It is our hope that this Conference will bring forward new concepts and new ideas which will in the long run help to improve the living conditions of the peoples of South East Asia.

## Welcoming Address

on behalf of

### **The Director-General of the United Nations Educational, Scientific and Cultural Organization (UNESCO)**

by

MR. G. BETANCUR-MEJIA

*Assistant Director-General for Education of UNESCO*

Your Royal Highness, Excellencies, Distinguished guests and participants, ladies and gentlemen:

On behalf of the Director-General of Unesco, I have the great honour to greet you this morning and to welcome all of you to this Conference on the Conservation of Nature and Natural Resources in Tropical South East Asia. I am especially pleased to have this opportunity of thanking His Royal Highness, the Representative of the Government of Thailand, for his esteemed patronage and for the generous hospitality and facilities for the Conference offered by his Government through the National Research Council of Thailand. The willingness of the Government of Thailand to be host to various international and regional meetings and projects is highly appreciated by Unesco and your fine spirit of international co-operation should be commended.

It is also a great satisfaction for Unesco to continue to work closely with the International Union for Conservation of Nature and Natural Resources, who have so ably organized this Conference. Seventeen years have passed since the Union was established at a meeting held under the auspices of Unesco and the Government of France. During these seventeen years, there has been a continued close association and co-operation between the Union and Unesco.

Unesco has participated actively in the various sessions of the International Union's General Assembly and Technical Meetings, and has joined with it to organize or sponsor many international and regional meetings in various parts of the world. In 1961, for example, Unesco was a co-sponsor of the First Pan-African Conference on the Conservation of Nature and Natural Resources in Modern African States, held in Arusha, Tanganyika. In the following year, Unesco also was associated with the Union as sponsors of the First World Conference on National Parks in Seattle, Washington, U.S.A.

Through these and other modes of co-operation, such as the granting of an annual subvention, the provision of study contracts, the organization of survey missions, and through technical assistance to Member States instituting national parks and other conservation measures, Unesco has worked closely with the Union and will, I am sure, continue to do so in the future. The 13th General Conference of Unesco in 1964 approved two resolutions on Nature Conservation, which invite the Member States of Unesco and authorize the Director-General to support conservation activities in general and, in particular, such organizations as the International Union.

I would also like to call your attention to the paper in the first Session entitled 'Unesco's Natural Resources Research Program' which outlines Unesco's general program of Natural Resources Research, and in addition mentions our interest in the development of conservation education materials. In my capacity as Assistant Director-General for Education of Unesco, I have especially noted that one of the Technical Sessions will be devoted to Education and Training. The Unesco Secretariat will look forward to studying the deliberations and resolutions of this Conference with a view towards possible further co-operation. Unesco is also very happy that the Food and Agriculture Organi-

zation of the United Nations is participating in this Conference as a fellow co-sponsor, and we welcome this opportunity of continuing close collaboration with FAO on matters of mutual concern.

Concurrently with this Conference, the Unesco Regional Centre for Science and Technology for South East Asia will also be organizing a meeting of its Regional Working Group on the Conservation of Nature and Natural Resources in Tropical South East Asia. It is hoped that the Regional Working Group will also find a mechanism to assist in the implementation of some of the resolutions which may be passed at this Conference.

In conclusion, may I repeat how pleased Unesco is to be part of this Conference, which is the first of its kind in South East Asia, and which has brought together such a distinguished assemblage of scientists, educators, and other specialists concerned with conservation. We feel that there is a great need for action on conservation on South East Asia and particularly at this point in history where the natural resources of many countries, developed and developing, are disappearing at an alarming rate. The waste and abusive exploitation of natural resources is not only a national problem for individual countries, but an international problem on which all nations should be vitally concerned, and on which Unesco, by virtue of its international nature, feels itself called upon to assist.

Again, may I express our deepest appreciation to our hosts, to the International Union for Conservation of Nature and Natural Resources, and to our fellow co-sponsors, and to wish the Conference all possible success in the work which it will be undertaking.

Thank you.

## Welcoming Address

on behalf of

### The Director-General of the Food and Agriculture Organization of the United Nations

by

DR. H.N. MUKERJEE  
*Acting Regional Representative of FAO Far East Regional Office,  
Bangkok, Thailand*

Your Royal Highness, Excellencies, Distinguished Delegates, Ladies and Gentlemen:

On behalf of the Director-General of the Food and Agriculture Organization of the United Nations, a co-sponsor of this Conference, it is my privilege to extend to you a hearty welcome and to acknowledge our grateful appreciation to the Government of Thailand for being host to this Conference on Conservation of Nature and Natural Resources in Tropical South East Asia.

Unfortunately, due to the FAO Conference, which is in session at the present moment in Rome, some of our staff members who would have attended this Conference could not do so.

FAO is an organization whose main activities are in the fields of land, water, plants, animals, fisheries, forests and nutrition, and hence it is impossible for us not to be interested in conservation. In fact, FAO's primary tasks as laid down in its Constitution are to assist Member Nations to raise the nutritional levels of their peoples through improved production and distribution of food, to raise the living standards of rural populations and to contribute to an expanding world trade in agricultural products; and at the 10th FAO Conference in 1959, it was also decided to include wildlife management among its regular activities.

It is only appropriate that the theme of the Conference is 'Conservation Spotlight on Tropical South East Asia.' Due to the rapid increase in population in the developing countries of this Region, it is necessary to obtain an annual growth of about 4 percent in food supplies to eliminate under-nutrition and provide a modest improvement in the nutritional quality of the diet, but in fact, the average annual rate of increase in food supplies during the last five years, has not exceeded 2.5 percent and the per capita production is still less than it was before the war - more than a quarter of a century ago.

The important factor to watch is that the development of available resources and the production of goods and services keep pace with population growth. Where there is maladjustment between the two, famine, pestilence, wars, etc., have in the past intervened to restore the balance. Hence the general outlook in this Region is rather alarming and FAO is trying to assist the Member Nations in ameliorating the situation through the Freedom-from-Hunger Campaign, which it started in 1960, in addition to the assistance given under the Expanded Program of Technical Assistance, the UN Special Fund, the World Food Program, the FAO/IBRD projects, Funds-in-Trust projects, etc.

In this context, the conservation of Nature and Natural Resources, with special emphasis on ecological studies, integrated planning for the proper use of land and water resources, and education and training and exchange of information and techniques is of special importance in increasing production. We are therefore extremely interested in your deliberations and the recommendations which the Conference would make.

FAO has had a strong and happy association with IUCN and values the privilege that it enjoys for one of its officers to sit as an observer on the executive board of IUCN.

You will no doubt hear reference to the joint IUCN/ FAO African Special Project, where FAO sent its Regional Forestry Officer to African countries to arouse interest in a meeting such as the present one for the South East Asian Region. This meeting was followed by a third stage where missions were completed in 19 African countries involving the organization of wildlife services or assistance with special problems of wildlife and National Parks, protection, development and management.

A fourth and continuing phase has developed from this project in the form of an African regional working party on wildlife and national park management where countries of the Region meet periodically as a working party under the African Forestry Commission to discuss priorities for training and research, legislation, tourism based on wildlife and international problems such as import-export regulations and the management of National Parks or wildlife areas that extend across international borders.

But we like to think that even international Organizations can profit from past experience and the South East Asia Project seems an excellent example of this. Already Dr. Talbot has travelled to various countries obtaining a general perspective of the wildlife and its potential in relation to other resources and, with the help of UNESCO, has been able to visit a number of countries to encourage their attendance at the present meeting. This the present project is, in comparison with the African Special Project, at the III stage, and even before the general meeting of interested countries in the Region well ahead of the African Special Project. Other evidence of the more rapid effects of the present project is that requests, at least some of which have been stimulated by the visits of Dr. Talbot, are already coming into FAO for specific assistance in the field of wildlife conservation and National Park management and development.

More details of our interest in the field will be presented in the eight papers prepared for the various technical sessions by our staff members.

Finally, I should again express our most cordial thanks to the Government of Thailand for acting as host to this Conference and to His Royal Highness for inaugurating the same. Our thanks are also due to the International Union for Conservation of Nature and Natural Resources for its initiative in proposing the Conference; to the National Research Council for its considerable efforts in details of planning and excellent arrangements; and to the UNESCO for its generous contribution for not only helping in Dr. Talbot's travel, but also in bringing so many delegates to this Conference.

Thank you.

## Welcoming Address

on behalf of

### **The Thai Organizing Committee and the National Research Council of Thailand**

by

DR. PRADISTH CHEOSAKUL

*Deputy Secretary-General, National Research Council of Thailand  
Chairman, Thai Organizing Committee of the Conference, Bangkok, Thailand*

Your Royal Highness, Your Excellencies, Mr. Chairman, Ladies and Gentlemen:

It is a great pleasure for me to have the honour of extending, on behalf of the National Research Council of Thailand and the many Thai authorities who have co-operated in organizing this important conference, our warmest welcome to all who are taking part in its deliberations and particularly to our distinguished colleagues from abroad.

We thank the sponsoring bodies, I.U.C.N., U.N.E.S.C.O. and F.A.O., for the confidence they have shown in our ability to play hosts to this meeting. We hope that the arrangements we have made will run smoothly and my colleagues from a wide range of local groups are joining to ensure that they do. I would like to record our special appreciation of the devoted and dedicated work of Dr. L. M. Talbot and his wife and collaborator, Mrs. Marty Talbot, and for the assistance they have given us with the programme planning and all phases of our work. Likewise, I wish to express my sincere indebtedness to Mr. Frank G. Nicholls, the Special Governor of the Applied Scientific Research Corporation of Thailand, for his timely advice and endless assistance.

We in Thailand are seized with the importance of conservation. In historical times Thailand abounded with numerous natural resources, its forests were alive with game of all kinds and its waters teemed with fish. Now our natural resources are being depleted, our forests are in danger, and wildlife is diminishing. We are determined to protect these valuable resources and to conserve the precious heritage that is uniquely Thai. We look to this meeting as a focus for action and we are sure that its resolutions will be of the greatest significance in achieving our noble objective.

During the Conference we have provided opportunities for relaxation and we look forward to entertaining you in the Thai way. After the meeting we will have the pleasure of showing you the beauty of our countryside and some of the national parks we have established in our scheme for nature conservation. We hope that you will enjoy your stay with us and I ask you to let members of the Thai Organizing Committee know of any opportunity they may have of increasing your pleasure whilst you remain with us as our honoured guests.

# Welcoming Address

on behalf of

## The IUCN Secretariat

by

SIR HUGH ELLIOTT

*Secretary General of IUCN, Morges, Switzerland*

Your Royal Highness, Your Excellencies, Mr. Chairman, Ladies and Gentlemen:

Having the privilege on behalf of the International Union for Conservation of Nature and Natural Resources (IUCN), chief sponsoring organization of this Conference, of bringing to a close our inaugural session, I wish as briefly as possible to mention one or two of the considerations which make it such a special pleasure for IUCN to welcome those attending the Conference and to thank your Royal Highness for having done us the signal honor of opening it.

IUCN's particular viewpoint is explained by its full title, emphasizing as it does our interest in *nature*, the wild fauna and flora, but always in the context and as an integral part of the *renewable natural resources* of each country or region. IUCN was founded 17 years ago, as already mentioned by the distinguished representative of UNESCO (which took an important part in its foundation), and eight years later its present name was adopted in order to reflect more accurately its policy and purposes. There is no doubt that the founding of IUCN met a clear demand and filled a gap in international effort and co-operation.

A further asset of IUCN is its non-governmental status, combined as it is with the consultative relationships it enjoys with the United Nations Economic and Social Council, and with the two great U. N. Agencies which have co-sponsored this Conference. This has enabled it to approach the problems of conservation on a scientific and entirely non-political basis, in keeping with the plain fact that the aim of conservation to keep the world fit for mankind by making wise and continuing use of the *whole* of his natural environment, cannot, if it is to be achieved, be restricted by boundaries.

It is true that, for its main support, IUCN depends very greatly on its 23 Member States, of which I am happy to say that four, or about one in six, are situated in South East Asia. But I think it would also be true to add that the moral strength of IUCN derives from its 200 Corporate Members, now spread over nearly 70 countries. Certainly our hope and purpose is that all organizations concerned with conservation, whether governmental or private, national or regional (or for that matter the international organizations with essentially complementary and mutually supporting aims), should automatically join or affiliate with IUCN.

This leads me to try to summarize IUCN's special role or functions. The latter could be said to fall into three very closely related parts. The first is to help to co-ordinate and promote the proper understanding and use of the activities and assistance which can be given by organizations in this field, organizations which have tended to multiply with the increasingly widespread realization of the importance and urgency of conservation. Apart of course from our co-sponsors, UNESCO and FAO, many of these organizations are formally or informally represented here today, including the International Council for Bird Preservation (ICBP), the World Wildlife Fund, the Fauna Preservation Society, and such national organizations as the Conservation Foundation, which have taken a leading part in the international conservation effort.

IUCN's second main function, arising out of the first, is to encourage and facilitate

effective conservation, on sound ecological principles, throughout the world, concentrating attention in order to make the best use of time and means available on areas where it appears that natural resources are in danger of being lost through oversight or misuse. A necessary adjunct to such facilitation, which in fact constitutes the third feature of IUCN's role is to be able to supply directly or indirectly information that is as up to date and reliable as possible.

It may well be asked how anything other than a vast and expensive organization can aspire to fulfil these roles. The answer lies in IUCN's Commission System which, in effect, means the establishment of a network of experts, meeting together whenever and wherever it is possible to meet but most usually at the time of the Union's General Assembly every three years, who are divided into five groups each of which deals with one of the aspects of conservation to which we have found that most problems are referable. Each group or Commission is directed by a Chairman and served by a Secretary, and each is entitled to appoint its specialist sub-committees. The existing structure comprises -

A Commission on Ecology, with sub-committees specializing on the ecological effects of toxic chemicals, landscape-planning, and soil and water conservation. This Commission has the responsibility of planning the major Technical Meetings of IUCN held in conjunction with its General Assembly;

A Commission on Education, with a sub-committee specializing on conservation education problems in North-West Europe (it would be one possible and happy outcome of the present Conference if it led to the establishment of another regional committee to specialize on working out the best approach to conservation education in South East Asia);

A Commission on National Parks, with sub-committees specializing on Latin American Parks and on the concept of Park Systems Planning (aimed at the combination of national parks, reserves, controlled hunting areas and recreational areas such as city parks, which is advocated by IUCN). The Commission also has the important responsibility of keeping up to date the U. N. List of National Parks and Equivalent Reserves;

A Commission on Legislation, which aims to collect and make available the texts of all laws relevant to conservation of natural resources, with a view to exchange of information and experience, and to a co-ordinated legislative policy among countries with similar problems;

Finally, the Survival Service Commission which, with already a dozen sub-committees concentrating on particular groups of fauna and flora, concerns itself with the problem of securing the survival of endangered species. For this purpose its main task is to obtain the essential information relevant to such species, on which to base, in collaboration with all concerned in the countries where the species occur, the action needed to rehabilitate and safeguard them.

I hope I have said enough to show that IUCN is designed to make a positive contribution within the scope of its international functions, and one that is steadily expanding as support for its work increases. The relevance of this Conference to its objectives will also I hope have been made clear. In expressing once again, therefore, IUCN's gratitude to the National Research Council of Thailand for being host to the Conference and to your Royal Highness for inaugurating it, I will conclude by saying that, having with the kind help of our co-sponsors brought together so many distinguished and expert persons, IUCN considers it a great responsibility and privilege in the immediate future to place on record and make available for reference and fruitful use their reports, views, data and recommendations on the conservation of nature and natural resources in a region of the world so richly endowed, beautiful, and important to science and therefore to mankind, as South East Asia.

## **Opening Plenary Session**

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### **PART 2:**

Addresses by representatives of the international agencies participating in the Conference, keynoting the problems and importance of conservation in South East Asia and the special relationship and concern of their respective organizations with conservation in the region.

# FAO Interest in Conservation of Nature and Natural Resources in the Asia-Pacific Region

by

DR. O.E. FISCHNICH

*Assistant Director-General, Food and Agricultural Organization of the United Nations, Rome, Italy*

Delivered by

MR. THANE RINEY

*Wildlife and National Parks Officer, Forestry and Forest Products Division, FAO, Rome*

Mr. Chairman, Distinguished Delegates. The conservation of nature and natural resources is of obvious importance to FAO, concerned as it is with practical measures for accelerating the rate of food production and agriculture development and constantly aware as we all must be of even greater proportional population increases.

We recognize, of course, the two different major aspects to conservation: on the one hand protection, that parts of man's natural environment do not disappear from the face of the earth, and on the other hand, management of the resource on a continuing stable basis. We incline to a positive, practical, active view of conservation as several of the papers we have prepared for this meeting imply or suggest. We see conservation in a very broad way. Not only is it ecological common sense but, in the long run it is economic and social common sense as well.

Within our organization there is an increasing awareness that our activities take place within the ecological limitations of the regions, the large catchment areas, the specific hillsides, plains and river flats of the world: that these limitations may, under certain conditions, be greatly changed but that the vastly different potentials are by no means unlimited. We are also aware of social and economic aspects of development that mingle with the ecological factors so that in discussing conservation, as in discussing the development process itself, all three sets of closely inter-dependant parts must eventually be considered as part of our routine thinking and planning.

Developing countries will continue to develop notwithstanding the absence of adequate data on soils, vegetation and climate, just as the more highly developed countries did in their early years of development. Ideally, as we move slowly forward with development we will integrate conservation principles within our programs while at the same time obtaining appropriate additional ecological data on which a higher level of stable productivity can be built.

There is an increasing tendency to recognize that practices of sound management must eventually include profiting from lessons of the past as well as planning for the future. It is impossible, for FAO or any other organization involved with Technical Assistance in the field of renewable natural resources, not to have the greatest interest and concern for the deliberations of the plenary sessions of this meeting and in each of its five technical sessions.

Following the African Special Project interest in the field of wildlife management, National Parks and Forest Recreation areas has been growing and there is now a small unit in FAO dealing with these subjects, working as an integral part of forest management and relating appropriately to other forms of land use.

Projects already completed by wildlife officers, along with requests in hand, involve national surveys of the wildlife resources, and help with the formation of legislation or with the organization of administration. Requests are made for specific research to facilitate various aspects of wildlife management such as hunting schemes, the preparation of management plans for National Parks and tourist development, or harvesting

wild animals for meat or animal products. Other projects deal with animal problems such as conflicts with other forms of land use, the question of animal introductions or the preservation of rare species, the effects of insecticides and problems of damage to forests, crops or stored foods. Two projects give assistance in conservation education and public relations.

To provide this type of help FAO activities have been organized along the following lines:

First, through reports from wildlife experts in the region, meetings and regional working parties, to assess and keep up-to-date, priorities for international aid in the field of wildlife management, and to consider how these priorities may be met within the means of Special Fund, EPTA, OPEX or Freedom-from-Hunger Campaign projects.

Second, to assist developing countries with the formulation of projects through special visits of headquarters staff or, more commonly, through the network of FAO regional and country representatives and technical officers. In supervising these projects we are acutely aware of the present stage of development and potential of the country and the implications of the wildlife project to other forms of land use, so that aid programs in wildlife can have the needed long-term effect.

Finally, we have established liaison with other international and bilateral organizations and private foundations active in the international field of wildlife management and this liaison is becoming ever more important as it results in assistance with counterpart contributions and provision of bilateral experts for FAO projects and at little or no expense to the countries concerned.

In addition to the various special projects in this field, three working parties have been set up under the regional forestry commissions in Africa, Latin America and North America. The international legal research branch for the past two years has been reviewing wildlife and National Park legislation as a service to developing countries in the process of formulating new or revising old legislation. A bibliography of literature on African wildlife is being prepared and a handbook for field men is being written dealing with management of large mammals, the preparation of management plans for National Parks, game reserves, hunting schemes, and the protection of rare species.

The program of assistance with wildlife and National Parks management is growing rapidly with four experts and consultants in the field in 1963, 6 in 1964, 9 in 1965 and a minimum of 36 (on the basis of requests already in hand) foreseen already for the 1966/1967 period.

Although initial emphasis was placed on Africa, projects and requests for assistance are already under way in Latin America, the Middle East and the Asia-Pacific Region and in the Meetings of the Technical Committee on Forestry held two weeks ago in Rome there were enough specific requests for assistance to justify a special mission to several countries of this region following the present meeting.

Although it is an important part of the interests of this particular meeting, it would be a grossly unfair perspective of the interest FAO takes in the conservation of natural resources to limit discussion to wildlife and National Parks for the concept of conservation of natural resources knows no such limits.

An obvious way to summarize FAO interest in Conservation is to have a brief look at the approved and operating field program for 1965 and 1966 for 14 countries in the Asia-Pacific Region and then to exemplify ways in which various types of projects become involved with and can contribute to conservation in the region.

For these 14 countries the Organization has 360 experts in the field working on about 240 different projects. Fellowships have been or are in this period being made available to about 250 citizens of these countries to enable them to improve technical competence in various aspects of management and training within their countries. There are 39 Special Fund Projects in the region and for these rather large projects considerable amount of equipment forms part of the Technical Assistance.

Papers on the International Biological Program, the Co-ordination and Integration of Research in Natural Resources, on Animal Husbandry in Land Use, and on certain problems of watershed management, fisheries, medium grade training and agricultural extension and training have been prepared for this meeting by various officers and you will be hearing from them during the course of the technical sessions.

A few specific examples of projects featuring conservation in the Asia-Pacific region follow:

In Taiwan a project involves selecting, testing and demonstrating acceptable soil and water conservation measures, preparing conservation plans for both communities and farms as well as assisting with their implementation. These men also assist in the formulation of watershed plans for the project areas. In another Taiwan project, in a marginal area of low productivity and characterised by serious soil erosion a plan is under way to introduce efficient dairy and beef production through establishment of proper grass-legume pastures, suitable forage utilization, economic methods of water harvesting and storage and adequate animal management techniques.

An important watershed, range management, afforestation project is getting started in the Philippines in a large catchment basin that has been over-grazed, over logged and over-eroded. The Special Fund Project consists of an inter-disciplinary team, one of the most important members of which is a rural sociologist. This project also includes a wildlife ecologist as a consultant for integrating the development of the wildlife resources within a rational land use program for the area. In another Philippine project, in a recently deforested area, on Mindanao, a Dairy Training and Research Institute is demonstrating the introduction of beef and dairy production based on permanent pastures and appropriate forage utilization.

Within the Far East Asian region the Animal Production and Health officers are becoming increasingly interested in the need to determine proper stocking rates. The Agricultural Economics Division, because of a natural interest in continuity of supplies, is concerned with the most productive forms of land use on a regional basis. The Forest and Forest Products Division is acutely aware of the serious watershed problems rising from various unsatisfactory uses of forest land, and some of their projects, like a newly developing project in Nepal, reflect the principle of planning to meet conservation requirements in the very early stages of the work of the project. A wildlife expert is also included as an integral part of the project, for the area involves a rhino reserve being developed as a tourist attraction, possible hunting areas and certain problems of competition between wildlife and other forms of land use.

The Land and Water Development Division deals with soil and soil fertility surveys, the preparation of farm plans and the Farm Management Specialist in Bangkok is also a trained sociologist. The Nutrition Division is concerned with food processing and in food consumption surveys in this region to assess future needs which assist in setting targets for production: another parameter within which the concept of conservation is slowly growing. The Plant Production Division is working with better varieties of crops and protection against plant diseases and is especially active in the field of range management, which implies the balancing of animal numbers within the carrying capacity of the land. The Rural Institutions Division emphasizes the field of agricultural education and extension and is assisting in various ways with problems of land tenure.

This is, roughly, the skeleton within which we are trying to integrate conservation concepts.

## CONCLUSION

These observations mean very little. We have great need for ecological understanding on which development that incorporates conservation principles may take place, but there is still a long way to go before satisfactory methodologies evolve. Here and there within the various divisions of FAO and within active field projects, some of the ideas of conservation are taking root. There may even be room for guarded optimism, as the trend seems to be growing. It is meetings such as this that can help us enlarge our understanding of conservation problems of the region and provide us with opportunity for re-shaping and re-sharpening our ideas which we cannot have too clearly before us in the interests of the future of the South East Asian region.

**THE PROGRAM OF UNESCO IN RELATION TO THE CONFERENCE  
THEME**

**'Conservation Spotlight on Tropical South East Asia'**

by

MR. WAYNE A. MILLS  
*Acting Director of the UNESCO Regional Centre for Science and Technology  
for South East Asia, Bangkok, Thailand*

Mr. Chairman, ladies and gentlemen:

I am very pleased this morning to have this opportunity of addressing you briefly on behalf of Mr. Mattsson, Director of the Unesco Regional Centre for Science and Technology for Southeast Asia, formerly called the Southeast Asia Science Co-operation Office (SEASCO).

Almost since the founding of SEASCO, conservation, in its broadest sense, has been a very important part of its work in the Southeast Asia Region. Recognizing that research knowledge is essential as a foundation for education and development, the Eighth Session of the General Conference of Unesco held in Montevideo in 1954 authorized the Director-General to extend the activities of the Department of Natural Sciences into the field of promoting scientific research on problems related to the Humid Tropics regions.

On the occasion of a Unesco sponsored symposium on Studies of Tropical Vegetation held in Kandy, Ceylon, in 1956 a preparatory meeting of experts in Humid Tropic Research was convened, and this meeting recommended to the Director-General the establishment of an International Advisory Committee for Humid Tropics Research. This Advisory Committee, consisting of eminent internationally recognized experts, was constituted the following year and has held four meetings in subsequent years, the last one being convened in Bandung, Indonesia, in 1963. This Advisory Committee and a similar one on Arid Zone Research have this year been merged into an Advisory Committee on Natural Resources Research.

Within the framework of Unesco's Humid Tropics program, as recommended by the Advisory Committee and approved by succeeding General Conferences, SEASCO has organized a series of symposia on problems relating to humid tropics vegetation and ecology: Symposium on Humid Tropics Vegetation, Tjiawi, Indonesia, 1958; Symposium on the Impact of Man on Humid Tropics Vegetation, Goroka, Territory of Papua and New Guinea, 1960; Symposium on Ecological Research in Humid Tropics Vegetation, Kuching, Sarawak, 1963. In all cases the holding of these symposia was made possible by the great interest and support of the host countries. Proceedings of these symposia have been printed and a limited number of copies will be available upon request for distribution at this Conference.

A series of our Botanical Training Expeditions devoted to the study and collection of humid tropics vegetation have also been organized by SEASCO between 1960 and 1963 with the active co-operation of various Southeast Asia Countries. Taking advantage of the visits of eminent specialists to the region, special lectures have been arranged and survey missions have been promoted and assisted in various ways, one recent example being the extended conservation mission in Southeast Asia countries by Dr. and Mrs. Lee Talbot, on behalf of the Southeast Asia Project of the IUCN.

Arrangements were also made for a trip to some Southeast Asia countries by the Unesco visiting sub-committee for tropical herbaria. In the very important field of promoting the establishment of key botanical and zoological reference collections, a visiting committee on Key Zoological Collections in South Asia has been established by Unesco's

South Asia Science Co-operation Office in New Delhi, which resulted in a start towards the establishment of a Central Card Index of Zoological Specimens and a Key Zoological Collection at the Zoological Survey of India in Calcutta. SEASCO is tentatively planning to activate a similar committee for Southeast Asia and to co-operate whenever possible in the development of such reference collections.

During the 10th Pacific Science Congress in Honolulu in 1961, the delegates, expressing concern over the rapid deterioration of natural resources in Tropical Southeast Asia, felt that there was an urgent need for closer co-operation among these countries, and resolved to ask SEASCO to convene a regional meeting of conservation specialists to discuss ways and means of dealing with the problem. With the active collaboration of the Council for Sciences of Indonesia and the Divisions of Research and Forestry of the Department of Agriculture of Indonesia, a meeting of the Regional Working Group on the Conservation of Nature and Natural Resources in Tropical Southeast Asia was convened in Tjiawi, Bogor in February 1962.

The meeting was of an exploratory nature and aimed at finding ways and means of promoting regional collaboration between the countries of the area. One of the recommendations of this meeting was that SEASCO should set up this regional Working Group on a more permanent basis and the Working Group members were accordingly appointed by SEASCO in 1963 after consultation with the governments of the region. The Working Group consists of one or more conservation specialists from each of most of Unesco's Member States in Tropical Southeast Asia who serve in their private capacities as expert advisors and honorary consultants to SEASCO on matters related to conservation.

Dr. Boonsong Lekagul of Thailand has ably served as the Honorary Co-ordinating Secretary of the Working Group and has generously lent the use of the journal *Conservation News* as a vehicle for communication between the members of the Working Group for the purpose of promoting conservation activities in the region. Concurrently with this present Conference, meetings of the Working Group are being held, and on behalf of Unesco and the Working Group, I should like to thank our hosts, the National Research Council of Thailand, for their support and for the facilities accorded.

Since within the original terms of reference of the Working Group, it was to function only until this present conference, one of the main purposes of its present meeting is to discuss its future organization, composition and modes of action.

At its first meeting held yesterday, the Working Group expressed its desire to try to organize itself so as to be able to assist in regional follow-up action pursuant to some of the recommendations which may be passed at this conference. Further meetings of the Working Group will therefore be held on the last three days of this conference and it is expected that the Working Group will consider the Conference recommendations with a view of possibly finding a way to implement some of them.

Finally, speaking on behalf of the Division of Studies and Research relating to Natural Resources of Unesco's Department of Advancement of Science, which is responsible for Unesco's global natural resources research programme including conservation and ecology, I should like to refer the participants to a general background paper on Unesco's program in this field which will be distributed at this conference.

And on behalf of SEASCO, I should like once more to thank our hosts, the Government of Thailand, and also to express our pleasure in working so closely with IUCN and our fellow co-sponsors, the National Research Council of Thailand and the Food and Agriculture Organization of the United Nations.

The deliberations and recommendations of this most timely and important conservation conference focussing attention on Southeast Asia will be studied closely and with great interest by Mr. Mattsson and myself, Unesco Headquarters, and the Regional Working Group, and we shall look forward to continued collaboration with all organizations concerned with this vital problem.

Thank you.

# The Biological Necessity of Conservation in South East Asia

by

PROF. S. DILLON RIPLEY

*President, International Council for Bird Preservation;*

*Member, IUCN Executive Board;*

*Secretary, Smithsonian Institution, Washington, D.C., U.S.A.*

Mr. Chairman, ladies and gentlemen. Conservation is not a matter of taste or of aesthetics. It is a matter of biological necessity.

It is highly appropriate that the International Union for Conservation of Nature and Natural Resources is holding this conference in South East Asia, because for perhaps fifty thousand years, Asians have been aware of their environment and the intense struggle to balance their lives against the ageless ebb and flow of environmental change. Man as a hunter, a harvester of game for food, has existed in Asia for perhaps seventy-five thousand years. Elephants, both contemporary kinds and extinct mastodon-like species, as well as dwarf kinds no more than four or five feet high, are known from association with fossil human remains from 35, 000 to 75, 000 years old. Man probably hunted out these elephants on Java, Sulawesi and the Philippines in the same manner that he hunted out the orang-utan on Java and in southern China, the giant pangolin in Borneo, and probably the tapir there as well, and as he is busily hunting out the rhinoceros and the orang-utan in other places today.

Man as a cultivator has probably lived in south Asia for at least twelve thousand years, shifting his farms from plot to plot of burned-over forest. Evidence from Borneo suggests that all tropical jungles in South East Asia are in a sense secondary, that is, that at some time in the past they have been burned over, probably cut over by man as a cyclic phenomenon. If man then has been constantly disturbing whatever we choose to call the original environment, man is thus a prime agent and influence within that environment, as closely linked to it as it is to him. Whether it is the old-style cultivation of slash and burn, or the new-style cultivation beginning with the terracing of rice and irrigation practices, man is as much related to soil and water today as before, and will be so no matter how many asphalt pavements are laid down, no matter how many air conditioning sets are installed within concrete and glass walls.

Indeed our concern today is about the rapidity with which man, equipped with highly technical aids and an aggressive desire to reproduce himself, is creating an unfavorable balance between man's population and his resource base. Improved agricultural techniques to feed burgeoning populations are in themselves potentially far more rapacious in using up the environment than the old stand-bys of fire and axe. Erosion and pollution of our soils and streams is just as much a feature of modern-day agriculture and development as ever. And this is compounded by the development of industrial chemistry which creates its own waste problems, from smog in the air, to chemical bondings with soil particles, to the expansion of eutrophic conditions in fresh and brackish waters. In certain types of overuse of our soils, we are creating actual unfavorable conditions for life in our adjacent waters.

Formerly man lived in roughly steady state conditions so far as his total environment was concerned. Today the gap between man's numbers and his resource base in the environment is widening steadily. No more is he roughly in a condition of homeostasis with his surroundings.

To maintain a large and growing human population in at least an harmonious adjustment

with his environment requires a very complete understanding of man in his tropical Asian ecosystem from prehistory to the present. Also it requires careful landscape planning to maintain the necessary diversity of living environments. Each of the sub-ecosystems of tropical Asia must be put to its best use in the production of agricultural crops, timber, livestock, wildlife or where possible, combinations of these.

Although the effect of the human invasion in changing the face of the earth has been recognized and discussed for several decades, within the past two or three years, there has been a sudden growing recognition, that if man is to survive and develop decent standards of living in the years immediately ahead, there is urgent need for adjustments between man and his environment on a sound ecological basis. The human population explosion and the contamination of our environments with industrial wastes, radioactive fallout, and biocides are largely responsible for the public awakening to the seriousness of the problems with which we are faced.

In recognition of this world problem the International Biological Program has been developed. One of its principal themes is to conduct intensive research on a global basis over a five year period to achieve a better understanding of the mechanisms of productivity in the world's ecosystems with the hope of broadening the productivity base for supporting human populations.

I suggest that Thailand and other South East Asian nations participate directly in the International Biological Program. Your country has a national correspondent, Dr. Kasin Suvatabandhu, and I would encourage you to form a committee, and, with our aid, to seek financial support from such organizations as FAO and UNESCO in the United Nations, various foundations, AID, PL 480 funds, and possibly the Peace Corps. It should be pointed out that the program should involve training as well as research.

It might be possible to develop, with Smithsonian help, a Thailand Institute for Environmental Sciences. Other sources of funds may be attracted to the development of such an institute in South East Asia. We could go forward with ecological studies in such an institute as part of a world network of centers for research and learning aimed at bringing biologists and behavioral scientists together in an effort to achieve the fundamental understanding of man in his ecosystem essential to new levels of homeostasis, and I might add, to some real possibility of world peace.

Our generation has seen an argus pheasant disappear and the pink-headed duck of India lapse into the shadows. Two species of rhinoceros seem headed that way, along with the orang-utan, the giant panda, the marsh-loving Eld's deer, the great oxen, the Komodo lizard and perhaps the tiger. As man's numbers increase, as each generation becomes more demanding, our environment and our animal heritage will give way. In the process man finds himself creating inexorable changes. Himself an agent of natural processes, he has the power to affect irrevocably the nature of his world. We owe it to ourselves not to misuse this power and thereby diminish irreversibly our resources and the future of our planet.

# The Concern of the World Wildlife Fund and the Survival Service Commission with Threatened Wildlife in South East Asia

by

PETER SCOTT

*Vice-President, International World Wildlife Fund;  
Chairman, IUCN Survival Service Commission;  
The Wildfowl Trust, Slimbridge, U.K.*

Mr. Chairman, ladies and gentlemen. Professor Ripley has covered a wide range of conservation aspects in the eloquent speech we have just heard, including many of the things I had hoped to mention. I will, therefore, concentrate on certain aspects which concern the two organizations I am representing at this Conference.

South East Asia, as many speakers have already said, has tremendous wildlife resources. The World Wildlife Fund is particularly interested in those aspects of these resources which are today threatened.

The World Wildlife Fund was formed at the time of the Arusha Conference four years ago in Africa. It was formed as a world Community Chest for conservation for raising voluntary money wherever possible for conservation on a worldwide basis. Its headquarters are in Switzerland; the international president is His Royal Highness Prince Bernhard of the Netherlands. Various national appeals have been set up in a number of countries. The President of the appeal in the United Kingdom is His Royal Highness Prince Philip; and in the United States former President Eisenhower is the honorary president of the national appeal.

In the four years of its existence, the Fund has supported 127 projects, and quite a number of these have been in South East Asia. One has been the South East Asia Project (SEAP) of the IUCN, which has been conducted by Dr. and Mrs. Lee M. Talbot, and which has played so large a part in bringing us together at this great Conference. There are many more projects which we hope to support in South East Asia, and we should like to hear of additional projects which would be suitable for the World Wildlife Fund.

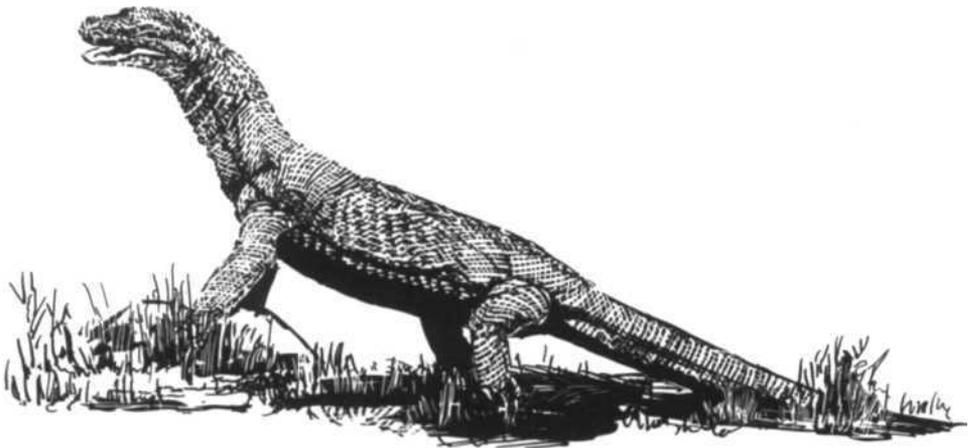
The second organization which I represent is a part of the IUCN, the Survival Commission. This is a Commission especially devoted to the threatened species of animals and plants, and for this purpose the Commission has set up what it calls the Red Book, a working tool for conservation. This is a book of data sheets, and each species which is threatened with extinction has a page of the book. There are a large number of South East Asian species in the book, some of which have already been mentioned by Professor Ripley, and most notably the rhino. Of the world's five species of rhinoceros, three of them are in Asia and two in South East Asia – the Javan rhino and the Sumatran rhino. Other threatened species among the mammals are the Kouprey in Cambodia, the Tamarau in the Philippines, the Anoa of Celebes, and the tigers, two sub-species of which are on the verge of extinction. Perhaps the Bali tiger has already disappeared, and the Javan tiger is at the edge of extinction. The great Komodo dragon has a very restricted range and there are, of course, many endangered birds including the monkey-eating eagle of the Philippines.

All of some 1000 species in the Red Book are subject to what we call the 'action treatment', which is a check list of those things which can be done to help to prevent a species' extinction. Without doubt the most important thing that is required is to maintain the habitat. If you can keep some of the kind of place the animals need to live in, you can in most cases keep the animals.

These are subjects of worldwide interest, and many people feel we have a responsibility for not allowing these species to disappear forever. We feel that this conviction rests

on four different reasons – the four pillars of conservation. First the ethical pillar, which is the question of whether the extermination of a species is a matter of right and wrong; I think it is wrong if it can be avoided. Second is the aesthetic pillar, since there is a great deal of potential enjoyment in animals for people all over the world. Third is the scientific pillar since these creatures are the raw material of science; and finally there is the economic pillar as wildlife can have extremely important potential economic aspects; among other things it can form the basis of a thriving tourist industry. This last is an aspect that can rather easily be developed and is capable of very great extension in many parts of the world.

As Thane Riney of FAO said a few moments ago, conservation is common sense, and conservation needs new impetus all over the world, not least in South East Asia.



KOMODO

# The International Biological Program and Conservation in South East Asia

by

DR. EDWARD H. GRAHAM <sup>1</sup>

*Deputy Convener, Conservation Section of International Biological Program; Chairman, IUCN Ecology Commission; Vienna, Virginia*

Inasmuch as we will have a special session on IBP within the hour and time is short, I shall not burden you with details, but simply tell you that IBP is a new international scientific program in the planning stages. Under the auspices of the International Council of Scientific Unions, IBP is strictly a program of research, but this research is directed at the study of the human environment. It is basically an ecological program. The President of IBP is Prof. Jean Baer, the distinguished zoologist from Switzerland, and former president of the IUCN. The Central Office for IBP is in London at 7 Marylebone Road, London, N.W.1, England.

The success of the program will depend entirely on the way in which scientists in various countries are able to organize their own participation and co-operation with scientists in other countries.

With respect to conservation, IBP is important because it promises to give us a scientific basis for conservation activities. We have made many mistakes in the use of our natural resources because we did not possess the basic knowledge of our environment we required to successfully manipulate and manage it and the natural resources the environment provides. We still require a great deal of basic scientific information to be ecologically successful in forestry, fisheries, agriculture, establishment of parks and natural areas, and particularly in the development of land-and-water-use capabilities. The support of the scientific community of the world through IBP can help to give us this base on which we can develop the conservation of nature and natural resources.

At present (1965) some 30 countries have already established national committees for IBP, a few of which are in South East Asia. Plans are afoot to develop others. Here we have an opportunity for the first time to co-operate among all the nations of the world to gain a better understanding of the environment in which we live. It has been felt for some time that biologists have spent too large a portion of their time on molecular and cellular research. As important as that is, we have not yet had sufficient opportunity to concentrate on field biology and ecological studies. IBP gives us an opportunity to do that, and we hope that South East Asian countries, will take their share of this program, which promises to provide the scientific foundation for sound and solid conservation programs in various parts of the world. What is needed in South East Asia must be based on a knowledge of South East Asia. You must learn more about your own conditions. We know by experience that we cannot transfer knowledge of temperate ecology to the tropics, and we hope you will take steps to participate in this world-wide program which promises so much to all of us concerned with conservation of nature and natural resources.

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<sup>1</sup>

Deceased, 1966.

# The IUCN South East Asia Project and its Implications for Conservation in the Region

by

DR. LEE M. TALBOT

*Director, IUCN South East Asia Project*

Mr. Chairman, Ladies and Gentlemen. The previous Keynote Speakers have described in encouraging terms the interest of the international organizations they represent in conservation in Tropical South East Asia, and the possibilities for co-operation in conservation that they provide. I shall describe briefly the South East Asia Project of the IUCN, principally to illustrate the activity and interest in conservation that already exists in this region; and in this way, to show that – from the standpoint of South East Asia itself – the stage appears to be set for increasingly productive international co-operation in conservation.

## BACKGROUND AND OBJECTIVES

Until recently most international attention to conservation problems has been directed toward Africa. This is especially true for conservation problems involving parks and wildlife. However, similar problems and potentialities exist in tropical South East Asia, and there has been a growing interest, awareness, and concern with the often-increasingly urgent conservation problems in this region.

Early in 1963, during a visit by Dr. Harold Coolidge to a number of the South East Asian countries, it was proposed by some of the governments that the IUCN should organize a project to send a specialist team to visit the countries involved. This proposed project would be similar in outline to the African Special Project, mentioned earlier this morning, and the objective of the first –field mission – stage would be to define and evaluate conservation problems involving parks, wildlife, and other associated natural resources, and to make recommendations on appropriate technical assistance.

Accordingly, under the direction of Dr. Coolidge, the South East Asia Project on Wildlife Resources and Parks was organized; and later in 1963, at its 8th General Assembly held in Nairobi, Kenya, the IUCN formally approved the project.

The purpose of the first stage of the Project has been to obtain a broad perspective of the status of renewable natural resources, especially wildlife and related land use; and to examine and evaluate the problems in the conservation and management of renewable natural resources with a view of recommending conservation measures and to help determine ways in which technical aid in conservation could be sought and applied.

## ORGANIZATION

This project has been an example of effective international co-operation in conservation. The Project was organized and administered by the International Commission on National Parks of the IUCN. It was approved by the Executive Board of the IUCN and the World Wildlife Fund, and financed basically by the American Appeal of the Fund. Various aspects of the Project have been carried out in close co-ordination with – and in some cases with the support of – the activities of FAO, UNESCO, the UN Technical Assistance Board offices, and the Conservation Section of the International Biological Programme. Invitations and local facilities and co-operation have come from the governments involved; six countries were included in the original plan but by now ten countries in the region have been visited and invitations have been received from other countries outside this region.

## **PROCEDURES**

The procedure has been that a team – my wife and I – has visited each of the countries involved. Conditions vary from country to country, so the approach and methods have varied also. In general, the work of the Project in each country has involved five steps:

First: on arrival, consultations have been held with Governments for orientation and to find out what specific things they wanted from the Project.

Second: consultations have been held with those concerned with conservation – both in government and out – to obtain as broad a perspective as possible on the status, use, and conservation of the natural resources involved.

Third: reconnaissances have been made of as much of the country as practicable and more detailed surveys made of areas of particular conservation interest. These surveys have ranged from reconnaissances by vehicle or aircraft lasting only a few hours, to foot expeditions lasting several weeks.

Fourth: before leaving the country the results and conclusions have been discussed with those involved and reports and recommendations written up. In general, these have involved not a single report but a series, and have included a general report on the country plus reports, recommendations and proposals on specific items.

The last stage is the follow up, which involves seeing that the reports, recommendations and proposals get to the people and places where they will do the most good; following through on various recommendations; and helping to organize this conference.

## **ACCOMPLISHMENTS**

At some stage in this process my wife and I have had the pleasure and honor of meeting and working with most of the participants in this conference. Consequently most of you have direct knowledge of at least one aspect of the Project. However, there are many facets to conservation; and both to provide a better perspective of the Project, and of conservation within the region, it is worthwhile to review briefly the different aspects of conservation that have been involved in the Project.

The accomplished objectives may be divided into three types: direct assistance and advisory services provided; recommendations for technical assistance; and facilitation of contacts and liaison between conservationists within the region.

## **DIRECT ASSISTANCE AND ADVISORY SERVICES**

Within each country the requests have been somewhat different. The services requested of the project and provided by it in various countries have included the following:

Surveys of national parks and reserves to make recommendations and assist with management plans, development, staffing, suitability of areas and boundaries;

Drafting or revision of conservation legislation;

Ecological reconnaissances of areas of particular conservation interest;

Evaluation of the effect of lumbering in reserved areas and parks;

Development of reorganization plans for government conservation organizations;

Feasibility surveys for national systems of parks, reserves, and recreation areas;

Wildlife surveys and censuses, including the training of local staff to carry on with the work;

Assisting with curricula for training courses;

Surveys of the status of certain rare species and evaluation of habitats and of factors affecting them;

Training local staff in wildlife management and research techniques;

Defining research needs and priorities;

Planning and organization of research projects, stations, and facilities;

Assistance in formulation of land use plans and policies.

This is not a comprehensive listing of all services provided, but it serves to show the breadth of the conservation problems that are recognized in the region, and the type of approach that has been made to provide direct tangible assistance.

## **RECOMMENDATIONS FOR TECHNICAL ASSISTANCE**

Proposals for specific assistance projects; evaluation and revision of existing proposals as requested; and recommendations on appropriate sources of assistance and follow up contacts with those sources where governmental or other authorities have made specific requests based on recommendations of the Project.

Although such things tend to move relatively slowly, some of the proposals involving research and provision of facilities have already been initiated, and many others are still in preparation or under consideration by the organizations concerned.

## **FACILITATION OF CONTACTS AND LIAISON BETWEEN SOUTH EAST ASIAN CONSERVATIONISTS**

This last type of accomplishment is at once both the least – and at present the most – tangible.

It is hard to overemphasize the importance of bringing together conservationists within a country or a region and of acquainting them with each other's work. Normally this is an intangible thing, but here, at this conference, with over 150 conservationists assembled from some 30 countries, liaison and contact become tangible indeed.

The impressive and enthusiastic attendance at this conference is parallel to the reception given to the South East Asia Project in the countries of this region. In every country the hospitality afforded us has been marvelous, but this is not unusual in this part of the world where hospitality is an art and a tradition. But, beyond hospitality, the welcome extended the Project, the enthusiastic co-operation and assistance provided from start to finish, and the subsequent follow up actions within the countries, have been truly outstanding.

Along with the participation at this conference, the reception of the South East Asia Project indicates the extent of the interest and concern with conservation that is felt within this region.

In the long run, effective conservation in South East Asia must be carried out by South East Asian Conservationists. But the various international organizations represented here can provide essential specialized assistance and facilities that may not be available in this region. The South East Asia Project has shown the possibilities and potentials for international co-operation in conservation in Tropical South East Asia.

But the project is only a beginning; it is now up to all of us to determine where we go from here.

## Closing Remarks

by  
MR. COOLIDGE

This Conference is going to be a happy Conference, and this is in no small measure due to the personality of Lee and Marty Talbot. I have had messages from several countries they have visited indicating to me the satisfaction people in those countries have with new ideas developing as a result of the project, and I am sure that as time goes on there will be more and more ways in which the carrying out of the South East Asia Project will encourage and assist developments in this region, and I am especially happy that the conclusion of this Project in the field mission stage in which the Talbots have been engaged should coincide so well with the holding of this first regional conference where we can give further consideration as to where do we go from here.

The Opening Plenary Session is now concluded.

## **Technical Session I**

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### **INTERNATIONAL BIOLOGICAL PROGRAM (IBP)**

This Session presents some of the plans and proposals for the conservation work of the International Biological Program. This Technical Session is co-sponsored by the Terrestrial Conservation Section (CT) of the International Biological Program.

## Summary of Technical Session I: International Biological Program (IBP)

by

MR. SAMPURNO KADARSAN

*Director, Museum Zoologicum Bogoriense, Bogor, Indonesia*

The International Biological Program (IBP) is a worldwide plan of scientific research in biology concerned with the biological basis of productivity and human welfare. It is established within the framework of the International Council of Scientific Unions, and has a Central Office at 7 Marylebone Road, London, N. W. 1, England, where a small staff works under a Scientific Director, Dr. E.B. Worthington. IBP is organized within an operating framework of seven sections as follows:

1. Productivity of Terrestrial Communities (PT)
2. Production Processes (PP)
3. Conservation of Terrestrial Communities (CT)
4. Productivity of Fresh Water Communities (PF)
5. Productivity of Marine Communities (PM)
6. Human Adaptability (HA)
7. Use and Management of Biological Resources (UM)

The United States has added to its program two more sections, namely (1) Systematics and Biogeography and (2) Environmental Physiology. The central, international organization provides overall co-ordination, but most of the work of IBP is carried out by National Committee for IBP.

Reports were made by several South-East Asian countries on the status of IBP. Prof. S.M. Cendaña reported that the Philippines has established a National Committee and has outlined the framework of a national program. Emphasis will be given to Taxonomic studies of Philippine biota throughout the 7000 islands which compose the nation. Rat reproduction, pests, and pesticides will be investigated, as will the influence of irrigation on the fauna. Biological studies are also planned on Taal Volcano Island, where recent volcanic eruptions have occurred. The question was raised as to whether the island might be declared an IBP research reserve.

Dr. Kasin Suvatabandhu reported that in Thailand an ad hoc group has been appointed to determine whether it will be necessary to establish an independent national committee for IBP, or whether heads of existing institutions might collectively serve this function. The National Research Council is very much interested in the Program. Biological surveys and mapping of natural and semi-natural vegetation were mentioned as subjects of high priority.

In Indonesia the IBP National Committee consists of the directors of the institutes in the National Biological Institute, according to Professor Otto Soemarwoto. These institutes comprise the Marine Research Institute, Botanical Garden, Herbarium, Botanical Institute, and Zoological Museum.

Although no official program has as yet been formulated, stress was put on the need to train ecologists, there being scarcely more than 100 biologists now in the country. Rats form a problem for study, and mountain ecology is of interest. It is planned to establish two IBP research reserves in western Java, one near sea level in the Ujung Kulon Reserve, the other on the twin peaks of Mt. Gede and Mt. Pangrango near Bogor.

Dr. Pham-Hoang-Ho reported that in South Vietnam the National Society of Biologists is taking the leadership for IBP, no national committee having yet been formed. Attention is being given to land, littoral, and marine environments. Studies are likely to include bird migrations, effect of vegetation on climate, water pollution and water conservation. There is interest in coastal island reserves and the establishment of a network of national parks in major ecosystems, both coastal and mountain. The need for more trained biologists was stressed, as was the need for co-ordination between countries, as in the establishment of cross-boundary parks, etc.

Malaysia has not formed a national committee, but Dr. Paul Wycherley reported that action may be taken after a visit by a member of the U. K. National Committee in the near future. The University of Malaya may serve as a focus for action, at least of productivity studies.

Among points brought out in discussion, were the following:

IBP knows no political boundaries, as a half dozen communist countries are among the thirty which have organized national committees and have started to develop programs.

It is important to include man in the ecosystem and consider man in relation to his environment, which has developed with him in it over a long period of time.

A world network of research reserves, representing the major ecosystems of all continents, will serve as check areas or yard sticks for use and management of comparable areas of land or water under intensive use. These protected areas can also serve as the source of animals employed in experimental medicine, especially the large primates, and as reservoirs of genetic materials which may one day be of economic or medical value.

The lack of specialists trained in the biological sciences was stressed throughout the session as one of the critical needs in the improvement of knowledge of the human environment, much of which is still poorly understood in the region. The need for specialist assistance from outside the region in developing IBP projects was also expressed.

Perhaps the most significant point that was repeatedly emphasized was the urgent need for fuller understanding of our environment as a basis for our wise and productive use of it and existence within it, and the opportunity that the IBP offers biologists of all countries to fill this need.

# The Philippine Participation in the International Biological Program

by

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## SUMMARY

A long-range program of biological work for the Philippines has been prepared by the Philippine National Committee on the International Biological Program, and parts of the program considered to have reference to conservation are presented. The Philippines IBP organization has no separate conservation section, but conservation studies are incorporated in other sections.

## INTRODUCTION

The following are some of the projects on ecology and taxonomy that we are either now working on or have planned to start work on in the immediate future, that have some bearing on conservation.

## TAXONOMIC STUDIES ON THE PHILIPPINE BIOTA

Information on the components of the biota is basic to any endeavour in conservation. Much of what we now know of Philippine biota were from results of efforts of foreign collectors and systematists. Now that we have a number of young Filipino workers engaged or are being trained in taxonomy, this phase of activity will receive more attention from local workers, but help from more experienced systematists will be needed to push the work more successfully.

## ECOLOGICAL STUDIES

### Distribution

There are over 7,000 islands comprising the Philippine Archipelago. With what limited information we now have, there is evidence that there are differences in the animal and plant life in these different islands. Contributing to this inequality in quality and quantity of the biota are differences in climatic conditions in different parts of the Philippines.

More intensive collectings and identifications of the biota of the different islands are necessary to have a clearer concept of the extent Philippine species are localized. This will furnish a measure of the affinity of the Philippine biota with that of neighboring land areas.

### Undesirable effects of injudicious application of insecticides

Filipino farmers are continuously being coaxed, especially by private companies, to use insecticides in the control of plant pests.

Yet, we know that injudicious applications of insecticides often have undesirable effects on the natural biota. To cite one example in the Philippines:

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<sup>1</sup> There are four climatic area types in the Philippines, differing not only in the amount of precipitation but also in the distribution of precipitation during the different parts of the year, depending upon the location of the area with respect to the mountain ranges, the prevailing monsoon and prevalence of typhoons.

*Gulaphallus mirabilis* Herre is a small Phallosthetid fish known to exist only in Molawin Creek in Laguna and to a limited extent in another small stream near Manila. In an effort to minimize mosquito incidence in the World Boy Scout Jamboree City in Los Banos in 1960, insecticides, including Dieldrin, were used extensively in the Creek for six months preceding the Jamboree. Recent attempts to collect the fish from the stream failed to yield any specimen where the fish used to be common. It is now feared that the extensive application of insecticides may have been the cause of the vanishing of the fish.

The effect of excessive application of insecticides to control pests on the other natural components of the biota (insect parasites and predators, fishes, frogs, lizards, earthworms, etc.) is considered of immense importance. Studies on this are of high priority.

### **Succession and seasonal abundance of pests**

With an eye on the possibility of minimizing the application of insecticides in the control of pests, it is felt that studies on the succession of pests during the growth of crop plants, and the seasonal abundance of these pests is of utmost importance. It is hoped that this can be started early next year.

### **Effects of irrigation on the fauna**

In our work on rice stemborers, we stumbled on a very interesting phenomenon. The yellow stemborer, *Tryporyza incertulas* Walk, and *Chilo suppressalis* Walk., are the two most important among four species of riceborers in the Philippines. Normally where there is no irrigation in areas of Climatic Area Type I (where there is a long and pronounced dry season in the year), *T. incertulas* comprised about 90 per cent of the borers encountered in the field, and *C. suppressalis* only about 5 per cent. Where irrigation has been brought in, the predominance was reversed – about 90 per cent of the borers encountered were *C. suppressalis* and only about 5 per cent were *T. incertulas*.

More extensive studies on the effect of irrigation on crop pests in all the four climatic area types in the Philippines should be done.

### **Studies on the effects of the Taal Volcano eruption on the biota**

Effects of the volcano eruption on the biota of Taal Volcano Island; Taal Volcano, which is located on an island in Lake Taal violently erupted on September 28, 1965. Observations have already been made on the destructions wrought on the volcano island biota. Monthly observations on the successive re-establishments of the biota on the Volcano Island, both in quality and quantity, are now being made at different observation stations. Soil insects and other arthropods, helminths, molluscs, amphibians, reptiles and rodents, among the animals, and the fungi and higher plants are the chief biotic components that are being watched. The changes in the soil, both physical and chemical, are also being observed. It is planned to compile all the results in one volume at the close of the observations.

The effects of Taal Volcano eruption on the waters and biota of Lake Taal: The effects of the eruption of Taal Volcano on the waters of Lake Taal and on the biota are now being observed and studied by the Commission of Fisheries.

### **Ecological studies on rats**

Rats exact enormous losses on Philippine crops. The chief control measures now employed are poisoning and rat campaign (mechanical). The ecology of the field rats has not been sufficiently studied to be able to make use of it in rat control.

It was found that more protein in the diet induces greater rat reproduction. Examination of stomach contents of field rats showed that insects constitute a good portion of their diet. Does abundance of insects condition rat population? Do outbreaks of locusts trigger heavy rat infestations?

More study of the ecology of Philippine rats is needed. This is of high priority.

At this time the Philippines National Committee does not have a separate Conservation section for the IBP. Instead, conservation studies have been incorporated in several of the other sections. These may be presented in outline form as follows:

**I. CONSERVATION STUDIES IN THE PRODUCTIVITY OF TERRESTRIAL COMMUNITIES SECTION.**

1. Genetics and breeding.
2. Asexual propagation of economic plants.
3. Care management.
4. Control of pests and diseases.

**II. CONSERVATION METHODS IN THE PRODUCTIVITY OF FRESHWATER COMMUNITIES SECTION.**

1. Population studies for sustained maximum production.
2. Effects of fishing gear and/or other methods of exploitation.
3. Effects of changing agro-industrial practices on population growth and movement.
4. Watershed and siltation investigations.
5. Migratory, including rare, and fast disappearing species.

**NOTE:** Collaborative efforts should be made with the sectional committee on Productivity of Marine Communities regarding studies on estuarine or brackish waters.

**III. CONSERVATION IN THE PRODUCTIVITY OF MARINE COMMUNITIES SECTION.**

1. Studies for sustained maximum production.
2. Effects of exploitation methods to the marine resources.
3. Migratory, including rare and fast disappearing species.

**NOTE:** Collaborative efforts should be made with the sectional committee on Productivity of Freshwater Communities regarding studies on estuarine or brackish waters.

# Scientific Development for the Ujung Kulon and Tjibodas Nature Reserves as a Basis for the Indonesian National Participation in the IBP

by

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and

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## SUMMARY

The value of national parks and equivalent reserves for scientific study is less well recognized than the value of these areas for conservation. Nature reserves in the tropics with their great wealth of flora and fauna are vital laboratories for the ecologist. Two areas in Indonesia, Ujung Kulon and Tjibodas, were selected as nature reserves because of their large size and their representation of different biotopes. They offer unlimited opportunity for study and research, and they form the basis for the conservation work of the Indonesian participation in the International Biological Program.

## INTRODUCTION

With accelerated agricultural and industrial development with the consequent shrinkage of open spaces, hardly any government can afford to neglect the issue of conservation. National parks and equivalent reserves are necessities whose values and functions with regard to conservation are widely recognized. Less well recognized are the values of these parks and reserves for scientific purposes. The presence of man in nature reserves is necessary for most scientific studies, but the presence of man may also alter the attributes we wish to preserve. A compromise is necessary and what the compromise will be depends on the knowledge and wisdom of the persons who are privileged to work in the reserves.

The tropics with their great wealth of fauna and flora and the well known complexity of their ecosystems offer ample opportunities to study the relationship of living beings and their environments. Plants and animals hardly known today or regarded as worthless may become valuable material for the well being of mankind tomorrow. Such knowledge can only be obtained in study in a nature reserve.

Furthermore a base unit or control is indispensable to scientific endeavor. The base unit for a systematist is the type specimen, and it is equally important for an ecologist to have a type environment, which is usually a nature reserve. A nature reserve is vital to the ecologist in that it is a real laboratory enabling him to follow the evolution of artificial environments in comparison with the untouched natural one.

Indonesia, located in the tropics, offers many sites where tropical ecology can be studied. As early as 1922 it was proposed that a marine biological station be set up in the Moluccas; in previous years in the field of terrestrial ecology no similar proposal was put forward, but it is recognized that this multi-island country has the greatest possible number of different biotypes. At the present time only two individual reserves – Ujung Kulon and Tjibodas – meet the requirements of a biological station. A brief description is given hereunder.

## UDJUNG KULON NATURE RESERVE

This reserve is a funnel-shaped peninsula with the neck connecting the mainland. It is located at the southwestern point of Java occupying an area of 41, 120 hectares. The western and eastern sides are bordered by the Sunda Strait and the southern one by the Indonesian Ocean (= Indian Ocean). Except for the southwestern part which is mountainous due to the presence of Mt. Payung, the rest of the peninsula consists of plateaus with gently rolling hills. Swamps are found in the eastern part and in the area of the peninsula's neck. Steep cliffs with walls of 50 M high are found on the southern coast, near the mountain. The remaining southern coast is flat and sandy. Dozens of rivers and rivulets originating in the central part of the peninsula transect the whole area and find their outlets in the Indonesian Ocean as well as in the Sunda Strait.

The average annual rainfall is 3137 mm. June through September are the driest months during the year, the greatest rainfall on the other hand occurs from November through February. Maximum daily rainfall is found in December. The temperature is pleasant throughout the year ranging from 18° to a little more than 22°C.

There are three principal islands lying adjacent to the peninsula and they are Panaitan Island (12, 000 hectares), Peutjang Island (460 hectares) and Handeuleum group of islands (70 hectares), each with their distinct topographical features and vegetation. The strait separating the peninsula and Panaitan island offers excellent opportunities for marine biological studies.

The peninsula is covered with luxuriant forest. It includes woodland, grassland, wetlands and many endemic plant and animal species may be found as well. On top of its rich vegetation, this reserve is the only remnant of lowland forest on Java. It is also the last stronghold of the Javan Rhino, *Rhinoceros sondaicus* and the Javan Tiger, *Felis tigris*.

## TJIBODAS NATURE RESERVE

The nature reserve covers an area of 1, 200 hectares and is one of the richest mountain rain forests in the tropics. It is located in West Java on the eastern slope of the twin volcanoes Gede-Pangrango at an elevation of 1400-1900 m above sea level.

The rainfall is abundant. The dry season is confined to a few months in the year and often lasts no more than a few weeks. We are thus in the rain forest in the truest sense of the word.

The reserve is transected with trails which can be followed as far as the summits of Mt. Gede and Mt. Pangrango. At an elevation of 1600 m are three waterfalls, whose water dashes down from a perpendicular wall of 40-50 m high. Near the summit at an elevation of 2150 m one will find hot springs whose presence is revealed from a distance. The springs come out of a rocky wall and flow down into a ravine. The primeval forest is consequently rich in all kinds of plants, trees as tall as 60 m, shrubs, herbs, lianes, epiphytes, hygrophytes, and also in fauna, but as far as large mammals are concerned, the reserve is very poor.

Annexed to this reserve is a mountain garden of 102 hectares which is administered by the National Biological Institute. The reserve and the garden proper form an integral part. The garden, destined for keeping a live collection of plants originating from temperate zones, partly owes its existence to the introduction of cinchona culture in Java. It has been there since 1852 and is located at an elevation of 1400 m above sea level. The average temperature is 18°C.

The garden is provided with a laboratory and living quarters in which one may find facilities to live and work comfortably. In addition to these facilities a small station with similar facilities has been set up near the summit of Mt. Gede. These facilities enable one to work unlimitedly, either in the vicinity of the laboratory or in the forest proper, in close proximity to plants and animals in their natural surroundings.

## **CRITERIA FOR SELECTING THESE RESERVES**

Udjung Kulon and Tjibodas Nature Reserves were selected on the following grounds:

1. The colloquially so-called 'outdoor-laboratories' cover an area of sufficient size. It is imperative that they be self-supporting should their immediate surroundings be entirely altered by human interference.
2. Udjung Kulon is a reserve on the lowland and Tjibodas is representative of the highland, thus forming excellent complimentary samples of different altitudinal ranges in a relatively limited space.
3. The two reserves are readily accessible from the site of the National Biological Institute in Bogor, the largest center in Indonesia where biological research is carried out. The institute provides facilities to work in laboratories and residence for guest research workers. It can thus serve as a base permitting scientists to work in these reserves without taking along excessive equipment.
4. The Tjibodas Nature Reserve and the garden proper, as stated above, already provide working and housing facilities where scientists may conduct uninterrupted research close to the subject they wish to study. The garden is accessible by car from the site of the National Biological Institute at a distance of 50 km.
5. The Udjung Kulon Reserve is not as accessible from Bogor, but it can be reached by a boat trip of about six hours. Housing and working facilities are primitive yet, but one might find the working opportunities more inspiring than Tjibodas since different biotic communities may be found in one nutshell. Plans are being made to set up a field station on Peut jang Island, 500 meters from the peninsula, where working and housing facilities will be provided.

## **CONCLUSION**

From the above discussion it appears that the selection of these two reserves for IBP research is justified for reasons of their large size and their representation of different biotopes. Much has been done in the past in inventorying the flora and fauna of these reserves. A broad ecological survey including quantitative studies of the various biotic communities is indispensable in order to arrive at a better understanding of the secrets of complexities of tropical natural ecosystems. Research of a long range nature is a necessity and in order to facilitate such undertakings the reserve must be equipped with adequate physical facilities, living quarters and laboratories.

In Indonesia, Tjibodas Nature Reserve (and to a lesser extent Udjung Kulon) is the only site with adequate facilities for the type of work described above and can thus immediately be utilized for national as well as international projects. We have, therefore, made them as the basis for much of our national program for participation in the IBP. Both reserves offer unlimited opportunities and it is entirely up to us whether these opportunities will be properly utilized for the sake of science and the future of the human race.

# Unofficial Progress Report on a British Commonwealth Project on Terrestrial Productivity within the International Biological Program in Malaya

by

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## SUMMARY

The preliminary discussions on a project to investigate primary productivity in Malayan tropical rain forest are reported in relation to the need to preserve the sites selected.

The study of primary terrestrial productivity requires sophisticated instrumentation to determine radiation balance and other aspects of the flow of energy. Secondly actual measurements of plant production, especially if these are to be expressed in terms of such parameters as leaf area index, net assimilation rate and relative growth rate, require repeated samplings of whole plants, weighing, counting and measuring their parts. The latter becomes an undertaking of considerable magnitude and remarkably heavy capital and recurrent expenditure if trees are concerned. My colleague Dr. Keith Templeton has conducted such a growth analysis of rubber trees (*Hevea brasiliensis*) from planting until after the canopy had closed over and commercial exploitation of the trees had begun. Dr. Shorrocks has analyzed the chemical composition of the trees. Another research associate, Mr. Yoon Pooi Kong, has investigated growth of several leguminous species under differing degrees of shade and also initiated radiation recording. Perhaps because of this work in progress members of the British Commonwealth Subcommittee on Terrestrial Productivity in the International Biological Program asked for comment on the feasibility of such studies in natural vegetation in Malaya.

There is no need to stress again the fundamental importance of assessing productivity under natural conditions. Such investigations are well advanced in the temperate regions, a beginning has been made for certain tropical crop plants, including rubber trees, in Malaya and other equatorial countries, but so far this has not been attempted for natural rain forest vegetation. It is understood that our American friends intend to promote such a project somewhere in the Caribbean or Central American area, while the Nuffield Foundation will sponsor work in East Africa. Therefore it is logical that the Commonwealth committee should turn to Malaya, partly because the Asian tropics are not covered by the other schemes and partly because Malaya is centrally situated between Australia, New Zealand and the United Kingdom.

Although those of us in an applied institution cannot participate very actively in a long-term fundamental project of this nature and some of the government departments might have similar difficulties, we were enthusiastic to foster this project by placing our experience at the disposal of the committee. Fortunately the University of Malaya provides an ideal research centre for the project and a number of staff in the Faculty of Agriculture, Departments of Botany, Geography and Zoology are already working on allied problems, therefore the essential nucleus for research and training is there. The Executive Secretary of the Royal Society informs us that Professor Burges, chairman of the committee, proposes to visit Malaya in the near future to meet those concerned, assist in formation of a national committee, and make suitable arrangements with the University of Malaya. If any further encouragement is needed to either the University of Malaya or the Commonwealth Committee, I hope this meeting will support the project.

Various actual sites for field investigations have been proposed. Level undisturbed virgin rain forest by flat topography is necessary to reduce complications due to lateral

movements of nutrients or corrections of radiation exchange for aspect. One of the most suitable areas is in or near the 'Jenka Triangle,' about 200,000 acres which are proposed for land development in Central Pahang. Dr. M.D. Poore, previously in the University of Malaya, has run some pilot studies there. Proximity to the land development scheme will provide facilities of access, accommodation, labor and power. However, it is very essential that whether the site for these studies of productivity in natural rain forest is in the Jenka Triangle, adjacent to it or elsewhere, that this site of adequate size to be a self-perpetuating unit (say 200 acres) should be reserved for perpetuity. Obviously it must remain untouched for the period of the project, but it must be available also for others to return to it in later years or the full value of this large scientific capital investment will not be realized. Consequently it will be extremely helpful if this meeting can support the principle that whatever sites are chosen for major IBP studies of this nature should be protected as reserves.



"BIRD OF PARADISE"

# FAO Contribution to International Biological Program

by  
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## SUMMARY

During the last year the International Biological Program (IBP) has taken form. Some projects have been elaborated to the point where possibilities for further specific FAO/IBP collaboration may be rather clearly seen. An attempt is made here to summarize FAO contribution to IBP activities to date.

## INTRODUCTION

### Purpose

The broad purpose of IBP is to advance knowledge of the 'biological basis of productivity and human welfare' through promotion of the worldwide study of;

- (a) organic production on the land, in fresh waters and in the seas, and the potentialities and use of new as well as existing resources; and
- (b) human adaptability to changing conditions.

### Timetable

The first phase of IBP is to be terminated in 1967 and will consist of design and feasibility studies and considerations of methods to ensure that results will be comparable. It will include publication of a series of handbooks, the first of which is now being prepared on the measurement of primary productivity in freshwater.

The second phase, which is scheduled to last about five years, will carry out those studies which were designed and shown to be feasible during the first phase.

## RELATION TO FAO

### Studies of interest to FAO

Examples of studies under consideration in IBP of particular interest to FAO include:-

1. Determination of the proportion of total biological production harvested by man. This is of special importance when comparisons are being made between wild and tame herbivores.
2. Estimates of maximum primary productivity in the principal biogeographical regions of the world of the most productive communities, e.g. artificial grassland, well-manured field crops, forests with dense canopy.
3. Studies of nitrogen-fixing organisms and systems.
4. Surveys of knowledge of genetic variation and adaptation of major crop plants and their wild relatives to determine areas where investigations should be made for sources of additional germ plasm; interactions between cereal genotypes and factors of the environment, survey, conservation and utilization of genetic resources in plants useful to man.
5. Studies of genetic variation and adaptation in animals; animal germ plasm pools.

6. Use and/or adaptation of little used domesticated, semi-domesticated wild animals.
7. Use and/or adaptation of little used plants; upgrading of unimproved tropical plants and of the adaptation of non-tropical plants to tropical conditions.
8. Stages of production in a variety of climatic zones and the conservation of freshwater aquatic ecosystems.
9. Basic ecological mechanisms which control the abundance, distribution and productivity of marine organisms of all kinds.
10. Biological control of animal and plant pests.
11. Processes involved in food preservation and deterioration with a view to improving the former.
12. Conservation and classification of terrestrial environments for the maintenance of large, heterogenous gene pools, to serve as outdoor laboratories, and as a standard for comparison with managed areas, etc., and
13. Adaptability to changes in diet.

### **FAO's Participation in IBP to date**

FAO has participated with observers in the formulation of the IBP almost since its beginning, through S. J. Holt for Fisheries Division and R. A. Peterson for the terrestrial program. Several other FAO officers have participated in various working groups. In the fall of 1962 an inter-divisional Working Group (Chairman: Peterson) was formed to make program proposals for IBP, and to co-ordinate FAO action. The original suggestions were presented to the IBP Program Committee at a meeting in Rome (January 1963) and were later widely circulated. After a meeting of the original Program Committee of IBP (January 1963), Dr. G. L. Stebbins, a member of the Committee, visited FAO and talked to the Deputy Director-General, the Assistant Director-General (Technical Department), Division Directors of the Department, and other interested individuals.

The Director-General early appreciated the value IBP could have in fulfilling the objectives of FAO and on 18 January 1963, in a letter to Professor Montalenti, Convener of the IBP Planning Committee, pointed out the importance of fundamental knowledge in agricultural production to FAO and stated: 'FAO, therefore, looks hopefully to the IBP. . . . to strengthen our fundamental knowledge so that more rapid progress can be made in the applied sciences designed to increase production for human use'. The letter then enumerated some of the kinds of studies in which FAO would be especially interested, and urged 'that where possible these [programs] include collaboration of applied scientists to help in assuring an orientation which will permit a maximum contribution to human welfare'.

The Director-General's letter, the recommendations of the inter-divisional working group and the discussions between IBP and FAO officers all helped to give the IBP a more practical orientation and influenced the decision to include a Section on Use and Management of Biological Resources.

### **Specific Contribution of FAO to IBP and Divisional Interests**

In February 1965 SCIBP met at FAO, Rome, and visits were made to the Director-General who commended the IBP warmly. Various Section Conveners present reviewed and discussed their program proposals with FAO scientists. In October 1965 the Committee of Marine Communities and the working group on Biological Control of the UM Committee met at FAO, Rome. Accommodations and certain services were supplied without cost to IBP.

Fisheries Division is sponsoring several symposia over the next three biennia, some of which IBP will co-sponsor, with FAO bearing the secretariat costs. The Division will also make technical contributions to SCIBP-sponsored symposia, and has offered to assist where possible through EPTA and UNSF programs, as have other divisions.

Plant Production and Protection Division personnel have assisted in the formulation of the program of the working group of the UM Section dealing with germ plasm. The Division has set up a panel relating to various aspects of plant exploration and introduction.

Animal Production and Health Division are concerned with a number of projects or studies which are closely related to IBP objectives including: establishment of animal germ plasm banks; ovum preservation and transplantation; ecology and epizootiology of animal diseases; animal nutrition; stress factors in animals; adaptation and selection at high altitude and temperature extremes; physiological and pathological studies on high altitude mammals and birds; biological control of insect and other species; use of chemical attractants and sterilants and food preservation. Ways and means for effective co-operation with IBP are being considered.

Forestry and Forest Products Division has indicated interest in studies of forest productivity, resistance of forest trees to pests and diseases, the ecological effects of pesticides, range of tolerance of forest trees and other problems which might be studied under IBP. Some of the activities of the Division, include preparation of a methodology handbook for the study and management of large wild mammals, as well as teaching and research activities in this field. Assistance to the CT Committee is being given through field officers. Co-operation with IBP through the already established network of Forest Research institutes should be particularly productive.

It may be concluded that IBP can, by filling vital gaps in the knowledge of the biological processes of production, make a basic and long-lasting contribution to feeding the world's peoples. FAO is supporting IBP as fully as possible as a logical complement to its own program.

# Unesco's Natural Resources Research Program— The Background to Unesco's Participation in IBP<sup>1</sup>

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Bangkok*

## **SUMMARY**

From the beginning UNESCO's science program has been concerned with the natural environment and natural resources.

A description is given of the principal means employed over the past fifteen years in various programs. In the light of a few achievements some general principles have emerged as essential to the work, i. e. the necessity of:

1. an ecological approach to the study of the environment;
2. the integration of studies of the environment; and
3. a conservation approach.

The general tenet underlying UNESCO's program is that international action should be taken to develop knowledge of the natural environment and its potential resources, and means of investigating them, on as systematic a basis as possible for the whole of the planet, and particularly for the less well-known areas. The program is designed to advance scientific knowledge concerning natural resources, to make a synthesis of it, and to provide member states with the research and teaching facilities and the infrastructure that they need in this respect.

## **INTRODUCTION**

### **Background**

Since the organization's earliest days, part of UNESCO's science program has been concerned with certain problems relating to the natural environment and natural resources. One of the first landmarks in these activities was the establishment in 1948, under UNESCO's auspices, of the International Union for the Conservation of Nature and Natural Resources (IUCN); but it is the arid zone research program, launched by the General Conference at its third session, at the end of 1948, that has been the most spectacular line of action and provided the basis, together with much of the substance, of the present program. The Advisory Committee on Arid Zone Research was set up in 1951 to advise the Director-General on the preparation and implementation of the program. It has held twenty sessions, the last of which took place at Jodhpur on the occasion of the opening, in December 1964, of the Central Arid Zone Research Institute of Jodhpur (India). Throughout its fourteen years as a distinct item in UNESCO's scientific program, the arid zone program has developed considerably, the annual appropriations for it under the regular budget alone having risen from a few thousand dollars at the start to over \$300,000 in recent years. The funds provided from the Expanded Program of Technical Assistance and, of course, direct allocations by governments for studies and appropriate national institutions, have increased similarly.

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<sup>1</sup> This paper is part of an article, 'Unesco's Natural Resources Research Programme', published by UNESCO in *Nature and Resources*, Vol.1, Nos. 1/2, June, 1965. Not included in this version are sections of the original article on 'Hydrology', 'Geological Sciences', 'Soil Sciences', and 'Planning of Programs and Co-ordination'.

Although on a much more modest basis, an international program of research on the humid tropical zones was included in UNESCO's activities in 1955. It too was placed under the supervision of an Advisory Committee for Humid Tropics Research, which has held four sessions.

As these various projects developed, it became increasingly evident: that certain activities undertaken under a given program in fact concerned an entire continent or the whole world (e.g., saline soil problems); that, on the other hand, other activities should be undertaken which did not exactly fit in with any of the existing programs (e. g., geological mapping); finally, that there was in fact a great similarity of methods and problems between such apparently different programs as those concerning the arid zone and the humid tropical zone (e.g., agroclimatological studies).

For these reasons, in 1960, all these activities were regrouped within a single division known as the Division of Studies and Research relating to Natural Resources.

## **SOME ACHIEVEMENTS**

There can be no question, in this context, of giving a detailed enumeration or appraisal of the results achieved over the past fifteen years against the background sketched above. The most that can be done is to give an idea of the principal means employed and to bring out, in the light of a few achievements, some general principles that have emerged as essential to the work.

### **1. Principal means employed**

The first task was naturally to define the concepts and problems to be dealt with. It was thus necessary to define what was meant by arid or semi-arid zones, to classify them, and to fix their bounds. This kind of work, incidentally, immediately raises a considerable number of questions and controversies which suggest lines of research to be investigated. To give an example, the somewhat academic work concerned with the classification of arid regions very soon led to extremely practical applications in agroclimatology, where yields and agricultural possibilities are linked with definite climatic factors.

Once they have been defined as a result of the discussions of advisory committees or the studies of experts, the general framework of programs and the methods used developed according to a process which is now classic in the international field. Its principal features are, first, general surveys (surveys of the institutions carrying out certain items of research, surveys regarding the nature and scope of current research, and so on), the preparation of reviews of the present state of knowledge (reports and inventories), the organization of symposia to discuss research and new ideas, the publication of reviews, reports and studies, etc. For instance, under the arid zone program alone, about twenty major international symposia have been organized, and about thirty volumes of studies on reviews of research have been published directly by UNESCO; twenty-six issues of the quarterly bilingual Arid Zone Newsletter have also been published. At the same time, a large number of research projects of general interest have received technical or financial assistance, and regional studies have been carried out. In step with this, the research and teaching infrastructure of Member States is being created or developed. This may be done under the Organisation's regular program, under the Expanded Program of Technical Assistance, or through a combination of the two, or, now, through the Special Fund. Institutions that have received this aid include, apart from the Jodhpur Institute already mentioned, the Negev Desert Institute (Israel), the Egyptian Desert Institute in Cairo, the Geophysical Research Institute of Quetta (Pakistan), the Ankara Botanical Institute, the Abu Ghraib Arid Zone Research Institute of Iraq, the Mexico City Institute of Applied Sciences, and the Tunis Arid Zone Research Centre. Lastly, as a complement to this and in order to train the necessary national personnel, as many fellowships as possible are, of course, awarded for study abroad, extended post-graduate courses are organized in the universities of developed countries, or short training and refresher courses are arranged on a regional basis (some thirty such courses have already been held).

Experience seems to show that these various methods need to be combined. It should be stressed that, in all that pertains to the study of the natural environment and natural resources, it is important, while promoting a general advance of knowledge at the

international level, simultaneously to provide the necessary 'home-based' facilities for work and training at the local level, precisely because this study, dealing with such a subject, cannot be conducted from abroad, and should, first and foremost, benefit the local populations.

## **2. General principles concerning environment**

The results achieved and the experience gained have also suggested certain general principles concerning the environment; these principles are of particular importance to the developing countries. The methods are the subject of a document being submitted separately to the Advisory Committee under the title 'New Methods of Natural Resources Study', and so only the bare essentials will be mentioned here.

The first of these methods is to adopt as far as possible an 'ecological approach' to the study of environment, that is, to keep constantly in mind the interactions between living beings and their physical and biological environment. This approach makes it possible to work with, rather than against, nature. It is particularly necessary in those areas where relatively little is known about the environment, as indeed is the case in many developing countries, and it helps to avoid failures due to the hasty adoption of agricultural or industrial methods successfully used in different ecological conditions. In a broader sense, this ecological approach may be taken to include sociological considerations, which are much too often neglected.

The second method, which is not entirely independent of the first, involves integration of studies of an environment for the good reason that the various components of a given environment are closely related one to another, whether it be a question of geomorphology, geology, soils, hydrology, climate, vegetation or fauna. Integrated studies are greatly facilitated by the use of aerial survey methods, as was made clear at the conference organized by UNESCO at Toulouse in 1964. They have the further advantage, in countries which are little known and difficult of access, of employing interdisciplinary surface expeditions, which are in the end less expensive than a series of individual surveys.

Finally, some mention must be made of the need, in all environmental studies for a 'conservation approach', which means giving attention not only to the possible ways of using the resources and mechanisms of nature, but also to the basic perturbations and irreversible processes that may be set in motion and to the real net result of human intervention. Indeed, such considerations are responsible for the important place that conservation has always been given in UNESCO's program.

## **THE PRESENT PROGRAM**

The foregoing remarks will give some idea of the general trend of UNESCO's present program with regard to natural resources research. It should be stressed that this program is essentially concerned with the study of the various components of the natural environment which are capable of providing man with resources, and of the interplay of these components. It is therefore a basically scientific program in which economic considerations are only incidental. The general tenet underlying the program is that, since man lives on the resources of nature, since the increase in the number and needs of the world's population is making steadily increasing calls on these resources, since the developing countries do not know enough about the potentialities of their territories and since the natural sciences, i.e., biological and geological sciences, are pre-eminently international, it follows that international action should be taken to develop knowledge of the natural environment and its potential resources, and means of investigating them, on as systematic a basis as possible for the whole of the planet, and particularly for the less well known areas. Leaving aside the marine sciences, which are the subject of a comparable but separate program, the principal activities are, of course, concentrated on geology, geomorphology, soil science, surface and sub-surface hydrology, and plant and animal ecology (with the physical, climatological and biological factors involved). These activities are described in UNESCO's program and budget as adopted by the General Conference at its last session. This report will merely recall the guiding principles in each major subject, while stressing from the start that there is much similarity in working methods from one subject to another and, above all, that in each project concerning a given subject the broader view of the oneness of the natural

environment and the need for its elements to be integrated are kept constantly in mind. This is helped by the fact that all these activities are grouped within a single division of the Secretariat.

## **ECOLOGICAL STUDIES AND CONSERVATION**

This general heading covers a fair number of activities which are largely derived from the arid zone and humid tropics programs.

First come studies and research concerning ecology and the potentialities of certain type regions with particular environmental conditions. The agroclimatological study undertaken jointly with FAO and WHO in the Near East, for example, is being followed up by a similar study in the Sahel region of West Africa, and a third study is planned for the Andean Plateaux. These studies give rise to some major problems of methodology which will be analyzed at an international symposium in 1966. A symposium on the ecology of subpolar regions is also planned for the same year. Other studies of a more fundamental character are under way; in particular, a symposium on methods of measuring the productivity of the earth's plant cover will be organized in 1965 at Copenhagen, in liaison with the International Biological Program. Lastly, action designed to promote the systematic study of tropical fauna and flora will be continued (Flora Neotropica Project, studies of termites, organization of tropical herbaria and zoological collections, etc.).

Work on the synthesis of knowledge will also be continued. Provision is thus being made for the standardization of methods of representing vegetation on maps and the publication of small-scale vegetation maps (1 : 5,000,000 for the Mediterranean zone, and 1 : 10,000,000 for Africa). A general work on the natural environment and resources of Latin America (similar to that already published on Africa) is being prepared.

As regards nature conservation, action is centered primarily on the development of co-operation with the International Union for the Conservation of Nature and Natural Resources (study contracts, organization of regional meetings, such as the one to be held in 1965 at Bangkok for South-East Asia, publications, preparation of long-term work plans, and so on). Besides this, certain special activities will be undertaken (e. g. the revision of the London Convention on Nature Protection in Africa) or continued (e. g. assistance to countries in instituting national parks and organizing conservation measures, or the assistance provided for the Charles Darwin Station in the Galapagos Islands).

Lastly, as in other domains, a considerable part of the activities bears on the training of specialists and the creation or strengthening of the research and teaching institutions needed by developing countries. Apart from the regional courses and full-length post-graduate courses, mention should be made here of the particular effort being made for the establishment of multidisciplinary research and training institutes for the study of the natural environment and its resources. Such institutes will normally find their place within universities (or, possibly, national scientific research councils). Their structure will obviously depend on the special circumstances of each country, and they will in some cases be based on the extension of existing institutes. However, they will all have to be assured of clear liaison channels and effective co-operation with the various national services concerned with the study of the natural environment and resources. Their function will be to make a thorough and penetrating study of a country's ecological problems, to arrange for the integration of overall studies, to promote scientifically sound working methods, to carry out comprehensive reviews and draw up general inventories of the resources of the natural environment, and at the same time to train the specialists of post-graduate standard needed for this work and for other appropriate national services. The Jodhpur Institute already mentioned is a good example of what seems to be needed in this respect in many Asian, African and American countries. Be it noted, simply that in the case of Jodhpur, the institute is concerned with the problems peculiar to a climatic region within a large country, but that, on the other hand, it would be possible, particularly in Africa, to have a single institute serving several countries sharing specific ecological features (e.g., the Sahel zone).

The program described in part above is designed to advance scientific knowledge concerning natural resources, to make a synthesis of it, and to provide Member States with the research and teaching facilities and infrastructure that they need in this respect.

## Technical Session II

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### ECOLOGY

This Session considers the ecological aspects of conservation in Tropical South East Asia, with emphasis on comprehensive, integrated planning for the use of land and water resources.

An overall Summary of the Session and a more detailed summary of the papers and discussion are presented, and the papers have been grouped into six major sections:

1. Comprehensive, integrated resource planning and research.
2. The human factor.
3. Forest and watershed management and research.
4. Wildlife resources.
5. Pesticides and herbicides.
6. Aquatic resources and pollution.

# Summary of Technical Session II – Ecology

by

Session Summarizer

DR. F. FRASER DARLING

*Vice President, The Conservation Foundation, Washington, D. C.*

Since it is the treatment of the watersheds that determines the ecological health of the lands and waters below all the way down to the sea, it is preferable to start with the watersheds and work down to the sea, instead of starting with the coast and fisheries as the papers were read.

Dams were no cure-all if siltation and rapid run-off were allowed. The anthropologist from Ohio had remarked on the increasing populations of the hill tribes and immigration from over the borders; he had put his finger on the crux of the problem in saying that eventually these people must be coaxed out of the mountains to safeguard the watersheds. This led on to land-use planning mentioned by several speakers: the new thinking in the ecology of land use was towards intensification of agriculture on the good lands which could endure high treatment and take advantage of plant genetics and precision placement of fertilizers, and to leave marginal lands alone or rehabilitate them to their former habitat conserving vegetation. These marginal lands, after all, were the choicest recreational lands which become more important and valuable as leisure and wealth increase. The great rice-bowl of Thailand was one of the most favored highly-productive areas of land in the world.

Mich appreciated were the remarks of the agricultural entomologist from Malaya who had come independently to the view held by forward-thinking ecologists in U. S. A. and Europe that dangerous insecticides should be used on a principle of minimal use after all ecological aids to suppression of incidence of plague populations of insects had been employed.

It was evident that much of the protein in the diet of South East Asia would come as fish from fresh and salt waters; therefore, the remarks of the Australian fisheries biologist were pertinent, that we must follow research into life cycles to find where intervention and manipulation were possible. Finally, it must be pointed out that the whole problem of the rapidly increasing human populations had been politely ignored by this session of the conference. Yet, without solution of this problem there could be no chance of conservation catching up with degradation of habitat.

## **SUMMARY OF PAPERS AND DISCUSSION OF TECHNICAL SESSION II – ECOLOGY**

### **1. Comprehensive, Integrated Resource Planning and Research**

Mr. Nicholls discussed methods of surveying elements of the natural environment and emphasized the team approach.

Mr. Panton outlined an approach to land capability classification used in Malaya and showed maps demonstrating existing land classification compared with future land capability.

Dr. Thai Cong Tung presented a summary of the soil-vegetation relationships and system of soil classification in Vietnam.

Mr. Devred of FAO urged countries within common ecological zones to cooperate in investigation and solution of resource problems.

Mr. Daley talked about the need of the large urban population of Hong Kong to utilize the several hundred square miles of territory not now occupied by people and the necessity to engage in systematic land planning.

Mr. Gülcur talked of research as a basis of natural resource management, to counteract their wide mis-use in South East Asia today. The need to conserve renewable natural resources is causing a shift in emphasis in research, and he recommended creation of a high level body to support this type of research, and encourage training.

## **2. The Human Factor**

Dr. Gill of the U.S.A. discussed the problems of land mis-use in Asia and stressed the need for land classification.

Dr. Denton described the traditional ecology of the hill peoples of South East Asia and its breakdown and needs of any conservation program for them.

Mr. Gülcur discussed water, soil, and forest problems as related to socio-economic needs in the Philippines.

What was the response of the Thai people to their government's efforts to stop illegal cultivation was asked during the discussion.

It was replied that the people or cultivators themselves subscribe to the ideas of stopping these illegal practices; however, they need the support of the government for resettlement etc. for their survival.

Other discussion centered upon ownership of the land, which was said to be in government hands.

The need of increased research and intensive use of the land to sustain the basic necessities of life was stressed.

## **3. Forest and Watershed Management and Research**

Mr. Udhai Chanphaka discussed efforts by the Forestry Department to reforest lands where the watershed has been damaged and described the river systems of Thailand.

Mr. Sa-ard Boonkird described the pioneer efforts to study the influence of forest fires on surface runoff and soil erosion in different forest and soil types in Thailand.

Dr. Sanga discussed the destruction of watershed in areas inhabited by the hill tribes of Thailand.

Mr. Rahman-Ali gave a brief history of forestry in Malaya, described conservation plans and action and made suggestions for future forest policy.

During the discussion period Mr. Nablo from the Philippines inquired of Thailand's goal for a maintained vegetation balance. The reply was fifty per cent of the land in forest or cover.

#### **4. Wildlife Resources**

Dr. Payne stressed the importance of the ecological approach in the development of animal husbandry resources in South East Asia, emphasized the needs for expansion of these resources and visualized the integration of wildlife in the overall farming operations in the area.

Vu-Ngoc-Tan of Vietnam presented a detailed case for domestication of wild deer, principally the sambar and hog deer.

Mr. Hitchcock presented a preliminary survey of the wildlife of Australian New Guinea, sketched the background of the area, and told how the plants and animals played an important role in the lives of the people.

Mr. de Silva described Sabah's rich wild resources, the need for reserves to protect both flora and fauna, and explained some of the important features of the excellent 1964 Fauna Conservation Ordinance.

Nguyen Van Hiep and Nguyen Dinh Mo described the raising of deer by rural people in Vietnam as a cash crop.

Dr. Harrison's research showed that cosmopolitan 'pest' species (i. e. rats) move in to replace the original forest mammals when the original Malayan rain forests are cleared.

#### **5. Pesticides and Herbicides**

Mr. Conway described the effects of insecticides in temperate countries; by comparison the effects of insecticides can be much more severe in the humid tropics where there seems to be a good natural balance for the continuous development and extension of pests. Research is needed to determine the origin of the pests and make up of the natural forests.

Dr. Meijer described the extent of logging in Sabah, the use of arboricides, and their effects, and suggested that regeneration of tropical forests might be best accomplished without the use of poison girdling.

Mr. Brooks asked Mr. Conway whether there was evidence of accumulated pesticidal damage to birds and their reproduction, and Mr. Conway replied that he was aware of none.

In discussion Dr. Bourlière warned about oversimplification and that what may be true for mammals may be quite incorrect for invertebrates.

One must also be careful about the extension of concepts from one country to another; one cannot always generalize about the best means of pest eradication.

In the tropics where many crops are tree species, use of pesticides may be especially harmful through the destruction of natural parasites. Such interrelationships need further study.

Mr. Coolidge recommended that there be a resolution calling for more research on rats and their ecology and noted that a rat research institute has been set up in the Philippines to study rat behavior and control.

Dr. Wycherley noted that rubber plantations vary greatly in their degree of proximity or isolation from natural forest or secondary vegetation and in form of ground cover: shrubs, grasses, legumes, or bare soil. Cosmopolitan rat species invade from the villages. Domestic cats control some of the rodents in the village but also drive them into the rubber, where the natural control by snakes is jeopardized by the constant persecution of these reptiles.

Repellants are of variable effectiveness, some mammals seem to be little disturbed by them.

It is very difficult to persuade people to wait patiently while some damage to crops or ornamentals goes on until natural control is achieved especially as they are under constant pressure by salesmen or advertisements. Probably if one once starts spraying contact insecticides in gardens or around domestic dwellings one is wedded to it indefinitely, an area is created where parasitic and predatory insects are destroyed preferentially to the pests which may spread out. The effect of residual spraying against malarial mosquitoes is undoubtedly beneficial to human health, but there is evidence that this too destroys other insects which exercise natural control whose suppression is indicated by the increase in number of caterpillars eating the atap roofs.

Thus the domestic habitats must be considered as centres of mammal and insect pests in the context described by Conway and Harrison.

## **6. Aquatic Resources and Pollution**

Mr. Tubb said that the fresh water fish population of the Mekong River area was highly complex, with several hundred species. A great deal of information on life cycles of fishes is urgently needed and should be part of the elaborate development plans of the Mekong River Basin. To date various types of studies and technical assistance have been undertaken.

Mr. Bromhall linked the conservation of river basin systems to the fisheries resources of marine areas, emphasized the need for research to develop the marine resources of the region and cautioned against destruction of coastal waters by the more subtle means of water pollution and dumping of spoil.

Mr. Rosell pointed out that the rapid industrial expansion to meet the needs of greatly increasing population is the source of the water pollution in the Philippines.

In the discussion a Thai delegate asked Mr. Tubb how many fish species should be studied for their life cycle and if the studies should be confined to economic species or species in general.

The answer was that there are many hundred species living in various niches. If one species is eliminated then others may be affected. One should therefore study the life cycles of all species. But it is desirable to study the commercial species first. A research program should be based on these.

The Chairman inquired if the foundations concerned could propose fisheries research and could this be initiated before the river system is disturbed.

Mr. Tubb answered, yes, the U.N. Special Fund is considering two projects – one in the Mekong for preimpounding studies. It is hoped that these will become the focal point of fisheries research.

Dr. Darling asked Mr. Bromhall what was meant by lack of development of marine resources.

Mr. Bromhall replied that this is a complicated question. In the sea there is no control and management and the fishermen are itinerant. In general the industry is poorly financed. The vessels are old and the ignorant fishermen are heavily in debt. We know very little about the fish as fish. There is no research.

Dr. Cedana said that in the Philippines pollution is also due to explosions and asked if this were serious.

Mr. Bromhall described the widespread practice of dynamiting to catch fish and to collect coral specimens, thus destroying habitats. He pointed out that in Chinese the word 'dynamite' means fish bomb.

This practice dates back to centuries and even legislation is not able to stop it. In certain cases the reason for using dynamite is the rapid movement of the fish which makes it difficult or impossible to catch them with conventional nets. By the time the nets are spread the fish are gone. The answer may, therefore, lie in using new methods e.g. the use of light synthetic material for making nets and the use of fast moving boats.

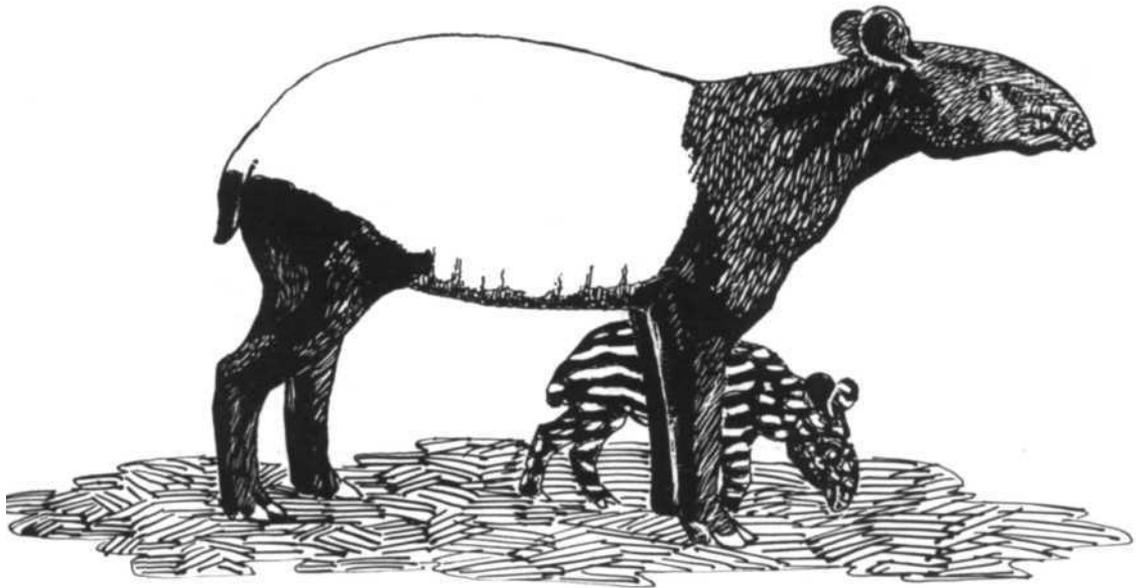
Dr. Cedana pointed out that the people of Asia depend on fish and rice for their food and people around sea-shores depend on the sea fishes. He suggested transplanting fishes from one country to another. He recommended that a working group be formed and representation be made to governments concerned recommending the catch of fish be based on size limits i.e. only fish above a size limit be caught, others to be returned to the sea.

It was agreed that a draft resolution be submitted to the Resolutions Committee.

Asked what the major source of pollution was, Mr. Bromhall replied that it was toxic effluent from industrial wastes, especially tannin, dyeing, and sulphites. Sewage is a factor but not a serious one yet.

Dr. Marshall inquired if there is any research into getting rid of industrial wastes.

Mr. Bromhall replied it is generally fairly well understood that poisonous effluents can be neutralized before release. There are international agreements on the control of radio-active wastes. The local authorities can exert the right control.



MALAYAN TAPIR

# Part I

## Comprehensive, Integrated Resource Planning and Research

### Proposed Inventory of Natural Resources of Thailand

by

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#### SUMMARY

The importance of natural resource inventories is examined and proposals reviewed for cataloguing of natural resources in Thailand using integrated survey techniques.

#### INTRODUCTION

Rational resources management and land-use planning requires a basic knowledge of the existence, location, and status of the country's natural resources which unfortunately few developing countries have. The need for resource inventory has been recognized and emphasized by many authorities – Fontaine (1964), Spencer (1957), Talbot and Talbot (1964), and Brown (1964). There is no doubt as to the losses that can occur when development proceeds on the basis of expediency instead of on the basis of needs and the capabilities of the land. Scientific data about the various regions in Thailand has not yet been gathered in a systematic or co-ordinated manner although a generalized soil map and some detailed studies of vegetation and soils in selected areas do exist.

#### STUDIES IN AUSTRALIA AND NEW GUINEA

Regional resource studies in Australia and New Guinea by Christain (1952, 1958, 1963) and his co-workers (1960) enable the necessary data to be collected and co-ordinated with considerable economy of effort. A classification of similar areas – 'land units' – which tend to be associated in distinctive landscape patterns over definable areas – 'land systems' is arrived at by interpretation of patterns observed on aerial photographs and the correlation of these patterns with detailed surface observations at selected sites. The co-ordinated observations are made by a team consisting of a climatologist, agriculturalist and a hydrologist and by various scientific services. Experience has shown that apart from making the overall objective possible by this approach the association of different disciplines has greatly assisted each specialist with observations in his own field. Moreover, the method lends itself to surveys at stages starting with broad-scale reconnaissance and leading on to more detail in those areas indicated in the first phase as being worthy of closer attention. The data collected at each stage is permanently valuable.

## RESEARCH IN THAILAND

The Applied Scientific Research Corporation of Thailand expects to commence in 1966 on an inventory of natural resources in Thailand undertaken largely through such an integrated survey. Already preliminary work on the production of a 1:1, 000, 000 scale soils map has been started through a co-operative program between the Kasetsart University, the Department of Land Development, and the Research Corporation. Some phases of the associated climatological studies are already in hand through another program.

The results of this inventory will be used to indicate problems which require investigation and will assist in assigning priorities to research programs aimed at solving these problems. The survey will also be used to identify conservation problems and to delineate ecological type habitat areas which should be preserved for future studies. During the survey the opportunity will be taken to build up the Thai National Reference Collections of flora, fauna, and other materials which are being assembled by the Research Corporation as part of its statutory obligations.

## LITERATURE CITED

- Brown, Leslie H. 1964. An assessment of some development schemes in Africa in the light of human needs and the environment. I. U. C. N. Publications New Series No. 4.
- Christain, C.S. 1952. Regional land surveys. *J. Aust. Inst. Agric. Sci.* 18: 140-143.
- Christain, C.S. 1958. The concept of land units and land systems. Proc. 9th Pacific Sci. Congr. 20: 74-81.
- Christain, C.S. 1963. Survey and assessment of land resources. United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas, Geneva, Paper No. 950.
- Christain, C.S., G.A. Stewart, and R.A. Perry. 1960. Land research in Northern Australia. *Aust. Geogr.* 7: 217-231.
- Fontaine, R.G. 1964. F.A.O. ecological studies as a basis for agricultural development. I.U.C.N. Publications New Series No. 4.
- Spencer, Joseph E. 1952. Land and People in the Philippines – Geographic problems in rural economy. (Univ. of Calif. Press, Berkeley and Los Angeles).
- Talbot, Lee M. and Martha H. Talbot. 1964. Renewable Natural Resources in the Philippines – Status, problems and recommendations. Int. Comm. on Nat. Parks, I.U.C.N.

# Land Capability Classification in the States of Malaya, Malaysia

by

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## SUMMARY

This paper outlines an approach to land capability classification for land use planning purposes which is being applied in the States of Malaya, Malaysia, where data from specially prepared maps showing mineral potentiality, soil suitability and forest productivity are used in the assembly of capability maps indicating the areas best suited to mining, agricultural development, and productive or protective forest, or other resource use purposes.

The land capability maps which are produced on a scale of one inch to a mile (1:63, 360) are accompanied by reports which compare the capability classification data with the present use pattern, and outline the broad development opportunities apparent from the contributed resource maps. These are designed to be of use to development planners and others concerned with the best use of the land within a sound conservation context.

The program of land capability classification is a closely co-ordinated program involving a number of Government agencies, and the intention is to prepare maps with accompanying reports for the whole of Malaya within a three-year period which commenced in 1965.

## INTRODUCTION

With an average population density of 70 persons per square mile, Malaysia is fortunate in having a relatively low population in relation to her territorial area and large tracts of unused land are available for future development. There are considerable reserves of unexploited minerals, uncultivated soil, uncut forest, and un-utilized water.

Surveys of these and other resources are in an advanced stage, and particular emphasis is given to strengthening the survey organizations which are concerned with the mapping of the exploitable reserves, and to utilizing the results of these surveys for practical purposes of development planning.

For throughout Malaysia today the pace of development is rapid, and new lands are being opened up and new industries developed in accordance with carefully prepared Five-Year Plans. Diversification of both agriculture and industry is of paramount importance, and feasibility studies into new crops and new industries utilizing local produce are constantly being undertaken.

It is apparent that Malaysia can learn from the experiences of other countries, many of which are more economically advanced than herself, in planning for use of the unused areas before the land in question is irretrievably committed to a particular use purpose which may later be found to be inappropriate. In order to do this it is extremely important that the results of survey and other investigations are co-ordinated for land planning purposes. This in turn implies a spirit of co-operation not only between the agencies conducting such surveys, but also with those carrying out the physical planning and actual development.

Such conditions exist in the States of Malaya, where an impetus has been given to this work by the pressing need to settle large numbers of landless persons, particularly from the crowded West Coast States, by opening up large areas of unexploited land,

particularly in the East Coast States and in the interior which are the places with the greatest potentials for agricultural, forest, and water use development.

## **LAND CAPABILITY CLASSIFICATION**

Land Capability Classification has been seized upon as being the appropriate technique for translating the technical data amassed by the survey agencies into meaningful terms for the developers and the community at large. The essence of this classification is its simplicity, the intention being to present the data in such a way that it is understandable to those who are not necessarily well informed about the actual resources. The maps which embody this classification are intended to be used as guides to planning by the development authorities, who should thus be able to prepare their development plans with greater assurance, and to direct their efforts into those areas where the most beneficial results can be expected.

The classification is a very simple one, and it divides the land into the following five broad groups: -

- Class I      Land possessing a high potential for mineral development and therefore best suited for mining.
- Class II     Land possessing a high potential for agricultural development with a wide range of crops and therefore best suited to agricultural diversification.
- Class III    Land possessing a moderate potential for agricultural development with a restricted range of crops and therefore best suited to agricultural development with crops having a wide range of soil tolerance.
- Class IV    Land possessing a potential for productive forest development and therefore best suited to commercial timber exploitation.
- Class V     Land possessing little or no mineral, agricultural, or productive forest development potential but suitable for development as protective reserves for conservation, water catchment, game, aborigine, recreation, or similar purpose, or possibly suitable in the future for productive forest plantations with introduced species.

## **HISTORY OF LAND CAPABILITY CLASSIFICATION**

The story of how Land Capability Classification has come to occupy its present place in the field of economic planning is an interesting one which goes back several years. In 1954 a World Bank mission visited Malaya, and in a comprehensive report this mission recommended the creation of a Land Use Survey team to direct attention towards diversification crop potentials, particularly in the undeveloped areas, and to co-ordinate the survey aspects over the entire resource-use field with emphasis given to agricultural development opportunities. Later, in 1962, a team of experts provided by the Ford Foundation visited Malaya in order to undertake a study of agricultural diversification of the Malayan economy and to report and make recommendations thereon. The report particularly emphasized the need for more soil surveys but advocated that greater attention should be given to surveys of resources generally. Emphasis was also given in this report to the need for utilizing the indigenous forests to better effect, and to ensuring that the permanent forest estate was sited in those areas where it would least interfere with the pressing need to develop more land for agriculture.

In many respects these recommendations were reflecting local sentiment in the technical departments of Government. A degree of co-operation amongst the various resource survey agencies had existed for many years and in some cases this extended to joint field programs, and a healthy exchange of field data and experience.

During the period of the Malayan First Five Year Plan (1956-60) data collected by the resource survey teams was applied to development problems by means of a certification system, which was introduced to assist in ensuring that land chosen for large agricultural development schemes was suited to the purpose of the scheme, and particularly to the crop which would be the mainstay of the scheme. The certificates, which were

insisted upon by the development agencies, principally the Federal Land Development Authority, included a clearance certificate prepared by the Geological Survey to the effect that the area was free of workable mineral deposits, and a similar clearance from the Forest Department indicating that the area had been properly exploited of commercial tree species prior to felling and clearing. A soil suitability certificate was also insisted upon, and this was supplied by the Department of Agriculture which carried out a soil examination of each site before issuing the certificate. In some cases the soil suitability certificates were withheld for several years until the crop in question has been proved suitable by observation of a test plot under the prevailing soil and other environmental conditions, or until the soil had been ameliorated by drainage or other improvement measures.

Within a few years some sixty major schemes, each covering 4,000 acres, and several hundred smaller schemes, mostly between 50 and 300 acres in extent, have been successfully established in various parts of the Malayan peninsula.

The advent of the Malayan Second Five Year Plan in 1961, saw the introduction of the Red Book, a compendium which includes information on the present land use pattern, and proposals for development during the period of the plan, which was prepared for each of the 70 administrative districts and which proved to be a useful device for stimulating development at all levels of the administration. This very practical approach to development is outside the scope of the present paper, but deserves mention as it is a most striking innovation which has contributed greatly to the success of the immensely successful current Malaysian Rural Development drive. It has brought the lower echelons of local expertise into the planning process, and has considerable popular appeal, while it has also helped to instill a realization of the importance of careful selection and sound planning throughout the country.

Experience in dealing with the problems of development led to a general recognition throughout all sectors of Government concerned with land administration and resource development that the present land use pattern, which had largely resulted from a *laissez-faire* approach to land alienation and a somewhat arbitrary system of allocating land for reserve purposes in the past, was incompatible with the best economic uses over many areas. For example, agricultural development was being forced on to erosion-prone hillsides in some areas where the demand for agricultural land was particularly great, while in neighbouring districts lowland areas of good topography which contained rich soil might be gazetted as forest reserve and remain un-utilized.

Sensible re-allocations which reflected the capability of the land as deduced from existing survey data, usually supplemented by rapid soil reconnaissances, were made from time to time, but only on a small scale, and they were ad hoc in the sense that the land use proposals were not interconnected, and no systematic appreciation was yet being carried out on a national basis. These ad hoc plans have however worked very successfully and have culminated in recent years in a proposal to carry out a detailed natural resources appraisal and prepare a development master plan for a particularly large area, covering 600,000 acres, which has been found from reconnaissance surveys to be well suited for a large development scheme incorporating both agriculture and forest exploitation.

The experience gained from these exercises in development planning for better natural resource utilization has emphasized the importance of co-ordinating the data from resource surveys and using it for classifying the broad land use capabilities, and a logical follow-up was to draw up a generally acceptable Land Capability Classification system using quantitative as well as qualitative criteria to mark the limit of suitability for the different resources, and to apply this classification over the States of Malaya as a whole.

At the same time attention was focused on those fields in which the survey coverage was inadequate or the survey organization was weak due to shortages of trained staff, or deficiencies in equipment, or, as in the case of present land use survey, non-existent, and efforts have been made to remedy these shortcomings with the aid of Colombo Plan assistance. The co-ordinating aspects of the work program are entrusted to a technical committee which is a sub-committee of the National Development Planning Committee, and this committee publishes land capability classification maps and reports drawn from specially prepared suitability maps contributed by the main resource survey groups covering minerals, soils, and forests.

The Sub-Committee is guided in its judgment by sound conservation principles, and is anxious to make provision for national parks, recreation, and game reserves amongst others in its reports and to include recommendations for reserves for aesthetic and scientific purposes. All the departments with interests in these fields are represented on the committee and an impressive spirit of give and take exists between the different groups.

## **OPPORTUNITIES FOR THE FUTURE**

The Committee is not unaware that this readiness to accommodate the wishes of the different sectional interests, including the minority interests, is largely due to the fact that the States of Malaya has much land which is presently unallocated, and this gives considerable room for manoeuvre. A preliminary assessment of the land use situation and a comparison with the broad capability pattern has very encouragingly shown that while 22 per cent of the area of the country is presently gazetted as forest reserve, 43 per cent of the forested land area is unsuitable for agriculture, mainly on account of steepness of slope, and free of possible conflict with mining interests, and could therefore be utilized as forest estate with little risk of subsequent loss of estate to other land use interests, while of this total perhaps 33 per cent may prove to be productive forest capable of commercial exploitation. This same appraisal has indicated that the figure for the area devoted to agriculture could be more than double the present figure, if development is properly planned.

A program of preparing Land Capability Classification Maps, on a scale of one inch to a mile (1:63,360) which will assist considerably in the development planning process by indicating the details of the capability pattern is now being undertaken and is expected to be completed by the end of 1967.

The results of the Land Capability Classification Program are published as special reports, with reduced copies of the relevant maps, on a district basis, and these reports highlight the development opportunities apparent from the survey material available for each district for the information of the district authorities and others, including developers from the private sector.

# Land Capability Classification in South Vietnam

by

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## SUMMARY

In South Vietnam soil surveys have been made and soil maps drawn up in order to make land capability classifications for the most efficient utilization of the land. While physical factors are important in this classification, the agronomist must also remember other aspects of agriculture and economics.

Two examples are given – resettlement in the highland regions of Vietnam and an irrigation project in the low coastal area.

## THE RAPID DEGENERATION OF TROPICAL SOILS AND POSSIBLE REMEDIES

There are numerous factors of soil erosion in tropical countries, among which it is important to mention the following:

1. Bush fires which destroy the forests and render the soils easily liable to pluvial erosion. This is especially true of the tropical regions of Asia where the annual rainfall is excessively heavy.
2. Shifting cultivation which is practiced on a too-short rotation cycle thus exhausting the soil.
3. Cultivation of very steep lands without any soil conservation measures.
4. Exhaustion of the soil due to the lack of restitution by fertilizers or to over-grazing by cattle.

Soil conservation – synonymous with scientific use – aims at the most agronomic potential or 'capability' and its actual condition as a result of man's activities, in order that the land may be maintained in a state of permanent productivity.

Several aspects of soil conservation might be considered:

1. The efficient use of water, fertilizers and organic matter.
2. The combination of irrigation and drainage in the management of saline or acid sulphate soils.
3. The drainage of swampy areas.
4. The reforestation of shallow and marginal soils.

## SOIL SURVEY AND LAND CAPABILITY CLASSIFICATION

Soil survey is necessary in making an inventory of soils since the soil management varies in accordance with characteristics of the soils. In South Vietnam a generalized soil map of the scale 1/1, 000, 000 has been made with the following divisions:

1. The Mekong Delta area, with alluvial, saline, highly acid sulphate and peat soils.
2. The coastal plains of Central Vietnam, with the following soils:
  - (a) Red and yellow podzolic soils generally formed on old fluvial terraces or at the footslope of mountains. These are as a rule shallow soils very suitable for afforestation.

- (b) Alkaline soils found in arid areas with low rainfall. The pH of these soils varies from 8 to 10, and the  $\text{Na}_2\text{CO}_3$  goes even above 10 per cent.
  - (c) Alluvial soils along the river banks composed of mostly medium textured materials are well drained whereas in the areas far from the river banks, the soils tend to be clayey and hydromorphic.
  - (d) The regosols on the sand dunes along the coast are very sandy soils.
  - (e) The red Mediterranean soils are clayey and reddish in color, have a high base saturation, and are weathered from the basic rocks.
  - (f) The non-calcic brown soils are of a brownish color with a high pH. When they are deep they are suitable for intensive cropping, but the larger part of these soils found in South Vietnam are shallow and therefore reserved solely for forestry.
3. The highland area is covered by red latosols, gray podzolic soils, and also, to a certain extent, some alluvial soils deposited from the rivers.

In addition to the general soil map, the Soil Service has made regional soil maps on the scale 1/50, 000. Here the basic principle of classification adopted is the soils series which groups together all the soils with similar morphogenetic characteristics thus giving a complete picture of the soil distribution in a given region.

Once these soil maps have been drawn up the obvious questions are:

- 1. What should be cultivated on such a soil, and
- 2. How should it be cultivated in order to obtain the greatest yield while maintaining the fertility of the soil?

The answers to these questions may be found in the 'capability classification' whose purpose is to evaluate the agronomic potential of the soil and to suggest the most appropriate methods of land development.

## **FACTORS WHICH AFFECT THE CLASSIFICATION OF AGRONOMIC CAPABILITY**

A 'capability class' groups together the different soil series whose susceptibility to intensive cultivation techniques is subject to the same limitations. Certain physical factors must be taken into consideration such as topography, natural drainage, texture, depth of the profile, degree of stoniness, salinity or acidity. In addition there are other factors no less important such as proximity to existing roads, availability of potable water in all seasons, etc. Furthermore while the soil classification may remain relatively stable, the agronomic classification – i.e. division into land capability classes – varies with the evolution of agricultural techniques and is only valid in well-defined geographical areas where the climate is more or less uniform.

Two examples illustrate this, one from the highland area of South Vietnam and the other from the coastal lowland area:

In the highland area there are various uncultivated soils suitable for agricultural development. Once a soil map is done, the agronomist can evaluate the agronomic potential of the soils in order to study the feasibility of resettling farmers from the overpopulated areas of the central coastal lowlands.

Taking into account the topography (more than 20 per cent of the land is on steep slopes); availability of water (wells have to be drilled mechanically due to the extremely deep water-table, hence water in streams is clearly important); proximity to means of communication (in order to facilitate marketing); depth of soil profile and soil textures; drainage (poorly drained soils are subject to flood damage and can be cultivated only with rice) the soils of the highland area can be grouped into five classes of agronomic capability.

- Class I      Deep soils in flat or slightly undulating terrain, well drained and situated near roads and permanent streams. These have no agricultural limitations and annual cropping can be carried on indefinitely.

- Class II Deep soils with a fairly steep slope (from 3 to 8%). Contour planting or planting with perennial crops with cover crops between rows is necessary.
- Class III (a) Deep soils in flat terrain but poorly drained and liable to periodic flooding. Only rice can be cultivated.  
 (b) Deep soils on steep and very steep slopes (from 8 to 12 per cent). Their production capacity is more limited than in Class II.
- Class IV Deep soils situated on extremely steep slopes (from 12 to 20 per cent); excessively well drained. This land is severely limited and cannot be used for annual cropping. Hevea trees can be planted if the soil is banked or otherwise very erodible.
- Class V Stony or very poorly drained soils or those on excessively steep slopes. Of no use to agriculture, these should be used for afforestation or for the extensive raising of livestock if there is sufficient herbaceous vegetation in the underbrush.

In the second example, on the Plain of Phan-Rang where an irrigation project is being carried out, the land capability classification is based primarily on soil properties which affect irrigation and drainage techniques. These properties include:

1. The sandy nature of the sub-soil is a restricting factor in irrigation.
2. The alkalinity of the water-table: for plants other than rice, gravity irrigation involves a rising of the alkaline water-table which damages root development through contact with alkaline salts. Irrigation must therefore be accompanied by adequate drainage.
3. Micro-relief of the soil which may make land leveling necessary before irrigation.
4. The stoniness and the usable depth of the soil. The depth of stony soil varies and affects both root development and the water economy of the top soil.

From these two examples it may be seen that land capability classification should be based on a number of varying criteria according to the region and the project. It involves not only physical aspects of soil science but also other aspects of agriculture.

# Conservation of Nature and Agricultural Development Co-ordination and Integration of Research<sup>1</sup>

by

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## SUMMARY

The conservation of nature and its rational control implies the carrying out of research from all aspects – physical, biological, economic, and human – by the concerted action of a team of specialists, each one sharing equally in discovering an acceptable balance between 'untamed' and 'civilized' nature. Ecology, an integrated and multi-disciplinary science, presents a particular field for co-operation and co-ordination of research. Nature follows other rules of organization than those accepted by man, and bio-climatic or ecological zones do not concern themselves with political barriers or administrative limits. It is therefore in the interests of the countries which belong wholly or partly to a given ecological zone or enjoy similar agro-eco-climatic conditions to unite their efforts and investigate mutually the solution of their common problems in nature's preservation, conservation, and development.

## INTEGRATION OF RESEARCH

Agricultural science represents a vast integration of ecology and economy. The rational use of natural resources brings into play a group of factors and disciplines which are extremely varied and which include natural factors of the inorganic and biological environments, and factors of the economic and human environments. Agronomy as well as being the science of the development of natural resources for the benefit of man, must make every endeavour to discover the mutual interrelationship and inter-dependency which link these factors together.

The awareness of the relation between the biological world and its physical environment is the purpose of ecology; the awareness of the relation between man and his social and economic environment is the aim of economy. These two – ecology and economy – constitute the two principal components of the force of development.

Man, during the course of history, has taken a more and more important place in nature. Having had time to perfect his intellectual capabilities he has emerged from his natural habitat to better dominate and impose his will, modify and assert his proper environment. The future is directed towards a humanized nature which will give priority to a rational modification of the environment, raise production and increase productivity in proportion to the needs of an expanding humanity.

The humanization of nature implies a minute study of the ecological and economical organization of the earth's countryside. In many studies investigations are principally concerned with the physical factors involved and often neglect the biological aspects and their connection with natural or derived biocenoses. Ecological studies too often limit themselves to qualitative facts and static aspects, giving only a fixed image of the environment. It is necessary to include more quantitative studies to understand better various dynamic cause-effect interrelations operating within the total environment, in order to improve measurement of production and evaluate and define in economic terms the actual and potential productivity of nature. It is by the use of quantitative methods that the ecologist may join hands with the economist so that together

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<sup>1</sup> Original in French.

they may become good agronomists. Conservation of nature and its rational control implies the carrying out of research from all aspects, physical, biological, economic and human, by the concerted action of a team of specialists, each one sharing equally in discovering an acceptable balance between 'untamed' and 'civilized' nature.

## CO-ORDINATION OF RESEARCH

Nature follows other rules of organization than those accepted by human societies. The geographic distribution and behavior of plants and animals are conditioned by factors of environment for which natural vegetation constitutes the most faithful integral. The natural sciences, ecology and agricultural research, are perhaps the most suitable fields of scientific activity for inter-governmental co-operation which is becoming more and more necessary. It is in the interest of the countries which belong wholly or partly to a given ecological zone, to unite their efforts and mutually investigate the solution of their common problems of land development.

The essential, at first, is to identify the ecological zones and corresponding agro-eco-climatic areas, and to define for each one the schemes of research to be undertaken mutually; to plan regional research programs for the ecological areas defined and to agree upon the most appropriate means of co-operation and mutual aid.

The co-ordination of research programs for the conservation and use of natural resources, planned according to the concept of ecology, is particularly desirable in cases where:

- there is a similarity of conditions, evoking the solution of mutual problems;
- research related to a natural phenomenon must be undertaken simultaneously over the whole ecological zone concerned, if valuable interpretation and data are to be obtained;
- basic problems and their technical application should be solved by similar or comparable techniques and methods;
- a great number of experiments and checks are necessary before being able to question or prove a theory or a working hypothesis;
- the complexity of the research work to be undertaken necessitates the participation of a host of scientific disciplines and numerous specialists working as a team, or implies the intervention of some financial support which is beyond the possibilities of any individual country.

The reasons given above must apply in order to justify the sound foundation of an organization and co-ordination of research under ecological conditions.

By keeping in touch with other continents, Africa has compiled a very complete cartographic study on climate, soil and vegetation, and many detailed studies on the habitat give a precise definition of the principal biogeographic and ecologic zones of that continent. General studies and cartographic documents such as this do not exist for Asia and Latin America.

The study on the concept of agro-climatic analogues extended to include inter-tropical regions, similar to that undertaken by the American Institute of Crop Ecology, must begin as rapidly as possible. The integration of facts such as those for climate, soil and vegetation, with information on agricultural ecology and the agro-climatics of Nuttonson, would make it possible to draw up a world map of homo-eco-climatics, by which the interest in the field of natural sciences and the conservation of nature and agricultural research could be continued by a better organization of international co-operation for the integrated development of natural resources and a more efficient co-ordination of agricultural research programs.

Similar biological reactions correspond to comparable ecological conditions, and that which is true for an 'untamed' state of nature must also be true, to a certain degree, for a 'domesticated' nature. For scientific and technical co-operation between developing countries it is more useful and economical to assure co-ordination and collaboration between nations situated within similar ecological regions rather than between countries more artificially arranged. The science of nature and its application for development offers an easy road to co-operation, because science knows no barriers other than

those caused by nature. Conserving nature's wild state is taking a growing place in the preoccupation of those in charge of forming our habits and leisure time.

## CONCLUSION

The history of the development of industrialized countries as well as the progress being achieved in developing countries today gives sufficient evidence of

1. the primary role played by the improvement of natural resources, and
2. the scope of agriculture in the unleashing of the process of economic and social development.

For growing countries in particular the study of the potential resources of nature for the benefit of agricultural development constitutes the main plan for their economic and social evolution. Throughout the world there exist ecological similitudes and identical problems which point the way towards co-operation. The societies, institutions, and international bodies which concern themselves with the things of nature would gain much by co-ordinating their efforts in order to better understand nature and to protect man against his exploitation of nature. Man will always need to seek his rest amidst the peace and tranquillity which nature offers and to breathe in the garden of the earth.

# Conservation and Public Administration

## The Need for Co-Operative Planning

by

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### SUMMARY

The general appreciation of man's dependence on natural resources is increasing, but adoption and implementation of a national policy may meet with difficulties due to inadequate communication between workers in different departments and disciplines.

In Hong Kong, where urban activities tend to dominate the life of the community and distract attention from the value of the countryside and its resources, drafting of revised forest policy has led to discussions between a wide variety of key workers both inside and outside government departments. These discussions have brought about a better appreciation of the problems involved in resources management, have helped misunderstandings to be dispelled, and have opened up new vistas of co-operative service to the community.

### INTRODUCTION

Today man's dependence on natural resources is being appreciated by an increasing number of people, and so is the urgent need for determined conservation measures.

If in a particular community the stage has been reached of drafting national policy there may still remain the problem of getting it understood, adopted and implemented. The ardent conservation worker, eager to see an end to the wastage of natural resources which goes on around him, may imagine that no one else shares his concern, but he would do well to climb out of the latest erosion gully and look around for allies in the cause. They may be found in greater numbers than he ever expected.

It is important that these allies be found, and to the conservationist in the ranks of the Civil Service their discovery is specially important because he may not be in a position to conduct a general publicity campaign to present the case for conservation. Such a liaison is not to be thought of as a sinister affair with political undertones, but as a sensible harnessing of interests and talents in the service of the community.

### EXPERIENCE IN HONG KONG

In the British Crown Colony of Hong Kong, where the management of the countryside and its associated resources have been given careful consideration, conservation is not a new idea. Before the end of the 19th century there was a Botanical and Afforestation Department, and substantial areas of forest plantations. However, in the circumstances which have prevailed since 1945 (the end of the Pacific War) commercial, industrial and urban development have tended to dominate all else.

With this development, however, has gone a great increase in population. From about 2½ millions in 1960 it has risen to almost 4 millions at the present time. This increase has brought great problems, associated with overcrowding, for not only is the land area of the colony only 398 square miles, but of these about 320 are steep, rough hills which do not lend themselves to urban expansion. However in some respects this is a blessing in disguise, for it has meant that right next to the crowded tenement blocks of the city are areas of countryside, albeit steep but very picturesque, ideal for field studies or for open-air training and recreation.

However, these areas near the city, and the remainder of the 320-odd square miles of this kind of country, are not otherwise completely unused. They contain hill villages and hamlets, forest plantations, quarries and mines, and, most important of all, increasing areas of them are used as waterworks gathering grounds, water being caught and led by an elaborate system of drains, tunnels and pipes, to the Colony's fresh-water reservoirs. (Agriculture is confined almost entirely to low-lying, flat land, not within the area just mentioned).

Thus, many interests must be heeded, and reconciled, if the management of these non-urban lands is to serve the best interests of the community as a whole.

In some respects Hong Kong is, no doubt, unique, but so many people have seen in its domestic problems a foretaste of what many other communities must soon face, that it is felt that progress in harnessing support for conservation may be of interest beyond the borders of the colony. From his experience in West Africa the writer suggests that some of the conservationist's problems are fundamentally very similar, whether the society in which he works is dominated by newly-made politicians or traditional chiefs rather than by modern business tycoons! His cause needs all the understanding and support that he can muster.

### **THE ROLE OF FORESTRY**

As we have already seen, conservation is not a new concept in Hong Kong. The problem of water conservation is as old as the colony itself, and from the early days the improvement of the vegetation received attention. In 1953 the government adopted a simple statement of forest policy which drew attention to the necessary connection between soil, water, and vegetation (particularly forests) and this has served as a useful guide in the intervening years. Unfortunately it could not be entirely fulfilled, partly because of the insufficiency of qualified staff, and partly because of the great changes in the colony's population and economy.

In 1963 a determined effort was made to start drawing up a revised statement of forest policy more suited to the prevailing circumstances, and to expected developments, within the colony.

At about the time these studies commenced it was noticed that the numbers of weekend visitors to the countryside, hitherto few, was rapidly increasing, particularly in a certain beauty spot within walking distance of a new town.

Similar developments were to be seen in other districts and it seemed as if the patient work of those teachers and youth leaders who had sought to interest children in the 'great outdoors' was beginning to bear fruit, in a spectacular way. Therefore the foresters discussed their own proposals with the appropriate education specialists, and also brought them into contact with other colleagues who were establishing a special section to deal with comprehensive land-use planning throughout the colony.

The government's informal advisory committee on the conservation of wild birds and mammals was told of the new, tentative proposals, and this led to the formation of an *ad hoc*, and also informal, working party to bring together appropriate biologists in government and the university. And so the process went on, educationists, planners, scientists, leading amateur naturalists and hunters, civil administrators, social workers and youth leaders being gradually drawn in to the discussions.

### **INTERNATIONAL ASSISTANCE**

At the same time the trend of developments was made known to officials of the IUCN and this led to most valuable contacts with a wide range of conservation workers overseas, from whom both sincere encouragement and practical help has been received. Among those who have been able to actually visit the colony to see for themselves the feasibility of our ideas there have been several who gladly gave up what would otherwise have been leisure time in order to travel round the colony and to meet with government officials and others to discuss conservation affairs.

Through the IUCN and co-operating agencies it was made possible to obtain the services of two experienced ecologists who devoted over three weeks to a thorough, though

inevitably quick survey of the colony, and to discussions with the various people, referred to in earlier paragraphs, who had been brought into association with the foresters' proposals during the previous year or so.

As it happened the period of this particular survey overlapped that of a visiting team of advisors on the development of the tourist industry, and of a specialist on youth work and recreation. Joint consultations proved to be of great help to all concerned.

## **PRACTICAL VALUE OF CO-OPERATION**

This contact with people from other disciplines and walks of life did not alter the basic policy proposals originally formulated by the foresters in 1963, but it did help to show where there might be misunderstanding, and what complexities might be involved in organizing the implementation of the revised policy. These wide-ranging discussions were a great help when it came to wording the basic statement of policy in a way which would show its relevance to other requirements of the community, and to make it more likely to meet with general acceptance than might otherwise have been the case.

Some examples of possible conflicts which came to light may be of interest.

It soon became evident that the relationship of soil, water, vegetation and wildlife to natural resources as a whole, and man's dependence on these resources, would have to be carefully explained, as well as the implications of conservation and sustained yield management.

Misunderstandings over terminology came to light, particularly over 'national park' and 'recreation'. It was realized that not everyone accepted that a national park, in the generally accepted sense, should be kept in as natural a state as possible, - nor that, in this same context, recreation did not refer to organized games or to playground activities on swings and see-saws.

Civil administrators had to be assured that reserving areas of the countryside for particular conservation purposes did not have to mean precluding all chances for rural communities to develop their villages and to share in some urban-type amenities and prosperity. Yet they readily acknowledged that some restrictions might be necessary in the interests of the community generally, and in fact they went so far as to modify their policy on the leasing of Crown land so that it would conform as nearly as possible to the new forestry proposals. This was done without waiting for the formal acceptance of new policy by government, or the enactment of new legislation, but by using the powers already available in order to further the proposals for more effective conservation.

The way in which the thoughts and plans of other agencies, and of key individuals, were modified by the many discussions showed how other people were taking advantage of the sharing of problems or opinions, and revising their own ideas so as to work more effectively for the common good.

## **NEW VISTAS**

It is probable that to all participants, in fact, the discussions brought a fresh realization of the place of their own work in meeting the needs of society, and enabled them to see new possibilities in working more effectively for the common good.

Two examples will suffice.

Some government departments, including that of Agriculture and Fisheries, of which the Forest Service is a part, employ university students in small numbers during their vacations, to give them an opportunity to undertake practical work, and perhaps lead them into a career in the Department. They often do useful field work. Many secondary (or 'high') schools also carry out field studies and produce reports of a very high standard. In the realm of natural resource management there has appeared the possibility of planning occasional joint ventures in which senior school pupils, undergraduates, research students and government staff might each play a part and achieve far more than by working in isolation. Agricultural or ecological census work seems to offer good opportunities for such co-operation, but the possibilities are many and varied.

Even if student participation were on only a modest scale it would add greatly to the participants' sense of purpose and of service to the community. Studies would take on a new meaning.

On the part of government staff, on the other hand, the foresters have been helped to appreciate the need for better public relations and to co-operate closely with the education authorities in helping to raise a new generation which will understand at least the fundamentals of conserving nature and natural resources.

Far too few communities try to plan the use of all available resources, including the land, yet even in Hong Kong, noted for its free enterprise, circumstances have made it clear that a considerable degree of centralized land planning must be undertaken, and so an outline plan is now being prepared. In circumstances of continual change and development there can never be a 'final' plan, but even in the preliminary stages of collecting data, the planning officers, and their maps, can greatly help individual agencies to see more clearly how they fit into the general picture.

Conservation cannot, indeed, be undertaken adequately and rationally without comprehensive land-use planning, and where there are no central government planning offices, perhaps conservation workers should press the case for their introduction. In the trained planning officer they are likely to find a valuable ally.

In closing, it might be said that co-operation does not just happen. It requires individual exertion, the exploring of new lines of communication, but it is well rewarded by the new vigor which it brings, and the obvious contribution which it makes, to effective public administration.

# **Critical Importance of Research as a Basis for Management of Natural Resources in Tropical South East Asia**

by

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## **SUMMARY**

Tropical South East Asia is exceedingly rich in renewable natural resources but there is a lack of research on these resources. Such research is of critical importance to the area. If the various countries could co-operate on research plans wiser use of natural resources might result with a consequent rise in the standard of living of the people.

## **NEED FOR RESEARCH**

Although tropical South East Asia is rich from the standpoint of renewable natural resources, these resources are not fully developed for the support of the people. Because of very high population growth and misuse of the resources, the standard of living in the region is low. Yield per unit area is alarmingly low, if compared with other countries.

There is a need for conservation and sound use of natural resources. Unfortunately, we have only fragmentary knowledge of the natural resources of the region. Any kind of integrated research in the area is practically lacking.

## **NEED FOR PLANNING AND CO-ORDINATION**

The time has come for the planning and the implementation of an integrated research program in the use of renewable natural resources in tropical South East Asia, a region facing overpopulation, underemployment and undernourishment. Each country in the area should undertake a long-term integrated research program in its renewable natural resources with government and private co-operation. On the basis of this an annual research program with specific work plans should be prepared again with both government and private co-operation. A planning body at the highest level should be created for this purpose with adequate authority, responsibility, and financing.

Government and public enterprise must contribute much more than they have heretofore, particularly in the field of finance, because of the mounting problems. It might be that the governments could designate certain areas as experimental research areas and try to make them financially self-sufficient. All income derived from these areas could form part of a general fund for the continuation of research on natural resources.

## **EXCHANGE OF INFORMATION**

The various countries of South East Asia face the same problems: increasing population and the need for agricultural land to feed this population; tropical vegetation; high density and long duration of rainfall resulting in floods during the rainy season and the lack of water for irrigation, hydro-electric and domestic use in the dry season; soil erosion; shifting cultivation and indiscriminate logging operation; general unwise use of natural

resources. If co-operation between countries could be obtained in planning and exchanging of information regarding research on renewable natural resources, these resources might be more wisely used and a higher standard of living for the people of South East Asia might result.

## RECOMMENDATIONS

Along this line, the following recommendations are worth mentioning for Tropical South East Asia:

1. A planning research body in the highest level should be created in every country.
2. Adequate authority with sufficient financing for this body should be secured through legislation.
3. Effective and smooth co-operation of government agencies including universities, private sector and public concerned with natural resources should be obtained from the standpoint of financing and implementation.
4. 'A Long-Term Integrated Research Program on Renewable Natural Resources' should be prepared in co-operation with government and private sector.
5. 'An Annual Research Program' should be prepared and implemented together with private sector concerned.
6. A training program for research workers should be initiated.
7. A portion of existing natural resources should be put aside, with adequate financial sufficiency for research purposes. Legislation should be prepared that all income derived from those experimental areas will form a part of general fund for only these research activities.
8. A close co-ordination among the countries of the Region should be achieved regarding research on renewable natural resources.

## REFERENCES

- Colman, E.A. 1953. *Vegetation and Watershed Management*. The Ronald Press Company, New York.
- College of Forestry. 1964. National Conference on the Kaingin Problem, Philippines. University of the Philippines.
- Conklin, H.C. 1957. *Hanunoo Agriculture, A Report on an Integral System of Shifting Cultivation in the Philippines*. FAO Forestry Development Paper No. 12.
- FAO. 1962. *Watershed Management*. Forestry Occasional Paper No. 13, Rome.
- FAO. 1952. *Land Utilization in Tropical Areas*. FAO Development Paper No. 17, Rome.
- FAO. 1963. *Forestry Research*. Forestry Occasional Paper No. 11, Rome.
- French Technical Co-operation Institute-Faculty of Agronomy of Karadj, Iran. Seminar on Soil and Water Conservation, 1960.
- Haig, I.T., M.A. Huberman, and V. Aung Din. 1958. *Tropical Silviculture*, Vol. I, II, III. FAO, Rome.
- Soil Conservation Service of India. 1957. *The Challenge of our Watersheds*. Hazaribagh, Bihar, India.
- Talbot, Lee M. and Martha H. Talbot. 1964. *The Status of Renewable Natural Resources in the Philippines*. International Commission on National Parks, International Union for Conservation of Nature and Natural Resources.
- United States. Department of Agriculture. 1955. *Yearbook of Agriculture (Water)*. U.S. Printing Office, Washington, D.C.
- United States. Department of Agriculture. 1957. *Yearbook of Agriculture (Soils)*. U.S. Printing Office, Washington, D.C.

## Part 2

### The Human Factor

#### Mis-Use of Land in South East Asia

by

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#### SUMMARY

This paper deals with forms of land mis-use particularly 'shifting agriculture' and with the attempt to establish permanent agriculture on forest soils incapable of supporting food crops. The need is stressed for a program of land classification to prevent blunders that may be irreversible.

#### INTRODUCTION

The story of man's restless occupancy of the land is the story of a never-ending search for food. Portions of South East Asia are blessed with stable, fertile soil and favorable climate which under careful husbandry has produced food crops for generations with little or no deterioration of the land. Over most of South East Asia, however, mis-use of the land is a more familiar story. This varies with the climate, the soil, and above all with the intensity of human impact.

#### SHIFTING AGRICULTURE

While fire, over-grazing, soil erosion and floods have all taken their toll of the land, by far the most destructive to natural resources is the practice known as shifting cultivation. It bears many names, *agriculture nomade* to the French-speaking peoples; *kaingin* to the Filipinos; *ladang* over much of the East, but the fundamental practice of clearing a patch of land with fire and axe and sowing the area with agricultural crops remains the same. Fertilized by the ashes of the burned trees, the land for a year or two produces harvests. Then, when fertility is exhausted or weeds have so invaded the area that further cultivation is impossible, it is abandoned.

Under some favorable conditions, where population pressures are not great, the land after lying fallow for many years may be clothed again with forest growth and the whole process repeated. However, more frequently circumstances are less favorable. The soil deprived of its protective forest cover loses all ability to support vegetation and becomes desert; on steeper slopes the soil erodes silting the water courses and adding to the destructiveness of floods; or the shifting cultivator may allow his fire to run uncontrolled destroying thousands of hectares of timberland.

The practice of shifting cultivation is so wide-spread that it must be dealt with as a major land-use pattern throughout South East Asia. Whatever intrinsic value it had in the past, today, with the great increase in human population, one must face the fact that it is an outmoded, wasteful, and increasingly menacing mis-use of the land. Most of the Asian world has already passed the day when it can afford the uncontrolled existence of a practice that, each year, becomes less productive and more destructive. The problem is not easy to deal with, but neither is it insoluble. There is no all-inclusive panacea; different regions and conditions demand different approaches. How-

ever, many countries have shown that shifting agriculture can be controlled. The essential element is time. Unless governments take rapid remedial measures, shifting agriculture will rapidly become more and more destructive to forest, soil, and water resources; and its inevitable breakdown will bring disaster to the population which depends upon it.

### **ANOTHER MIS-USE OF THE LAND**

Less widespread in extent, but no less destructive to forest and soil is the attempt to establish a permanent agriculture upon soils capable only of supporting forest growth. Too often in governmental zeal to feed an ever-increasing hungry population the forest cover is removed from lands which any soils scientist or forester could have foretold were doomed for permanent agriculture from the very start.

The very lushness of the unrivaled rain forests would seem to guarantee that they are supported by deep fertile soils ideal for agriculture. Actually this soil is extremely sterile. All the nutrient material is locked up in the vegetation or kept in continual circulation by the almost instantaneous decomposition of dead plant residues. The forests are nourished by their own organic matter, by the humus which they themselves produce, and take very little from the soil. Clearing the land destroys the source of this humus and exposes the land to sun and rain. With rainfall always in excess of evaporation, there is a net downward movement of water in the soil, a leaching which impoverishes the surface layers by sweeping the plant food beyond the reach of roots and leaving the soil itself a sterile mixture of mineral particles.

Plowing increases the rate of soil impoverishment, for the usefulness can be plowed out of tropical soils in a very short time, and with the ultimate failure of agriculture it may even be impossible to restore forest growth.

All this is far from suggesting that forested lands should be exempt from clearing for agriculture, but it is to say that land clearing for agricultural development should not be a matter of government expediency or 'land boom' enterprise but should be preceded by examination carried out by competent soils scientists to assure that the harvest from these lands will really be food and not blasted hopes and wasted dollars.

### **LAND CLASSIFICATION**

In those areas of South East Asia where soils are difficult to manage and precise knowledge is still lacking, classification of a country's soils is basic to permanent land use. In temperate countries, land classification has been found indispensable. The need is even more crucial in the tropics, for, except for relatively small areas of soil from volcanic ash and recent alluvial deposits, most tropical soils are extremely deficient in plant nutrients and organic matter.

Land planning is simply a matter of learning what a country's land types can best contribute to human welfare in the long run – whether it be food crops, pasturage for man's herds, or the varied products of the forest. Already we have the knowledge – we need only to apply it.

Time plays a critical role. With rising populations and higher levels of nutrition the pressure upon governments to find increased sources of food supply grows greater daily. As never before, we need the land's full productivity. Unless we know the kind of lands we are dealing with, unless we are certain they can support the use to which we put them, we are gambling with the very stuff life depends on – the good earth and its resources.

# Some Problems in Determining the Conservation Needs of the Hill Peoples of South East Asia

by

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## SUMMARY

The traditional ecology of the heterogeneous hill peoples of South East Asia and the breakdown of that system are described. Any program of conservation for these people must face the fact of the breakdown, recognizing the diversity of the people and of their, as yet poorly understood, microecologies.

## INTRODUCTION

Two major problems make the determination of the conservation needs of the South East Asian hill peoples difficult. First, these peoples are culturally among the most heterogeneous populations in the world. Second, any prediction of their future conservation needs at this time must be based on their traditional ecology, and their traditional ecology seems doomed.

The South East Asian hills have for millennia been a refuge for peoples of diverse origins fleeing their economically more advanced and hated neighbors in the valleys. So intermingled have these peoples become that it is impossible to regard them as 'tribes' in any strict sense, let alone to make generalizations that apply equally to all South East Asian hill peoples. The following account must be read with this reservation in mind.

## TRADITIONAL ECOLOGY

Agriculture is the dominant subsistence activity in the hills for most groups. The kind of farming practiced varies among these groups, but by far the most widespread type of agriculture is the slash-and-burn cultivation of dry paddy swiddens (Assamese *jhum*, Burmese *taungya*, Malay *ladang*).

The criteria by which the hill peoples select swidden sites vary from group to group. In general, however, soil color, soil texture and plant cover are taken as indices of fertility. Trees should be small enough to fell easily, so that the preferred site is a swidden abandoned 10 to 15 years earlier. The site should be readily accessible, i.e., usually on a slope beside a stream, despite the increased danger of erosion. Finally, someone expert in magic must determine that the site is free of baneful supernatural entities.

The field is cleared, burnt off and farmed for from one to four years, depending on its fertility and on the availability of other land. Most groups using a swidden for more than a year rotate their crops. When the swidden becomes unproductive, it is left to lie fallow. Some people, especially in the higher regions, then move off to clear new swiddens. Others, mostly on the lower slopes, rotate their fields around semi-permanent villages.

Trapping and fishing traditionally supply the bulk of animal protein in the diet; the latter is of considerable importance in some areas. Although meat is highly prized, neither hunting nor keeping domesticated animals plays a primary part in the economy. Almost

all hill peoples raise their animals primarily for sale and/or for consumption on ceremonial occasions only.

This traditional ecological system has two important characteristics.

1. It is almost completely closed.
2. It is in equilibrium.

Most highland settlements are economically (and politically) autonomous. The main subsistence goods required from the outside world are axes and machetes. Otherwise, the traditional mistrust of lowlanders combines with the difficulty of the terrain to limit trade to a few localized manufactures.

Conservationists sometimes seem to think of the hill peoples as parasites on their natural environment, causing erosion, deforestation and the extinction of species. On the contrary, the human presence benefits many species of animals and plants. Domestic animals provide food for marauding carnivores. Similarly, crops provide food for many kinds of birds, ungulates, rodents and insects, which in turn provide food for the hill people. In abandoned swiddens grow plants which would be choked out in primary rain forest; for example, Malayan gaur depend on Senoi agriculture to provide them their ecological niche. Finally, botanists long ago recognized the importance of hill peoples inadvertently or deliberately distributing the seeds of edible wild fruits and berries.

### **THE COLLAPSE OF THE TRADITIONAL SYSTEM**

The maintenance of the traditional ecological system depended on four sets of factors:

1. the hostility between highlanders and lowlanders, which kept the system closed;
2. low population density;
3. a relatively simple hunting technology; and
4. ritual restrictions on the exploitation of the environment.

These have been modified considerably with the arrival of European colonists and the suppression of wars and slave-raids a more peaceful intercourse has developed between hill and lowland; the gradual extension of health services has lowered the mortality rate which had been responsible for the low population density; at the same time national governments have started to sequester hill land and it is becoming unavailable at just the time that pressure on land resources is starting to rise; hunting and fishing methods have become far more sophisticated and deadly; traditional taboos which often spared useful or rare fauna and flora have broken down with increased contact with the valley; and ritual restrictions against overexploitation of the environment as a whole are collapsing at the same time that the range of the environment exploited is narrowing.

### **CONSERVATION NEEDS OF THE HILL PEOPLES**

To determine the conservation needs of the hill peoples, one must face the following facts.

1. The micro-ecologies of the various groups are probably as heterogeneous as the people themselves, but we know very little about them.
2. The hill peoples' mistrust of lowlanders makes legislating conservation futile.
3. Attempts to base conservation programs on the traditional ecological system will provide only temporary palliatives, for that system is inexorably failing.

1. Detailed micro-ecological studies of selected groups are imperative. Teams for such studies might include an anthropologist, a nutritionist, a doctor or medical anthropologist, an agronomist and an ecologist. There can be no detailed plan for the hills as a whole; but there can be specific plans tailored to the conservation needs of specific areas or types of area.

2. National governments must improve their liaison with hill peoples. Legislation against, e.g., felling fields on steep slopes or shooting protected animals is unenforce-

able and futile, serving only further to alienate the hill peoples. With improved liaison, however, it may be possible to introduce from other areas agronomic systems that have proven adaptable to a balanced hill ecology, e.g., the complex crop-rotation of the Chin or Kachin terracing. On the lower slopes, people might be taught how to manage carabao, for inability to 'talk to carabao' seems to be a major impediment to developing wet paddy agriculture.

3. Ultimately, however, the only way to preserve a balanced ecology in the hills is to lure people out of the uplands. Providing for the men some job that is as emotionally and economically rewarding as hunting should be a matter of first priority. Most hill men seem, for example, to enjoy being soldiers. Traditional hill life seems to fit men, at least in Malaya, to become watchmen, foresters and traveling medical aides. In the very long run, there is no conservation program that, by itself, can meet the needs of the hill people. They must be integrated into the life of the nation.

**REFERENCES**

Cole, R. 1959. Temiar Senoi agriculture. *Malayan Forester* 22: 191-207, 260-71.  
 Conklin, H.C. 1957. Hanunoo agriculture. *FAO Forestry Development Papers* 12: 1-209.  
 Freeman, J.D. 1955. Iban agriculture. *Colonial Research Studies* 18: 1-148.  
 Institute of Pacific Relations. 1951. *The Development of Upland Areas in the Far East*. Vol. 2, New York.  
 Lebar, F. M., G.C. Hickey and J. K. Musgreave (eds.) 1964. *Ethnic Groups of Mainland South East Asia*. New Haven: Human Relations Area Files Press.  
 Malayan Nature Society. 1961. *Malayan Nature Journal*. Special Conservation Issue.  
 Ridley, H.N. 1893. On the dispersal of seeds by mammals. *J. Royal Asiatic Society, Straits Branch* 25: 11-32.  
 Taylor, G.D. 1953. Some crop distributions by tribes in upland southeast Asia. *Southwestern Journal of Anthropology* 9: 296-308.  
 Zelinsky, W. 1950. The Indochinese peninsula: a demographic anomaly. *Far Eastern Quarterly* 9: 115-45.

TABLE I. WET PADDY CULTIVATORS

Many of these groups are 'hill peoples' only by origin, since they live at low altitudes and are heavily acculturated to their lowland neighbors.

Group Name (After Lebar <i>et al.</i> 1964)	Location of Wet Paddy Growers
<b>CHINA</b>	
Minchia	Tali Basin, West Yunnan
Achang*	Hohsa and Lahsa, near Taiping R.
Lignan Yao	Kwangsi and Kwangtung
Chung-Chia,* Tung-Chai*	West Kweichow
Chuang*	Kwangsi
Li	Southern Hainan Mountains
<b>BURMA-ASSAM</b>	
Kadu*	Katha District
Chin	Manipur

Karen	Irrawaddy and Sittang Valleys
Angami Naga	Nagaland
THAILAND-LAOS	
Lawa	Bo Luang, Chiangmai Province
Chaobon	Eastern Sak River valley
Cheng, Sork*, Sapuan*, Sou	Plain between Sekong and Sekamane Rivers, Attopeu Prov.
Menam, Noar, Sayan	Upper Song Tranh River valley
Ngung Bo	Rao Lao and upper Sekong River valleys
Oy, The	Beloven Plateau, Attopeu Province
Ngeh	Thateng, Saravane Province
Sonei	Saravane Province
Sek, So	Mekong R. Valley
Tai	Scattered throughout Thailand and Laos
Neua	Northeast Laos
Phuthai	Northeast Laos and Thailand
VIETNAM	
Trung-Cha*, Nhang	China-Vietnam border
Tho	Near Cao Bang, N. Vietnam
Meo	North Vietnam hills; also Xieng Khouang, Laos
Bih*	Lower Krang Kno River valley
Chum*	Dran Valley
Rhadhe, Mnong Rlam*	Darlac Plateau
Ma*	Upper Donnai River valley
Sre*	Djiring area
Kui	Vietnam-Cambodia border
MALAYA	
Lowland Senoi Semai	South Perak
Semelai	South Pahang
'Aboriginal Malays'	Southern Malaya

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\* For groups marked with an asterisk, wet paddy agriculture is the main subsistence activity. For the other groups, swidden agriculture is also important.

# Renewable Natural Resources and their Problems in the Philippines

by

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## SUMMARY

The author summarizes the problems arising from mis-use and underdevelopment of renewable natural resources in the Philippines. Water and timber resources are the most badly managed – the frequency and magnitude of floods have increased, water yield has decreased, the quality of water has been lowered, and valuable watersheds have been rendered useless. Forests and pastures have been destroyed, valuable top-soil washed away; siltation rate in reservoirs has increased; productivity of agricultural land has decreased. Wildlife has diminished.

The *kaingin* system is described and recommendations for conservation action are given.

## INTRODUCTION

The Philippines is one of the richest countries in South East Asia in its renewable natural resources. Mis-use and underdevelopment of these resources are widespread limiting the standard of living of the people; if wisely used these resources might in the near future support the existing population. There is a public awakening to the importance of the problem.

## WATER RESOURCES

The present and future economy of the country is largely dependent upon availability, amount, and quality of water supplies. The Philippines with an average annual rainfall of 99" or 248 centimeters is endowed with an abundant water supply (Weather Bureau, 1960). The problem is one of watershed management which implies the wise use of all soil, water and human resources so as to provide a clean and uniform water supply for beneficial use and to control damaging overflows (FAO, 1962; Soil Conservation Soc. of India, 1957). The overall annual flood damage is estimated over U.S.\$13 million with an increase of 25 per cent in the last five years (Philippine Water Res. Plan, and Dev. Com., 1961). In Central Luzon, the average annual potential loss from floods for rice was estimated at U.S.\$60 per hectare.

Increased irrigation could increase the production of rice the most important crop in the Philippines as, at the present time, less than a third of the rice crop is irrigated and that only once a year (See table 3). Almost every community suffers from a lack of municipal water and electricity.

Stream flow measurements of the country started as early as 1908 (Bur. of Public Works, 1960); a water resources survey in seven major river basins has recently started (Water Res. Survey Team, 1965); and a watershed reconnaissance survey was conducted in co-operation with several agencies for training purposes (Bur. of For., 1964).

The watershed management program in the Philippines has now four major objectives:

1. The conservation of natural resources such as soil, water, forest, forage and wildlife;

2. The maintenance or improvement of land productivity for crops, forest products and livestock through proper land-use and the introduction of conservation farming practices;
3. The increase and maintenance of water yield for domestic, irrigation, industrial and hydro-power uses;
4. Watershed protection and flood control.

However, difficulties arising from socio-economic necessities in the country in many cases render these objectives useless.

## **SOIL RESOURCES**

The Philippine Archipelago is the crumpled edge of the Asiatic Continental Platform. The structure is a complex one, for besides faulting and folding, volcanic action of diverse kinds has taken place. The soils in the forests are usually rich under virgin conditions but deterioration starts quickly once the soil cover is destroyed; in the plains, soil fertility is high, depending upon irrigation and drainage facilities and past use.

### **Erosion**

Erosion in varying degrees is active all over the country. Volcanic soil is not as susceptible to accelerated erosion as soils derived from soft sedimentary materials but under mismanagement and inadequate ground cover, these too will erode rapidly. High intensity of rainfall coupled with high soil erodibility and steep topography indicate the need of control measures. It is estimated that 200 million cubic meters of soil are lost annually.

The soil loss in the Ambuklao Watershed, (63, 200 hectares) averaged annually 36.5 tons per hectare. One area, covering 4, 800 hectares, produced 640.6 tons per hectare annually. This corresponds to about 4.9 centimeters of soil layer lost (Bur. of For., 1964a). From this it can be seen that soil erosion is one of the most serious dangers that threatens the Philippines.

### **Sedimentation**

Reducing the sediment carried by main channel and tributary streams is one of the major problems of the country. The life expectancy of the most important reservoir, Ambuklao, has been reduced from a calculated 62 years to 32 years as a result of the mismanagement of lands in the past seven years (Bur. of For., 1964a; Gülcür, 1964).

Sedimentation usually

1. increases frequency floods by causing bank overflow;
2. reduces efficiency of drains resulting in waterlogging and causing abandonment of farm land;
3. requires raising or relocation of roads etc. from frequent inundation;
4. increases maintenance of irrigation canals and ditches.

The high concentration of sediment which is usually high in salt content frequently smothers crops. The dispersed fine particles seal the soil surfaces and reduce infiltration; therefore deep plowing is necessary.

## **TIMBER RESOURCES<sup>1</sup>**

It has been estimated that forests provide a direct livelihood to over half a million people, with forest products ranking third, sometimes second, in exports. In the past half century, the forest area has been cut by roughly half of the total area, 80 per cent of this occurring since the Second World War (Nat. Ec. Council, 1964; Talbot and Talbot 1964). The commercial forests now cover 27.8 per cent of the total land area. The

<sup>1</sup> See table 1 for timber status.

decline of 2 million hectares of forest areas in the past 25 years is critical if 30 per cent is considered the minimum adequate percentage of a nation's land area (Gill, 1959; Lansigan, 1959).

The average commercial timber growth per hectare – 1.7 cubic meters annually – is too low. Plantations of fast-growing tree species are based on a minimum of 10 cubic meters of increment per hectare per year and even an annual increment of five cubic meters per hectare is considered low.

The two most important factors destroying forest are

1. shifting cultivation, with an estimated 172,000 hectares cleared annually, and
2. indiscriminate logging operations and logging roads.

Both silvicultural systems – the seed tree method and selective logging – as practiced in the Philippines have decreased soil, water, and timber resources. With an average of 90 per cent of timber removed in the 'seed tree method' the area is exposed to the impact of heavy rainfall and sun-shine, which decrease the infiltration capacity of soil resulting in heavy runoff. Whereas the 'selective logging' as practiced in the Dipterocarp region where 50 to 80 per cent is left standing, is more suitable for sound watershed and soil management, the natural regeneration is in undesirable species which in combination with vines have been observed to kill the remaining desirable trees within 3 to 5 years. (Reyes and Tagudar, 1965; Tagudar, 1957).

Technical and economic possibilities of vine control and natural regeneration versus artificial regeneration are still to be investigated.

The problems of forestry in the Philippines may be summarized as follows:

1. A permanent forest should be established and a land classification system for the whole country should be inaugurated.
2. A survey of forest resources is needed for future planning in forestry and forest industries.
3. The success of the program on selective logging depends largely upon introducing logging techniques that will minimize cutting injuries, including soil destruction. It would therefore be necessary to control the operation of the private companies who now perform all of the logging in the public forests under permit from the Bureau of Forestry (Keith, 1956).
4. Large scale reforestation projects are needed throughout the country with special emphasis on watershed management if the present rate of destruction is to be reduced.
5. The work of the several agencies relating to forestry should be co-ordinated. These include the Bureau of Forestry, Reforestation Administration, Parks and Wildlife Office, Forest Products Research Institute and College of Forestry.
6. An integrated research program in forestry should be set up in order to develop forest resources. More money, personnel and equipment are needed.
7. A massive campaign to awake public opinion, more in-service training of foresters and a reorganization of forestry agencies should be undertaken.
8. The existing regulations are adequate if they could be adequately implemented.

## **FORAGE RESOURCES**

The pasture lands of the Philippines comprise about 2.1 million hectares (Reforestation Administration, 1965); they are under the Bureau of Forestry and pasture permits are issued to private enterprise.

At present the protein consumption per capita is a low 15 grams per year. The live-stock population which was depleted during the Second World War now consists of 1.1 million cattle and 3.7 million buffalo.

A large portion of pastures are overgrazed and soil deterioration is prevalent; frequent burning is practised with little regard to the consequences of severely increasing erosion. The problems involved in restoring the grazing capacity of the rangeland need immediate solution in order to meet the increasing demands of the country for meat and milk. Augmenting the production of livestock will not only increase the income of pasture and create job opportunities but will also utilize large portions of idle open land.

## LAND USE AND RESOURCE MANAGEMENT<sup>2</sup>

Forty-two per cent of the total land area of the Philippines is theoretically to be reserved for timberland, but as it is, much of the land is still unclassified. With boundary lines not readily apparent and with population pressures increasing yearly, land seekers usually go to the nearest forest to make a clearing.

The *kaingin* system, that of clearing forest land for crops then moving on to another plot in two or three years when the first one is exhausted, is primitive and wasteful (Laudelout, n.d.; Vergara et al., 1963). Originally it was practised by natives living in the high mountains. Because of the fewness of their numbers the system was not harmful. With the Second World War and occupation many Filipinos were forced to live off the land in order to survive. People in densely populated areas have since immigrated to other parts of the country in order to own a piece of land to feed their families. Then there are the *kaingineros* –who make a profession out of the practice and are usually well organized under land speculators (National Conf. on Kaingin Problems, 1964). It is almost impossible to remove the *kaingineros* or squatters until the land is rendered useless by soil exhaustion. Public sympathy is with them, because of the ineffective distribution of land, the present prevailing system of land tenure, and the need for food coupled with overpopulation.

*Kaingin* and present unsound agricultural practices even in the fertile lowlands have resulted in a lower agricultural production than in many other countries of South East Asia.

The solution lies in the more productive use of the abundant agricultural lands. Selection of seeds, proper use of fertilizers, insecticides, and proper irrigation, need emphasis for the whole country.

An example of the existing possibilities is the world famous Banaue Terraces in Bontoc, Mountain Province, which cover 40,000 hectares and were constructed about 2,000 years ago by the natives. These terraces were built on steep slopes, sometimes 60° to 70° steep and are still supplying food. The still untouched forests above the terraces supply irrigation water. No soil erosion is apparent.

Another striking example is the comparison made during the survey of the Ambuklao Watershed where one terraced area yielded a high net profit of U. S. \$1,620 per hectare per year (Five-Year Integrated Socio-Economic Program, 1962).

In order to accomplish a more productive use of Philippine lands a fundamental new socio-economic approach is necessary to halt the present alarming rate of destruction of natural resources (Talbot and Talbot, 1964).

## THE PILOT PROJECT

In order to approach the problems which are outlined above, the Philippine Government requested technical and financial assistance from the United Nations Special Fund. As the result, a project titled 'Forest, Forest Range and Watershed Management' has been recently set up.

The project will continue for four years with United Nations Special Fund contributing up to U.S.\$729,000 and the Philippine Government contributing U.S.\$631,000, altogether amounting to U. S. \$1,360,000.

<sup>2</sup> See table 2, Philippine Status of Land Use, and table 3, Philippine Area Planted to Rice.

The purpose of the project is:

1. to establish one or more pilot units for demonstration and training in forest and watershed management, including forest range and pastures in selected watersheds;
2. to assist the Government in formulating policy, re-organizing administration and preparing legislation to ensure the proper management of land, water, forest and range resources;
3. to prepare a plan for the development and rehabilitation of the forest lands sector of the project area, which will eventually be used as a pattern for the development of other similar areas throughout the Philippines.

Seven experts with an additional six consultants will study forest and land-use economics, including shifting cultivation, watershed management and hydrology, forest policy, reforestation, logging, range management, forest industry, animal husbandry, wildlife, forest protection, with special emphasis on socio-economic problems.

The Food and Agriculture Organization of the United Nations will be the executing agency. Fourteen Philippine agencies including private forestry sections are expected to cooperate.

## **RECOMMENDATIONS**

The problems enumerated above are similar to those of other countries of South East Asia, and for this reason the recommendations given below might be equally applicable to other countries.

1. A comprehensive resource inventory should be undertaken.
2. A practical conservation policy should be established and implemented.
3. A training program for education and extension should be initiated. Technical assistance from international organizations should be requested.
4. A fundamental land-use program should be prepared based on the information received through the resource inventory. Resources should be considered as a whole.
5. An integrated research program should be initiated with long and short term plans and basic as well as applied research should be included. Several pilot farms could be dedicated to research activities. All income derived from the products of these areas, such as timber, livestock, and agricultural crops could form a part of a general fund to be used only for research activities. Once the pilot areas were efficiently established, continuation of funds for research would be secured.

Only through survey, planning, and implementation on a national basis can the natural resources of a country be wisely developed for the support of present as well as future generations.

## **LITERATURE CITED**

- Bureau of Forestry. 1964a. Ambuklao Watershed Reconnaissance Survey Report. Food and Agriculture Organization of the United Nations.
- Bureau of Forestry. 1964b. Forestry Statistics.
- Bureau of Public Works. 1960. Drainage areas of River Basins in the Philippines.
- FAO. 1962. Watershed Management. Forestry Occasional Paper No. 13. Rome.
- Five-Year Integrated Socio-Economic Program for the Philippines. 1962.
- Gill, T. 1959. Forestry Proposals for the Philippines.
- Gülcur, M.Y. 1964. Method of Economic Analysis for Ambuklao Watershed. (Unpublished manuscript).

- Keith, H.G. 1956. Forest Policy and Legislation. FAO Report No. 470. Rome.
- Lansigan, N. P. 1959. An Appraisal of Forestry in the Philippines. Manila.
- Laudelout, H. n.d. Dynamics of Tropical Soils. FAO Report No. 11266. Rome.
- National Conference on the Kaingin Problem, March 12-13, 1964.
- National Economic Council. 1964. Forest Resources Survey No. 1-3. U.S. Agency for International Development.
- Philippine Report on Water Resources of Central Luzen. 1961. Water Resources Planning and Development Committee.
- Reforestation Administration. 1965. Research Program in Reforestation. Research Note No. 1. Philippines.
- Reyes, M.R., and E.T. Tagudar. 1965. Timber Stand Improvement. Bureau of Forestry, Philippines. (unpublished report).
- Soil Conservation Society of India. 1957. The Challenge of Our Watersheds.
- Tagudar, E.Y. 1957. Some Selective Logging Techniques and Guides Practised in the Nasipit Lumber Company, Philippines.
- Talbot, Lee M. and Martha H. Talbot. 1964. The Status of Renewable Natural Resources in the Philippines. International Commission on National Parks, International Union for Conservation of Nature and Natural Resources.
- Vergara, N. T., W.W. Alisson, and F.V. Cagampang. 1963. Kaingin Agriculture in the Philippines. NSDE Project no. 2.59.
- Water Resources Survey Team. 1965. Annual Report No. 1-4. National Economic Council-U.S. Agency for International Development, Manila.
- Weather Bureau. 1960. Monthly Average Rainfall and Rainy Days in the Philippines.

TABLE 1 – STATUS OF FORESTS OF THE PHILIPPINES<sup>3</sup>

	Area (Hectares)	Per cent	Volume(1) (Cubic Meters)
Commercial Forests	8.3	27.8	900.0
Non-Commercial Forests(2)	4.1	13.8	81.2
Brushland	2.0	6.8	
Cogon or openland	3.5	11.7	
Swamps	0.7	2.2	
Cultivated Land	11.2	37.7	
Total (in million)	29.8	100.0	981.2

(1) diameter, 30 cm. and over.

(2) Less than 40 cubic meters per hectare.

<sup>3</sup> Statistics, Bureau of Forestry.

TABLE 2 – STATUS OF AGRICULTURAL LAND USE IN THE PHILIPPINES<sup>4</sup>

(In million hectares)

CROPS	1955	1960	1964
<i>Food Crops</i>			
Palay (rough rice)	2.7	3.3	3.1
Corn	1.4	1.8	1.9
Fruits & nuts	0.3	0.3	0.4
Rootcrops	0.3	0.3	0.3
Other crops	<u>0.2</u>	<u>0.3</u>	<u>0.2</u>
Total (in million)	4.9	6.0	5.9
<i>Commercial Crops</i>			
Coconut	1.0	1.0	1.5
Sugar cane	0.3	0.2	0.3
Abaca	0.2	0.2	0.2
Other crops	<u>-</u>	<u>0.1</u>	<u>0.1</u>
Total (in million)	1.5	1.5	2.1

TABLE 3 – AREA PLANTED TO RICE IN THE PHILIPPINES<sup>5</sup>

(1962)

Kind of land	Area in Hectares
1. <i>Productive land</i>	2.1
a. Irrigated	0.8
b. Second crop	0.2
c. Lowland rainfed	0.7
d. Upland	0.4
2. <i>Marginal land</i>	1.1
a. Rainfed	0.8
b. Upland	0.3
Total (in million)	3.2

<sup>4</sup> Released by the Bureau of Agricultural Economics.<sup>5</sup> Based on Five-Year Rice Production Program of the Philippines.

## Part 3

# Forest and Watershed Management and Research

## The Royal Forest Department Program for Watershed Management and its Problems

by

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### SUMMARY

Many watershed areas of the seventeen important rivers in Thailand are damaged and are not in a condition to supply water regularly throughout the year. In many cases there are erosion and floods. To improve and rehabilitate watershed areas, the Royal Forest Department has set up a project for watershed management research for water yield improvement, management for prevention of watershed damage, and rehabilitation and improvement of damaged watersheds. The research project will be successful provided the Royal Forest Department receives co-operation from various government offices and has sufficient technical men, laboratory facilities and money.

### INTRODUCTION

Forest lands, generally the areas of highest precipitation and water yield, make up more than one half of the whole land area in Thailand which is about 514, 000 square kilometers. It has been estimated that between half and three quarters of the total runoff occurring in Thailand comes from forest, brush, and related rangeland watersheds especially in watershed areas in which trees are illegally cleared. It is obvious how significant is the management of these watersheds.

There are seventeen important rivers in the country – four in the central region, two in the northeast, six in the north, three in the west, and two in the south (see Table 1) upon which the livelihood of more than 80 per cent of the population depends. Increasing population and consequent need for more agricultural land plus industrial expansion demand more water.

The royal Forest Department has set up programs in watershed management and at the same time explored various watershed areas, each of which has its own special characteristics, for studying proper methods of improvement. The research program is organized around:

1. water yield improvement,
2. management for prevention of watershed damage, and
3. rehabilitation and improvement of damaged watersheds.

### WATER YIELD IMPROVEMENT

One of the first activities has been the construction of a water-gauging station at Chieng Doa Watershed Experiment Station to determine

1. how forest cover affects the high and low water stages of mountain streams,
2. the total runoff from these watersheds as compared with annual precipitation, and

3. the amount of erosion of the surface soil.

One of the prime concerns of the Royal Forest Department has been the amount of sedimentation in reservoirs and dams. Although the work of the water gauging station is incomplete an interesting account may be given here. After a heavy rain of about 10 inches under normal forest condition, we were able to collect approximately 900 kilograms of sediment in the catchment area of 65.2 rais (about 26 acres). From this figure we can visualize the enormity of sedimentation going on in the 26, 400 square kilometers catchment area of Yan Hee dam.

### MANAGEMENT FOR PREVENTION OF WATERSHED DAMAGE

Under the Land Development Project, most forest lands are managed for other resources as well as water, and pressures on watershed areas are increasing. Legal and illegal timber harvesting is advancing into the steeper and erodible slopes while the practice of shifting cultivation by hill tribes and villagers worsens the condition of the areas. Roads have always been a prime source of runoff and sediment and their location and design are becoming more critical with respect to the watershed. Serious consideration should be given by the Highway Department to the fact that during the summer their workmen engage in uncontrolled burning of grasses and shrubs along the road which can lead to forest fires. A project for studying road erosion on roads of different surfaces running through different types of forests is expected to be carried out in the north.

Livestock – cattle, horses, and elephants – are usually left to graze in the forest after working and apart from causing physical movement of soil down the steep side slopes they also damage young trees and seedlings.

Our research program is partially designed to make comparisons of different methods of land use, but more basically we are striving to develop protection standards for different types of soils, different vegetative cover and different topographic characteristics, as guides in the management of forest and related rangelands.

Studies of soil disturbances by streamflow will be undertaken in different parts of the country.

### REHABILITATION OF DAMAGED WATERSHEDS

A vast number of watersheds in the north and northeast have been damaged thus resulting in excessive floods and sediment flow. Water control through revegetation and mechanical control is needed, but many of these sites are difficult to reach. Airplane seeding has been tried on some sites but the grass cover has been too thick for this to be successful or to allow for rehabilitation by natural regeneration.

At present four watershed research stations are conducting experiments with 40 exotic and domestic tree species such as *Pinus khasya*, *P. merkusii*, *P. elliotii*, *Eucalyptus spp.*, *Spondias pinnata* which would be useful not only for watershed management purposes but for the pulp and paper industry. The first two of these have been planted in strips and terraces at Kunkong Watershed Protection Unit and have proven to be very successful and profitable species at an elevation of 1, 000 meters or above. *Broussonetia papyifera* thrives and shows a remarkable rate of growth. *Tectona grandis* has been planted at a lower elevation (about 50 meters to sea level).

Research is underway into the most practical and effective method of rehabilitation of the damaged watershed areas. Techniques and species for establishing quick ground cover to compete with the grasses are badly needed. Along with research in revegetation will be studies of classifying pyritic soil materials, chemistry of spoiled banks, and possible ways of the improvement of vegetation.

### CONCLUSION

The program of the Royal Forest Department thus far has taken into consideration only rather specific problems of watershed management. There is much research to be done on the hydrologic and erosional processes which underlie the evaluation and

interpretation of the results from these studies. The importance of watershed research is not realized by the majority of the people. We need more men, money and facilities to work towards solving watershed problems and improving our national water resources for the wealth of our country.

TABLE 1 – RIVERS OF THAILAND

Geographic Region	Name of River	Length (in kilometers)	Notes
North	1. Mae Kok (Nam Kok*)	285	These two rivers flow north.
	2. Mai Ing (Nam Me Ing*)		
	3. Ping (Mae Nam Ping*)	590	These four rivers flow south and join to form Chao Phra (and Suphan Buri)
	4. Wang (Mae Nam Wang*)	590	
	5. Yom (Mae Nam Yom*)	555	
	6. Nan (Mae Nam Nan*)	627	
Central	7. Maenam Pasak (mae Nam Pa Sak*)	365	Flows from Petchaboon Province to join Maenam Chao Phya.
	8. Maenam Chao Phya (Chao Phraya*)		
	9. Maenam Bangpakong	294	
	10. Maenam Nakorn Nayok	110	
Northeast	11. Maenam Mume (Mae Nam Mun*)	672.5	Runs east through the vast agricultural lands to join the Mekong.
	12. Maenam Chee (Lam Chi*)	442	Flows into Maenam Mune at Ubol Rachathani Province.
West	13. Maeklong (Mae Khlong*)	140	These three rivers originate in the high Tennesse- rin mountain range and flow into the Gulf of Thailand.
	14. Maenam Phet	170	
	15. Maenam Thachin	270	
South	16. Maenam Pattani	165	
	17. Maenam Tapi	214	Flows west.

\* Spelling used in 1958 edition of The Times Atlas of the World, edited by John Bartholomew.

# Effects of Forest Fire on Runoff and Erosion

by

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## SUMMARY

The widespread use of forest fires to burn litter and understory vegetation in deciduous forests is a common occurrence in Thailand. This paper describes a pioneer effort in Thailand to study the influence of repeated forest fires on surface runoff and soil erosion in different forest and soil types.

## INTRODUCTION

The widespread use of forest fires to burn litter and understory vegetation in the deciduous forests during the dry seasons is a common yearly occurrence in Thailand. It is important therefore to find out how this practice affects runoff and erosion yield on these forest lands.

This study which takes place in the Mae Huad Watershed, Mae Huad precinct, Ngao district and Lampang province in northern Thailand (Longitude 100°E, Latitude 18° 45' N.) (Fig. 1) is a pioneer effort in Thailand to study the influence of repeated forest fires on surface runoff and soil erosion in different forest and soil types. It will provide basic information for watershed management and for formulating forest protection programs in the future. The study was started in April, 1960 under the Kasetsart/Oregon Control and in 1962 was continued under Kasetsart/Hawaii Contract. Since the termination of the latter contract in 1965, Kasetsart University has been solely responsible for the support of this project.

## REVIEW OF LITERATURE

Prior to this study there had been no research in Thailand concerning the hydrologic consequences of fire. The effects of burning watershed on surface runoff, infiltration, percolation, and erosion had been studied at a number of locations in the United States (Colman, 1953). Some of the studies involved fires that completely destroyed the vegetation. Others were limited to the effects of ground fires that did not burn the trees, thus more nearly simulating the practice of burning in Thailand.

Studies by Rowe and Colman, 1951; Kittredge, 1948; Pope et al, 1946; Daniel et al, 1943; and Copley et al, 1944 have concerned the hydrologic consequences of fire in the United States.

## METHODS OF STUDY

In this study, surface runoff and erosion in relation to rainfall will be compared on unburned and annual burned plots under each of the following forest and soil conditions:-

1. Teak plantation (closed canopy) on sandy clay loam
2. Natural teak forest (open canopy) on sandy clay loam and shale
3. Dry dipterocarp forest on lateritic soil
4. Natural teak forest (open canopy) on limestone soil

Two plots, 2 meters wide and 10 meters long, were established under each of the above

conditions in April 1960. The sides and upper end of each plot are delineated by boards partially buried in the soil. Runoff and sediment are caught in a galvanized iron trough placed across the lower end of each plot and are conveyed by pipe to at least three collector tanks or barrels for each unit. (Fig. 2) The litter and understory vegetation was burned on one plot under each condition, during the dry seasons of 1960 to 1962 in the first period of study. The other plot of each pair remained unburned.

The series of plots were duplicated in 1962 and triplicated in 1963 to provide two and three replicates of each treatment respectively under each of the four conditions. One plot of each pair under each condition was burned until 1962. The other plot of each pair remained unburned.

All plots are on east slopes but sites with the same degree of slope could not be located under each of the four conditions. However, all plots within each condition have nearly the same slope.

To provide further study, a second period of investigation was launched in 1963 in which no burning was carried out, to compare the results in all the plots. The record period will be finished in 1965. In 1966-1968 the plots which were burnt in 1960 to 1962 annually will be kept unburned, and the other plot in each pair which was unburned before, will be burnt annually, thus reversing treatments on the older pairs of plots.

### **THE STUDY WHICH HAS BEEN DONE**

1. Rainfall by storms is measured in non recording raingauges at four locations near the plots.
2. The total volume of runoff and sediment from each plot for each storm is measured in the collector tanks provided for this purpose and the data recorded on tally sheets.
3. Before each collector tank is drained the contents are stirred and a one-litre sample of water with suspended sediment taken to the shelters to determine the quantity of sediment in the runoff. After adding a few drops of calcium chloride into each sample of stirred water for two hours the sediment will precipitate, and settling and the volume of sediment can be observed and recorded.

### **RESULTS**

In the first period of study data (1960-1962), Table 1 and Fig. 3 & 4 show the weight of sediment and volume of runoff per hectare per year in diagrammatic chart.

### **CONCLUSION**

In the first three years of study the following conclusions can be drawn:-

1. In the teak plantation runoff in the burned plot is above five times as much as in the unburned plot, and sediment in the burned plot is about 14 times as much as in the unburned plot.
2. In natural teak forest on sandy loam and shale, runoff and sediment in the burned plot are nearly twice that of the unburned plot.
3. In dry dipterocarp forest on lateritic soil the runoff of the burned plot is about 80 per cent that of the unburned, while sediment from the burned plot is 40 per cent greater than the unburned plot.
4. In natural teak forest on limestone soil runoff from the burned plot is about  $\frac{1}{3}$  greater than from the unburned, and there is  $2\frac{2}{3}$  times more sediment from the burned than the unburned plot.

## DISCUSSION

The data which was recorded for the three-year period indicates that

- (a) Runoff in Plot Series No. 1, 2 & 4 is more, in burned plot than in unburned plot, especially in Series No. 1 in which litter and humus had accumulated in the plantation more than ten years before the experiment started. It is the reverse in Series No. 3 (dry dipterocarp forest) in which the forest floor had been burnt for years and there was nothing left except gravelly bare ground. Top soil is full of pores in the gravel and sandy loam soil through which water can percolate easily. In the unburned plot, the litter and slash tended to plug in some of the pores and some are decomposed which contributes to more runoff and sediment in unburned plot.
- (b) The amount of sediment in Plot Series No. 1 shows a very distinctive difference between unburned and burned plot. This Plot Series is in teak plantation which had been fire protected for more than ten years and there is an accumulation of a thick layer of litter and duff but none on the burned plot.
- (c) Runoff and sediment in Plot Series No. 2 are higher than Plot Series No. 4 even though these two plot series are both in natural teak forest. The preceding plot series is on sandy loam and shale and the ground cover and undergrowth is rather sparse whilst the latter plot series is on limestone or clay loam soil and there is a dense undergrowth cover all the year round.

## LITERATURE CITED

- Colman, E.A. 1953. Vegetation and watershed management. The Ronald Press, New York, N.Y. 412 pp.
- Copley, T. L., et al. 1944. Investigations in erosion control and reclamation of eroded land at the Central Piedmont Conservation Experiment Station, Statesville, N. C, 1930-40. U.S. Dept. Agric. Tech. Bull. 873. 66 pp.
- Daniel, H.A., et al. 1943. Investigation in erosion control and reclamations of eroded land at the Red Plains Conservation Experiment Station, Guthrie, Oklahoma, 1930-40. U.S. Dept. Agric. Tech. Bull. 837. 94 pp.
- Kittredge, J. 1948. Forest Influences. McGraw-Hill Book Company, Inc. New York, N.Y. 387 pp.
- Pope, J. B., et al. 1946. Investigations in erosion control and the reclamation of sandy clay lands of Texas, Arkansas, and Louisiana at the Conservation Experiment Station, Tyler, Texas, 1931-1941, U.S. Dept. Agric. Tech. Bull. 916. 76 pp.
- Rowe, P.B., and E.A. Colman. 1951. Disposition of rainfall in two mountain areas of California. U.S. Dept. Agric. Tech. Bull. 1048. 84 pp.

TABLE 1 - TOTAL AMOUNT OF RAINFALL, RUNOFF, AND EROSION AT MAE HUAD WATERSHED, NGOA, LAMPANG PROVINCE IN THREE-YEAR PERIOD (1960 - 1962)

No.	Plot Number & treatment	Forest type	Rainfall (millimeters)			Weight of sediment (Kilograms per hectare)			Volume of runoff (Cubic meters per hectare)					
			1960	1961	1962	average	1960	1961	1962	average	1960	1961	1962	average
1	1-1 +1-3(Burned) 1-2+1-4 (Unburned) 2-1 + 2-3 (Burned)	Teak plantation	1,299	1,254	1,012	1,188	116,127	89,300	53,208	86,212	3,572	3,277	2,589	3,146
							8,909	6,414	3,163	6,162	1,012	497	310	606
							55,920	15,199	24,144	31,754	2,465	1,725	1,228	1,806
2	2-2 + 2-4 (Unburned) 3-1 + 3-3 (Burned)	Natural teak forest	1,274	1,154	939	1,122	53,540	2,436	1,752	19,242	2,332	487	301	1,040
							5,647	4,360	10,527	6,845	1,126	717	657	833
3	3-2 + 3-4 (Unburned) 4-1 + 4-3 (Burned)	Dry dipterocarp forest	1,241	1,152	969	1,121	11,318	1,765	2,300	5,127	1,948	706	506	1,053
							16,887	25,769	8,332	16,996	1,335	1,180	700	1,071
4	4-2 +4-4(Unburned)	Natural teak forest	1,145	1,234	1,001	1,126	5,077	9,686	3,515	6,092	628	841	549	637

Figure 1.  
Map of Thailand Showing Location of Mae Huad Watershed Experimental Area.

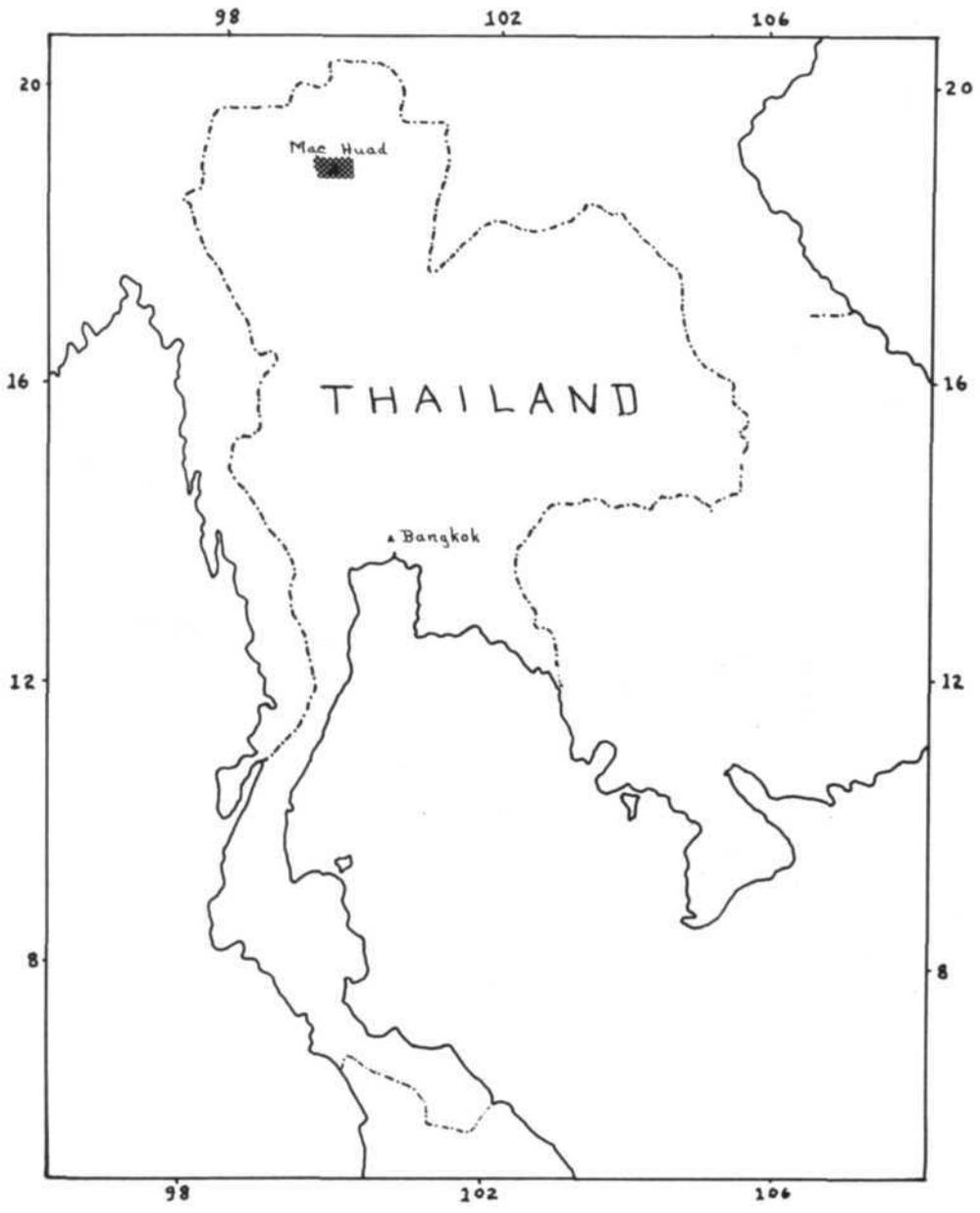
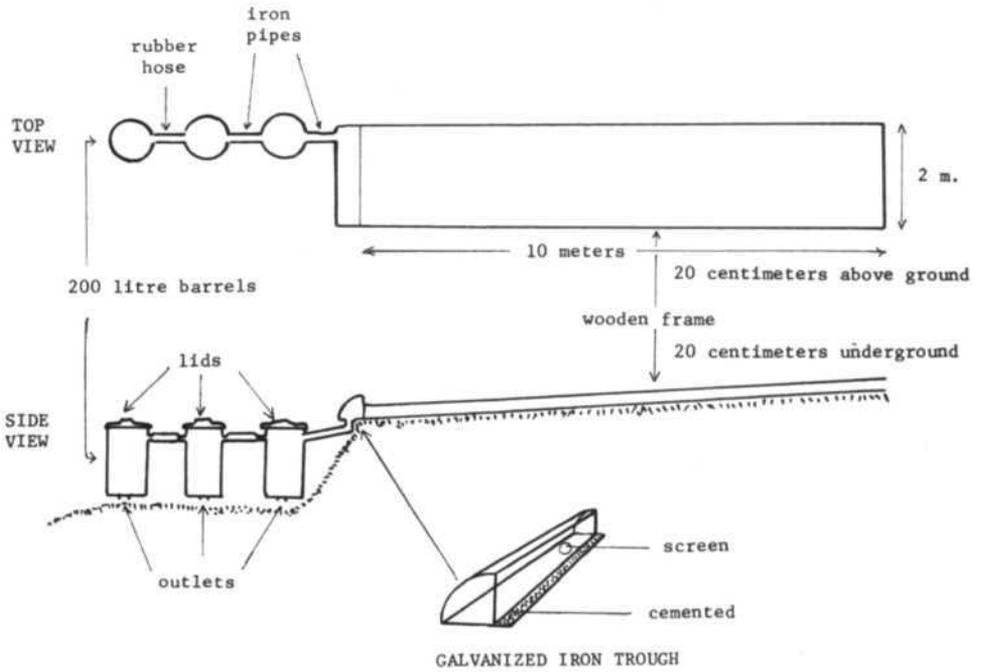
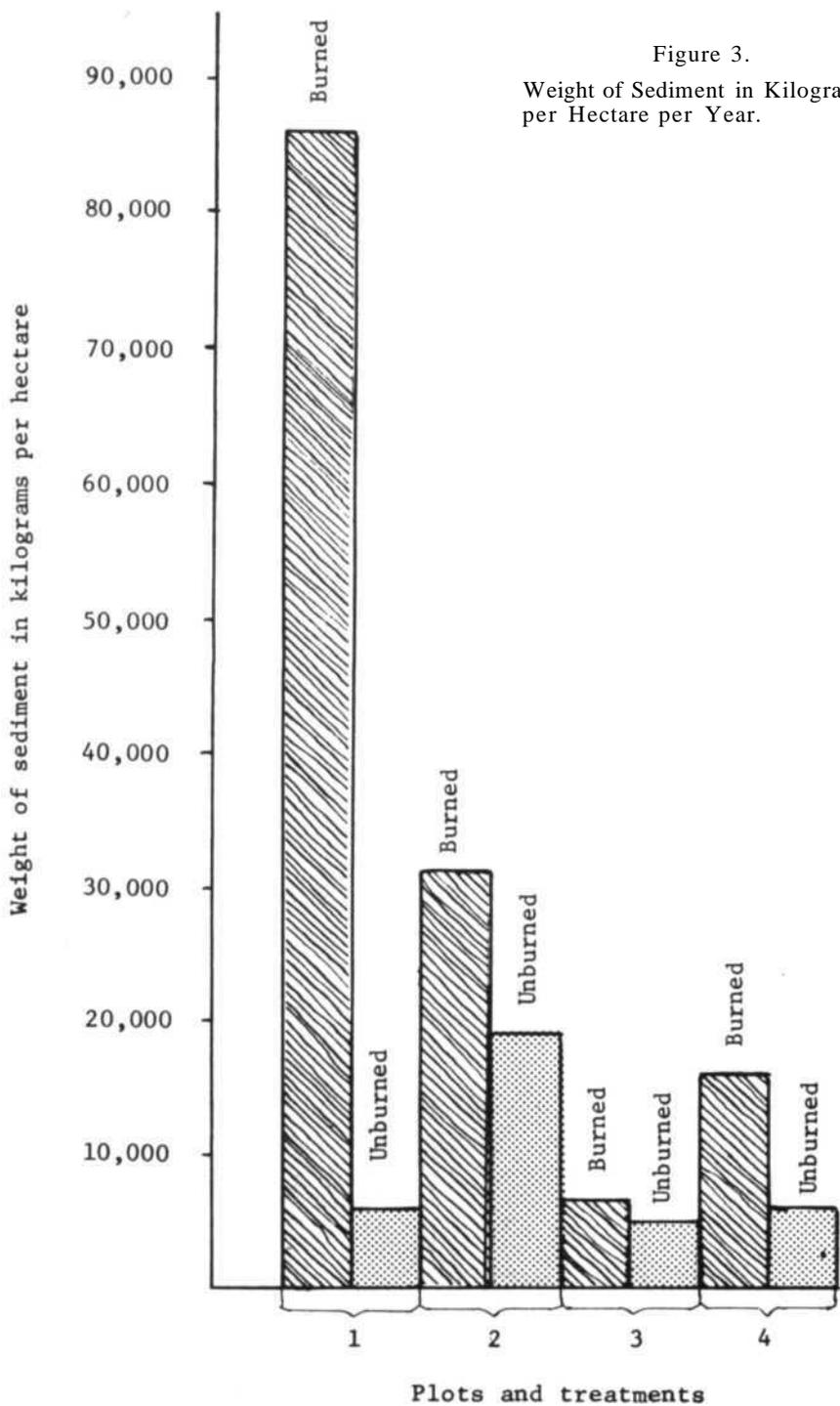
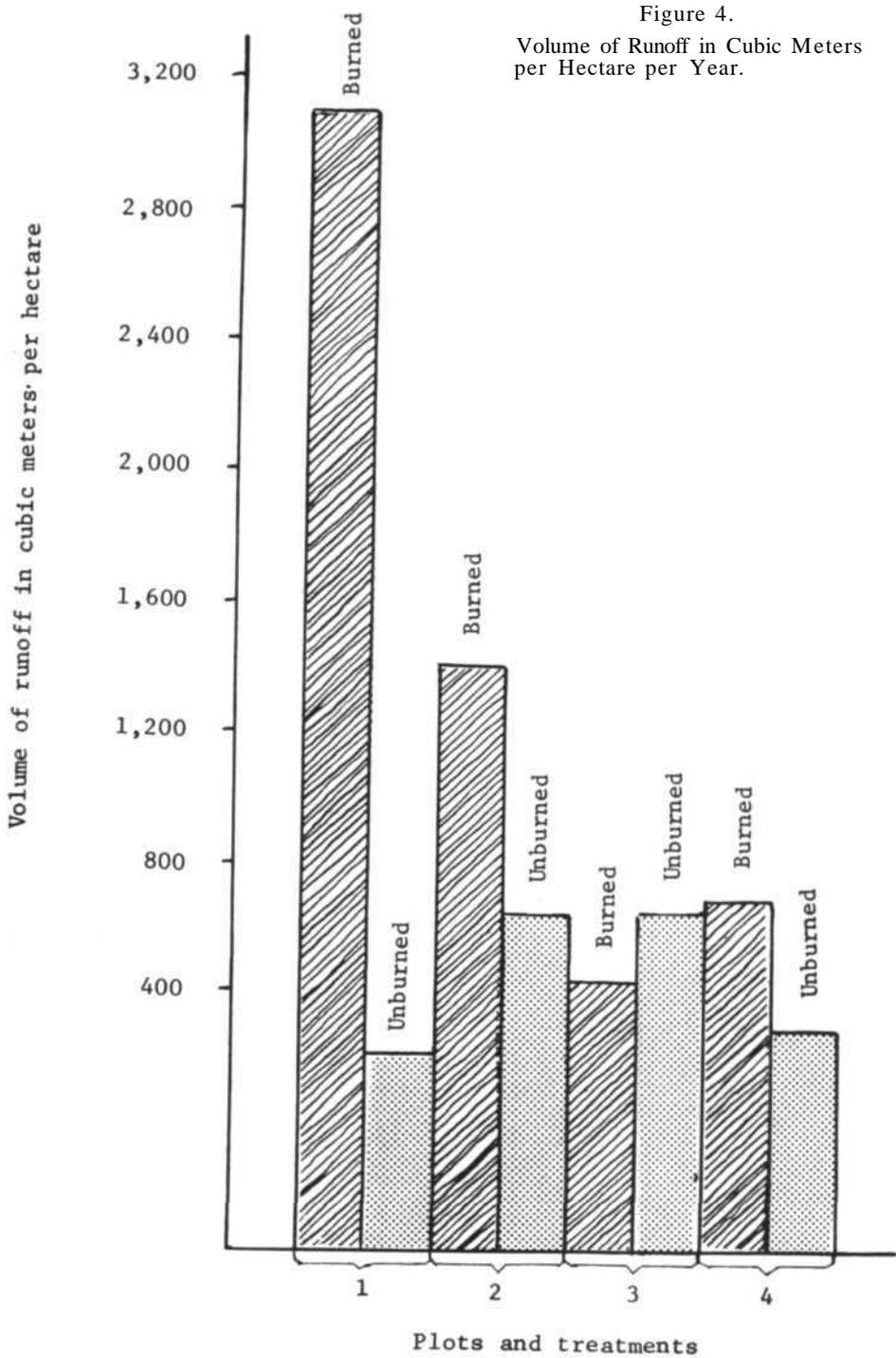


Figure 2.  
Diagram of the Experimental Plot Plan and Side Elevation.

SCALE 1:100







# Preliminary Watershed Management Research in Northern Thailand

by

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## SUMMARY

Deforestation of mountain watersheds which leads to increased erosion and sedimentation is one of the major problems of developing countries, Thailand included. A committee on a national level was formed in 1965 to deal with conservation and management of watersheds, and a sub-committee was set up to initiate research. In 1965 the Royal Forest Department began definite scientific research in the northern part of the country; the objectives of this program are described.

## INTRODUCTION

Deforestation of mountain watersheds is one of the major problems of several developing countries. Thailand is no exception. Increase in population has led to rapid deforestation on both low and high land. It has been reported that sixty per cent of the forests in the principal catchment areas of Thailand have been destroyed by shifting cultivation and that this cultivation is still being practiced by the hill tribes of the country (Komkris, 1962). Devastation of timber resources is apparent, and has contributed largely to the increased movement of water as surface flow as well as in streams. Rapid runoff during the rainy season results in peak floods in the northern provinces yearly. During summer water is in short supply and siltation is evident in streams and rivers.

## BACKGROUND

The rice bowl in central Thailand depends largely on the water that comes from the northern mountain watershed. Therefore, continuous and sufficient flow of water must be assured. Construction of hydro-electric as well as diversion dams has meant an increasing problem of siltation which is considered to be as important as water yield and water quality. Kittredge (1948) and Sinclair (1963) have pointed out that destruction of vegetation contributes to the problems of erosion and sedimentation. The developing countries trying to make use of their available resources are suffering from unaware destruction in their watershed areas which delays their progress. The situation therefore needs urgent remedial action.

In Thailand effective measures have not been carried out in the conservation and management of watersheds; this is due to the lack of basic information about the areas and about their tribal inhabitants who play an important role in the denudation of watersheds. However, the problem is receiving the serious attention of the government. In August 1963 a watershed management committee on the national level was formed. The committee was comprised of an Undersecretary of the Ministry of National Development as Chairman, and the Director-Generals of the Departments of Irrigation, State Highways, Land Development, Royal Forestry, Agriculture, Public Welfare, Police, and Public Health and representative of Kasetsart University as committee members. The Chief of the Land Improvement and Management Division of the Department of Land Development serves as committee secretary. The functions of this committee are as follows:

1. Planning of operations in all watershed areas, giving priority to the major river basin.
2. Preparing a yearly budget for all watershed management activities including operating funds and man power.
3. Distributing the works to the appropriate departments concerned and finding ways and means for inter-departmental co-operation.
4. Studying the sedimentation problem of the Bhumipol Dam and implementing the result of such study.

The national committee after its first meeting, realized that in order to execute the watershed management program successfully, basic facts and figures on watershed should first be collected. A sub-committee on watershed management research consisting of representatives from the Departments of Irrigation, Land Development, Royal Forest and Public Welfare is obliged to initiate and follow up all research activities concerning watershed areas.

## **THE EXPERIMENT**

The research projects on watershed management began with preliminary studies initiated by Kasetsart Forestry staff and an advisor on soil sciences from Oregon State University, with the co-operation of a USOM conservationist in Bangkok. The experiment carried out in 1960 by Sa-ard Boonkird and M.D. Dawson (1964) on the effect of forest burning on runoff, soil moisture and erosion was begun at Huay Tak Forest, Lampang Province. Surface runoff and sediment in relation to rainfall were measured from plots under each of the following forest and soil types:

1. Teak plantation on soil derived from shale.
2. Natural teak forest on soil derived from shale.
3. Natural teak forest on soil derived from limestone and
4. Dry dipterocarp forest on laterite soil.

Data collected in 1960 revealed that runoff is double in volume on burned plot as compared to unburned plot, and soil loss also follows the same trends; that is, it is about twice as much on burned plots when compared with unburned plots.

Results to date indicate that burning increased runoff and erosion in the teak plantation but the treatment was less effective under the natural teak and dry dipterocarp forest types.

An attempt to start comprehensive research on the whole watershed area was made in early 1965 by V. Naraballop and the writer under the advisory work of Dean Komkris and a USOM advisor, J.D. Sinclair, with funds provided by Kasetsart University and the University of Hawaii contract. Kind and valuable co-operation were given by both the Royal Forest Department and Department of Irrigation. The study aims at the influences of natural forest cover, shifting cultivation and other uses of mountain land on water yield and soil erosion.

Having inspected the watershed areas all over the north and the north-eastern parts of Thailand, the Huay Kog-Ma area was chosen by the research team as the most suitable site for carrying out the research project. Sinclair in 1965 reported that "This Huay Kog-Ma area has several outstanding features, namely:

1. Small watersheds with perennial Streamflow and sites for detailed plot studies, all in undisturbed, old growth Hill Evergreen forest.
2. Apparent abundant rainfall and Streamflow, though neither has been measured.
3. Forest burning (ground fires) and clearing of the forests in the process of shifting cultivation are common practices in the vicinity.
4. The area is within the head waters of the Ping River drainage which is principal source of water for irrigation and power in northern and central Thailand.
5. The area has near-by accessibility by paved mountain road.'

The project is conducted on plots designated as Phase I and watershed as Phase II. The plot studies were composed of nine plots (original aim totaled 18 plots), each 4 × 20 meters in size and equipped to measure surface runoff and erosion. Six of the plots are in undisturbed forest and the remaining three plots in a formerly forested area which is now covered withalang grass. Burning is planned for the three grass-covered plots and three of the forest plots after a calibration period of two years. Five small undisturbed watersheds at Huay Kog-Ma were surveyed in order to set up small dams for measuring streamflow and sedimentation, however, due to the limitation of research fund, only three watersheds were equipped with rain gauges and small dams with weirs. Streamflow and sediment yield will be investigated prior to application of treatment on the forest cover. The result from preliminary trial on the small plots is expected to be tested in two of the watersheds while the third one will be kept as a control area.

The system of cultivation practice by the tribal people will be tested to find out the effects of this kind of land use on runoff and soil movement. (Samapuddhi and Suvana-korn, 1962).

### **THE PILOT WATERSHED**

Since the rate of destruction of mountain forests is increasing the sub-committee felt that some means of rehabilitating the watersheds should be tried out. An approach to this would be to set up a pilot watershed project where all agronomic practices could be experimented with. The sub-committee agreed that

1. the site of the pilot project should be north of Bhumipol Dam with the idea that if rehabilitation were successful then implementation of the result could expand to all the other watersheds in the north, and
2. only measures suitable for the hill people i.e. those farm crops that are easily transported and essential for daily food would be considered.

Afforestation on some part of the pilot watershed will also be carried out and meanwhile varieties of grass and cover crops will be grown to provide for grazing. The whole program aims at both research and demonstration.

The sub-committee selected the area of Huay Mae Nai watershed near Doi Pui, Chiang-mai as the site for the project. It is to be carried out as follows: In 1965 the stream-flow measuring unit is to be installed by the Department of Irrigation, then aerial mapping on the whole watershed will be made at the scale of 1:10,000; in 1966 survey of land use will be conducted; in 1967 improvement measures will be implemented by several governmental agencies such as introduction and growing of fruit trees andalang grass control by Kasetsart University, afforestation and forest fire prevention by the Royal Forest Department, soil and water conservation by the Land Development Department and bank erosion control by the Department of Irrigation. The Public Welfare Department will take charge of all matters concerned with the stabilization of hill tribes settlement and promotion of their welfare including education and vocational training in agriculture and home industry.

### **CONCLUSION**

Watershed management research is a long term complicated project due to the fact that it involves a complexity of environmental factors. The work requires personnel from various professions. In the overall program of watershed management, research in this field is imperative and promising. The watershed problems in Thailand are concerned not with technology alone, but also with the socio-economical aspects of the problem as they affect the hill tribes as well as the lowland people who depend upon the water. A share of responsibilities and a spirit of co-operation among those concerned would be the key to the success of this indispensable program.

## LITERATURE CITED

- Dawson, M.D. 1964. Watershed management with special reference to Thailand's forests. *Kasetsart Journal*. 4 (1 & 2): 23-36.
- Kittredge, Joseph. 1948. Forest Influences. McGraw-Hill Book Company Inc., New York, N.Y. 394 pp.
- Komkris, Thiem. 1962. Organization and program planning for forest research in Thailand. *Kasetsart Journal*. 2(2): 57-76.
- Samapuddhi, K. and P. Suvanakorn. 1962. A study of the effect of shifting cultivation on forest soils. Ministry of Agriculture, Royal Forest Department No. R 51. Bangkok, Thailand. 6 pp.
- Sinclair, J.D. 1963. Personal communication.

# Forest Conservation in Malaya

by

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## SUMMARY

A brief history of forestry in Malaya, Malaysia, is presented. The country is faced with a conservation challenge and an account is given as to how this is being met. It is suggested that in forming the future forest policy following land capability classification, consideration should be given to conserving rare species of flora and even fauna in their natural habitat.

## HISTORICAL BACKGROUND

The earliest forestry report in 1879 described the major timber trees and recommended the setting up of a forest department. In 1883 a department for the Crown Colonies was formed and placed under the Director of Gardens and some valuable work in reserving forests was done although on a small scale. Later this department was placed under the control of the Lands Office, and in 1895 a full-time forestry officer was appointed to the State of Perak where *Palaquium* forests were being rapidly destroyed. A few years later certain states were employing untrained forest inspectors and, shortly after, the States of Selangor and Negeri Sembilan obtained full-fledged forest officers.

In 1901 the forest administration became more organized and was put on a more scientific footing. Valuable mangrove forests were reserved in Perak and Selangor and areas of rich lowland forest – which naturally support durable heavy hardwood species and also *Palaquium gutta* – were also included. There followed the reservation of forests of many species of *Shorea* and *Dipterocarpus*. The process continued over all the states being most advanced in those states with properly organized forest departments.

By the late thirties the extent of forest reserve had increased from about 150 square miles to over 10,000 square miles or about one-fifth of the total land area of the country. Since then there has been much slower progress due to the demand for the land for agriculture and other developmental purposes. Today the total area of forest stands at some 13,400 square miles. Annex A gives a list of forest reserves in the order of establishment; the list includes those or part of those which have since been revoked or excised but does not include proposed forest reserves.

Along with the work of forest reservation, observations were made and suggestions put forward for improvement, such as improvement felling, experimental plantations in the lowlands and highlands; poison-girdling of unwanted species. The tatten, a method of cutting, is still in use today.

## THE FOREST AND THE NATIONAL ECONOMY

The value of well-managed forests is generally taken for granted until the disappearance of a forest results in

1. a shortage of forest products, and
2. disastrous floods causing loss to life and property with consequent inbalance of the national economy.

It is to stave off such distress that the government is advised to lay down a far-sighted forest policy and to enforce it no matter what opposition it may entail. Forests are a natural asset of inestimable value to the nation and although they are not inexhaustible they are replaceable and in this manner may be kept perpetually productive and useful.

Forest conservation lies in the wise, economic and protective use of the renewable resource with the object of perpetuating it. It is the aim of forest management to convert the original forest comprising trees of all ages and sizes and a mixture of utilizable and inferior species into an even-aged forest containing a high proportion of the best quality timber species. To achieve this aim of producing the greatest possible amount of useful timber in the shortest possible time Malaya has followed two systems:

1. In the early 1950's Malaya adopted a shelterwood silvicultural system which prescribed successive fellings at intervals of a few years. Undesirable species were removed in one or two operations by fellings or by poison-girdling. When the regeneration was from five to ten years of age the main timber crop was harvested. After a cleaning and girdling operation the area was declared regenerated. The system was expensive because of repeated cleanings of undergrowth, but it worked well with cheap labor and animal extractions and ensured successful regeneration.
2. The current practice, making use of machines and modern techniques, advocates the felling of a stand in one operation. This, the Malayan Uniform System, takes advantage of the capabilities of many of the important commercial seedlings when exposed to full light, but its success depends on the presence of sufficient seedling of timber species. This is determined by systematic sampling. If the number of seedlings is insufficient the system will not work unless the area is enriched by planting.

Silvicultural research has played no small role in achieving better techniques and in the evolution of the present Malayan Uniform System. Whether the present yield from virgin forest can be increased by improving the condition under which the trees grow, or whether new crops of forest grown can be economically improved in species composition and growth rate, or whether the quantities of timber produced can be supplemented by plantings of exotics are some of the many questions to be answered by silvicultural research.

Forest products research is concerned with the manner by which the total timber produced may best be utilized. Its task, therefore, is a study of the following: improving the present yield by using better felling and extraction methods or by more intensive utilization; finding uses for those species not at present utilized; utilizing in the best and most economical fashion forest products used in construction and in manufacturing articles; avoiding or lessening wastage by better saw milling practices and by preventing the losses by technical mis-use.

Legislation for conservation of the forests is not adequate as evidenced by excisions and revocations which of late have been taking place. Perhaps the policy is not explicitly formulated; with the enunciation of the new policy it is hoped that the effect could be better felt.

## **OF THE FUTURE**

Over the country, both within forest reserves and outside them, there are large areas covered with sheet lalang and scrub, land which was devastated as a result of uncontrolled cultivation during the Japanese occupation. After two decades of research the rehabilitation of such ruined land is being considered by the launching of a quick growing conifer plantation project. Another factor in destroying the forest has been nomadic aborigines who practise shifting cultivation. The effect of such primitive agriculture is calamitous and a solution has yet to be found. Inroads are also being made on forest reserves to meet the demand for more agricultural land. Forests have been depleted either by small scale alienation or large scale excision resulting in the loss of the more accessible ones.

In the modern world with enlightened public opinion forests should not disappear. A balance should be maintained between forest land and land used for agriculture and other purposes. To this end, in Malaya, a judicious land-use planning program has

been started. The planning envisages a classification based on economic capability, but a certain amount of consideration should be given to the conservation of rare species of flora and fauna. The Forest Service is very much involved with this planning and since its policy would have to be readjusted to fit into the overall land-use policy of the country, it is its hope that fair consideration can be accorded to forest conservation in its widest sense.

## REFERENCES

- Wyatt-Smith, J. 1963. Manual of Malayan Silviculture for Lowland Forests. *Malayan Forest Records* No. 23.
- Landon, F.H. 1955. Malayan Tropical Rain Forest. *Malayan Forester*, Vol. 18.
- Walton, A.B., R.C. Barnard, and J. Wyatt-Smith. 1952. The Silviculture of Lowland Dipterocarp Forest in Malaya. *Malayan Forester*, Vol. 15.
- Landon, F.H. and G.G.K. Setten. 1961. Forestry and Forest Research in the Federation of Malaya. *Malayan Forest Research Pamphlet* No. 19.

## ANNEX 1

### LIST OF FOREST RESERVES IN THE COUNTRY IN CHRONOLOGICAL ORDER OF ESTABLISHMENT

Date of Establishment	Name of Forest Reserves	Locality	
1897	July 30	Kanching	Selangor
	Aug. 27	Gunong Itam	Selangor
	Dec. 17	Pulau Klang Mangrove	Selangor
1898	Jan. 14	Sungai Buloh	Selangor
1902	Jan. 31	Matang Mangrove	Perak
	Feb. 9	Bukit Kutu	Selangor
	Dec. 24	Ampang Catchment Area	Selangor
1903	Sept. 25	Trolak	Perak
	Nov. 6	Behrang	Perak
	Dec. 4	Matang Mangrove Extension	Perak
	Mar. 20	Rantau Panjang	Selangor
1904	Jan. 29	Matang Mangrove Extension	Perak
	July 22	Teluk	Selangor
1905	May 26	Pulau Lumut Mangrove	Selangor
	Nov. 30	Matang Mangrove Extension	Perak
	Dec. 22	Ulu Dong	Pahang
	Dec. 29	Gunong Semanggol	Perak
1906	May 11	Ulu Gombak	Selangor
	June 22	Kuang	Selangor
	July 27	Plus	Perak
	Aug. 1	Bukit Galing and Bukit Kuantan	Pahang
	Oct. 5	Keledang Saiong	Perak
	Nov. 1	Weld's Hill	Selangor
	Nov. 1	Lesong	Pahang
	Nov. 1	Menchali	Pahang
	Nov. 23	Ayer Hitam	Selangor
	Nov. 30	Tanjong Tualang	Perak
	Nov. 30	Asam Kumbang	Perak
	Dec. 22	Bangi	Selangor
1907	Feb. 2	Klau	Pahang
	May 1	Baloh	Pahang
	Nov. 22	Sungai Lalang	Selangor

Date of Establishment		Name of Forest Reserves	Locality
1908	Mar. 27	Bukit Cheraka	Selangor
	July 1	Mangsok	Pahang
	July 1	Putat	Pahang
	July 1	Rotan Tunggal	Pahang
1909	Feb. 1	Mentas	Pahang
	Mar. 5	Sepang Besar Mangrove	N. Sembilan
	Aug. 6	Triang	N. Sembilan
	Sept. 1	Kuantan Mangrove	Pahang
	Nov. 12	Changkat Jong	Perak
	Dec. 31	Bikam	Perak
1910	Jan. 27	Larut Hills	Perak
	Feb. 4	Parit	Perak
	Mar. 4	Erong	Perak
	Mar. 4	Lenggeng	N. Sembilan
	June 24	Berembun	N. Sembilan
	June 24	Jahit	Pahang
	July 8	Bukit Tunggal	Selangor
	Aug. 5	Gunong Tampin	N. Sembilan
	Sept. 2	Senaling Inas	N. Sembilan
	Nov. 11	Pasir Panjang	N. Sembilan
	Dec. 23	Pasoh	N. Sembilan
	Dec. 23	Kemasul	Pahang
1911	Jan. 6	Government Hill	Penang
	Jan. 6	Highlands	Penang
	Jan. 6	Penara Bukit	Penang
	Jan. 6	Pantai Acheh	Penang
	Jan. 6	Laksamana	Penang
	Jan. 6	Telok Bahang	Penang
	Jan. 6	Bukit Genting	Penang
	Jan. 6	Bukit Gumuroh	Penang
	Jan. 6	Relau Hill	Penang
	Jan. 16	Jugra	Selangor
	Jan. 27	Pangkor North	Perak
	Jan. 27	Pangkor South	Perak
	Jan. 27	Sungai Pinang	Perak
	Jan. 27	Tanjong Burong	Perak
	Jan. 27	Tanjong Hantu	Perak
	Jan. 27	Telok Muroh	Perak
	Jan. 27	Gunong Besout	Perak
	Feb. 3	Bukit Belata	Selangor
	Sept. 1	Sungai Puteh	Selangor
	Sept. 22	Bukit Senggeh	Melaka
	Sept. 22	Bukit Sedanan	Melaka
	Sept. 22	Batang Melaka	Melaka
	Sept. 22	Ayer Panas	Melaka
	Sept. 22	Merlimau	Melaka
	Sept. 22	Ramuan China	Melaka
	Sept. 22	Brisu	Melaka
	Oct. 20	Bukit Juru	Province Wellesley
	Nov. 6	Bukit Seraya	Province Wellesley
	Nov. 6	Bukit Mertajam	Province Wellesley
	Dec. 8	Tebong	N. Sembilan
	Dec. 22	Jelai Gemas	N. Sembilan
	1912	Jan. 5	Pulau Tiga
Jan. 5		Chikus	Perak
Jan. 19		Banjar South	Selangor
June 7		Matang Mangrove Extension	Perak
July 5		Bukit Enggong	Selangor

Date of Establishment	Name of Forest Reserves	Locality	
	Aug. 30	Gunong Semanggol	Perak
	Nov. 22	Sungai Menyala	N. Sembilan
1913	Jan. 3	Kepis	N. Sembilan
	Jan. 17	Bukit Badong	Selangor
	Feb. 14	Baloh Mangrove	Pahang
	April 11	Pondok Tanjong	Perak
	April 25	Pulau Lang	Pahang
	May 9	Kuala Langat South	Selangor
	Aug. 1	Semangkok	Selangor
	Aug. 29	Kapar	Selangor
1914	Feb. 13	Bruas	Perak
	Feb. 13	Telok Gedong	Selangor
	Feb. 27	Chikus Extension	Perak
	Feb. 27	Bukit Tarek	Selangor
	Feb. 27	Chior	Perak
	Mar. 13	Banjar North	Selangor
	Mar. 27	Chior Extension	Perak
	Aug. 28	Ijok	Perak
	Aug. 28	Tanjong Tualang Extn.	Perak
	Aug. 28	Lapang Nenerlng	Perak
	Oct. 23	Behrang Extension	Perak
	Nov. 21	Berkelah	Pahang
1915	Jan. 29	Piah	Perak
	May 14	Gunong Tunggal	Perak
	May 21	Mledang Extension	Perak
	May 21	Benchah	Pahang
	Aug. 20	Kechau	Pahang
	Nov. 26	Gadong	Selangor
	Dec. 3	Pulau Tengah	Selangor
1916	Jan. 28	Bahau	N. Sembilan
	Jan. 28	Lakum	Pahang
	April 7	Lepar	Pahang
	June 30	Kledang Saiong Extn.	Perak
	Sept. 29	Bukit Laggong	Selangor
1917	Feb. 2	Yong	Pahang
	Aug. 31	Som	Pahang
	Sept. 7	Batu Undan	Perak
	Sept. 7	Sungai Melintang	Perak
	Sept. 14	Chini	Pahang
	Oct. 26	Tekam	Pahang
	Nov. 9	Kerdan	Pahang
	Dec. 21	Tanjong Tualang Extn.	Perak
1918	Jan. 18	Jelai Gemas	N. Sembilan
	May 10	Jengka	Pahang
	Aug. 30	Jeram Padang South	N. Sembilan
	Oct. 11	Aur	Pahang
1919	June 20	Jeram Padang North	N. Sembilan
	Aug. 15	Batang Kali	Selangor
	Oct. 10	Rompin Mangrove	Pahang
1920	Feb. 27	Tanjong Burong Extn.	Perak
	April 23	Raja Hitam	Perak
	June 4	Pondok Tanjong	Perak
	July 2	Lentang	Pahang
1921	Jan. 14	Piah Extension	Perak
	Jan. 28	Tanjong Burong Extn.	Perak

Date of Establishment	Name of Forest Reserves	Locality	
Feb. 11	Bubu	Perak	
Feb. 25	Bukit Naga	Perak	
Mar. 24	Bintang Hijau	Perak	
April 22	Krau	Pahang	
June 2	Sepang Kechil	Selangor	
Oct. 21	Matang Mangrove Extn.	Perak	
Dec. 23	Cape Rachado	Melaka	
1922	Feb. 24	Tersang	Pahang
	Mar. 24	Piah Extension	Perak
	June 9	Sungai Melintang Extension	Perak
	July 28	Pontian Mangrove	Pahang
	Aug. 11	Telok Kopia	Perak
	Sept. 8	Bukit Arang	Selangor
	Sept. 8	Endong	Selangor
	Sept. 22	Larut Hills Extension	Perak
	Nov. 3	Larut Hills Extension	Perak
	Dec. 15	Bukit Kajang	Selangor
1923	Mar. 9	Palong	N. Sembilan
	May 4	Papulut	Perak
	June 15	Kuala Langat North	Selangor
	July 11	Pulau Kukop	Johore
	July 23	Jemaluang	Johore
	Aug. 24	Bintang Hijau Extension	Perak
	Sept. 21	Lukut Mangrove	N. Sembilan,
	Oct. 5	Kledang Saiong Extension	Perak
	Oct. 24	Pulai	Johore
1924	Feb. 8	Terengun	Pahang
	Feb. 8	Serigala	Perak
	May 16	Bukit Tunggul	N. Sembilan
	Aug. 22	Angsi	N. Sembilan
	Sept. 23	Mersing	Johore
	Nov. 19	Pendas	Johore
	Nov. 28	Larut Hills Extension	Perak
1925	Jan. 23	Berserah	Pahang
	Feb. 20	Bintang Hijau Extn.	Perak
	Feb. 20	Hutan Melintang	Perak
	April 3	Bubu Extension	Perak
	May 1	Hutan Melintang Extn.	Perak
	Nov. 4	Rengam	Johore
	Dec. 23	Kuala Sedali	Johore
1926	Aug. 11	Gunong Arong	Johore
	Sept. 17	Sungai Besi	Selangor
	Sept. 17	Sungai Jeloh	Selangor
	Oct. 15	Linggi Mangrove	N. Sembilan
	Dec. 10	Jerantut	Pahang
1927	Jan. 7	Tekai	Pahang
	Jan. 12	Banang	Johore
	Jan. 17	Rimba Mas Mas	Perlis
	Mar. 17	Basong	Perak
	June 10	Gallah	N. Sembilan
	Oct. 14	Basong Extension	Perak
	Dec. 23	Changkat Bharu	Perak
1928	Jan. 6	Bintang Hijau Extension	Perak
	April 13	Rawang	Selangor
	Aug. 24	Gunong Tunggul Extension	Perak
	Sept. 14	Payong	Perak

Date of Establishment	Name of Forest Reserves	Locality	
	Oct. 19	Tanjong Gunong Besaut Extn.	Perak
	Dec. 12	Mersing Extension	Johore
	Dec. 26	Benut	Johore
1929	Jan. 15	Panti	Johore
	Jan. 23	Kluang	Johore
	Mar. 15	Bintang Hijau Extn.	Perak
	May 10	Bubu Extension	Perak
	May 24	Serendah	Selangor
	June 18	Parit Buntar	Kedah
	July 10	Labis	Johore
	July 19	Changkat Jong Extn.	Perak
	Aug. 2	Behrang Extension	Perak
	Aug. 2	Tapah Hills	Perak
	Aug. 16	Trass	Pahang
	Aug. 21	Benut Extension	Johore
	Nov. 22	Piah Extension	Perak
1930	Jan. 3	Korbu	Perak
	Mar. 14	Ampang Pechah	Selangor
	April 30	Ayer Hitam Selatan	Johore
	May 9	Erong Extension	Perak
	May 23	Bubu Extension	Perak
	May 28	Belungkor	Johore
	June 19	Benut Extension	Johore
	July 4	Erong Extension	Perak
	July 29	Kampar	Perak
	July 29	Kinta	Perak
	July 29	Kledang Saiong	Perak
	Nov. 7	Serting	N. Sembilan
	Nov. 7	Gapau	N. Sembilan
1931	Jan. 2	Mentigi	Pahang
	Jan. 21	Rengam Extension	Johore
	Feb. 13	Setul	N. Sembilan
	April 24	Bukit Panchor	Province Wellesley
	June 24	Gunong Ledang	Johore
	Sept. 11	Sungai Sia	Pahang
	Oct. 23	Padang Chong	Perak
1932	Mar. 11	Pulau Tonggok	Selangor
	Mar. 24	Bubu Extension	Perak
	June 4	Bukit Naga Extension	Perak
	June 17	Kampong Gajah	Perak
	July 1	Ulu Lemoi	Pahang
	July 29	Ulu Teranum	Pahang
	Oct. 12	Pantai Extension	Johore
	Nov. 14	Bukit Enggong	Kedah
1933	Jan. 10	Koh Moi	Kedah
	Mar. 1	Pantai Extension	Johore
	Mar. 24	Slim Hills	Perak
	April 7	Bintang Hijau Extension	Perak
	June 7	Kluang Extension	Johore
	July 17	Sungkop	Kedah
	July 19	Bukit Sawah	Kedah
	Sept. 8	Bebar Mangrove	Pahang
1934	Jan. 3	Soga	Johore
	Jan. 26	Hutan Melintang Extn.	Perak
	May 4	Yu	Pahang
	June 29	Erong Extension	Perak

Date of Establishment	Name of Forest Reserves	Locality	
	Aug. 29	Ma'Okil	Johore
	Oct. 24	Kuala Palong	Johore
1935	July 3	Pulai Extension	Johore
1936	April 3	Sungai Melintang Extn.	Perak
	May 20	Relau	Kedah
	May 31	Gunong Jerai	Kedah
	Aug. 7	Ulu Bertam	Pahang
	Oct. 16	Pelangai	N. Sembilan
1937	April 16	Kledang Saiong Extn.	Perak
	July 6	Temangan	Kelantan
	Oct. 1	Kenaboi	N. Sembilan
	Nov. 12	Batu Gangan	Pahang
1938	Mar. 1	Chabang Tongkat	Kelantan
	June 7	Kemahang North	Kelantan
	June 24	Ulu Ishat	Pahang
	June 29	Gunong Arong Extn.	Johore
	Aug. 5	Sungai Miang Mangrove	Pahang
	Nov. 2	Gunong Ledang Extn.	Johore
1939	Mar. 19	Selat Panchor	Kedah
	May 23	Tumpat	Kelantan
	June 28	Sedenak	Johore
	Oct. 13	Cherating	Pahang
	Oct. 19	Kuala Sepang Mangrove	Selangor
	Dec. 5	Semerak	Kelantan
1940	Feb. 6	Ulu Temiang	Kelantan
	Feb. 6	Lebir	Kelantan
	Feb. 19	Kuala Bernam	Selangor
	Feb. 28	Ayer Hitam Utara	Johore
	Mar. 13	Sungai Kiah	Pahang
	April 17	Mersing Extension	Johore
	July 24	Petoh	Pahang
	Aug. 7	Bukit Hantu	Johore
	Oct. 10	Lumut	Perak
1941	Feb. 5	Belungkor Extension	Johore
	Feb. 5	Bukit Mambai	Johore
	Feb. 16	Cherul	Terengganu
	Feb. 26	Jabor	Terengganu
	Mar. 5	Kluang Extension	Johore
	April 16	Sungai Johore	Johore
	May 14	Lenggor	Johore
	May 16	Balek Pulau	Penang
	June 11	Benut Extension	Johore
	June 15	Pulau Tunggol	Terengganu
	July 3	Hutan Melintang Extn.	Perak
	July 19	Pulau Tuba	Kedah
	July 23	Labis Extension	Johore
	Aug. 6	Bukit Hantu Extension	Johore
	Aug. 28	Hutan Melintang Extn.	Perak
	Sept. 9	Berangkat	Kelantan
	Sept. 11	Bikam Extension	Perak
1947		Sungai Tong	Terengganu
1948	Jan. 15	Relai	Kelantan
	Jan. 22	Jedok	Kelantan
	May 27	Sungai Durian	Kelantan
	Oct. 28	Layang Layang	Johore

Date of Establishment	Name of Forest Reserves	Locality	
	Oct. 28 Nov. 9	Telok Muroh Extension Jeli	Perak Kelantan
1949	April 1 July 21 Nov. 10 Nov. 10 Dec. 8 Dec. 22 Dec. 29	Kuala Kemaman Hutan Melintang Extn. Padang Terap Pontian Pendas Extension Benut Extension Pendas Extension	Terengganu Perak Kedah Johore Johore Johore Johore
1950	Mar. 16 Mar, 30 May 18 May 25 June 11 July 6 Aug. 17 Nov. 12 Nov. 29 Dec. 7 Dec.	Sogo Extension Sungai Badak Terenas Rungkup Gunong Bongsu Labis Extension Banang Extension Pelagat Bukit Bauk Benut Extension Gunong Tebu	Johore Kedah Kedah Perak Kedah Johore Johore Terengganu Terengganu Johore Terengganu
1951	Jan. 4 Jan. 4 Jan. 18 Mar. 29 April 12 May 23 July 1 July 6 Nov. 8 Nov. 8 Nov. 14 Nov. 26 Dec. 20	Chebar Kechil Chebar Besar Dayong Bunting Merbok Sungai Santi Ulu Muda Besul Gunong Inas Tenggaroh Ulu Sedali Bukit Perangin Rasau Kerteh Pulai Extension	Kedah Kedah Kedah Kedah Johore Kedah Terengganu Kedah Johore Johore Kedah Terengganu Johore
1952	Jan. 17 Jan. 17 July 8 Sept. 11 Nov. 19 Nov. 22	Pulai Extension Sungai Johore Extension Kledang Saiong Extn. Pedu Bukit Bintang Rimba Teloi	Johore Johore Perak Kedah Perlis Kedah
1953	Jan. 21 June 18 July 30 Dec. 31	Bukit Kayu Hitam Erong Extension Bukit Malut Hutan Melintang Extn.	Kedah Perak Kedah Perak
1954	Feb. 28 Oct. 17	Tampoi Lebir	Kedah Kelantan
1955	April 18 June 19 July 28	Ulu Temiang Pulau Langgun Sungai Johor Extn.	Kelantan Kedah Johore
1956	Mar. 18 April 16 May 2 Aug. 10 Aug. 10 Aug. 10 Oct. 4 Dec. 27	Pulau Timun Pulau Singa Besar Segari Melintang Extn. Kubang Badak Kisap Ayer Hangat Labis Extension Batu Undan Extension	Kedah Kedah Perak Kedah Kedah Kedah Johore Perak

Date of Establishment	Name of Forest Reserves	Locality	
1957	May 20	Jugra Hill	Selangor
	June 13	Bukit Naga Extension	Perak
	Nov. 14	Jementah	Johore
	Nov. 16	Bukit Perak	Kedah
	Nov. 28	Bruas Extension	Perak
1958	Jan. 23	Sungai Rek	Kelantan
	Aug. 21	Piah Extension	Perak
	Sept. 4	Bukit Tinggi	Pahang
	Sept. 4	Ulu Sat	Kedah
	Oct. 10	Sekor – Taku	Kedah
	Oct. 12	Bukit Langga	Kedah
	Oct. 16	Pangkor Laut	Perak
	Nov. 15	Raya	Kedah
	Nov. 27	Kota Siam	Perak
1959	June 25	Parit Dayong Belara	Perak Terengganu
1960	Mar. 29	Kuah	Kedah
	April 27	Gua Cherita	Kedah
	April 27	Machinchang	Kedah
	July 9	Tanjong Dagu	Kedah
	Nov. 17	Kulim Catchment Area	Kedah
1961	Jan. 8	Mata Ayer	Perlis
	Jan. 19	Sungai Kemudi – Sungai Bahan	Johore
	Sept. 24	Bukit Pagong	Kedah
	Sept. 24	Bukit Tiang Layar	Kedah
	Sept. 24	Bukit Kerong	Kedah
	Oct. 11	Jambu Bongkok	Terengganu
1962	Feb. 15	Ma'Okil Extension	Johore
	April 1	Sungai Sator	Kedah
	July 19	Erong Extension	Perak
1964	June 15	Jerangau	Terengganu
1965	Sept. 23	Sungai Lebam	Johore

## Part 4

### Wildlife Resources

## Development of Animal Husbandry Resources in South East Asia

by

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#### SUMMARY

The importance of an ecological approach to the development of the animal husbandry resources of South East Asia is stressed. It is possible to visualize a practical policy by which wild game meat could be produced in the forests; milk and perhaps high quality beef on the higher altitude plateau areas; beef and breeding cattle and perhaps sheep and goats on the extensive grazings that could be developed between the mountain forests and the plains; and poultry, pig, water buffalo and some cattle production as a result of integrating livestock with existing farming operations in the settled areas.

Three major reasons are listed for hastening the expansion of the animal husbandry resources of South East Asia. First, the diet of most South East Asians is particularly deficient in nutritionally valuable animal protein. Second, local production of animal protein foods will conserve foreign exchange urgently needed for the purchase of essential industrial imports. Third, the diversification of agriculture with consequent integration of animal and crop farming will hasten the modernization, provide additional rural employment and increase the overall productivity of traditional agriculture.

The possibilities for development of the animal husbandry resources of this region and some of the limiting factors are briefly discussed.

#### INTRODUCTION

The climate in South East Asia may be classified as either equatorial, tropical or upland and mountain. The equatorial zone exists 6° to 7° latitude north and/or south of the equator in the Malayan peninsula, Indonesia, New Guinea and the southern Philippines, and is characterized by relatively high and even temperatures, no true dry season and high humidity. The tropical zone includes the remainder of South East Asia, except for the upland or mountain areas, and embraces areas that are humid, semi-humid and semi-arid; the climate varying with the total precipitation and the topography. The rains are concentrated in one season that may last from four to ten months and in general total precipitation decreases with increasing distance from the equator. The upland or mountain zone is characterized by lower and uniform temperatures and by high solar radiation, as altitude strongly influences ambient temperature. There are some upland or mountain areas in most South East Asian countries.

Details of the land resources and population of South East Asia are given in Table 1. It will be seen that the population density varies between 30, 603 and 43 per 1,000 hectares in Singapore and New Guinea and Papua, respectively. A major part (55 per cent) of the total land area is still forest and only 14 per cent is used for agricultural purposes (3,787,000 hectares out of a total of 71,702,000 hectares being classified as permanent meadow and pasture).

The livestock populations of South East Asian countries are shown in Table 2 and the

number of ruminant stock units per 1,000 hectares of land and per 1,000 population, in a limited number of these countries, is given in Table 3. It will be seen that the water buffalo is an important animal, that pigs are important in some countries and it would appear that climatic environment and the type of farming practised in the region has had a profound effect on the composition of the livestock population. The density of ruminant livestock per 1,000 hectare and per 1,000 population varies widely from country to country, but is usually low by world standards (FAO, 1964).

### **THE IMPORTANCE OF AN ECOLOGICAL APPROACH TO THE DEVELOPMENT OF ANIMAL HUSBANDRY RESOURCES**

The agriculture of South East Asia, with few exceptions, has been gelled in a mono-cultural system for centuries, and livestock are in general ancillary to the main purpose of growing subsistence crops such as rice and maize and cash crops such as coconuts, rubber and sugar cane. This situation cannot be changed very rapidly but a conscious effort should be made to encourage the integration of livestock production with existing farming practices.

The water buffalo (*Bos bubalis*) is very well adapted to a humid tropical climate, but it is usually considered only as a draught animal, whereas it could also make a very important contribution to milk and beef supplies in the region. It possesses the advantage of being able to utilize roughages, produced in abundance in the humid tropics, more efficiently than either *Bos taurus* or *Bos indicus* type cattle.

Coconut plantations provide a favored microclimatic environment for cattle management, that is only too often neglected. Cane tops and other agricultural by-products are usually wasted when they could be fed to cattle, buffalo, pigs and poultry.

No attempt at all has been made to utilize the 55 per cent of the land area of South East Asia that is still forest for the production of meat, although several wild or semi-domesticated species of forest dwelling *Bos* are indigenous to the region. These are: the gaur (*Bos gaurus*) indigenous to mainland South East Asia; a semi-domesticated type known as the gayal (*Bibos frontalis*) indigenous to Assam and Burma; the kouprey (*Novibos sauveli*) that may have ancestral ties with *Bos indicus*, and is still present in small numbers in the open forests of Laos and Cambodia; and the banteng, syn. Tsine and Banting (*Bibos sondaicus*) found in the wild and domesticated state in mainland South East Asia and in Indonesia. In addition, a wild buffalo known as the tamarau (*Bos mindorensis*) is still present in very small numbers on the island of Mindoro in the Philippines.

Little is known of the physiology of these animals, but it is likely that they are more efficient at converting the poor quality browse available in the forests into meat than are *Bos indicus* or *Bos taurus*, or any other type of domestic livestock. It is also likely that the meat is of good quality and represents a high proportion of the total carcass, if a comparison can be made with the possibilities for meat production exhibited by wild herbivores in Africa (Talbot, *et al*, 1965).

In any comprehensive development plan it would be rational to conserve and 'farm' game, and particularly the larger *Bos* species in the areas that are scheduled to remain afforested. The scope for the production of wild game meat from the forests is obviously very large. Even if the overall forest area was eventually reduced to 25 per cent of the total land area, there would still be approximately 125 million hectares of forest land in South East Asia. A policy of conservation of wild forest herbivores for meat production purposes would also have other advantages; such as providing recreation in the form of hunting for the ever increasing urban population, fostering a tourist industry, and easing the task of controlled timber felling operations by keeping underbrush growth under control.

It is likely that the total area of forest will be reduced very rapidly during the next decade, and in general the land situated between the steep hill slopes that should remain afforested, and the valley bottoms that are most suitable for agricultural purposes, should be developed as grazing lands, or as fruit and/or nut plantations. At present much of this 'cut-over' forest land remains under-utilized, and what is worse, rapidly deteriorates in fertility as it is subjected to the ravages of haphazard shifting cultivation, that barely provides a subsistence livelihood for the indigenous farmers.

In planning the development of animal resources in this region, advantage should also be taken of the fact that some of the more highly productive livestock will produce at a higher level in a cooler climate. Thus, purebred or high grade *Bos taurus* type milking cattle should be managed at higher altitudes and the milk transported to the lowlands.

If an ecological approach is made to the problem of the development of animal husbandry resources in South East Asia, then it is possible to visualize a practical policy by which wild game meat would be produced in the forests, milk and perhaps high quality beef on the higher altitude plateau areas, beef and breeding cattle and perhaps sheep and goats on the extensive grazings that could be developed between the mountain forests and the plains, and poultry, pig, water buffalo and some cattle production as a result of integrating livestock with existing farming operations in the settled areas.

## NECESSITY FOR THE DEVELOPMENT OF ANIMAL HUSBANDRY RESOURCES

There are three major reasons for hastening the expansion of animal husbandry resources:

1. The diet of most South East Asians is deficient in calories, protein and fat, and particularly in nutritionally valuable animal protein. In Table 4, some detail is shown of the number of calories and the amounts of animal and total protein and fat in the diet of the population of five South East Asian countries. For reference purposes, similar details of the diet of Americans and Australians is also shown. It will be seen that the lack of animal protein in the diet is particularly well defined and projections by U. S. Department of Agriculture (1964) suggest that given present rates of development, there will be virtually no improvement in the animal protein intake of South East Asians by 1970.

For nutritional reasons alone, there is, therefore, a very urgent need for a more radical and dynamic approach to the problem of the development of animal husbandry resources in South East Asia.

2. One phenomena in South East Asia is the emergence of an urban population enjoying markedly higher living standards than those of the mass of the population in the rural areas. This urban population will demand, and will be able to afford, a higher proportion of milk, meat and fish in their diet than they have enjoyed in the past. If these commodities are not available locally, they will be imported. This will mean a serious drain on the balance of payments, and foreign exchange that should be used for the import of high quality animal protein foods. Thus the rapid development of animal husbandry resources will effect a major saving in foreign exchange.
3. There is every reason to believe that diversification of agriculture with consequent integration of animal and crop farming, would not only improve the supplies of locally produced animal protein food, but would also assist in the improvement of soil fertility and consequently the yield of traditional crops. Some animal production techniques, particularly dairy farming, are also more labor intensive and usually less seasonal than crop production techniques, and their introduction would assist in solving the rural problems of unemployment and seasonal under-employment.

## POSSIBILITIES FOR DEVELOPMENT

It has been shown that the need exists. What are the possibilities?

### Availability of land

As only 14 per cent of the total land area of South East Asia is used for agricultural purposes at the present time, it is unlikely that the availability of land will be a limiting factor, except in particular instances. Emphasis has already been placed on the importance of the ecological approach to the question of land utilization.

## Availability of animals

The hot humid conditions in the equatorial and tropical climatic zones preclude the use of purebred highly productive *Bos taurus* type cattle for the production of milk and meat in the lowland areas. The indigenous cattle are not, in general, very productive. It is suggested that cross bred *Bos taurus* x *Bos indicus* cattle are likely to be most suited for use in the lowland and lower altitude areas, but purebred herds of indigenous cattle should be established in all countries and their productive potential investigated.

It would, therefore, appear to be a rational policy to import a limited number of highly productive *Bos taurus* cattle and establish them in the higher altitude areas under good management, and high quality semen of *Bos taurus* bulls in order to initiate a grading-up policy, using indigenous female stock. A major advantage of a grading-up policy is that there is time to 'grade-up' the managerial ability of the farmer while undertaking the grading-up of his livestock. The number of cattle available to use as a base for a grading-up policy varies from country to country but in general is small. Availability of cattle may, therefore, be a limiting factor. Large scale experimentation will be required in order to determine the most suitable type of crossbred cattle for the different environments.

An effort should also be made to determine the potential of the water buffalo for milk and meat production as it is well adapted to a hot humid climate.

The pig and poultry populations could be rapidly increased once adequate feedstuffs and suitable markets and technical advice were available.

## Pasture and forage production

An immediate start should be made to determine what pasture and legume species grow well in specific localities. Once promising species have been discovered a major experimental program will be needed to determine how these promising species should be managed and utilized. A pasture grass and legume seed industry will also have to be created in each country in order to supply the vast quantities of seed that will be required. The speed at which this work will progress will depend on the availability of trained scientific manpower.

## Management

It is likely that a major limiting factor will be a lack of knowledge on the part of farmers and workers as to the proper management of all livestock. This will be a crucial problem. Managerial training and stockmanship can only be acquired at the farm level and the establishment of colleges of agriculture may assist, but will not solve this problem. Perhaps one of the most fruitful approaches would be to mobilize the latent idealism and spirit of adventure of young men and women raised on livestock farms in New Zealand, Australia, North America and Europe and persuade them to work for one or two years, at the farm level, teaching their husbandry 'know-how' to South East Asian farmers.

## LITERATURE CITED

- FAO. 1964. Yearbook of Food and Agric. Stat., 18; Rome.
- Talbot, L.M., W.J.A. Payne, H.P. Ledger, L.D. Verdcourt, and M.H. Talbot. 1965. The Meat Production Potential of Wild Animals in Africa. Tech. Comm. No. 16., C.A.B. Animal Breeding and Genetics: C.A.B., Farnham Royal.
- U.S. Department of Agriculture (USDA). 1964. The World Food Budget, 1970. Foreign Agric. Econ. Rep. No. 19: U.S. Dept. Agric, Washington.

TABLE 1 – LAND RESOURCES AND POPULATION IN SOUTH EAST ASIA  
(FAO, 1964)

Country	Total area	Agriculture (×1,000 hectares)	Land Use Forest	Not classified	Population	
					Total (×1,000)	Per 1, 000 hectares
Burma	67, 803	14, 758	45, 274	7, 771	23, 664	349
Thailand	50,400	10,088	28,182	13,130	28, 835	561
Laos	23, 680	1,900	14, 200	7,580	1,925	81
Cambodia	18,104	2,938	9,900	5,266	5,900	326
Viet Nam (North)	15, 875	1,300	8, 850	5,725	17, 800	1,121
Viet Nam (Republic)	17, 081	6, 000	5,600	5,481	15,317	897
Malaya	13,131	2,479	8, 814	1,838	7,604	579
Sabah	7,611	188	7,340	83	490	64
Sarawak	12,521	2,953	9,172	396	809	65
Brunei	577	24	553		93	161
Singapore	58	13	4	41	1,775	30, 603
Maldivé	30			30	93	3,100
Indonesia	149,156	17, 681	90, 825	40, 650	100, 795	} 529
West Irian	41,278	20	31, 000	10, 258		
Portuguese Timor	1,492		1,000	492	536	359
New Guinea and Papua	47, 536	150		47, 386	2,059	43
Philippines	29,968	11,210	12, 360	6,398	30, 241	1,009
Total	497, 301	71, 702	273, 074	152,525	237, 936	39, 847
Mean						<u>2,490</u>
Per cent total land area	100	14	55	31		

TABLE 2 – EXISTING NUMBER OF LIVESTOCK IN SOUTH EAST ASIA (x 1, 000)  
(FAO, 1964)

Country	Ruminant live-stock				Total Units	Pigs	Poultry <sup>1</sup>
	Cattle	Buffalo	Sheep	Goats			
Burma	5,696	1,061	78	448	6,845	744	
Thailand	5,441	6,915	13	27	12,362	4,872	30,252
Laos	300	450		30	780	600	8,210
Cambodia	1,322	471		4	1,794	689	2,927
Viet Nam (North)						3,620	
Viet Nam (Republic)	1,119	803	5	38	1,929	2,953	
Malaya	298	276	37	287	628	492	19,000
Sabah	14	67		18	84	81	
Sarawak	9	7		9	17	166	107
Brunei	4	20		3	25	8	172
Singapore	7	3		2	10	402	10,212
Maldives							
Indonesia	6,348	2,893	2,421	5,321	10,531	2,687	97,160
West Irian	3			2	3	2	27
Portuguese Timor	28	114	45	227	188	224	
New Guinea and Papua	27		1	3	28	6	75
Philippines	1,094	3,323	14	484	4,500	6,234	50,445

<sup>1</sup> Includes chickens, ducks, geese and turkeys.

TABLE 3 – THE NUMBER OF RUMINANT STOCK UNITS PER 1, 000 HECTARES OF LAND AND PER 1, 000 POPULATION OF SOME SOUTH EAST ASIAN COUNTRIES

Country	Ruminant stock units	
	Per 1, 000 hectares	Per 1, 000 population
Burma	101	285
Thailand	242	426
Laos	33	390
Viet Nam (Republic)	114	129
Cambodia	100	299
Malaya	48	79
Sabah	11	168
Sarawak	1	21
Brunei	42	278
Singapore	1,667	6
Indonesia (including West Irian)	55	104
Portuguese Timor	125	376
New Guinea and Papua	1	14
Philippines	150	150

TABLE 4 – INTAKE OF CALORIES, PROTEIN AND FAT PER CAPITA PER DAY, 1959-61

USDA (1964)

Country	Calories No.	Protein		Fat grams
		Animal grams	Total grams	
Burma	2,170	8.8	46.2	33.3
Thailand	2,120	9.1	45.0	31.7
Malaya	2,400	14.0	53.7	41.6
Philippines	2,000	10.7	44.6	32.0
Indonesia	2,160	5.0	43.3	36.8
U.S.A.	3,190	63.8	95.3	146.3
Australia	3,210	66.8	99.8	142.5

# The Raising of Deer, an Attractive Resource for Developing Countries in South East Asia<sup>1</sup>

by

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## SUMMARY

The wild deer, principally the sambar (*Cervus unicolor*) and the hog deer (*Axis porcinus*) are herbivores which deserve domestication for three principal reasons:

1. They are hardy and resistant to disease.
2. Their young antlers, produced annually, have a high market value in the Orient.
3. The raising of these animals contributes indirectly to the preservation of the species.

## INTRODUCTION

Domestication of animals, i.e. rendering them more manageable and productive from an economic standpoint, has a very ancient history. In the past century, especially, various animals have been the object of rational farming for fur production, birds have been raised for hunting, and insects, rodents, carnivores, and other primates have been raised for laboratories and vaccine producing institutions.

All these recent animal husbandry activities are valuable in themselves because they contribute to the national revenue and at the same time are one of the best measures for the preservation of the species. However, they require two conditions difficult to find in developing countries – considerable investment and technical skill.

## ANIMAL HUSBANDRY AND SECONDARY OCCUPATIONS IN SOUTH EAST ASIA

The inhabitants of tropical and sub-tropical Asian regions have a need for an occupation during the slack period between the two rice harvests. Fishing, home industries, and the raising of silk worms, poultry and pigs have been tried. The first two are of rather doubtful economic value and, as for the last, the most productive animals are the most difficult to raise. Double cropping is practical only in certain areas which are well irrigated during the dry season.

Wishing to make a modest contribution to the problem of a secondary occupation for the rural population in these rice-growing regions, we have tried, as the authority responsible for a zoological park and as veterinarians, to propose a solution. This does not pretend to be universally applicable, but it may be of interest for a certain number of regions.

## THE DEER

We have been impressed with the hardiness and disease resistance of most of the deer raised in the park, especially the sambar (*Cervus unicolor*) and hog deer (*Axis porcinus*) as compared with such wild cattle as the gaur and banteng. During the past three years we have made the following observations, which while they are specific cases, are nonetheless significant.

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<sup>1</sup> Original in French.

### **Resistance to ticks**

Our deer which are confined in a large park (at the rate of about 10 per 2, 000 square meters) planted with trees and short grass, but without shrubs, have never been infested with ticks (*Rhipicephalus sanguineus*) although the dogs and cattle around them and deer in rubber and coffee plantations are almost permanent tick carriers.

### **Resistance to foot and mouth disease**

Draught bulls afflicted with the foot and mouth disease in May 1964 entered the deer park daily without any of the deer being affected.

### **Resistance to parasites and lung diseases**

Systematic tests for intestinal parasites yielded negative results and no symptoms of lung diseases (pleural pneumonia) appeared among the deer although among banteng under identical ecological conditions there were recorded cases of both.

### **Sociability**

Like all non-domestic animals deer are easily frightened and flee at the slightest sound or sudden movement by human beings, but once accustomed to people they become gentle and affectionate. Those who have kept them as pets are very attached to them. The deer do sometimes turn dangerous for about 15 days during the rutting season around September and before they discard their antlers around March and April, and accidents have occurred to those who didn't know this peculiarity.

### **Feeding**

Deer are herbivorous ruminants but unlike similar animals they readily adapt to different diets and will eat any kind of plant material, alive or dried. (Barking deer are the only exception.) This makes them much easier to raise in regions where there are long periods of drought.

### **Reproduction**

The deer appear to accommodate perfectly to the 'loose' method of captivity and the females give birth regularly. The young, if need be, can be raised perfectly on cow's milk in bottles and wean themselves, quite precociously, in two weeks.

Deer farming is thus lucrative because the animals are hardy and more disease resistant, they have an earlier maturity than our domestic bovids, and their meat brings 30-60 per cent more on the local market than that of domestic cattle.

## **THE VELVET**

'Velvet' as used here refers to the entire antler during the early stage of development before it hardens; it is in great demand throughout the entire continent of Asia as a medicine and tonic. To get an idea of its value, one can estimate that every year a male deer produces velvet of a value equal to two or three times his own market value as meat, or that one buck earns for the farmer an income double or triple that of a bovid, with the same expense.

The technique of collection, treatment, and preservation of velvet is quite simple and can be done by any one who has watched the operation two or three times.

1. Collection: This varies slightly with the region and with the kind of deer, but is usually carried out annually. The antlers are either cut or sawn off about 2 centimeters above their base. In some cases the deer is confined for about a week, a wire tourniquet is put at the base of the antlers and tightened each day until the velvet comes off without hemorrhaging. Great care is taken not to hurt the antlers which would then lose much of their value.
2. Treatment: This consists of coagulating all the tissues and fluids by submitting the velvet to a long 'bath' in hot, fine sand or superheated steam. The velvet is then dried out by means of a hot sand bath or by putting it in a hot oven or charcoal stove. This takes about three to four hours.

3. Preservation: The velvet is then put in a sealed jar which is filled up with flour of glutinous rice toasted brown which is an excellent preservative against humidity.

### **CONSEQUENCES OF VELVET COLLECTION**

Unfortunately because of donations and the number of births in the zoo the deer have increased considerably and the resultant overcrowding has led to several fights. Some deer have been sent to islands rich in vegetation but lacking herbivorous animals and with others for the safety of the caretakers we have cut the horns of the most quarrelsome males. The result has been remarkable. A magnificent male about ten years old, which had the reputation of having seriously wounded a half dozen people and killed a number of its own kind, has now become the tamest and most affectionate deer in the park.

The period when an animal is growing his antlers is known as the 'velvet crisis', which often lasts as long as three or four months. Using up material and energy from its own body to form the antlers, the animal would leave the herd, scarcely touch food, lie down and grow thinner until the horns were completely formed.

Three or four days after the horn cutting a crust forms on the remaining stump, and the animals resume their normal activities. On the average the velvet cutting shortens by half the period of 'velvet crisis' and can only have beneficial effects on the animal.

After the healing, a horny plate of the same histological nature as the normal antler grows on the stumps; it usually falls off after about six months just when the bases become turgid and are ready for the forming of a new pair of antlers. Sometimes, in the case of animals more than five or six years old, a new pair of velvets is ready to be collected after three months.

### **FUTURE PROSPECTS**

The domestication and farming particularly of the sambar and hog deer, have already been undertaken in some areas of Central and South Vietnam for more than ten years. We still have to improve our technique of increasing the yield while maintaining the hardiness of the species. The prices of velvet and venison will be lower certainly with the increase in production, but the market is far from reaching a saturation point. Furthermore, the wild deer would be less pursued and would have more chance to perpetuate their species if their commercial value were recognized. It is for this reason that the author has believed it proper to submit this article to this Conference.

# Wildlife Resources in New Guinea

by

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## SUMMARY

A wide range of wildlife resources, vertebrate and invertebrate, is available to contemporary New Guinea man. In the more remote areas, where contact with European man is slight or non-effective (in terms of helping to promote a more varied economy), the exploitation of natural resources is minimal because the people are still primitive hunters and food-gatherers.

Vertebrate animals, especially birds and mammals, are still important in some areas, e.g. the highlands, either as food, as ornament, and objects of trade, or because they are associated with traditional cultures and folklore.

In the densely populated highlands man's impact upon the vegetation, and ultimately the contained fauna, has been to clear the lower montane rain-forest between about 4000 and 8500 feet, the practical limits of sweet potato (*Ipomoea batatas*) cultivation – a shifting agriculture, and the very base of the present (highland) economy. This is threatening, in places, the survival of some species of mammals and birds (e.g. *Paradisaeidae*).

Of the 37 species of birds of paradise found in mainland New Guinea, no less than 25 are restricted to mountain forests; quite apart from their scientific and aesthetic interest, it is clear that special and urgent study of these birds is needed to foster and protect a unique potential tourist resource for the New Guineans.

## INTRODUCTION

This preliminary review of wildlife resources in New Guinea has three aims:

1. To provide background information on the total environment.
2. To itemize some of the wildlife resources available to contemporary indigenous man, including his range of exploitation of those resources.
3. To summarize the impact of indigenous and European man on the fauna.

In general, the information on resources relates to that part of New Guinea administered by Australia, i.e. the lands and waters roughly enclosed by latitude 2° to 11° S. and longitude 141° to 156° E. I am not competent to discuss the situation in West Irian vis-a-vis wildlife, but incidental reference will be made to this country on aspects of the environment and on birds of paradise.

## LAND AREAS AND INDIGENOUS POPULATIONS

Political Region	Area (square miles)	Indigenous Population
West Irian	160,000	500,000 <sup>1</sup>
Papua	90,000	550,000 <sup>2</sup>
New Guinea	93,000	1,520,000 <sup>2</sup>

<sup>1</sup> Estimated from various sources

<sup>2</sup> Based on annual census at June 30, 1964

## The People

The indigenous people of New Guinea show great diversity in physical characteristics, language, and culture. Ethnically they range from Australoid, through Papuo-Melanesian to Micronesian and Polynesian, with the Papuo-Melanesian element predominating. Following original immigration and settlement it would appear that purely physical barriers of terrain often isolated whole communities, with consequent evolution of discrete cultures. The situation has, of course, drastically changed during the last 50 years and there are now very few people who have not been contacted by native affairs officers of the Administration. Speaking quite generally, this has led to a widespread cessation of inter-tribal warfare; to the promotion of a more varied native economy; and to an upsurge of interest and co-operation in education and health programs – especially for the younger people.

## ENVIRONMENT

### Physical and Climatic

The island of New Guinea is second only to Greenland in size: about 1500 miles long, about 400 miles in greatest width and 200 to 250 miles in average width. The massive central cordillera is the dominating feature of the island. The main ranges form a complete divide between the rivers flowing north and south; these do not consist of a single chain but a complex system of ranges separated by broad intermontane valleys up to 5500 feet above sea level. The highest peaks are Mt. Carstenz (16,400 feet) in West Irian and Mt. Wilhelm (15,400 feet) in central New Guinea. In the southeast the highlands rise abruptly from the sea or from narrow coastal lowlands, but in the west they descend by foothill zones to flanking depressions. The topography of the cordillera is mature but in places there are deep gorges with stupendous cliffs and spectacular waterfalls. The three largest rivers, the Idenburg, the Sepik, and the Fly, all rise in the central highlands near the political border zone. The Sepik and Fly Rivers are navigable by ships of moderate size for some 500-600 miles. A volcanic belt extends from the Schouten Islands off the north coast of the mainland, along the north coast of New Britain, and through New Ireland to the Solomons. Both extinct craters and active volcanoes exist in this belt.

The whole island lies within the tropics and the climate is typically monsoonal: the northwest monsoon blows from December to March and the southeast trade winds from May to October, with transitional periods in November and April. Hurricanes and cyclones are extremely rare.

Rainfall varies from about 50 inches at Port Moresby (its hinterland ranges run parallel to the direction of the southeast trades) to about 250 inches in the Huon Peninsula. Atmospheric temperatures range between 70° F. and 90° F., and the humidity on the coast between 60 per cent and 90 per cent. Ground frosts are common above 8000 feet and there is snow on the highest mountains for several months of the year.

### Vegetation

Robbins (1961a) has described the vegetation in broad terms, and Fig. 5 shows the main types and their distribution. More detailed information will be found in the various reports by L. J. Brass on the American Archbold Expeditions; in the CSIRO Resources Surveys reports; and, on the montane vegetation, by Robbins (1961b, 1964) and Kalkman (1963).

Briefly, according to Robbins (1961a), the formations range from coastal mangroves and strand forest through a range of humid lowland rainforests and swamps to mountain oaks (*Lithocarpus-Castanopsis*) and beeches (*Nothofagus*), and finally rhododendron shrubberies and alpine meadows.

Due, however, to the favorable climate and soils, perhaps 80 per cent of the region is covered with the floristically rich and luxuriant rainforests. Only in a southern zone of lower rainfall near to Port Moresby and the Fly River do extensive dry communities of savanna woodland and monsoon forest occur. The savannas of scattered *Eucalyptus* and ground cover of grasses are regarded as extensions of north Australian vegetation. At higher elevation along the central mountains the vegetation shows remark-

able affinities with southern floras such as those of Tasmania and New Zealand. Generally, however, the bulk of New Guinea plants reflects an Asian origin, and thus botanically the island belongs to the Indo-Malayan region.

## WILDLIFE RESOURCES AND THEIR RANGE OF EXPLOITATION BY NEW GUINEA MAN TODAY

Literature on the New Guinea fauna, including ethnozoology, is extensive and scattered: reference should be made to the bibliography for several un-cited sources on which I have drawn freely, amongst others, for the following account. It is convenient to consider vertebrates and invertebrates separately, and within each group to discuss resources in the sequence: terrestrial, arboreal, freshwater, and marine, as applicable.

### Invertebrates

1. Mollusca. Both operculate (25 per cent of the land and freshwater fauna) and pulmonate Gastropods are well developed in New Guinea rainforests and include a wide range of terrestrial and arboreal species. Land snails are eaten in the Schrader Mountains, and doubtless elsewhere.  
S. and R. Bulmer (1964) state that shell, imported from coast and lowlands, was used throughout the highlands for personal ornaments, as currency, and more rarely as implements. At least seven types of marine shell are reported as present in some quantity at the time of European contact (1932): *Pinctada* (Mother-of-pearl), *Melo* (bailer), *Turbo* (green snail), *Nassa* and *Nassarius* (dog-whelk), *Conus* and *Cypraea* (cowrie)... The larger shells were used either whole or in pieces as pendants... while *Nassa*, *Nassarius* and *Cypraea* were sewn onto bark cloth... Freshwater mussel shells (*Unionidae*) from lowland rivers were used as banana scrapers in the Schrader Mountains. The Chimbu of the Lower Wahgi Valley are reported to have used pieces of marine shell, presumably *Turbo* or *Nautilus*, as spoons.
2. Insecta. The main items valued as food are larvae of the large longicorn beetles (*Cerambycidae*), found in dead timber, and the larvae of certain bees and wasps (*Hymenoptera*). Some very primitive food-gatherers in the Western Sepik District are reputed to eat cockroaches (*Blattodea*). On the Sepik River (and doubtless elsewhere) there are periodic immense fluses of mayflies (*Ephemeroptera*), which are scooped up in handfuls and eagerly devoured. A few insects are used for ornament, notably a brilliant green scarab beetle which forms the central motif of a ceremonial head-band worn in the Western Highlands.
3. Other invertebrates. Crustacea (crayfish, prawns, and crabs) are an obvious important food source for coastal and estuarine people; as also are some marine worms (*Annelida*) and beche-de-mer (*Holothuria*).

### Vertebrates

1. Fishes. Small fish are present, but not plentiful, in highland rivers and streams above 4000 feet; they are taken with wicker or bark traps and are a minor food resource for highland people (S. & R. Bulmer 1964). Barramundi (*Scleropages leichardtii*), a large primary freshwater fish (cf. Myers 1953), is a valuable lowland food source; other, secondary, freshwater fish include mullet, catfish, eels, and perches. On shallow reefs, wrasses, surgeon-fish and parrot-fish are abundant, and deep offshore reefs yield snapper, red bass, and emperor bream. Traditional native fish traps are still used widely, plus spearing and other methods (e.g. paralysis by derris root). More recently, of course, nets and long-lines have been introduced by Europeans.
2. Amphibia. Frogs are plentiful in many parts of the highlands and are probably quite important there as a minor food resource (cf. S. & R. Bulmer 1964, Tyler 1963).



Figure 5. New Guinea vegetation types – (Taken from Robbing, 1961a.)

3. Reptiles. Lizards (*Lacertilia*) of the family *Varanidae* (monitors), of which there are five species, have the most direct role in the lives of the people (Slater 1961). All are widely hunted for food and the skin is an essential component of the waisted hand-drum.

Of the snakes (*Ophidia*), only the green python (*Chondropython viridis*) is important as food: it is commonly caught and eaten by the Wahgi Valley people.

There are two species of crocodile: *Crocodylus porosus*, largely salt-water but also common in the larger rivers and swamps up to about 100 miles from the sea; and *C. novaeguineae*, an endemic freshwater species. Few natives now eat crocodile but the tails of the freshwater animal are relished by the Kiwai and other Fly River people (Slater 1961). Both species are exploited for their skins, especially in some parts of the Western District; and on the Sepik, and doubtless in West Irian too.

Of Chelonia, there are five marine turtles (none endemic), one endemic freshwater turtle, and ten freshwater tortoises. Some of the marine forms are netted or speared for food, or captured during egg-laying; one species, the Hawksbill turtle, *Eretmochelys imbricata*, was once widely hunted for tortoise-shell. The endemic freshwater species, *Carettochelys insculpta*, is common in larger rivers such as the Fly and Aramia, where the animal and its eggs are taken for food.

4. Birds. Birds are important as food, as ornament, and as objects of exchange. Terrestrial species of food value include the cassowaries (*Casuarius* spp.); the large crowned pigeons (*Goura* spp.); megapodes (*Aepyodius*, *Talegallus*, and *Megapodius*), mostly for their eggs. Arboreal species include the larger columbids (*Ducula* spp., *Reinwardtoena*, and *Gymnophaps*); hornbill (*Rhyticeros*); cockatoos (*Cacatua*, *Psittirichas*, and *Probosciger*); larger parrots (*Lorius* spp.); crows (*Corvus* and *Gymnocorvus*); and the larger raptors (*Accipitridae*). Freshwater species hunted for food include ducks (*Anatidae*), egrets and herons (*Ardeidae*), ibises (*Threskiornithidae*), and rails (*Rallidae*). Seabirds (e.g. *Sulidae*, *Fregatidae*, and *Sternidae*) and their eggs are available only to people living on the more remote offshore islands that serve as breeding grounds for the tropical species.

The following species are important, either as objects of adornment and trade, or because they are associated with traditional cultures and folklore: cassowaries; goura pigeons (*Columbidae*); cockatoos and parrots (*Psittacidae*: including *Cacatua*, *Psittirichas*, *Charmosyna*, *Trichoglossus*, *Neopsittacus*); grass owl (*Tytonidae*: *Tyto longimembris*); harpy eagle (*Accipitridae*: *Harpyopsis novaeguineae*); and, of paramount importance in the highlands, birds of paradise (*Paradisaeidae*); for example, among the Kuma (Western Highlands) and Chimbu (Eastern Highlands) the plumes of the Red Bird of Paradise (*Paradisaea apoda raggiana*) were a necessary part of the bride-wealth gift which the groom and his kinsfolk had to make to the bride's kin for a marriage to be recognized (R. Bulmer, unpublished).

5. Mammals. Apart from bats (*Chiroptera*), rats (*Muridae*), and the marine dugong (*Sirenia*), there are no indigenous placental mammals in New Guinea. There are two genera of monotremes (*Tachyglossus* 1 species and *Zaglossus* 3 species) and about 50 marsupials; these include wallabies (4 genera) and tree-kangaroos (4 genera) of the family *Macropodidae*; possums and gliders (*Phalangeridae*), bandicoots (*Peramelidae*), and a marsupial cat (*Dasyuridae*). It is of interest to note the recent archaeological discovery in the Australian highlands of bones of the Tasmanian marsupial 'wolf' (*Thylacinus*) (van Deusen 1963, S. & R. Bulmer 1964).

All of the larger terrestrial and arboreal marsupials are hunted and eaten. The fur of possums and cuscuses is used widely in the highlands for body adornment and also for decorating ceremonial axes, spears, and hand drums. Hunting techniques include bow and arrow, spear, snares, log-fall traps, and dogs. Flying foxes (*Megachiroptera*) are highly prized for food and for the teeth, which are made into necklaces; in the Wewak hills of northern New Guinea the animals are caught in huge nets strung across man-made flyways

in the forest. The smaller species, e.g. *Dobsonia*, are knocked down with sticks in caves. Forest rats are certainly eaten, but the common and widespread Pacific rat (*Rattus exulans*), which mostly occupies a niche similar to that of the brown rat elsewhere, is generally ignored, or viewed with distaste.

Finally, mention must be made of three feral animals:

1. the pig (*Sus scrofa*) is highly important both as food and in the traditional culture of, especially, the highlanders. The origin of the pig in New Guinea is still obscure, but it seems probable that man extended the range of the Sunda, or banded, pig (*Sus scrofa vittatus*) to New Guinea in early times (cf. Zeuner 1963). Aitchison (1960) suggests that they were first introduced as domestic animals, later running wild, and again domesticated as man grouped in settlements.
2. An endemic dog, somewhat like a small dingo, has been reported from Mt. Giluwe in the central highlands, and it can be supposed that early New Guinea man, like the Australian aborigine, brought the dog with him. In some areas the dog replaces the pig as a major food item, being reared and fattened with a zeal similar to that bestowed on the pig.
3. There are wild populations of the deer, *Cervus timoriensis*, in at least three areas in New Guinea: in the trans-Fly River; near Port Moresby, and near Madang on the north coast (Frith, unpublished). Very little is known about the origin and spread of these animals in New Guinea (they have possibly colonized southern New Guinea from Ceram), but it can be assumed that some are hunted for food.

## IMPACT OF MAN ON THE NEW GUINEA FAUNA

This summary of evidence, much of which is speculative, is a synthesis of data from several disciplines: archaeology, plant ecology, agriculture, and ethnobiology.

### Prehistoric Evidence

According to S. & R. Bulmer (1964: 41): 'The probability seems high that man has been present in New Guinea for at least 10,000 years. We may also assume that the earliest occupants ... were pre-agricultural hunters and gatherers, since the chronology for early settlement places them well before the time posited for the beginnings of agriculture in southern Asia, whence they must ultimately have derived.' If one accepts the belief that early man did not influence his environment to any degree (seemingly true for the Palaeolithic and Mesolithic periods; cf. Zeuner 1963: 15), then it can be assumed that pre-agricultural man in New Guinea made no appreciable impact on his resources.

A 'respectable possible time-depth' for agriculture in the highlands of New Guinea, based on radiocarbon dates for edge-ground axe-adzes, is between 3000 and 4000 B. C. (S. Bulmer 1964). Although it cannot yet be assumed that agriculture *did* in fact accompany these tools, such axes would presumably have facilitated the cutting of more and larger trees for building timber and firewood. From there it is conceivable that progressively intensified forest clearing led to the development of gardens for sweet potato (*Ipomoea batatas*) cultivation—a shifting agriculture, and the very base of the present economy in the highlands. Contemporary studies on plant ecology by Robbins (1963) also suggest that the extensive tall and short grasslands in the eastern highlands valleys and on the lower mountain slopes are man-made and created by forest-clearing agriculturists, who probably entered from the east via the Markham Valley.

Still confining our discussion to the highlands, we can postulate a period of some 5000 years during which 'man's impact upon the vegetation has been to clear the lower montane (rain) forest from the valley floors (from about 4000 feet) and up the slopes to the practical limits of sweet potato growing at an altitude of 8000-8500 feet above sea level. The clearing has invariably begun at lower levels and proceeded upward through

various altitudinal zones of forest; thus the degree to which these forest zones are currently removed in any one area is a measure of man's depredations in that area.' (Robbins 1963: 51).

It is evident that the clearing of forest between 4000 and 8000 feet, even when dense secondary growth remains, must eliminate a high percentage of the original fauna. Bulmer (unpublished) has, however, pointed out that 'human cultivation areas, provided that they include plentiful tree and bush fallow (as on the north slopes of Mt. Hagen and in many parts of the Jimi Valley), provide a home for as many kinds of birds as natural forest.'

Many forest birds are apparently restricted to fairly narrow altitudinal belts (cf. Mayr & Gilliard 1954, Gilliard & Lecroy 1961, Hitchcock 1964), and one beautiful species, the Blue Bird of Paradise (*Paradisaea rudolphi*), is confined to a narrow belt of primary oak forest between about 4000 and 6000 feet; it does not survive in garden areas unless there is abundant tall timber and undergrowth cover. Gilliard (1953: 465) has pointed out that this bird is doomed to extinction in the highlands unless forest at this altitude, which is also optimal for human exploitation, is preserved.

### Historical Evidence

The incursion of European man into the New Guinea environment is relatively recent and may be epitomized by reference to his record of contact and communication with the indigenes: first by sea and river, then by foot patrols, then by airplane, and lastly by road (it is of interest to note that the highlanders knew airplanes before automobiles). He brought steel axes and shotguns (now legally allowable to natives in some districts), and fought two wars on the land and waters. He has in places carved airstrips out of primeval forests; he has introduced exotic cash crops and grazing animals, logging and mining technologies, health and education programs, plus a host of lesser trappings of civilization. But I share with others the optimistic belief that there is still enough of the pristine environment to encourage dedicated biologists and wise administrators to keep plugging for research on the fauna and adequate reserves for its perpetuation – especially of its endemic elements, such as the incomparable birds of paradise.

These deserve special mention, and the following notes are culled from an article shortly to be published in an Australian wildlife magazine by a colleague of mine, Richard Schodde, whose overall knowledge of the family is second only to that of the late Tom Gilliard.

There are 41 known species, of which only six are found outside the New Guinea region: two are confined to the Moluccas, two to the east Australian rainforests, and the remaining two, the Magnificent Riflebird (*Ptiloris magnificentus*) and Trumpetbird (*Phonygammus keraudrenii*), are found both in Cape York Peninsula and throughout lowland New Guinea. Of the 37 species found in mainland New Guinea, no less than 25 are restricted to mountain forests. The only essentially lowland species are four manucodes (*Manucodia*), the Trumpetbird, the Magnificent Riflebird, the Twelve-wired Bird (*Seleucidis melanoleuca*), the King Bird (*Cicinnurus regius*), and four species of the *Paradisaea apoda* group.

Two lines of evidence suggest that the birds of paradise are quite recently evolved:

1. contemporary hybridization in the wild (both interspecific and intergeneric) – indicating that their evolutionary divergence is still young and incomplete; and
2. their confinement to the New Guinea region, i.e. they appear to have had little time to disperse. Furthermore, it would seem that they had their origins in the cool mountain forests of New Guinea, and their subsequent history has been one of expansion and evolution towards lower ground.

A new Fauna Conservation and Control Ordinance, now under draft by the Australian Administration, will prohibit the trading in bird of paradise plumes (Serventy 1963); this may help to reduce the contemporary local destruction of some species. But from every point of view: scientific, aesthetic, and as a potential tourist resource, the birds of paradise demand special and urgent study if appropriate steps are to be taken for their conservation.

## REFERENCES

- Aitchison, T. G. 1960. The pig and its place in the impact of the New Guinean on vegetation. UNESCO Symp. on Humid Tropics Veg. Goroka, N.G., pp. 158-67.
- Anderson, J. 1960. Introduction of ruminants to New Guinea. *ibid.*, pp. 170-3
- Anon. 1962. Fishing enterprise and research in Papua and New Guinea. *Aust. Territories* 2: 28-33. (Also discusses molluscs, Crustacea, and turtles as potential food resources.)
- Beaufort, L. F. de 1951. Zoogeography of the Land and Inland Waters. Sidgwick & Jackson.
- Blaut, J.M. 1960. The nature and effects of shifting agriculture. UNESCO Symp. on Humid Tropics Veg. Goroka, N.G. pp. 185-98.
- Bryan, W. 1960. The effects of grazing by the domestic animals of early man on the vegetation of the humid tropics. *ibid.* pp. 151-7.
- Bulmer, R. 1957. A primitive ornithology. *Aust. Mus. Mag.* vol. 12.
- Bulmer, R. (unpublished). Men and birds in New Guinea: an anthropologist's comments on problems of nature conservation in the Central Highlands. (Revised version of talk given to the New Guinea Society, Canberra, 14/5/1961).
- Bulmer, Susan. 1964. Radiocarbon dates from New Guinea. *J. Polynesian Soc.* 73: 327-8.
- Bulmer, S. & R. 1964. The prehistory of the Australian New Guinea Highlands. *Amer. Anthropol.* 66: 39-76, 309-22.
- Carter, T.D., J.E. Hill, and G.H.H. Tate. 1946. Mammals of the Pacific World. Macmillan Co.
- Frith, H.J. (unpublished). Wildlife problems in the Territory of Papua and New Guinea. (Report to the Administrator of Papua-New Guinea, 8/12/1964).
- Gilliard, E.T. 1953. New Guinea's rare birds and stone-age men. *Nat. Geogr. Mag.* 103, No. 4.
- Gilliard, E. T. and Mary Lecroy. 1961. Birds of the Victor Emanuel and Hindenburg Mountains, New Guinea. *Bull. Amer. Mus. Nat. Hist.* 123: 1-86.
- Hitchcock, W. B. 1964. An introduction to the natural history of a New Guinea highland community. *Emu.* 63: 351-72.
- Kalkman, C. 1963. Description of vegetation types in the Star Mountains region, West New Guinea. *Nova Guinea* (Botany) No. 15: 247-61.
- Keast, A. 1959a. Australian birds: their zoogeography and adaptations to an arid continent. In: Biogeography and Ecology in Australia. W. Junk. pp. 89-114.
- Keast, A. 1959b. The reptiles of Australia. *ibid.* pp. 115-35.
- Loveridge, A. 1946. Reptiles of the Pacific World. Macmillan Co.
- McMichael, D. F., and T. Iredale. 1959. The land and freshwater Mollusca of Australia. In: Biogeography and Ecology in Australia. W. Junk. pp. 224-45.
- Mayr, E. 1941. List of New Guinea Birds. *Amer. Mus. Nat. Hist.*
- Mayr, E. 1944a. Wallace's Line in the light of recent zoogeographic studies. *Quart. Rev. Biol.* 19: 1-14.
- Mayr, E. 1944b. The birds of Timor and Sumba. *Bull. Amer. Mus. Nat. Hist.* 83: 127-94.
- Mayr, E. 1953. Fragments of a Papuan ornithogeography. Proc. Seventh Pacific Sci. Congress. 4: 11-19.
- Mayr, E. & Gilliard, E.T. 1954. Birds of central New Guinea. *Bull. Amer. Mus. Nat. Hist.* 103: 317-74.
- Meggitt, M.J. 1958. The Enga of the New Guinea highlands. *Oceania*, 28: 253-330.

- Myers, G.S. 1953. Palaeogeographical significance of fresh-water fish distribution in the Pacific. Proc. Seventh Pacific Sci. Congress 4: 38-47.
- Nichols, J. T. & Bartsch, P. 1946. Fishes and Shells of the Pacific World. Macmillan Co.
- Pullar, E.M. 1953. The wild (feral) pigs of Australia: their origin, distribution and economic importance. Mem. Nat. Mus. Vict. 18: 7-23.
- Reay, Marie. 1959. The Kuma: Freedom and Conformity in the New Guinea Highlands. Melbourne Univ. Press on behalf of Aust. Nat. Univ., Canberra.
- Robbins, R.G. 1960. The anthropogenic grasslands of Papua and New Guinea. UNESCO Symp. on Humid Tropics Veg. Goroka, N.G. pp. 313-29.
- Robbins, R.G. 1961a. The vegetation of New Guinea. *Aust. Territories.* 1: 1-12.
- Robbins, R.G. 1961b. The montane vegetation of New Guinea. *Tuatara.* 8: 121-34.
- Robbins, R.G. 1963. Correlations of plant patterns and population migration into the Australian New Guinea highlands. Proc. Tenth Pacific Sci. Congress. pp. 45-59.
- Robbins, R.G. 1964. The montane habitat in the tropics. Proc. Pap. IUCN Tech. Meeting Nairobi, 1963. pp. 163-71.
- Schodde, R. 1966. About the Kumul. *Wildlife*, 2 (4): (In press).
- Serventy, D.L. 1963. Fauna conservation in Australia and in Australian-controlled New Guinea. Proc. Tenth Pacific Sci. Congress. pp. 212-27.
- Slater, K.R. 1961. Reptiles in New Guinea. *Aust. Territories.!*: 27-35.
- Troughton, E. le G. 1959. The marsupial fauna: its origin and radiation. In: Biogeography and Ecology in Australia. W. Junk. pp. 69-88.
- Tyler, M.J. 1963. A taxonomic study of the amphibians and reptiles of the Central Highlands of New Guinea, with notes on their ecology and biology. I. Anura: Microhylidae. II. Anura: Ranidae and Hylidae. Trans. Roy. Soc. S. Aust. 86: 11-21, 105-30.
- Van Deusen, H. M. 1963. First New Guinea record of *Thylacinus*. *J. Mamm.* 44: 379-80.
- Vos, A. de, R.H. Manville, and R.G. Van Gelder. 1956. Introduced mammals and their influence on native biota. *Zoologica.* 41: 163-94.
- Zeuner, F.E. 1963. A History of Domesticated Animals. Hutchinson.

# Wildlife Conservation in the State of Sabah

by

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## SUMMARY

The rich flora and fauna of Sabah is partly protected by the large areas of forest and by the undeveloped state of the country, particularly the east coast. Sumatran rhinos and orang-utans are, however, threatened species, and there is a need for game and bird sanctuaries, virgin jungle reserves to preserve examples of flora, and the staff to enforce protection in these sanctuaries.

An excellent new Fauna Conservation Ordinance came into force in 1964. Some of its important features are briefly explained.

## INTRODUCTION

Sabah is a land of dense, evergreen, equatorial rain forests, rugged mountains and innumerable rivers covering 29,000 square miles. The physiography of the country is dominated by the Crocker Range (4000-6000 feet), which follows the western coast line fifteen miles inland for 160 miles from Kudat in the north to the Sarawak border. The range has various spurs outlying to the east, one of which culminates in the granite massif of Mount Kinabalu (13,445 feet).

The population at the last census in 1960 was 454,000, of which about a quarter were Chinese and three fifths were made up of indigenous races. Most of this population is concentrated in the interior and west coast residencies with a density of 66 persons per square mile along the flanks and either side of the Crocker Range. In these regions extensive shifting cultivation is practiced and only the upper-most ridges are free of it.

The two east coast residencies of Tawau and Sandakan are very sparsely populated with less than 2 persons per square mile. Except around the towns of Sandakan, Lahad Datu and Tawau, this side of the country is covered by lowland dipterocarp forest with only an occasional river or timber camp to interrupt the canopy. Thus, in contrast to the poverty of wildlife on the populated west coast of Sabah, the eastern parts of the country have a rich and plentiful fauna.

## FAUNA OF SABAH

The larger animals include the Sumatran or two-horned rhinoceros (*Didermoceros sumatrensis*), the orang-utan (*Simia satyrus*), the Sunda Island or grey gibbon (*Hylobates moloch*), the crab-eating macaque (*Macaca irus*), the pig-tailed macaque (*Macaca nemestrina*), the banded leaf monkey (*Presbytis femoralis*), the Sunda Island leaf monkey (*Presbytis aygala*), the maroon leaf monkey (*Presbytis rubicundus*), the white-fronted leaf monkey (*Presbytis frontatus*), the silvered leaf monkey (*Trachypithecus pyrrhus*), the proboscis monkey (*Nasalis larvatus*), the tarsier (*Tarsius tarsier*), the Malay bear (*Helarctos malayanus*), the binturong (*Arctictis binturong*), the clouded leopard (*Felis nebulosa*), the marbled cat (*Felis marmorata*), the leopard cat (*Felis bengalensis*), the flat-headed cat (*Felis planiceps*), the scaly anteater or pangolin (*Manis javanica*), the Asiatic elephant (*Elephas maximus*), the bearded pig (*Sus barbatus*), the larger mouse deer (*Tragulid javanicus*), the smaller mouse deer (*Tragulid kanchil*), the sambar (*Cervus unicolor*), the barking deer (*Muntiacus muntjak*), and the banteng (*Bibos sondaicus*).

## SUMATRAN RHINO AND ORANG-UTAN

The two animals most threatened by man are the Sumatran rhino and the orang-utan. The former has been ruthlessly hunted for many generations and is now nearly extinct. Very occasionally tracks are reported, but the last time an animal was seen by a member of the Forest Department was in 1957.

Before the war orang-utan were fairly plentiful between Sandakan and the Kinabatangan. The hunting or capture of them was prohibited under the former Wild Animals and Birds Preservation Ordinance. This did not prevent a lot of adults being killed and young animals sent to zoological parks throughout the world. The usual specious story of the mother being killed when an isolated tree was felled was difficult to refute. With the responsibility for enforcing an ineffectual ordinance split between Residents, District Officers and Forest Officers, little effective protection could be achieved until the new Fauna Conservation Ordinance came into force and the Game Branch of the Forest Department became established in 1963.

In 1928 five orang-utan were collected by F.C. Wonder within eight miles of Sandakan, and the Harvard Primate Expedition collected seven in 1937 (Davis: Bulletin of the National Museum, Singapore). Twenty seven of these apes, 14 male and 13 female, are held for studies on social behaviour and the higher mental processes at a laboratory in America. It is their intention to breed them when they reach sexual maturity. It is not known how many, if any, came from Sabah. Between 1957 and 1963 twenty orang-utan were exported officially from Sabah to zoological societies, nine to the United Kingdom, seven to Australia and four to Denmark. None have been sent since 1963, but in 1964 four were illegally captured and two were killed. So far this year six babies have been found in captivity, and there may still be one or two to come before the force of the new ordinance percolates through to all would-be hunters.

The Game Branch had to take immediate steps to prevent any further drain on the orang-utan population and decided to attack the problem on two fronts. On the one side the aim is to dissuade hunting and capture of these apes, by prosecuting every case that comes to light with the uttermost vigor, by publicizing the severe penalties involved, and by spreading propaganda about the need for the benefits to be derived from protecting these animals. On the other hand an attempt is being made to rehabilitate all captured animals back into their native haunts. No export to zoological gardens is contemplated unless an animal is found unsuited for rehabilitation.

## FOREST RESERVES

The rich flora and fauna of Sabah is partly protected by the large areas of forest and by the undeveloped state of the country. Forest reserves afford full legal protection for animals and birds, and 10,500 square miles or thirty five per cent of the country has been constituted permanent forest reserve. This is a great advantage, but complacency about the security of these resources will lead to disaster. For one thing Sabah is a land of diverse races, many of whom have lived for centuries a semi-nomadic existence largely dependent on hunting. The ethics of wildlife conservation and the laws connected with it are hard for them to understand or support. They kill many animals for food, often in excess of their needs, but who can blame them for this! Again, within the productive forest reserves, vast areas of forest are being felled for timber every year. In the process the environment is changed, and the habitat may become unsuited to many animals and birds. These forests are being regenerated, but it may be ten years before a semblance of the original environment reforms.

There is thus an additional need for a game sanctuary or sanctuaries for the larger mammals, bird sanctuaries for birds with rather special habitats, virgin jungle reserves to preserve examples of the flora entirely undisturbed by man, and of course the extra staff to enforce protection in these sanctuaries. It is intended that virgin jungle reserves will be set aside within forest reserves in blocks of about 200 acres to every ten or fifteen square miles of logged forest. They also serve as holding grounds for a residual stock of smaller mammals and birds until the surrounding forest has been regenerated.

## GAME SANCTUARIES

No game sanctuaries have been so far constituted. One is proposed for a remote and little explored area in the Upper Segama and there are two or three other areas which might be suitable.

## BIRD SANCTUARIES

There are five such sanctuaries. The most important is approximately fifty square miles in extent and covers marshland, padi fields, small coconut plantations, village and the hills between the Tempasok and Pandasan Rivers near Kota Belud. There are a large number of buffalo and horses in the sanctuary. During the migratory season, garganey (*Anas querquedula*), tufted duck (*Aythya fuligula*), mallard (*Anas platyrhynchos*), shoveller (*Anas clypeata*) and wigeon (*Anas penelope*) have been recorded. Pin-tail snipe (*Capella stenura*), Swinhoe's snipe (*Capella megala*), American golden plover (*Pluvialis dominica*), little ringed plover (*Charadrius dubius*), common sand piper (*Tringa hypoleucos*), collared pratincole (*Glareola pratincola*), yellow wagtail (*Motacilla flava*), are found in large numbers.

It is interesting to note that the only Malaysian record of the black coot (*Fulica atra*) was made by Burgess in this sanctuary, and it was also here that the pied barrier (*Circus melanoleucus*) was for the first time recorded in Sabah, by Medway, in February, 1964. The sanctuary can be reached by Land Rover from Kota Belud where there is a good rest house, and the area is well worth a visit by naturalists. Bird ringing was attempted by Medway during November, 1964, but had to be abandoned as the traps were continually broken by buffalo and horses.

## VIRGIN JUNGLE RESERVES

Forty of these have been so far set aside covering about 14,000 acres. Included in this category are one or two small forest reserves on hills in the middle of alienated land.

## REHABILITATION CENTER FOR ANIMALS

All protected animals and birds which have been illegally captured are forfeited by order of the court and handed over to the Chief Game Warden. With a view to returning the animals back to the wild, a small scale experiment is being carried out in a forest reserve of 10,000 acres on the East Coast. Nine young orang-utan are kept there and given all the freedom they require. They are encouraged to climb, make nests and move about freely in the forest. With the provision of their natural surroundings it is hoped to stimulate their natural instincts and their incentive to feed, roam and to survive on their own. Most of the orang-utan are very young, and it will take several years of patient handling before they can be introduced into the wild. If the experiment proves a success the young apes will be released in batches in some remote forest reserve, preferably a game park if one is constituted on the East Coast. If they do not learn to survive on their own they can form a semi-wild breeding colony. Other animals such as gibbons, bears and wild birds are also treated in a similar manner. It will be some time before any results are obtained.

## LEGISLATION

The Fauna Conservation Ordinance, 1963, (Act. No. 11 of 1963) came into force on 15th July, 1964. It repealed the Turtle Preservation Ordinance, and the Wild Animals and Birds Preservation Ordinance. The new ordinance is administered by the Forest Department. The Conservator of Forests is the Chief Game Warden and other officers of the department have been appointed Deputy Game Wardens, Assistant Game Wardens and Game Rangers. Some of the important features of the ordinance may be briefly explained here.

## 1. Protected Animals

The Sumatran rhinoceros, dugong, tarsier, orang-utan, gibbon and proboscis monkey are completely protected. Very severe penalties are prescribed for hunting them, the maximum penalty being five years imprisonment and a fine of \$5, 000.00.

## 2. Game Animals

Elephant, clouded leopard, banteng and Malay bear are game animals and can be hunted under a game license issued by a Game Warden.

License fees are as follows:

Elephant	\$100.00	per	head
Clouded Leopard	40.00	"	"
Banteng	50.00	"	"
Malay Bear	20.00	"	"

No game license may authorise the hunting of female elephants.

Barking deer, mouse deer, and sambur cannot be hunted in Game Sanctuaries and Forest Reserves, but a Game Warden may issue Forest Game Licenses to hunt deer in Forest Reserves. At present no Forest Game licenses are issued to shoot animals or birds in Forest Reserves.

## 3. Birds

The Act affords protection to several species of birds and a comprehensive list is attached to this paper. (Annex 1).

Although the Megapode enjoys protection its eggs can be taken for egg collection. The maximum penalty for hunting a protected bird is imprisonment for 3 months and a fine of \$ 500.00.

## 4. Trophies

Trophies can only be retained when they are taken from animals killed under a license, or when a certificate of ownership has been issued by a Game Officer.

## 5. Illegal methods of hunting

It is illegal to hunt any animal from a stationary or moving vehicle, or from a car or aeroplane to drive or disturb any protected animal. Hunting within half a mile of a saline or mineral lick and the setting of any trap or snare which is likely to cause injury to humans is also illegal.

## 6. Exceptions to criminal liability

It is permissible to kill or injure an animal in the immediate defense of human life. It is also permissible to kill any protected animal (except orang-utan or rhinoceros) or bird which is trespassing or attempting to trespass in or upon any cultivated land. The circumstances have to be reported forthwith to a Game Officer, Forest Officer or Police Officer, and the burden of proof that such killing or wounding was necessary is on the person who carried it out.

Birds not protected under the ordinance can be hunted without a license outside game sanctuaries, bird sanctuaries and forest reserves.

## 7. Turtles

The green turtle and the hawksbill turtle cannot be hunted except under license. The present policy is not to issue any licenses for the hunting of these turtles. The indigenous races of Sabah, can, without a license collect turtle eggs in certain areas on the west coast and off Semporna.

In the Sandakan Residency eight islands have been declared turtle farms and the rights to collect turtle eggs are disposed of each year by the Deputy Game Warden. Turtle

eggs can be collected in other areas in the State only on a license issued by a game warden. March is the closed season, and turtle eggs cannot be collected anywhere in the State during this month.

During the last war large numbers of turtles were slaughtered by Japanese soldiers on the islands near Sandakan. The islanders themselves do not kill any of the turtles, but in the Tawau Residency the Cocos Islanders working on the estates used to kill a certain number of turtles every month as they considered the flesh necessary for their well being. It is proposed in 1966 to establish a turtle hatchery on one of the Sandakan islands.

## STAFF

A start has been made with wildlife conservation in Sabah, and the state is fortunate in having an excellent game ordinance. There are however many serious problems ahead. The chief of these is to attract and keep sufficient properly trained staff to administer the game laws, supervise the reserves, look after the rehabilitation project and undertake a variety of field studies.

At present the Game Section has an establishment of nine of which only six posts have been filled. None of my colleagues has any specialised training. Partially trained staff with at least some basic veterinary knowledge of hygiene and animal care are urgently required for the rehabilitation project. Other projects such as population counts, behaviour studies, investigations into the status, habitat and future of endangered species, ways and means of containing elephant within the reserves and elephant control generally apart from shooting – none of these can be undertaken by local staff at present. We must appeal to I. U. C. N. and other outside bodies for help with experienced zoologists and other experts for these studies. The staff problem is a twofold one; first to get Government to agree to establish posts at a sufficiently attractive salary, and then to find suitable applicants to fill the posts. I am not sure which is the more difficult.

## REFERENCES

- Burgess, P. F. 1961. Wild Life Conservation in North Borneo. *Malay. Nat. Spec. Issue.*
- Burgess, P. F. 1964. The Kota Belud Bird Sanctuary, Sabah. *Malay. Nat.* Vol. 18, No. 4.
- Devenport, R.K. Yerkes Laboratory, Atlanta, Georgia, U.S.A. Private Correspondence.
- de Silva, G.S. 1964. Borneo – Land of the Orang-utan. *Loris*, December.
- The Fauna Conservation Ordinance. 1963. Act. No. 11 of 1963.
- Harrison, John. 1964. An Introduction to the Mammals of Sabah. Sabah Soc. Jesselton. 244 pp.

ANNEX 1

PROTECTED BIRDS

FRIGATE BIRDS:

Lesser Frigate Bird

DARTERS:

Darter

HERONS AND BITTERNS

Dusky-Grey Heron

Purple Heron

Reef Egret

Chestnut Bittern

STORKS:

Storm's Stork

Lesser Adjutant Stork

EAGLES, HAWKS, KITES:

Honey Buzzard

Crested Goshawk

Grey-Headed Fishing Eagle

Lesser Fishing Eagle

Crested Serpent Eagle

OSPREYS:

Osprey

FALCONS:

Common Falconet

White-Fronted Falconet

Peregrine Falcon

MEGAPODES:

Megapode

PARTRIDGES AND PHEASANTS:

Long-Billed Partridge

Ferruginous Wood Partridge

Red-Breasted Tree Partridge

Chestnut-Breasted Tree Partridge

Black Wood Partridge

Crested Green Wood Partridge

Crimson-Headed Wood Partridge

Crestless Fireback Pheasant

Crested Fireback Pheasant

Bulwer's Pheasant

Malaysian Peacock-Pheasant

Great Argus Pheasant

CRAKES AND RAILS:

White-Breasted Waterhen

STONE PLOVERS:

Reef Thick-Knee

GULLS:

Black-Naped Tern

Bridled or Brown-Winged Tern

PIGEONS AND DOVES:

Black-Naped Fruit Pigeon

Pickering's Imperial Pigeon

Metallic Wood Pigeon

Grey Wood Pigeon

Spotted-Necked Dove

Fregatidae

*Fregata ariel*

Anhingidae

*Anhinga anhinga*

Ardeidae

*Ardea sumatrana*

*Ardea purpurea*

*Egretta sacra*

*Ixobrychus cinnamomeus*

Ciconiidae

*Ciconia stormii*

*Leptoptilos javanicus*

Accipitridae

*Pernis ptilorhynchus*

*Accipiter trivirgatus*

*Ichthyophaga ichthyaetus*

*Ichthyophaga nana*

*Spilornis cheela*

Pandionidae

*Pandion haliaetus*

Falconidae

*Microhierax caerulescens*

*Microhierax latifrons*

*Falco peregrinus*

Megapodiidae

*Megapodius freycinet*

Phasianidae

*Rhizothera longirostris*

*Caloperdix oculea*

*Arborophila hyperythra*

*Arborophila charltoni*

*Melanoperdix nigra*

*Rollulus roulroul*

*Haematoryx sanguiniceps*

*Lophura erythrophthalma*

*Lophura ignita*

*Lophura bulweri*

*Polyplectron malacense*

*Argusianus argus*

Rallidae

*Amaurornis phoenicurus*

Burhinidae

*Esacus magnirostris*

Laridae

*Sterna sumatrana*

*Sterna anaetheta*

Columbidae

*Ptilinopus melanocephalus*

*Ducula pickeringi*

*Columba vitiensis*

*Columba argentina*

*Streptopelia chinensis*

Emerald Dove  
Nicobar Pigeon

**HORNBILLS:**  
White-Crested Hornbill  
Bushy-Crested Hornbill  
Wrinkled Hornbill  
Wreathed Hornbill  
Black Hornbill  
Pied Hornbill  
Rhinoceros Hornbill  
Helmeted Hornbill

**HONEYGUIDES:**  
Malaysian Honeyguide

**THRUSHES AND CHATS:**  
Orange-Headed Ground Thrush  
Everett's Ground Thrush  
Chestnut-Headed Ground Thrush

**BABLERS:**  
Black-Browed Jungle Babbler

**WOOD SHRIKES:**  
Bald-Headed Wood Shrike

*Chalcophaps indica*  
*Caloenas nicobarica*

**Bucerotidae**  
*Berenicornis comatus*  
*Anorrhinus galeritus*  
*Aceros leucocephalus*  
*Aceros undulatus*  
*Anthracoceros malayanus*  
*Anthracoceros coronatus*  
*Buceros rhinoceros*  
*Rhinoplax vigil*

**Indicatoridae**  
*Indicator archipelagicus*

**Turdidae**  
*Zoothera citrina*  
*Zoothera everetti*  
*Zoothera interpres*

**Timaliidae**  
*Trichastoma perspicillatum*

**Prionopidae**  
*Pityriasis gymnocephala*

# **A Part–Time Job for Spare Money: Raising Deer in Vietnam**

by

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## **SUMMARY**

In this brief paper the authors describe the use of deer by rural peoples in Viet Nam as a cash crop. Deer of several kinds are kept in pens, much like cattle, and food for them is gathered from the nearby woods. The deer breeders 'harvest' the soft antlers that grow each year, selling them to local medicine practitioners; they also sell some of the fawns.

This economic use of the wildlife resource has provided a part time job and a source of income to the Vietnamese for hundreds of years.

## **INTRODUCTION**

Some of us would enjoy having a wild animal as a pet. Antelope and deer are the most preferred since they are near and easy to tame.

In some countries, raising a deer as a pet is rather expensive and space is required. In Viet Nam this is quite different. Some people raise antelope and deer, not as pets, but as a part-time job for some spare money.

## **A PART-TIME JOB**

In 1940, I had the opportunity to visit the coastal villages of the provinces Thanh-Hoa and Nghe-An in the northern part of Central Viet Nam. People in this crowded area make their living by fishing. Because of lack of paddy fields, agriculture is not important as off-season work, and the people find that they can get some extra money by raising deer. However, only the upper class families have facilities enough to raise these wild animals because the living standard in this area is low.

## **RAISING THE DEER**

Space for the animals to graze is not available in this narrow strip of land. Antelope and deer are kept in pens built of wood like most of the pens for cattle in South East Asia. The pens have paddy roofs. Some families raise from five to seven deer in a pen.

Food for the animals consists of grass and green leaves of forest trees cut from nearby woods by children and old people. Deer prefer china-berry leaves (*Melia azedarach*).

## **INCOME**

By selling soft horns and fawns, deer breeders get some extra income. Unfortunately I did not make a careful study on the income from this kind of business. It is necessary to keep in mind that in this area deer raising has already been a part-time job for hundreds of years. As other Vietnamese farmers, they do not calculate income from spare-time work, and this type of work is usually done by children and old people having no other

occupation. What they get when they sell the goods is their net revenue. Besides, no other part-time work exists.

#### **PRICES FOR SOFT DEER HORN**

Local Oriental medicine practitioners pay different prices for soft horns. According to them, the most valuable soft horns are from spotted deer (*Sika pseudaxis*). The price for soft horns from hog deer *Cervus porcinus annamensis* is higher than those from Sambar, *Cervus aristotelis*, *rusa unicolor*. Price also depends on age of the horns. It also differs greatly between tame deer and wild ones on the ground that the latter browse a wider variety of grass and green leaves, therefore their horns have a higher degree of tonicity. Prices for soft horns from tame deer are usually half the value of those caught in the forests.

# The Effect of Forest Clearance on Small Mammals

by

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## SUMMARY

In Malaysia progressive destruction of the native rain forest – perhaps the richest in species in the world – results in progressive elimination of the native mammal fauna. Selective lumbering causes the least disturbance to the fauna, but if the rain forest is destroyed only introduced rats remain.

This is not true of the rain forest of Queensland, Australia. There complete destruction of the forest for the growing of sugar cane reduced the number of mammals only slightly; the assemblage of species changed, however, rain forest species being replaced by native species from the nearby eucalypt forest.

## MALAYSIA

The belief that pests of crops 'Come out of the jungle' dies hard; indeed its ranks are still firm. I have in my possession a photograph of some hills covered with the grass, *Imperata cylindrica*, in a rain forest area. They had been cleared of primary forest by the neighbouring sugar-cane farmers because of an outbreak of insect pests in the sugar, which had been blamed onto the jungle.

In Malaysia the term 'jungle' is used indiscriminately for anything from untouched primary rain forest, to the dense secondary growth on cleared land. These growths however, are fundamentally different in both flora and fauna, and a study of the mammal population provides a useful index to this difference. Only terrestrial mammals will be considered, Malaysian rats are not known well enough for valid comparisons to be made.

Malaysian lowland rain forest is perhaps the richest habitat in the world. Rich in number of species that is. Its richness in species of trees is shown by counts such as those of Wyatt-Smith (1952), giving 227 different species among the 559 grown trees on a hectare plot. There are too many mammals to enumerate, but the first column of Table I gives a summary of the 76 species recorded from the lowlands of Selangor; West Central Malay Peninsula, group by group (I. M.R. 1958).

Such numbers are typical, although there are of course differences in detail, particularly of species, from place to place.

Such forest may be destroyed in a number of different ways. It may have most of the valuable timber trees removed by selective felling, leaving a few seed bearers and the remaining forest to regenerate. It may be clear felled and immediately replanted with a tree crop, such as rubber, oil palm, or cocoa, sometimes leaving some of the original forest trees for shade (e.g. cocoa). It may be clear felled for other non-tree crops (such as sugar cane, rice, market gardens) or for housing or mining. Finally it may be clear felled to extract timber and neglected, either growing up again into a dense secondary forest, which simulates primary forest but has a different species composition; or, if the land is exposed in the felling to baking by direct sunlight and leaching and erosion by rain, it may be seized by the widespread grass *Imperata cylindrica*, a weed which because of its persistent rhizomes, is perpetuated by the frequent burning – deliberate or accidental. Secondary forest is also formed by the process of shifting cultivation when the population becomes too high, and by the process of attrition which occurs in standing forest bordering human inhabited areas.

Selective felling and regeneration appears to have a minimal effect on the mammal fauna. The second column of Table I shows the numbers of species known to be present in an area of such disturbed primary forest in Selangor (Harrison & Hendrickson 1963). Allowances must be made for the size of the sample (about 40 acres and about 1 year's observation) and the fact that the sampling, comprising ground traps, sight records, and traps, was not uniformly effective; in particular the flying squirrels (*Petauristinae*) were not sampled. A calculation based on the fitting of a logarithmic series (Harrison 1965) shows that this difference is to be expected in samples of these sizes.

When the forest is replaced by a tree crop one might reasonably expect the bulk of the forest animals to remain in the new kind of forest. This however appears to be exceptional. I have seen cocoa in Sabah, Borneo, in which the following mammals were obtained:-

Insectivora:	..	..	..	..	1	- <i>Crocidura</i> sp.
Primates:	..	..	..	..	7	- <i>Tupaia</i> 4 spp, <i>Nycticebus</i> , <i>Macaca</i> , * <i>Presbytis</i>
Rodentia – Sciurinae:	..	..	..	..	6	- * <i>Callosciurus</i> 2 sp. * <i>Sundasciurus</i> 3 sp.
" – Petauristinae	..	..	..	..	2	- * <i>Petaurista</i> , <i>Hylopetes</i>
" – Muridae	..	..	..	..	6	- * <i>Rattus</i> 6 sp., (including * <i>R. exulans</i> )
" – Others	..	..	..	..	1	- <i>Trichys</i>
Carnivora:	..	..	..	..	3	- <i>Paradoxurus</i> , <i>Arctogalidia</i> , <i>Felis</i>
Artiodactyla:	..	..	..	..	2	- <i>Tragulus</i> , <i>Muntiacus</i>
Other Mammals:	..	..	..	..	1	- <i>Cynocephalus</i>
					Total	<u>29</u>

The animals starred (\*) were regarded as pests in that they were damaging cocoa pods. It is likely, however, that only the monkeys and giant flying squirrels were actually damaging pods, and that the squirrels and rats were feeding on the fruit from pods damaged by other mammals. The crop was, however, most unusual in that it was a new crop, grown on freshly cleared forest land with undisturbed forest adjacent to it, and furthermore a number of large trees had been left to provide shade for the growing cocoa. It seems likely that many of the mammals were not maintaining themselves in the cocoa as such, but were spreading into it from the adjacent forest. The rat *R. exulans*, however, is an introduced species, not native to Borneo.

Certainly in lowland Selangor the fauna of tree crops was much more restricted. The normal inhabitants of oil palm and rubber were:-

Insectivora:	..	..	..	..	0	-
Primates:	..	..	..	..	2	- <i>Tupaia</i> , <i>Macaca</i>
Rodentia -Sciurinae:	..	..	..	..	3(4)	- <i>Callosciurus</i> 3-4 spp, <i>Sundasciurus</i>
Petauristinae:	..	..	..	..	0	-
Muridae:	..	..	..	..	2	- * <i>Rattus tiomaicus jalorensis</i> * <i>R. exulans concolor</i>
Others:	..	..	..	..	1	- <i>Hystrix</i>
Carnivora:	..	..	..	..	2	- <i>Paradoxurus</i> , <i>Felis</i>
Artiodactyla:	..	..	..	..	2	- <i>Sus</i> , <i>Tragulus</i>
					Total	<u>12-13</u>

It should be noted that the two rats starred (\*) are pests which do not occur in primary forest; and *R. t. jalorensis* is one of the major pests of oil palm. The monkey and the squirrels seem at home there, but the others are, again, animals which seem to spread from forest. The tree crops, indeed, show a fauna similar to, but slightly more impoverished than that of secondary forest.

The lists given above are estimates based on continued observations. The actual results of mechanical trapping give a result which is more satisfying to the mathematically minded, and so Table II shows the numbers of small mammals caught, marked, and released again in a number of different kinds of vegetation for comparable times and areas, all in Selangor.

These are alike in that they are the kind of mammals which can be caught in small cage traps. The areas differ, so the numbers of specimens have been expressed, in the last line as a density of population per hectare (or here per equivalent hectare, allowing for size of home range).

It will be seen that the total populations of these small mammals are broadly comparable (3.2-8.9 per hectare) but that the number of species reduces as one moves from forest, through secondary forest, and scrub (i.e. brush) to grassland. Some of these species, however, are of commensal rats which appear to have come from outside Malaya: *Rattus exulans*, *R. argentiventer*, and *R. tiomenicus* the last two being often regarded as subspecies of *R. rattus*. If we consider only forest animals the numbers found were:

Disturbed Forest	..	..	..	SBF	8
"	"	..	..	Ampang	7
Secondary Forest	..	..	..	GR	4
Scrub	..	..	..	SBS	2
Grass	..	..	..	SBP	1

The 'grass' in fact was mixed grassland and scrub. In pure stand of *Imperata* only two species occur, *R. argentiventer* and *R. exulans*, both introduced. These are the two species estimated in Table III. A similar fauna is found in rice fields.

Small cage traps do not sample pigs, monkeys, cats, and so on, so making an estimate of the number of species of these, we get the figures shown in Table III.

A third condition after the destruction of the forest is exhibited by its complete replacement by built up areas. In Kuala Lumpur, cleared out of forest a century ago, the mammal fauna is, beside domestic pets:-

*Rattus rattus diardii*  
*R. exulans*  
*Mus musculus*  
*Suncus murinus*

all four of which are introduced.

We can sum up the state of affairs in Malaysia by saying that progressive destruction of the native rain forest results in progressive elimination of the native mammal fauna. Selective felling of primary forest, with a serious attempt to maintain the forest as a productive one, does not seriously deplete the number of species at least of the smaller mammals. Destruction of the forest and its replacement by secondary forest or tree crops causes a drastic reduction in the number of species. Complete elimination of the forest (scrub or grassland) causes an almost complete elimination of the native fauna, and its replacement by a few species of commensal rats.

## QUEENSLAND FOREST

These observations on Malaysia, however, are not necessarily of universal application. Thus Table IV, from Harrison (1962) shows the state of affairs in the rain forest area of northern Queensland.

The number of species recorded from forest is smaller, only 14 or so, while the number of species recorded from sugar cane (10) is almost as large. Of special interest, however, are the species in sugar cane. Only three (*Tachyglossus*, *Perameles* and *Hydromys*) are from rain forest, and three (*Rattus rattus*, *Mus musculus* and *Felis catus*) are commensal. The remainder are species derived from the more open Eucalypt forest which edges the rain forest a few score miles to the west.

## CONCLUSION

In this paper the reduction of the number of biota caused by the felling of rain forest, is illustrated by the numbers of species of mammals (other than bats). Malaysian rain forest is perhaps the richest habitat in the world, and 150 square miles in central Malaya was found to have about 76 species of mammals.

Selective felling of timber, in which useful trees are cut out and the rest left to grow, gives least disturbance of the fauna. Small areas sampled had only between 30 and 33 species, but sampling theory suggests that only about this number would be found in a similar sample of undisturbed forest. A similar fauna was found in cocoa which was being grown on the edge of forest, in fresh clearings with shade trees left.

The latter is unusual. Tree crops (rubber and oil palm) usually showed about the same number of species as secondary forest or scrub 11-13 species of which some were introduced rats.

Complete destruction of the forest left only some 4 to 7 species of which 2 or 3 were introduced rats. In towns all of the 4 species were introduced.

In Malaysia, therefore, the native fauna appears to depend on the existence of rain forest. If the rain forest is destroyed only introduced rats remain.

This is not true of the rain forest of Queensland, Australia. There complete destruction of the forest for the growing of sugar cane reduced the number of mammals only slightly. The assemblage of species changed, however, rain forest species being replaced by native species from the nearby Eucalypt forest.

## LITERATURE CITED

- Harrison, J.L. 1965. Numbers of Mammals on the Malaysian Islands. *J. Malay. Br. R. Asiatic Soc.* (Gibson-Hill Memorial Number). (in Press).
- Harrison, J.L. 1962. Mammals of Innisfail. *Aust. J. Zool.* 10: 45-83.
- Harrison, J.L., and J.R. Hendrickson. 1963. The fauna of the island of the Straits of Malacca. 10th Pac. Sci. Congr. Symposium on Pacific Basin Biogeography, Bishop Museum, Hawaii.
- I. M. R. 1958. Division of Virus Research and Medical Zoology. Annual Report of the Institute for Medical Research, Malaya, for 1957.
- Wyatt-Smith, J. 1952. Malayan Forest Types *Malay Nat. J.* 7: 45-55.

TABLE I

Numbers of species, by groups, of land mammals collected from lowland forest in Selangor. First column all forest areas, second one area of disturbed forest.

Group of Mammals	Number of species recorded from:-	
	150 square miles of primary forest over ten years	20 acres of disturbed forest over one year
Insectivora	5	1
Primates	10	4
Rodentia Sciurinae	12	5
"    Petauristinae	9	1
"    Muridae	10	6 + 1*
"    Others (Rhizomyidae & Hystriidae)	3	1
Carnivora	16	6
Artiodactyla	7	5
Other mammals (F. Lemur, Pangolin, Elephant, Tapir)	4	2
Total	76	31 + 1

\* One species of *R. argentiventer*, a grassland species found only in a grassy clearing.

TABLE II

Populations, in numbers marked, of Tree shrews, Squirrels, and rats in six sample areas, the first being of disturbed forest in Table I. Animals starred (\*) are not rats of forest.

Species	Experiment:	Kind of Forest:-				
		Disturbed SBF	Primary Ampang	Secondary GR	Scrub SBS	Grass SBP
TREE SHREW						
<i>Tupaia glis</i>		-	3	6	-	-
SQUIRRELS						
<i>Callosciurus caniceps</i>		-	-	1	2	-
<i>C. nigrovittatus</i>		1	-	-	-	-
<i>C. notatus</i>		10	7	8	-	-
<i>Sundasciurus tenuis</i>		4	-	-	-	-
<i>Rhinosciurus laticaudatus</i>		-	1	-	-	-
RATS						
* <i>Rattus exulans concolor</i>		*1	-	-	*6	*23
* <i>R. argentiventer</i>		*1	-	-	*2	*1
* <i>R. tiomanicus jalorensis</i>		-	-	*16	*17	*12
<i>R. muelleri</i>		12	1	-	-	-
<i>R. bowersii</i>		1	-	-	-	-
<i>R. sabanus</i>		2	25	-	-	-
<i>R. raja</i>		44	6	-	-	-
<i>R. Whiteheadi</i>		9	9	3	5	1
Total no. of species		10	7	5	5	4
Estimated density per equivalent hectare		4.9	4.1	8.9	3.2	5.5

TABLE III

Numbers of species of all mammals estimated to be present in the sample areas of Table II (pure stand of *Imperata* grassland added).

	Disturbed - SBF	Primary Ampang	Secondary GR	Scrub SBS	'Grass' SBP	Pure Grass
<i>Forest Species: Trapped</i>						
Primates (Treeshrew)	-	1	1	-	-	-
Rodents - Squirrels	3	2		1	-	-
- Rats	5	4	1	1	1	-
<i>Forest species - Estimated additional spp.</i>						
Insectivores	1	1	-	-	-	-
Rodents, all	5	5	-	-	-	-
Primates	4	4	1	-	-	-
Carnivores	6	6	2	2	1	1
Antiodactyls	5	5	2	3	2	1
Other Mammals	2	2	1	1	-	-
<i>Commensal Rats</i>						
Trapped	2	-	1	3	3	-
Estimated	-	-	-	-	-	2
Total - Forest spp.	31	30	10	8	4	2
Commensal rats	2	0	1	3	3	2
All species	33	30	11	11	7	4

TABLE IV

Species of mammals recorded from rain forest near Innisfail in north Queensland (17°30' S latitude) compared with those recorded from sugar cane fields on land cleared from forest, and from town. From Harrison 1962.

Group	Rain-Forest	Sugar Cane	Houses
Monotremes	<i>Tachyglossus aculeatus</i> <i>Ornithorhynchus anatinus</i> (stream s only)	<i>T. aculeatus</i> -	- -
Terrestrial marsupials	<i>Perameles nasuta</i> <i>Antechinus flavipes</i> <i>Hypsiprymnodon moschatus</i> <i>Thylogale stigmatica</i>	<i>Isoodon macrourus</i> <i>P. nasuta</i> - <i>Protomnodon agilis</i>	- - - -
Arboreal marsupials	<i>Dactylopsila trivirgate</i> <i>Pseudocheirus archeri</i> <i>Dendrolagus lumholtzi</i> and others	- - -	- - -
Rodents	<i>Hydromys chrysogaster</i> <i>Melomys cervinipes</i> <i>Uromys caudimaculatus</i> <i>Rattus assimilis</i>	<i>H. chrysogaster</i> <i>M. lutillus</i> <i>Rattus rattus</i> <i>R.s. conatus</i>	- - <i>Rattus rattus</i> <i>R. nor-vegicus</i>
Feral species	<i>Sus scrofa</i>	<i>Mus musculus</i> <i>Felis catus</i>	<i>Mus musculus</i> ( <i>Felis catus</i> domestic)
Total	14 +	10	4

## Part 5

### Pesticides and Herbicides

#### Crop Pest Control and Resource Conservation in Tropical South East Asia

by

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##### SUMMARY

Large scale insecticide use in temperate regions has produced new pest problems and other undesirable effects. This has resulted from a failure to appreciate the inevitable interaction between insecticides and the natural environment. In the tropics, crops are grown in closer relation to the natural environment and thus the uncritical adoption of temperate practices must inevitably produce even more serious problems, as experience is already showing.

It is postulated that natural enemies are the main regulating factors of insect populations in the tropics. Most crop pests are derived from species indigenous to the natural vegetation but this also acts as a source of their natural enemies. A pest control strategy is thus essential which concentrates on utilizing natural controlling factors, any further artificial control measures being integrated with these.

For vertebrate pests natural control mechanisms would appear less important. Emphasis should be placed on directly preventing damage by physical barriers or chemical repellents.

##### INTRODUCTION

In the more-developed countries of the temperate regions crop agriculture has come to be regarded as, essentially, an artificial activity which requires a man-made environment divorced from the natural environment by physical and chemical barriers. In practice this has led to the extensive use of chemical fertilizers, weed-killers, fungicides and insecticides, and comprehensive mechanical cultivation, applied to crop plants bred to give optimum performance under such conditions. It is a natural development from a desire to obtain returns from crop agriculture comparable with those of industrial investment, and, overall, it has been a successful policy producing high yields and returns; but in some of its aspects, it has created new and serious problems. Essentially these are a result of a failure to see that no crop can be entirely cut off from the natural environment, and that there is invariably an interaction between the man-made and the natural environment which may often make the activities of the former useless or even detrimental to crop production.

##### USE OF CHEMICAL INSECTICIDES

This has become apparent in the field of pest control in particular, where the large scale use of chemical insecticides has resulted in numerous undesirable effects. For example, an increasing number of insects are developing resistance to insecticides. Further, those insecticides which are most commonly used tend to be of the contact-acting form, killing most insects which come into contact with a deposit of the chemical.

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They are thus unselective in their action killing both insect species and the parasitic and predatory species, which are their natural enemies, and so upsetting the balance between them that resurgences of the pest species occur. Natural enemies which previously have not caused economic damage, are also killed off and these species quickly build up, producing new pest problems.

In addition, insecticides may have detrimental effects on other beneficial organisms, such as pollinating insects and soil dwelling organisms. In the total environment their effect is even more pervasive, causing death to fish, game and wildlife in general, leaving toxic residues in the soil, rivers and sea and possibly producing ill-effects in man (Bennett, et al., 1963; Carson, 1963; Cook, et al., 1964; Cramp, et al., 1964; Strickland, 1964; U.S. Department of Interior, 1963; to cite a few recent accounts). Of course in a number of cases insecticides, properly used, have given efficient and long term pest control; but far too often they tend only to reduce pest populations to unstable levels from which they rapidly recover. Invariably for one reason or another, further insect applications are required, often increasing in regularity and adding progressively to the costs of production.

### CHEMICAL INSECTICIDES IN THE TROPICS

Although these effects have been mainly noted in countries of the temperate region they are nonetheless of extreme importance for developing tropical areas. An uncritical adoption of temperate control practices must only produce similar problems which may be considerably more severe or even disastrous. The majority of tropical crops have essentially a low value per acre status and thus heavy expenditure on expensive machinery or chemicals is generally uneconomic. They are therefore grown in conditions which are less artificial and more closely linked with the natural environment, so that large scale insecticide use, which is in any case expensive, must only produce responses even more unfavourable and more liable to create serious problems requiring further attention and expenditure.

Already evidence is accumulating to support this contention. Wood (1965), for example, has described instances of severe outbreaks of bagworms (*Psychidae*) occurring over large acreages of estate oil palms in Malaya, following application of residual contact insecticides. These were initially applied either as a prophylactic, or against other minor pests, or in order to control small localised outbreaks, but in each case they resulted in major bagworm outbreaks, a few months later. The response on some estates was to spray again with contact insecticides and this produced continuing outbreaks which in turn elicited further and repeated spraying at considerable expense. On the other hand where, following Wood's proposals, the outbreaks were either left untreated or sprayed with a selective insecticide, such as lead arsenate (a stomach poison only affecting insects which actually eat the deposit) a rapid build up of parasitisation occurred and the infestation declined to more acceptable and balanced levels.

Other similar cases occur in the literature (e.g. Gerard 1964) but although, in the case cited above, Wood was able to obtain some degree of experimental evidence, in most the evidence is largely circumstantial. There is an urgent need for basic information on the ways in which insect numbers are regulated in the tropics and how these are affected by artificial control measures. This calls for a better understanding of the tropical environment as a whole and necessarily a great deal of data has to be collected and interpreted. However it is not so formidable a task as it appears. Investigations of the kind required have been conducted in temperate countries (see Morris, 1963) and many newly developed tools, including mathematical models and even computers (see Watt 1961, 1964) are available for use.

In the meantime much of our understanding must rely on conjecture. The present author and Wood have expressed some of their views derived from experience of pesticide use in Malaysia (Conway and Wood, 1964). They have in particular stressed the importance of the difference in climate between temperate and tropical regions. In the tropics and especially in humid tropical regions, of which tropical South East Asia largely consists, climatic conditions are ideal for the continuous multiplication of insects. This applies to both plant-feeding species (potential pests) and to those species which are their natural enemies, so that a situation of balance between them is the normal condition in the natural environment. In temperate regions the regular

onset of a winter season kills off most of the plant-feeding species, but for those which are pests this usually comes too late to prevent economic damage. The winter period is thus here the main regulating factor but in the humid tropics, seasonal differences are much less marked and natural enemies assume this role.

## **IMPORTANCE OF NATURAL VEGETATION**

Uvarov, in a recent paper, has drawn attention to the importance of the natural vegetation as the source of crop pests. He demonstrates that the majority of pests of a given crop are derived from species indigenous to the replaced natural vegetation and that further, the nearby uncleared remnants of this vegetation act as reservoirs. However, in emphasising this aspect he neglects the fact that the natural vegetation also harbours the natural enemies of the potential pest species and in this sense is neutral, potentially providing both pests and their enemies. In tropical South East Asia the majority of crop pests are undoubtedly derived from primary or secondary forest. When such forest is cleared and planted up there is, as Uvarov (1964) suggests, usually an early migration of forest plant-feeding species to the crop where they build up to pest proportions. However, after a time lag and providing there is no adverse interference, the natural enemies of many of the species will also migrate from the forest, multiply and restore much or all of the previous natural balance. The writer (Conway and Wood, 1964) had practical experience of this situation in Sabah. Many severe pest problems had arisen on young cocoa planted under secondary forest shade and adjacent to virgin forest. Heavy contact insecticide treatments were having little effect and appeared to be aggravating the problems. Then following cessation of these treatments and with only limited use of certain selective insecticides most of the pest populations dropped rapidly following a build up of natural enemies. Damage was reduced to non-economic levels and has remained so for some years. Evidently the heavy contact insecticide applications were preventing a restoration of natural control by the pests' enemies. One might logically argue from Uvarov's thesis that tropical developing countries should aim for as rapid destruction of the natural vegetation as possible. However, as has been pointed out above, such an approach would be quite uneconomic and practically impossible. In fact, the foregoing arguments suggest the opposite; a policy of preserving the natural vegetation, by leaving intact blocks of natural forest in crop growing regions, and by keeping elements of the natural vegetation within or adjacent to the crop itself.

## **INTEGRATED APPROACH TO PEST CONTROL**

Evidently, if the reasoning presented here is correct, crop pest control measures in tropical South East Asia must evolve as part of an overall 'strategy' which places prime importance on the utilization of natural enemies as regulatory mechanisms. The strategy must obviously be adapted for each crop while for each pest problem individual 'tactics' are necessary which take into account the nature of the crop and of the pest species and its enemies, their economic interrelation and the requirements of other agricultural practices. Using the word in its broadest sense this is an integrated approach to control (see Chant 1964 for a useful discussion on the philosophy and practices of pest control).

Many of the important crops of South East Asia are perennial tree crops. They are usually grown on cleared forest land and to an extent provide a relatively stable habitat similar to that of the forest they replace. They are also mostly of a relatively low value per acre. More than other crops they are thus grown in close relationship with the natural environment and provide most opportunity for carrying out this pest control strategy. At the other end of the scale quick-maturing vegetable crops which have a high value per acre and are grown under largely artificial conditions, would seem to provide little opportunity for a stable form of natural control to be established. Further, the products are marketed primarily on a basis of quality and thus tolerate a much lower degree of damage. Nevertheless under local conditions vegetable plots are often continuously cropped and within a small area a particular crop is always present at any time. It may thus be possible to establish some degree of natural balance which though liable to upset can be used as a basis on which to develop further control mea-

tures as required. Rice falls midway between these two situations. It is of a low value per acre status but is a short term crop with usually marked growing and 'off seasons. Natural parasitism is normally present but does not appear to build up sufficiently during the life of the crop to prevent economic damage. However, with the presence of alternative wild hosts and particularly in areas where double cropping is practised, some degree of semi-stable natural control would seem again theoretically possible.

Having attained by one means or another as great a degree of natural control as is possible for a particular crop, pest problems will, of course, remain. These will require further control measures which, while being geared to the nature of the pest, its damage, and the amount of expense permissible, must above all not interfere with the established natural control. With defoliating insects, for example, a certain degree of damage can usually be tolerated in most perennial tree crops and natural control may well be sufficient. However on vegetable crops this tolerance is much lower and even in perennial tree crops periodic fluctuations may give rise to outbreaks of economic importance. Then the use of a selective stomach poison insecticide or of a bacterial insecticide would be suitable. Economic damage may also be caused by low populations of sucking insects such as aphids, which may transmit virus diseases, and here systemic insecticides, which are translocated in the plant sap and only taken by the sap-feeding insect, give ideal control. Other pests may be treated with further kinds of selective chemicals or by localized or correctly timed application of those which are less selective.

## **MAMMAL AND BIRD DAMAGE**

This paper has so far dealt only with the problems posed by insect pests. However, equally, if not more important, is the problem of mammal and bird damage. Present control practices are often cruder than those used against insect pests, largely due to even less basic knowledge of the ecology of the pest species. Far too often haphazard shooting, trapping and poisoning are employed in attempts to eradicate mammal pests and usually these provide, at best, a respite from damage.

From present knowledge, reliance on a degree of natural control, as has been proposed for insect pest problems, does not appear to be the answer. Natural enemies are much less effective, largely because considerable economic damage can be caused by relatively smaller populations. Probably the most important single factor to bear in mind is that many species are capable of extremely rapid recovery from low population levels and thus for any direct control measure to have some kind of lasting effect it must be aimed at a 100 per cent kill. Rarely is this possible with shooting and trapping and only occasionally with poisoning. Nevertheless where, as for example with rats and birds attacking rice, the pests have made the crop their primary environment and source of food it may be worthwhile trying new methods of direct control such as chemical sterilization.

However many mammal and birds pests treat the crop as a secondary source of food and here the logical alternative is control by directly preventing damage rather than by pest eradication. This can be achieved by setting up physical barriers between the pest and crop or by the use of chemical repellents. Physical barriers such as fencing have long been commonly used and although they tend to be expensive, if they are correctly placed and maintained, they can be extremely effective. In many ways, on the other hand, cheap chemical repellents are an ideal solution to the problem, but unfortunately although many different compounds have been screened, so far, none have been found to be very efficient.

## **CONCLUSION**

This paper has been an attempt to argue that an ecological approach to crop pest control is essential in the tropics. Pests and insect pests in particular, must be studied in the context of both the man-made and the natural environment of the crop. The relationship between pests and the latter is of crucial importance to pest control. In this respect the natural environment can be regarded as a basic resource, inevitably supplying pest species on the one hand but, on the other providing much of the means for their control.

## LITERATURE CITED

- Bennett, S.H. et al. 1963. Use of Pesticides: A report of the President's science advisory committee. U.S. Gov't. Printing Office, Wash., D.C. 25 pp.
- Carson, R. 1963. 'Silent Spring', London.
- Chant, D.A. 1964. Strategy and Tactics of Insect Control. *Canad. Ent.* 96: 182-201.
- Conway, G.R. and B.J. Wood. 1964. Pesticide Chemicals -Help or Hindrance in Malaysian Agriculture. *Malay. Nat. J.* 18: 111-119.
- Cook, J.W. et al: 1964. Review of the Persistent Organochlorine Pesticides: Report by the Advisory Committee on Poisonous Substances used in Agriculture and Food Storage. Her Majesty's Stationery Office, London. 68 pp.
- Cramp, S., P.J. Conder, and J. S. Ash. 1964. The Risk to Bird Life from Chlorinated Hydrocarbon Pesticides. Royal Society for the Protection of Birds. London.
- Gerard, B. M. 1964. Side Effects from the use of Insecticides (II) Effects on Insects other than Mirids. Proceedings of the Cacao Mirid Control Conference 1963, Tafo. 28-32.
- Morris, R. F. (ed). 1963. The dynamics of epidemic spruce budworm populations. *Mem. ent. Soc. Can.* 32: 103.
- Strickland, A. H. 1960. Ecological Problems in Crop Pest Control In R.K. S. Wood ed. Biological Problems arising from the Control of Pests and Diseases. Symposia of the Institute of Biology 9: 1-15.
- United States Department of Interior 1963. Pesticide Wild Life studies, 1961-1962. Fish and Wildlife Service No. 167.
- Uvarov, B. P. 1964. Problems of Insect Ecology in Developing countries. *J. appl. Ecol.* 1: 159-168.
- Watt, K.E.F. 1961. Mathematical Models for Use in Insect Pest Control. *Canad. Ent.* 93 Suppl. 19. 62 pp.
- Watt, K. E. F. 1964. The use of Mathematics and Computers to Determine Optimal Strategy and Tactics for a given Insect Pest Control Problem. *Canad. Ent.* 96: 202-220.
- Wood, B.J. 1965. Severe outbreaks of caterpillars on oil palm estates in Malaya induced by the use of residual contact insecticides. *Proc. Int. Congr. Ent.* XII: 574-575.

# A Botanist's View on the Use of Arborescences in Forestry in Sabah

by

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## SUMMARY

A survey is given in this paper of the extent of logging and the use of arborescences during the past fifteen years in Sabah. While rare understory trees and climbers have been eradicated their place has not been wholly occupied by 'commercials' but by weed trees and climbers. Many rarer plants are threatened with extinction. Observations in some 40-year-old logged areas and general ecological observations and considerations suggest that regeneration of tropical forests after logging might best be accomplished without tampering with nature at all and allowing the area to grow back without the use of poison girdling.

## INTRODUCTION

Timber is the largest export of Sabah accounting for more than 70 per cent of the total export trade. Most of this timber comes from the commercial lowland dipterocarp forest of the east coast. Under the present trend of logging practically all primary commercial dipterocarp forests will have disappeared outside the permanent Forestry Estate by the year 2000.

However, on the mountainous areas of the west coast 1 million acres of protective forests and a national park are planned while on the east coast which is richest in the animals and plants of the lowland dipterocarp forest only 5,738 acres have been set aside as virgin jungle reserve. Other areas have been set aside as research forests as opposed to the Productive Forest Estates. The former non-commercial lowland reserves on the east coast total about 125,000 acres.

Since the Second World War about 300,000 acres of dipterocarp forests have been logged on the east coast of Sabah inside the Productive Forest Estate. Regeneration has been attempted since about 1949 with the use of arborescences. It is based on the principle that dipterocarp trees put up slow growth while they occur in the understory of primary growth but fast growth when they are released by opening up of the canopy. Sodium arsenite at 1 pound, per gallon of water with 1-2 pounds used per acre is considered the cheapest and quickest kill for the so-called non-commercial species. Foresters expected by using this method that they would secure a total crop of three times the volume of commercial trees in primary forest.

Between 1955 and 1964, 200,000 acres have been poison treated, at a cost of 1,629,130 Malayan dollars (about 2.2 per cent of total forest revenue), while expenditures on botanical research and forest education were under \$400,000, representing only about 2½ per cent of the total expenditure on forestry.

## USE OF ARBORESCENCES

The use of arborescences in Sabah's forests has undergone various changes in the past fifteen years.

First it was carried out by Senior Forest Officers and was restricted to the killing of defective trees and those 'non-commercials' which gave too much shade to dipterocarp regeneration. From about 1951 to 1954 it was done in a more or less experimental way

by the Working Plans and Surveys Branch of the Department. Then it was carried out as a routine operation by the District Forest Officer's staff, and it included all non-commercial trees down to a two inch diameter. During 1958 the diameter limit was raised to six inches. Since 1963 all fruit trees and legumes have been excluded from the girdling, but in fact less common commercial timber trees and fruit trees are occasionally girdled when the laborers do not know the trees or forget their instructions.

### **UNDERGROWTH TREES AND WEED TREES**

Distinction has to be made during the girdling between undergrowth trees and so-called belukar or weed trees (nomads) whose natural habitat in the forest is on landslides and places with severe windfall or other calamities.

The most common belukar tree in our forests is *Anthocephalus cadamba*. 'laran', which grows sparsely in the primary forest but which produces legions of seedlings and abundant young regeneration in logged areas, especially on disturbed soils. Poison girdling can do nothing against this as the girdling is done directly after logging and the weeds come up from seeds which apparently have been dormant in the soil for a long time.

Although the undergrowth trees are considered by the foresters as unwanted 'weeds' they are in general of a much more local and scattered occurrence and are the result of a very long time of flora evolution (100-200 million years). We need not be unduly worried about the growth of laran as a study of an area severely logged with high lead logging forty years ago shows a lot of laran in places where the soil was disturbed around spar trees. There is also plenty of regrowth of the dipterocarps among the laran trees which are now 4-6 feet in girth. Moreover, laran is not a useless weed as the foresters in Sabah consider it, but a valuable tree considered an asset in other tropical countries. It can be used for paper pulp and other purposes.

It is often a hopeless task also to try and cut and poison climbers as they come up in dense seed beds especially in tractor disturbed soils.

### **IMPACT OF ARBORCIDE GIRDLING ON THE ECOLOGY OF THE FORESTS**

The following aspects of the problem are at present under study: the influence on soils and soil microclimate; the influence on species composition of the forest tend on climber growth; influence on the succession from secondary growth to mature forest and the relation to future utilization of forest resources; the impact on wildlife.

#### **The influence on soils and soil microclimate**

Thus far we do not have any actual measurement of the direct influence on the soil of an area of one acre when one to two pounds of sodium arsenite are used. The indirect influence of the killing of the undergrowth left after logging is of course a great exposure of the forest microclimate near the soil to radiation from the sun. The microclimate in exposed areas in the forest is rather severe when the soil temperature varies between 26° centigrade at night and 42° at midday contrasted with the even temperature range usually not more than five or six degrees in primary jungle. Increased soil weathering, wash out of minerals, and strongly increased evaporation from the soil surface and transpiration of seedlings and saplings can be inferred from this. Observations point out a high mortality of dipterocarp seedlings in exposed sites and occasional wilting and scorching of saplings which are too strongly exposed.

#### **The influence on species composition**

The classical theory of aboricide poisoning is that by killing non-commercial undergrowth trees the place of these 'weeds' will be taken by commercial dipterocarps. However, the understorey trees are not short living 'weeds' but often 80-400 year old trees belonging to species which often have very restricted areas. They include about 1300 out of 2500 tree species in Sabah. The extra volume of raw material taken out by poison girdling is at the order of about half the commercial volume (determined from estimates of a virgin jungle reserve where all trees above 6 inch girth were enumerated).

I have analysed the species composition of undergrowth and climbers of some sample plots made in primary forest and found that only a few tend to become 'weeds' after exposure of the soil with logging and poison girdling. Those that do escape with their dormant seeds from the girdle operation, are actually favored by it because they are light demanding for their germination. Even in old laran forest there are no seedlings under the trees and *Mezoneurum* is a rare climber in a primary forest.

We are now studying some instances of species composition of forests at

- (a) Sg. Garinono and
- (b) Mile 3, Lungmanis.

At Sg. Garinono 10 acres of an area with high lead logging forty years before but with no poison girdling as compared with 10 acres of adjacent virgin forest on the same soil and topography showed a severe invasion of laran. Otherwise the ecosystem, the biotype of the mixed tropical multi-storey tropical canopy forest, has been restored within 40 years after human interference by leaving things on their own.

In forests at Mile 3 Lungmanis (Research Plot. 49) which were logged and girdled about ten years ago and possibly also earlier we see an extreme decrease of species, about 20 out of about 80-100 species of undergrowth trees survived, most of which are common weed trees. In fact what has occurred is that notwithstanding the instructions to girdle non-commercial trees, 'weeds' now occupy 65 per cent of the total basal area, and because of the suppression of weed trees and climbers 10 per cent of the commercial tree species are not healthy.

### **The influence on succession**

From what we have experienced so far in Sabah, poison girdling is certainly not improving the speed of succession from secondary stages to mature forest. It gives a set back to the accumulation of minerals in the top soil and it throws the whole ecosystem of the lowland dipterocarp forest so much out of balance that something of a very artificial forest evolves which gives the foresters extra work in either suppressing climbers or because dense stands of dipterocarp poles create a need for thinning operations. It has been realized now that the undergrowth supplies the necessary matrix of a rather open broken canopy with sufficient ground shade for healthy dipterocarp growth. The crowns put up good increments when they are free and exposed to the sun, the roots need a good stable water supply, and seedlings and saplings a soil which is not too far degraded.

### **The impact of wildlife**

Very little direct research has been done on this subject, and poison girdle techniques have been introduced and used without first studying the consequences. Should the IUCN support research on such a project I would suggest that the following be kept in mind:

1. (a) Little is known about the direct influence of poison girdling on jungle wildlife.
2. (b) Secondary jungle and grassy areas like those occurring in logged and girdled forests are probably good habitats for a number of larger animals like elephants, tamarau, and species of deer.
3. (c) The bird life of primary forests is probably as much upset by logging and girdling as the life of the understudy trees. However, this needs more detailed study.
4. (d) The smaller mammals are certainly affected but to what extent is also not known.
5. (e) The understory trees that are girdled (about 1300 species belonging to about 60 different families) offer a wide range diet to monkeys, apes, and birds.
6. (f) Variety in species of trees is very likely a guarantee against insect pests, but the entomology of our primary forests and its secondary stages is very poorly known thus far.

## RELATION TO FUTURE UTILIZATION OF FOREST RESOURCES

If nature conservationists are concerned about the impact of arboricides on the so-little-known life communities of the unique rich dipterocarp lowland forest of Borneo they might ask if it is not possible to use other and more effective systems of opening up the forest canopy so that there is good regeneration of the commercial dipterocarp trees without doing so much damage to Sabah's flora and fauna. I now consider that under the present intensity of logging operations in Sabah we might drop the whole system of poison girdling and instead take a stronger hand in the logging operations by marking trees and/or whole areas of forest islands for retention. Among foresters it is felt that considerations of nature conservation should not play any role in the purely technical problem of commercial logging and no consideration will be given to modifying the present poison girdling policy for another year or so, although the silviculturist before his departure in the middle of 1965 felt that the tractor damage was so alarming there was no further need for girdling. My personal experience (now confirmed by samplings) is that in forests on seasonal inundated riverine sites the regeneration of dipterocarps is so poor that girdling makes no sense at all. The same can be said around the bare places where logs are loaded on trucks or rail lines in the jungles and where the Forest Department has now started trial plantations.

## Part 6

### Aquatic Resources and Pollution

# A Consideration of the Fisheries Problems of the Lower Mekong Basin <sup>1</sup>

by

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#### SUMMARY

This is a brief description of the past and present development of the Mekong Basin fisheries emphasizing the present lack of knowledge of aquatic organisms found there and pointing out the inevitable radical changes that will occur with the proposed development projects. The available water supplies will be put to multiple uses. There is an urgent need for basic life-cycle studies and compilation of reliable information to permit the appropriate use of available water supplies for fish production.

#### INTRODUCTION

The development of the natural resources of the Lower Mekong Basin is development on the grand scale and brings with it problems that are in many ways entirely new.

One of the most significant replaceable resources is the fish population and the approach to its efficient utilization is beset with extraordinary problems.

#### BACKGROUND

Fish stocks of the Mekong Basin have provided a supply of animal protein for the people of the basin since time immemorial. With the scattered population living in tribal communities and not infrequently nomadic in habit, the concentration of fish killing was to a large extent seasonal and accomplished by fairly primitive means such as traps, weirs, etc. made from local materials such as wooden stakes, bamboo, lianas, fibrous grasses etc. Under conditions such as these the river and its tributaries afforded natural protection to a reasonable proportion of fish stocks which were subject to depredation mainly during low water periods and at such times as the various species congregated for feeding, migration, or spawning.

With increasing human population and urbanization, the breaking up of the tribes and evolution from nomadism to settled agriculture, improved health services and dietary habits, the demand for fish and other aquatic products is increasing faster than the present production and distribution methods of the fisheries. Complaints are already arising that fish supplies are inadequate and there is a clear need for urgent action to develop programs and systems under which the increasing demand for aquatic products can be partly or wholly met.

The fish population of the Mekong and its tributaries and associated waters contain a large variety of species, almost all of which are subject to exploitation. The habitats vary from lake-like waters to brackish or semi-brackish tidal streams and from the

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<sup>1</sup> This paper in an expanded form was prepared for inclusion in a Special Issue of the Indian Journal of Power and River Valley Development, to be published in connection with 22nd Session of ECAFE, New Delhi, March 1966.

main river itself and swift-flowing torrential mountain streams to meanders, swamps and temporary waters. There is a notable distinction between populations of the various types of habitats and each habitat presents its own problems first, from the point of view of exploitation and second, from the point of view of conservation and management. It is when we are confronted by problems of rational management of the stocks, their protection from over exploitation and the production of a greater supply for human food that the greatest difficulties arise.

## THE PROBLEMS

Weatherley<sup>2</sup> points out that the continuance of both populations and species turns on the effectiveness with which life-cycles are completed despite changing conditions. Extinction of both is a matter of broken life-cycles rather than death of individuals.

For those concerned with increasing the food supplies for the people of the Mekong Basin, the greatest handicap under which they suffer is the almost total ignorance concerning the detailed life-cycle of the fish and other aquatic organisms. Our present knowledge is largely restricted to the simple classification of the species concerned. Nowhere is there any real knowledge of the actual life-cycle of the individual species as it occurs under present conditions nor any assessment of the almost cataclysmic changes in the ecology that development of this great basin will bring. Water is required and will be used for many things other than fish production, yet with proper planning and programming and management many purposes including fish production can be served with the one water mass.

It would seem clear then that the immediate and urgent requirement is for extensive, detailed, and perhaps in some cases, relatively long term studies of the life-cycles of the fish of the basin, of the limits of tolerance within which conditions pertaining at any given stage in the life-cycle may be permitted to vary and, in the ultimate, to the determination of those members of the existing aquatic populations of the basin which will be susceptible to complete or partial 'domestication' and hence to efficient and productive management. Fisheries based on world stocks will of course continue but must be expected to vary and probably decline in significance as the environment changes. It is of the utmost importance then to determine the means to make good in some way the inevitable losses and to apply systems of control and management to ensure the maximum sustainable yield from the available water.

## CONCLUSION

Purely from the point of view of food production, the potential of the natural waters is markedly limited and production may even now be approaching the maximum although increasingly inadequate to meet the demands. The impoundment of the huge bodies of water behind the tributary and main stem dams should increase the potential for maximum production, but this can only be achieved on the basis of rigid control and highly efficient management.

The utilization of the water step by step until its final release to the ocean offers a great opportunity for the development of fish culture and management of fish stocks. It may be that through this means the demand on the native stocks of the water can be reduced affording some measure of protection to the more vulnerable of those species which may be able to survive the environmental changes induced by the development of the major and minor projects.

Under the impact of man's insistent and increasing demands, agonizing decisions may have to be taken and the least that can be done is to provide those responsible for such decisions with adequate information based on thorough studies and comprehensive statistical data.

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<sup>2</sup> Weatherley, 1965. *Nature*. 27 (4999): 806.

# The Conservation of Marine Resources in South East Asia

by

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## SUMMARY

South-East Asia has long suffered from protein shortage and with its high population density and millions more mouths to feed each year the situation will inevitably become acute. Countries in the region must increasingly look to the sea to meet their food demands. For the most part the fisheries of South East Asia are in an undeveloped, even primitive state, and considerable investment over a long period of time will be required if the marine resources of the region are to be exploited rationally. Proper management and conservation practices must go hand in hand and be based on adequate research. There is a need throughout South East Asia for greater effort in marine research and more support by governments. Integrated long term programs for the exploitation of land and marine resources are required, particularly in relation to shallow coastal waters which are biologically most productive.

## INTRODUCTION

Here in Bangkok we are in the rice bowl of Asia. But man cannot live by rice alone; he needs protein and South East Asia, along with other tropical regions, has long been protein hungry. While some of the nutritional needs of the steadily increasing population may be met from increased land production, we must look to the sea for the solution – if one is to be found – to the problem of feeding the millions of extra mouths each year.

Fortunately most countries of South East Asia are blessed with extensive coastlines, shallow coastal areas and associated fishing ground. However, the fisheries of most countries in the region are in a primitive state of development. The problems of developing these are outside the scope of this paper, but what must be emphasized is that development should not proceed without planning the proper management of the resource. To establish the proper level of exploitation of a particular resource considerable research must be undertaken, since what must be cropped is no more than the dividend from the capital resource exploited.

## MARINE RESEARCH

Marine research in South East Asia is, in general, at a very low level of development with limited staff, research facilities, and financial support. While recognizing that other demands on limited financial resources may appear in need of more immediate attention, marine research now is surely less expensive than spending huge sums in the future to buy food which rational exploitation based on a sound knowledge of the resource would have provided.

In commercial fisheries, sound management practice is based on scientific research. Sophisticated and mathematical methods of treating statistics may appear far removed from the primitive level of fishing now current in the majority of the countries of South East Asia, but it cannot be overemphasized how vital it is to a fishing industry that systems be devised and implemented which will provide data essential for the rational exploitation of particular fisheries.

## **CONSERVATION MEASURES**

The problems facing the nations of South East Asia concern less the high seas than the coastal waters. Here as on land, the dangers to fauna and flora are two-fold – destruction of the resource itself, and destruction of the habitat on which it depends for its survival.

Sound conservation measures depend ultimately on scientific research but prior to a full understanding of the life history and ecology of the animal concerned measures to safeguard it may need to be introduced as a precaution against over exploitation. The several species of turtles exploited by man provide a well-known example of such cases. Protection of turtles is of particular importance in South East Asia where their eggs could provide an important protein component of the human diet.

Measures to protect turtles or fish may take various forms. However, it must be stressed that no restrictive measures should be introduced, unless

1. the benefits to be gained can be amply demonstrated,
2. there is a real likelihood that the measures proposed are assured of achieving the desired effect and
3. that they are assured of implementation.

Man, being a land animal, cannot yet penetrate far into the sea to destroy as effectively as he can on land. Nevertheless where he has entered the sea to hunt by means of self contained underwater breathing apparatus (SCUBA) and using a spear gun he has rapidly driven away all those hunted marine animals which can escape or destroyed those which cannot. Many authorities in the Mediterranean and North America have introduced legislation restricting activities of this sort.

## **DESTRUCTION OF HABITAT**

Destruction of the habitat may be deliberate, accidental, or incidental. The unrestricted taking of coral, intensive fishing by trawl, use of explosives, and fish poisons are examples of the first two kinds of destruction. Of far greater consequence is the incidental destruction which results when land is reclaimed from the sea, or the waters are polluted.

Reclaiming and dumping in shallow coastal waters is commonly practised, and it is just these areas which are most productive biologically and which are also of limited extent. Once lost they cannot be recovered. It is here that the need for comprehensive, integrated planning for the optimum use of land and water resources is most required.

The sea has always been considered a final repository for waste, which, even if it cannot be removed altogether, can at least be hidden from sight. Other than in regard to the disposal of radio-active wastes, and the discharge of oil and ballast by ships at sea, the control of waste matter and effluents into the sea is the concern of national or local authorities. Pollution is insidious; it is also, regrettably, unavoidable in an industrial society. With strong and far-sighted legislation its effects may, however, be reduced. It is the shallow coastal waters and enclosed bays that are most vulnerable to pollution and it is these same areas that are most productive of marine life; they must be carefully protected. Here again the need for the integrated planning of land and water resources is clear.

## **CONCLUSION**

In conclusion, the marine resources of a nation are as much a part of its heritage as those on land and it is obligatory on all Governments to develop, manage and conserve these resources for the welfare of their peoples. Wise and far sighted policies are called for, effective internationally as well as within each country. Much more investment in research vessels, equipment and trained staff, technical and scientific, is required if the marine resources of the region are to be exploited properly and if we are to avoid the fearful consequences of unrestrained competition for a dwindling

resource as a result of the crying need of hungry people for food. In this, administrators and scientists share equal responsibility and must share each other's full confidence.

An understanding of the sea, its marine life, and the people who live and work on the sea, is a necessary part of a marine resources development program and every means should be adopted to educate the general public as well as those whose lives are already bound up with the sea. As there is a need for national parks and nature reserves on land, so is there a similar need in the sea. Most countries of South East Asia are particularly rich in coral reefs, which teem with an extraordinary variety and abundance of colorful and exciting marine life; such reefs should, wherever feasible, be associated with areas on land set aside as nature reserves and national parks. Where this is technically not possible, and where the sea is far removed from centres of population, every encouragement should be given to the establishment of public aquaria and even oceanaria, in which large marine animals may be seen in near open-sea conditions.

In an atmosphere of public sympathy and understanding both the administrator and the scientist can rely on support for their policies. Such support is necessary for the conservation of any natural resource, but is vital for the conservation of a country's marine resources where the magnitude of the problems to be solved is far greater than on land.

# **Water Pollution – a Conservation Problem in the Philippines**

by

DOMINADOR Z. ROSELL

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Acting Chief and Supervising Scientist, Division of Agricultural and Natural Resources Research, National Science Development Board, Manila, Philippines*

## **SUMMARY**

The great population increase in the Philippines has led to rapid industrial expansion to try to meet the needs of the expanding population. The waste products of these industries have been the major source of water pollution in the country.

The work of the various government agencies interested in this problem is described. The author concludes that conservation of the country's natural resources is vital for the nation's survival, and that the present public ignorance and apathy must be remedied chiefly by conservation education in the schools' curriculum.

## **INTRODUCTION**

Water pollution is an alternation of the physical, chemical and/or biological properties of any water in the country that renders such water detrimental or injurious to public health and welfare or to the plants and animals of the country. In a developing country like the Philippines the three P's –people, production, and pollution –are important interrelated factors. The great increase of population in the Philippines has led to a marked increase in manufacturing industries, and these industries in turn have deposited their wastes in the waterways of the country. These waste products have been the principal cause of water pollution.

## **COMMISSION OF FISHERIES**

The conservation of fish and fishery resource has been an important function of the Philippine Government since the Division of Fish and Game Bureau of Science was organized in the early part of the American occupation. This division became a bureau in 1932 and the bureau, the Commission of Fisheries, in an act approved in 1963. Section 14 of the act defines the type of waste that it is unlawful to discharge into Philippine waters. With our exploding population we shall depend more and more on the fisheries resource of our country to provide food and it becomes increasingly mandatory to see that the fish do not decrease because of polluted water. Putting more teeth into our laws and more men to enforce them may control or minimize the water pollution affecting the fish and fishery resources.

## **PARKS AND WILDLIFE COMMISSION**

As a result of the well-kept and properly managed parks producing abundant and clean water for the surrounding regions the Parks Commission is controlling or minimizing water pollution in areas where such parks exist. There are about 42 national parks in the Philippines: there is a need for more especially near the centers of population.

## **NATIONAL SCIENCE DEVELOPMENT BOARD**

The National Science Development Board is the principal co-ordinating agency of the Philippine Government for science and technology. A conference was called in January, 1963 to discuss ways and means of lessening water pollution caused by indiscriminate use of agricultural chemicals. It was suggested that the Food and Drug Act be re-examined to assure that the sale, use, and application of agricultural chemicals would be properly controlled and/or supervised.

## **WATER AND AIR POLLUTION CONTROL COMMISSION**

The Congress of the Philippines recently enacted a law, approved by the President in June, 1964, creating the National Water and Air Pollution Control Commission. Pertinent provisions of the law prohibited pollution of air and water; violators of this were liable to fines, imprisonment or both. The Commission, under the supervision of the National Science Development Board, is now in the process of being organized, and will implement the provisions of the law as soon as funds become available.

## **BUREAU OF SOILS**

The most important work of this bureau is the general classification of the soils of the country. Simultaneously a survey is also being conducted on soil erosion. On the basis of this and other data gathered by the bureau the farmers will be provided with guidance in the proper utilization of their land. There is, however, a great need of educating people, particularly the farmers in the proper use of their soils.

## **BUREAU OF FORESTRY AND REFORESTATION ADMINISTRATION**

The work of these two agencies is interrelated: the Bureau of Forestry determines the extent and location of the forests in the country determining which are permanent and which expendable; the Reforestation Administration handles the reforestation of deforested areas. If this administration were adequately financed and its projects carried out, accelerated erosion would be minimized and water pollution through silting would be controlled. If, in turn, the Bureau of Forestry would be stricter in its release of logging permits and in its enforcement of selective cutting there would not be the wide areas of deforestation that now exist for the Reforestation Administration to replant.

## **BUREAU OF MINES**

The Bureau of Mines which is concerned with the conservation of mineral resources is deeply involved in the water pollution problem due to the disposal of mine tailings in the operation of gold mining companies. An example of this problem is found in the report, 'The Silt Situation in the Agno River Below Binga Hydroelectric Project' prepared by Messrs. Conrado A. Fontanos and Hilario G. Marinas, Bureau of Mines, on the water pollution of the Agno Irrigation System by mine tailings from different mines in Baguio District.

The wastes go into the irrigated areas served by the Agno River Irrigation system and later will find their way into the reservoirs and turbines of the four hydroelectric plants proposed for construction below the Binga Plant. (The estimated amount of tailings thrown into the river in the 1959 operation is shown in Annex 1).

In addition to the mine tailings there is even more of erosional sediment; however, there is more of the former than the latter deposited on farms because the irrigation is at its lowest during the rainy season of the year when the greatest amount of erosional sediment is present.

There is no doubt of the need for re-examining the methods and techniques of the Gold Mining Companies in this area regarding mine tailings and to minimize silting and sedimentation.

## CONCLUSION

Conservation of our natural resources – land and soil, water, forest, grassland, wild-life, and minerals – must be recognized by our people if we are to survive and enjoy life in this country. In the past and even in the present we are careless in our use of these resources because of the people's ignorance and lack of appreciation of the beauties of nature. Courses on nature conservation should be included at all grade levels in our school system and there should be a manpower development program for teachers and professors to teach these subjects. For the present technicians in the various government agencies could handle the indoctrination of these teachers.

## ANNEX 1

### ESTIMATED AMOUNTS OF TAILINGS DISCHARGED INTO THE AGNO RIVER IN 1959<sup>1</sup>

MINING COMPANY	Total Tailing (tons)	-200 Mesh (tons) estimated	+200 Mesh (tons)
1. Philex Mining Corp.	549, 134	332,531	216, 603
2. Baguio Gold Mining Co.	142, 290	99, 603	42, 687
3. Benguet Const. Inc.	1, 221, 000	769, 230	451, 770
4. Itogon Mining Co. <sup>2</sup>	180,000	52,920	31, 080
TOTAL	2, 020, 424	1, 254, 284	742, 140

The authors indicated that assuming that only 5 per cent of the -200 mesh is carried down to Pangasinan (the level area) during the dry season and 50 per cent during the rainy season the estimated seasonal tailings are:

Dry season tailing carried to Pangasinan	664, 250 tons
Wet season tailing carried to Pangasinan	998, 210 tons

In addition to the mine tailings there are sediments from natural erosion. The authors indicated the following results of investigations:

### NATURAL EROSION SEDIMENTS CARRIED TO PANGASINAN

SEASON	Iron Watershed above Ambuklao <sup>3</sup> (tons)	Iron Watershed below Ambuklao (tons)	Total Sediments (tons)
Dry Season	11,134	205,151	216, 285
Wet Season	178, 866	3, 295, 273	3,473,589

<sup>1</sup> Based on Fontanos, Conrado A. and Hilario G. Marinas. The silt situation in the Agno River below Binga Hydroelectric Project. Bureau of Mines.

<sup>2</sup> Only 84, 000 tons thrown into creek, the rest used for slope fillings.

<sup>3</sup> Ambuklao is one of the hydroelectric power projects just above Binga project in the Mountain Province.

## **Technical Session III**

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### CONSERVATION EDUCATION AND TRAINING

Following the Summary of Session III and the Resolutions of the Conservation Education Workshop, the papers in this Session have been grouped into three major sections:

1. Education in schools
2. Training in conservation
3. Public education

# Summary of Papers and Discussion of Technical Session III – Conservation Education and Training

by  
SUMMARIZER OF SESSION III  
DR. S. M. CENDANA  
*College, Laguna, Philippines*

It was agreed that the conservation of nature and natural resources is desirable and is a necessary way of living. The present concern is how to encourage people to appreciate nature and to believe in conservation so that they can help in the conservation of natural resources.

Three possible avenues have been considered:

1. through the education in school,
2. through training in conservation, and
3. through public education.

## 1. EDUCATION IN SCHOOLS

Dr. Ngan of the University of Saigon, Vietnam, and Prof. J. L. Harrison of the University of Singapore pointed out that the difficulties encountered in enforcing conservation regulations spring mainly from inadequate understanding of the problem by the people.

Prof. Harrison explained the general unsuitability of overseas textbooks, but pointed out that the preparation of local texts must be preceded by detailed work on the description of local species.

Dr. Hernandez of the Philippines pointed to three levels of instruction at which knowledge about nature and conservation might be imparted, namely,

1. elementary schools, where the pupils are taught about animals and plant life;
2. secondary schools, where courses in biology are given, and
3. universities, where courses are taught in zoology, botany, chemistry, ecology, genetics and other subjects at undergraduate and graduate levels.

Dr. Miller from the U.S. discussed the role that IUCN, through its Commission on Education, has played and is playing in the worldwide education movement in nature conservation.

Mr. Chamnian pointed to the following difficulties with conservation education in Thailand:

1. lack of adequately-trained and experienced teachers,

2. lack of suitable textbooks oriented to local materials and conditions, and
3. lack of materials for demonstration.

Mr. Kadarsan and Prof. Soemarwoto pointed to these same difficulties in Indonesia, and suggested the following remedies:

- (a) the production of new textbooks that are oriented toward local materials and conditions,
- (b) the up-grading of training courses for teachers in biology, and
- (c) the writing of articles in biological journals in a more popular style.

Mr. Kadarsan reported progress in Indonesia in producing graduate biologists. Prior to 1955 there were none, but now (1965) there are 100. However, few young people could see the purpose of biological studies and the best students were not being attracted to them.

During the discussion, a Thai representative reminded the group that early educators and pioneers were able to teach without textbooks and teaching aids – making imaginative use of the materials at hand.

Mr. Alfred of the National Museum in Singapore underscored the urgent need for textbooks in South East Asian biology, and recommended a resolution to modify syllabi with the intention of increasing conservation content and insuring local treatment.

Mr. Thane Riney of FAO suggested that the professors (and scientists) in South East Asian countries, beginning with those present at the Conference, pool their resources and information. He cited the example of biologists in East and Central Africa who had taken steps to systematically share the burden of producing basic materials on species common to the countries concerned. This would be a means of developing substantial information for the use of all.

Mrs. Brooks (USA) suggested that South East Asian countries might request Peace Corps volunteers who have been trained in conservation to assist in teaching and developing conservation education materials.

Other suggestions were made to encourage students to explore the world of biology on their own.

It was further recommended that Boy Scout programs be integrated in one way or another with school programs.

## **2. TRAINING IN CONSERVATION**

Dr. Rudd suggested that Asian workers in conservation be given in-service training in the United States for a period of at least four months – preferably one year. This should include institutional affiliation, internal travel and the observation of public agencies in operation.

Mr. Kahn, a Game Department administrative officer in Malaya, recounted his year's experiences as a Fulbright scholar in wildlife training in the United States and Canada. He felt the technical training equipped him to make more competent decisions in his work.

Dr. Dasmann of the U.S.A. pointed out three values of wildlife resources:

1. direct commercial products,

2. recreational and aesthetic values that enrich people's lives, and
3. scientific values.

He also distinguished two groups of nature conservation workers:

- (a) wildlife scientists and administrators and
- (b) technicians in wildlife protection.

He proposed that the scientists and administrators should have graduate training at university level; the technicians have training at technical schools below university level.

Mr. de Silva pointed to the lack of adequately-trained teachers in biology as the special source of difficulty in Sabah.

Mr. Cajucom emphasized the critical need for training in parks and recreation management in the Philippines and made proposals for an initial conservation education program for the College of Forestry at the University of the Philippines.

Mr. Quist-Arcton of FAO (formerly of the Ghana Forest Service) reviewed the need for, and methods of achieving middle-grade conservation training in Africa. For the more responsible positions in Wildlife conservation, English-speaking students are trained in the College of African Wildlife Management. Another medium-grade school has been planned for the training of French-speaking game wardens in West Africa. He directed attention to the established, though perhaps rudimentary, concepts of conservation already embodied in the life and customs of peasant communities, and said that they should not be thoughtlessly dismissed in attempts to introduce foreign ideas.

Mr. Vallobh described the curriculum of the Department of Conservation at Kasetsart University in Thailand.

Mr. Made Taman reported on progress from 1961 to 1965 in training conservation workers in the Directorate of Forestry in Indonesia.

Dr. Chang pointed out that 'education, whether formal or informal, aims at bringing about desirable change in behavior,' which may be in

1. knowledge (or things people ought to know),
2. skills and/or
3. attitude.

He describes an effective extension method that has been successfully used in Pakistan and Taiwan, which uses

- (a) mass contacts (through the radio, posters, exhibits, leaflets and circular letters),
- (b) group contacts (through study hours, demonstrations, meetings and group discussions), and
- (c) individual contacts (through visits, result demonstrations, office calls and personal letters).

In the discussion, Mr. Alfred of Singapore directed attention to the training of officials, especially wardens. He asked if UNESCO had considered such activities. Mr. Coolidge brought up the idea of a 'floating faculty' which could circulate from country to country and provide training.

Mr. Daley complimented Mr. Quist-Arcton on his relation of conservation to the people. He also pointed out that we must do more than just create

biologists and foresters, we need to assure that men of influence, such as bankers, receive a certain amount of conservation education, and that foresters also be encouraged to enter into fields other than forestry in which they can serve very usefully.

### 3. PUBLIC EDUCATION

Dr. Goudswaard of the Netherlands, emphasized the basic importance of having young people understand nature in order to appreciate and conserve nature. He suggested that the schools, through courses in biology and ecology, be made use of, and the out-of-school youth organizations be utilized as bridgeways, so to speak, to conservation.

Dr. Ruhle described the Interpretive Service of the U.S. National Parks, which makes use of well-trained workers, who conduct walk talks, deliver lectures, write popular leaflets and popular journal articles, and put up museums in order to put conservation ideas across to the park visitors.

Mr. Berwick pointed out that legislation alone will not conserve natural resources – the co-operation of the people is necessary to realize the objective. An aggressive and persistent mass propaganda is necessary. In Sabah, mass education in nature conservation suffers from:

1. language difficulty (there are many),
2. dispersed responsibility, and
3. lack of adequate funds.

Dr. Wong informed us that in Malaysia, different techniques are used for different kinds of people – indoor and outdoor programs for the youth; posters for the rural folks; while the leaders (people of influence) are approached to join the Malayan Nature Society.

Mr. Fitter from U.K. added that personal contact with people of influence is a very important and essential ingredient to a successful campaign in conservation education.

Dr. Ratcliffe pointed out that private organizations can do much in helping educate the people. The Australian Conservation Foundation, a private institution, has been very helpful in promoting understanding about nature and nature conservation. It co-operates and supplements, rather than competes, with government agencies engaged in the same line of work.

Mr. Made Taman presented the 'animal garden' approach. In Indonesia, several zoos are maintained in different parts of the country.

Messrs. Moore and Fogden described the nature study and conservation program to be broadcast to the secondary schools in Sarawak, Malaysia.

During the discussion, Mr. de Silva mentioned that films, posters, photographic displays and lectures have been satisfactorily used in reaching and educating people in Sabah.

Mr. Buncio of the Philippines said that the Philippines' Park and Wildlife Office has been giving lectures in the schools as well as in the parks.

# **General Resolution and Specific Recommendations of the Conservation Education Workshop**

The productive discussions of the morning Technical Session, were continued into the afternoon Conservation Education Workshop. The main focal points of discussion were brought together in the form of the following general resolution of the Workshop, and four specific recommendations.

## **General Resolution of the Workshop on Conservation Education**

1. The Conference is conscious of the importance of environmental education at all levels as a sound basis for economic development and the conservation, restoration and enrichment of natural resources in South East Asia.
2. It is also conscious that progress is being made on different aspects of these educational problems in the countries of South East Asia and aware of the importance of exchange of ideas and information between countries within this region and with those in other parts of the world.
3. The Conference is also aware that urgent attention should be given to formulating policies and discussing machinery to consolidate and expand the initiatives already taken to promote education about the environment and conservation in South East Asia.
4. The Conference welcomes the interest shown in education in South East Asia by the Commission on Education of IUCN and by other international agencies particularly UNESCO and FAO but recognized that, although the technical and other assistance available from these sources have already been and will continue to be, invaluable in promoting such education, the initiative for expansion will have to be taken by the individual countries in the region working in co-operation with each other.
5. The Conference agrees that the objectives in education about the environment and conservation should be classified into three main groups namely those concerned with:
  - (a) Formal education in the schools:
  - (b) Formal education in institutions of higher education, and vocational training in conservation and the other land-linked professions; and
  - (c) Education of the public, involving information and extension services and propaganda.
6. In the light of the resolutions given above the Conference draws special attention to the following:
  - (a) There is a severe shortage of text-books, demonstration materials and educational aids which are relevant to the local environment.

- (b) Lack of experience in problems in the field related to environmental management and conservation is widespread to all educational levels and especially amongst children, students and teachers, and urgent attention should be given to providing facilities out of doors for excursions and other field studies, by establishing strategically located field education centers, educational nature reserves and the teaching sites, and by promoting more effective use of existing facilities.
  - (c) The Conference urges that consideration should be given urgently to (a) and (b) above but that those responsible for this should pay special attention to appraising local requirements carefully before adapting any materials or techniques used in other parts of the world which are considered of relevance to local needs.
7. In relation to the three main groups of educational problems referred to in 5 above the Conference urges:
- (a) That syllabuses and teaching methods should be examined urgently and revised as necessary as soon as possible and that UNESCO in particular should stimulate this assessment and revision.
  - (b) That consideration should be given to the value of adopting an ecological approach in the teaching of biology; attempts should be made to discover how to prepare the way for developing the ecological approach, with particular emphasis being placed on field studies.
  - (c) That out of school activities, such as out-of-doors programs in conservation by Scout groups, should be promoted.
  - (d) That voluntary societies engaged in natural history, conservation and related activities should play an increasing role in extending environmental education activities for children.
  - (e) That for higher education and training
    1. the objectives should be clearly defined but with special emphasis on
      - (a) the training of student teachers who should be given a sound foundation in the environmental sciences (especially geology, geography and ecology) and in conservation,
      - (b) the training of students who will later be engaged in resource management.
    2. Steps should be taken to improve the training of teachers as a matter of urgency; immediate improvement could be effected by means of workshops composed of mixed teams of teachers, scientists and conservationists.
    3. Effort should be made to improve the professional status of biologists and particularly to employ a large number of ecologists in all parts of the region.
  - (f) That for Public Education
    1. A study should be made of the pattern of public attitudes toward conservation; the organization of, and techniques used in, education of the general public, and particularly

of farmers and others in rural areas, should be carefully examined in the light of the cultural and racial background of the peoples concerned.

2. In connection with (1) above, conservationists should seek as much advice as possible from local educationalists and others so that methods of directing educational activities are used to provide the maximum benefit in relation to the manpower available for this purpose.
3. The voluntary societies should be regarded as a most important medium for public education, with special reference to:
  - (a) Those in policy making positions with government and administrations;
  - (b) Educational institutions; and
  - (c) The public at large.

### **Specific Recommendations of the Conservation Education Workshop**

1. IUCN Commission on Education should be urged to play a leading part in promoting investigations of regional education problems so as to obtain more detailed knowledge of requirement, and to provide as many educational aids as possible, in collaboration with the national and international organizations. In particular, IUCN should be conscious of its role in co-ordinating the experience and knowledge gained from relevant education programs undertaken by the organizations in the region notably FAO and UNESCO.
2. A committee on education in South East Asia, comparable in certain respects to the North West Europe Committee on Education of IUCN, should be established in the Region immediately which should obtain further information on educational requirements, provide guidance about future development and ensure co-ordination between the activities of the main organizations concerned, particularly IUCN, FAO and UNESCO. This committee should also pay regard to the position in other tropical regions by establishing liaison with African and other countries and in this connection act in a specialist advisory role to the Commission on Education of IUCN.
3. A crash training program for those engaged in the management and conservation of natural resources should be established. It is suggested that this might take the form of a travelling team of international experts, working on a regional basis, supported by UNESCO, FAO, IUCN and other appropriate international agencies. This team of experts should co-ordinate closely with local experts and organizations and should visit each country for a period of time appropriate for the solution of the problems under study.
4. UNESCO should be asked for aid to produce those educational materials that are required urgently.

# Part I

## Education in Schools

### The Time Lag in Teaching Biology

by

PROF. J. L. HARRISON

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#### SUMMARY

Sound biological knowledge is an essential foundation for public opinion in conservation. The author points out some of the difficulties of introducing biology training to the schools of a developing country so that these difficulties may be foreseen and overcome. He notes the lack of:

1. good text books on tropical biology,
2. easily available knowledge for the non-specialist,
3. good teachers.

He concludes that 'after twenty years in Singapore we are just beginning to catch up with ourselves in biology teaching'.

#### INTRODUCTION

Successful conservation depends finally on the pressure of public opinion, and public opinion needs education, particularly in biology. The basic knowledge and understanding of biology must come from the teaching in schools and universities. In this paper I want to point out some of the difficulties of introducing biological training to the schools of a developing country, not with the object of discouraging such training, but so that the difficulties may be foreseen and dealt with in good time. I shall confine my remarks to my own subject, Zoology, the teaching of which in Singapore and Malaya, has a history of about twenty years. Botany has a similar history.

We are all familiar with the story of a school, preferably far far away, somewhere in Africa perhaps, which decided to train its students to take the Overseas School Certificate in Biology. The syllabus demanded the practical dissection of a frog, which the English textbook called *Rana temporaria*. Accordingly a biology supply house in Britain was asked to send a supply of preserved *R. temporaria* for dissection. They duly arrived and were dissected. Meanwhile the teacher in charge complained that the noise of the bullfrogs in the school pond distracted his pupils from giving full attention to his account of the English frog.

Apocryphal, no doubt, but by no means far-fetched. Something not unlike that is going on every day. Even in my own department in Singapore I am still using *Obelia geniculata* as an example of a Hydrozoan Coelenterate for first-year students, although *Obelia* does not occur in Singapore waters. I shall explain why later. Stories of this sort, however, do draw attention to a real difficulty in biological teaching. Singapore has passed through this phase, and her experiences may be of value to this conference.

#### ZOOLOGY IN MALAYSIA

Singapore and Malaya have wisely associated themselves with the system of public examinations represented by the Cambridge Overseas School Certificate; which provides

an objective standard of learning unaffected by irrelevant local pressures, enabling the candidate to compare himself with the best anywhere else in the world.

Our teaching of Zoology follows the 'type' system (i. e. a number of different animals are studied in great detail, each being considered an example of a group, and being used as a framework on which to hang lessons and as a standard to which comparisons can be made) introduced by T. H. Huxley a century ago. The system needs good teachers-good zoologists – if it is not to degenerate into a blind learning of textbook accounts of a number of apparently unrelated animals, unfamiliar in the student's own environment.

## NEED FOR TEXTS

Good science teaching also needs good books, and here we meet our first real difficulty. For chemistry and physics it does not really matter where the books are written, but with biological sciences, it does matter a great deal that in one country trees lose their leaves in winter, frogs lay eggs in streams, and lizards are seen in bright sunlight on heaths; while in another, trees keep their leaves all year, frogs stick their eggs onto tree trunks, and lizards are to be seen on the ceiling at night.

At an elementary level, with a good teacher who knows what he is doing, this alone presents no great difficulty. Some years ago surprise was expressed by the examiners that a question on guano, thought of by the examiners as the accumulated droppings of sea-birds on desert islands, was universally answered by Malayan students who talked about the accumulated droppings of bats in limestone caves. In this case the examiners learned something new to them; but it would have been only too easy for the students to have dished up some quotation from a standard work which the examiners would have accepted without even knowing that it was an inappropriate answer for Malayan conditions. Only too often do we meet the attitude that students are studying for an examination; in an examination what the book says will be marked as right; so why worry about the truth – it is what the book says that matters.

This worship of the book is regrettable. We combat it by giving our students references which contradict one another, by disagreeing with the book, and with one another, and by making them observe for themselves; but it is a long slow battle and it wins over only the better students. We must, I fear, accept reliance on the book as one of the facts of life, and we must try to get the books right.

Unfortunately this means rewriting them completely. It is no mere hack-work of translating and adapting them. The broad outlines may be perfectly satisfactory. It is the details, the apparently trivial statement, which needs checking and often altering; and this checking must be done by people who know their subject, notice that I say 'people', not a 'person'. Such people are hard to find and need years of training. But apart from knowledge, there is another difficulty. In our first-year classes we dissect a dogfish or small shark. We have no completely reliable dissection guides, not so much because they have never been written, but because the class of some 180 students is dissecting not one species but six. The diversity of tropical species is such that I cannot guarantee to find 180 specimens of the same species!

One could sum up the difficulties vis-a-vis books by saying:

1. We are dealing with students who, by tradition, believe what the textbook says; so we need reliable books.
2. Our demand for books is too small to make it worth publishing our own in competition with those of vast circulation; so we need to adapt.
3. Writing new books or adapting standard works for local use demands a detailed knowledge which few possess, and which indeed may not exist.
4. Profusion of tropical species makes it less easy to make exact statements about specimens or conditions usually found.

Part of our problems are economic, and although they need to be discussed, they will not be discussed here. The remainder of our problems are those of the existence of knowledge and the availability of men and women to disseminate it.

## KNOWLEDGE

We start with a background of knowledge fundamentally different from that in which the standard textbooks were written. There are more species of animals and we do not know them as well. For example, my colleague, Miss L. Cheng commenced some studies in 1963 on the biology of the Gerridae or Water Skaters, conspicuous insects which run on the surface of every pool and stream. There were only 18 species known from Malaya. Now in 1965 she has produced a massive study which, among other things, records 41 species (Cheng, 1965). We do not know the names of species because many have never been named. We do not know their life histories, because zoologists have had to spend so much of their time naming them.

This perhaps, sounds a little more despondent than the truth justifies. Quite a lot is known about many of our animals, but then we come to the second part – the availability of this knowledge. For many groups the knowledge is locked up in comparatively obscure papers. This does not worry the specialist, but it does worry the ecologist who has to have a nodding acquaintance with many groups. This state of affairs is being slowly remedied as can be seen in the list of books given at the end of this paper. We are catching up but we still have a long way to go.

These books help to fill in the background for our students. The teacher is still left to find suitable 'types'. This was the first concern of Professor R.D. Purchon, in 1949, when the Zoology Department in Singapore was founded. He and his colleagues selected a number of local animals, and prepared summaries of what was known about them, investigated obscure points, and worked out dissection guides and so on. A book of instructions for first-year students was published (Purchon 1957). That book is now out of date because the process has continued. Thus now, in 1965, out of 25 species used as 'types' in the first year course, 12 are local, 6 are cultured (e.g. *Amoeba*, Guinea Pigs), 5 are cosmopolitan parasites, and 2 are imported. Of the 12 local species; 5 are sufficiently like the corresponding species used in standard text books for only minor adaptations to be necessary; 2 have been recently monographed as teaching types in India, and the remaining 5 have been studied here in Singapore. Two of these were studied by members of the academic staff, and three others formed the subject of M.Sc. or Ph.D. theses of students in the department.

## MAN POWER

You will observe that we rely on student theses for much of our new information. If we want to know more about local animals we must train people to find out about them and train them to train others. We consider that every school teaching pre-university biology (or zoology and botany) should have at least one teacher with an honors degree in a biological subject, and yet the total number of honors graduates in all biological subjects since the foundation of the University of Singapore has only been 106. The actual number of graduates in biological sciences is shown in Table 1. Since 1960, 181 students have also graduated from Nanyang University in biology, not however at honors standard. These graduates serve not only Singapore with a population of a little under 2 million, but also the whole of Malaysia, with a population of a further 8 million.

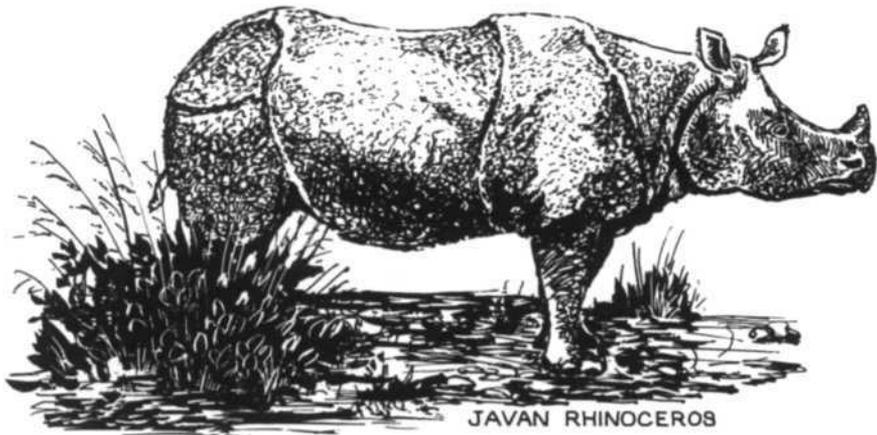
What of the teachers who are not Singapore honors graduates? The fact that a man was born and schooled in Singapore before he went to Harvard or to Oxford does not make the animals any the less strange. He has learned his zoology on a different fauna and in many respects he has to start all over again. In biology, at least, if we want good teachers we have to train them ourselves on the job.

My conclusion is that we are now, after 20 years, just beginning to catch up with ourselves in biology teaching.

One last note. I have provocatively headed this section, 'Man Power'. It is not true. A good half of our zoologists are women! It is noteworthy that, in a country where women are only now achieving full emancipation, a large proportion of its best students in biology are women.

## LITERATURE CITED

- Boulenger, G.A. 1912. A vertebrate fauna of the Malayan Peninsula – Reptilia and Batricha. Taylor and Francis, London.
- Cheng, L. 1965. Studies on the taxonomy and biology of the Malayan Gerridae. Thesis for M. Sc. University of Singapore.
- Chuang, S.H. 1961. On Malayan Shores. Muwu Shosa, Singapore.
- Corbet, A.S. and H.M. Pendlebury. 1934, revised 1956. The Butterflies of the Malay Peninsula. Oliver and Boyd, Edinburgh.
- Glenister, A.G. 1951. The Birds of the Malay Peninsula, Singapore & Penang. Oxford Univ. Press, London.
- Johnson, D.S. 1964. An introduction to the Natural History of Singapore. Rayirath, Kuala Lumpur.
- Madoc, G.C. 1947. An introduction to Malayan Birds. *Malay Nat. J.* 2; 3 & 4 (second edition 1957).
- Robinson, H. C. and F. N. Chasen. 1927-39. The Birds of the Malay Peninsula, Vols. I-IV., Whitley, London.
- Tweedie, M.W. F. 1953. The snakes of Malaya. Govt. Printer, Singapore.
- and J.L. Harrison, 1954. Malayan Animal Life. Longmans, London.



JAVAN RHINOCEROS

TABLE 1  
GRADUATES IN BIOLOGICAL SUBJECTS, SINGAPORE

Year	B.Sc. (Hon.) <sup>1</sup> all Biology Subjects	Zoology only	B.Sc. Pass University of Singapore <sup>2</sup> all subjects	incl. Zoology	Nanyang Univ. Biology
1952	2	2	(7)	0	-
1953	0	0	(23)	7	-
1954	2	0	(18)	7	-
1955	3	0	(38)	8	-
1956	7	3	(25)	4	-
1957	2	0	(25)	5	-
1958	5	4	(34)	9	-
1959	11	6	(39)	13	-
1960	8	5	(61)	16	11
1961	11	8	(26)	3	8
1962	4	3	(53)	13	33
1963	14	5	(70)	11	39
1964	22	7	(77)	10	47
1965	15	6	(110)	27	43
Total	106	49		133	181

Note <sup>1</sup> B.Sc. (Honors) is a second degree (after B.Sc. Pass) so that these students have already appeared under that column (at either University).

<sup>2</sup> At the University of Singapore the Pass degree is a general one which may or may not include biological subjects. In the next column is shown those taking Zoology, they may have taken other biological subjects as well.

# Project of Introducing the Idea of Conservation in Vietnamese Schools<sup>1</sup>

by

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## SUMMARY

In Vietnam there is little public enthusiasm for conservation. The author discusses different ways this concept might be introduced into the teaching program from the elementary to the university level. At the secondary and university levels students should be shown concrete examples of recent happenings in Vietnam that illustrate the consequences of uncontrolled and excessive exploitation.

There should be a thorough revision of the teaching of conservation. It would be desirable to create a new committee in the General Directorate of Schools to consider the problem.

## INTRODUCTION

In Vietnam the official authorities and a certain class of intellectuals are well-informed about conservation but the general public is uninterested in the protection of natural resources.

Numerous laws and decrees have been signed without any positive results whatsoever which proves that effective action can only be accomplished if the public is convinced of the real importance of the problem. It would therefore seem necessary to intensify instruction and propaganda taking into account the local possibilities and conditions for protection and conservation.

## TEACHING CONSERVATION

There are two aspects of the problem; on the one hand the introduction of this idea into the teaching program, and on the other the education of the general public with regard to conservation. In this paper we shall deal with the first.

In teaching conservation to children one must learn from the techniques employed in other countries. A project could be formulated along the following general lines;

1. In primary grades special courses on conservation are not needed, but the idea can be worked into the ordinary program of the school so that the child learns to love and respect the things that surround him and to beautify the environment in which he lives. Excursions to botanical gardens would be an important help. It would be desirable for every school to have its trees, its flowers, its own garden and its little hen-house to be kept and tended by the pupils themselves.
2. In secondary education the idea of conservation can be incorporated directly into the program of natural sciences from the upper third to the final year. The morphological and biological studies of animal and vegetable classes can stress the ecology of these living beings and the necessity of protecting them. The harmful consequences of erosion and of pollution of water and air could be studied and explanations given of the laws and decrees regarding nature conservation.

To be effective the lessons should be illustrated with concrete examples in Vietnam chosen from recent events such as the degeneration of dense forest into

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<sup>1</sup> Original in French.

low brush or bare savanna in the Hanoi region since 1955 due to the excessive breaking of new ground by refugees. The aim is to make the pupils understand the facts and principles involved in the protection and utilization of the natural resources of the country and to show them the woeful consequences of an excessive and uncontrolled exploitation.

Extra-curricular work should also be done by the students. We should encourage the organization of tree-festivals or bird-protection days. With the help of regional forest services the students could aid in reforestation and other work projects. This would make them aware henceforth of the seriousness of the problem in question. Guided excursions and museum visits would also contribute to awakening in the students a love of nature and the wish to protect the natural resources of their country.

3. On the university level, in the near future, chairs in Protection of Nature Should be created in the Faculties of Science and in the Agricultural Colleges. There should be laboratories specializing in different aspects of conservation in Vietnam. At present a compulsory course in protection of nature should be started in the Teachers' Training College and in the Faculty of Pedagogy in order to form a corps of instructors capable of inculcating the idea of conservation at all levels of teaching.

## CONCLUSION

While some aspects of nature conservation have been touched upon at the secondary and university levels, the hours devoted to this have been insufficient and the program inadequate. The crucial point is a revision of the teaching of conservation. It would be desirable to create within the General Directorate of Schools a committee of three to five members who could study the problem, edit books, and furnish the necessary teaching aids.

# Conservation Education in Curriculum Improvement Projects in the Philippines

by

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## SUMMARY

This paper describes aspects of elementary and secondary school curriculum improvement projects in the Philippines which provide opportunities for the inclusion of ecological principles basic to the understanding of conservation practices.

The first section describes the Biological Sciences Curriculum Study (BSCS) Adaptation Project in the Philippines, and the second section describes the current curriculum improvement projects of the Science Teaching Center, a new project of the University of the Philippines. The annexes include a tentative manuscript for a teacher's guide and a list of major biological themes for biology in Philippine High Schools.

## INTRODUCTION

From the educational point of view, conservation education is preventative, and to be effective it must be given to all citizens because conservation efforts succeed only to the degree that they are concerted, sustained, and co-operative. Perhaps the conceptual bases and special terminology are best learned in college, but only a small percentage of the population goes on to higher education. For a wider dissemination of knowledge of basic conservation practices it is best to concentrate on the secondary and elementary levels.

This paper describes those aspects of curriculum improvement projects which provide opportunities for the inclusion in the elementary and secondary schools of ecological principles basic to the understanding of conservation practices.

## THE BIOLOGICAL SCIENCES CURRICULUM STUDY (BSCS) ADAPTATION PROJECT IN THE PHILIPPINES

### 1. Why an adaptation?

Late in 1961 a group of Philippine biologists and educators was organized to consider the possibility of using modified BSCS materials in Philippine schools by adapting them to the Philippine biota. It was decided to adapt rather than to develop a new book because it was cheaper in terms of time and money. Furthermore, since for most of those involved this would be an initial experience in a curriculum improvement project of an interdisciplinary nature, adaptation work would be an excellent first step.

It was decided to select the green version, which stresses ecology, for a variety of reasons, chief among them the year-round availability of flora and fauna close at hand and the opportunity this approach afforded for close work with the natural environment which would develop a greater enjoyment of and appreciation for nature among the people. The choice of an ecological approach did present certain problems as ecology is a new field of specialization and there were few local studies available. However, it was felt that a satisfactory beginning could be made and future revisions might incorporate local studies as they became available.

## **2. Objectives of the Project and the Adapted Materials**

The Adaptation Project had besides the major objective of adapting the green version to suit local conditions, the purpose of training a corps of ten teachers in the use of the new materials.

The work was done over a span of three years. The first year was devoted mainly to the training of teachers and improving their biological background and adapting the laboratory manuals and teacher's guide. The second year the manuals and guide were tried out in ten public schools and two University of the Philippines high schools. The third year was devoted to revising the text, manual, and teacher's guide based on the feedback from the previous year. The ten teachers helped lead regional workshops in the use of the new materials.

The adapted course is designed to present the high school student with the biological problems he will face as a citizen, including those concerned with conservation, food production, health, reproduction, race and heredity. The laboratory work provides rich opportunities for experiences relevant to conservation including many field trips. Some exercises involve discussion and analyses of data bearing on biological principles basic to conservation. The exercise on the Kaingin system – a shifting agricultural practice – in the Philippines leads the student to analyze from an ecological viewpoint the changes which take place in a region where the Kaingin system is used.

The course is designed to develop techniques of inquiry in the students, competence in critical thinking and that humility essential to scientific investigation.

## **3. Acceptance of the adapted materials**

The adapted materials are most successfully used by teachers who have been trained in their use. Over and above the ten teachers who were originally trained over eighty biology teachers have participated in summer institutes of six weeks duration organized for this purpose. In addition there have been regional workshops and seminars.

The adapted materials continue to be used in the school that participated in the 'experimental year', and some of the teachers who have been to the summer institutes use selected exercises from this material which they introduce into related units of their school's syllabus. However, the method by which the new materials were developed did not follow the regular procedure required by the Board of Textbooks. As a result it is not certain that official approval for their use in public schools as texts can be obtained; this does not apply to private schools.

## **CURRENT CURRICULUM IMPROVEMENT PROJECTS OF THE UNIVERSITY SCIENCE TEACHING CENTER**

A new University of Philippines project, the Science Teaching Center, financed by the Ford Foundation, has for its major goal the development and production of curriculum materials in science for elementary and secondary schools. The materials are being produced through the joint efforts of scientists, educators, and practising teachers.

### **1. Elementary School Level**

The content of the first five grades emphasizes the study of living organisms through the first hand study of the physical and biological characteristics of their environment. Grade I deals with basic needs of living things; Grade II – meeting those needs; Grade in-growth and development; Grade IV – movement, and Grade V – life processes. In the sixth grade man and his relationship to the biotic and abiotic environment are studied and the idea of conservation and its significance is brought out. (see Annex A for a sample lesson).

### **2. Secondary School Level**

The emphasis in the first year of high school is on earth science and this emphasis continues into the second year high school course. In the second half of the second year the course is devoted mainly to the study of the effects of the physical environment on living organisms. This part of the course also introduces the student to the study of biology which is usually continued at the third year level.

The High School Biology Committee of the Science Teaching Center is developing three volumes intended as supplementary teaching materials to be used with the BSCS adaptation previously mentioned. These include:

- (a) a volume on common plants of the Philippines,
- (b) one on common animals, and
- (c) a third on the gene concept.

Within the context of each section of the books the biological themes incorporated in the green version (see Annex B) are indicated or developed wherever possible. Furthermore it is intended that the idea of utilizing and conserving materials will be developed in the description of specific organisms included in each section when applicable.

## **CONCLUSIONS**

These then, are the basic ideas relative to conservation that underlie the development of the biological portions of the projected curriculum materials. To produce materials which will help educate for conservation, however indirectly and modestly, and which at the same time takes account of sound pedagogy is no mean task, but it will certainly be rewarding. If such materials do not help in discovering scientific talent of a high order, they will at least provide students with reliable knowledge of the physical and biological world. It is the world in which they live, and the more they understand it, the better their chances of controlling its harsher forces and enhancing its life-sustaining aspects.

## **REFERENCES**

- American Association of School Administrators 1951. Conservation Education in American Schools, 29th Yearbook, Washington, D.C.
- Munzer, Martha E. and Paul F. Brandwein 1960. Teaching Science Through Conservation. McGraw-Hill Book Co. Inc., New York.

## Science Teaching Centre

TENTATIVE MANUSCRIPT FOR TEACHER'S GUIDE

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### ELEMENTARY SCIENCE VI

#### E. MAN AND HIS PHYSICAL ENVIRONMENT

### 3. THE LITHOSPHERE

#### Overview:

Soil is an important part of the environment of many organisms. Although considered non-living, the soil actually has both living and non-living components. It is a product of both physical and biological processes. Plants and animals as well as rocks contribute important components to it. There are different kinds of soils depending on the factors producing it – the climate, vegetation, parent rock, drainage, and age. This unit will acquaint the pupils with general characteristics of the soil, the processes by which it is produced, and the role it plays in the development of large vegetational areas like forests, grasslands and deserts. There will also be a study of the effects of man's activities on the lithosphere, both constructive and destructive.

#### LESSON 1

##### THE GENERAL CHARACTERISTICS OF SOIL AND HOW IT IS PRODUCED

#### Objective:

At the conclusion of this lesson, the child should be able to:

1. Describe the different layers of soil.
2. Explain how rocks are broken down into soil.
3. Explain the importance of organic matter (both living and dead) in soil.

#### Vocabulary:

Layers, humus, top soil, leaching, decompose, organic matter

#### Materials:

1. Two soil pits at least 30 cm. deep.
2. Several magnifying glasses.
3. Two samples of top soil, one very rich in humus, one quite sandy.
4. A pit in a shady, damp spot about 30 cm. deep.
5. Two large tin cans.
6. Two pails.

#### Originating the Problem

Unless one lives in a very flat area it is easy to see different kinds of soil within the community or a few kilometers away. Have the children bring in samples of different kinds of soil. See that they include several different kinds such as sandy, clay, gravelly, rich loam, etc.

Each child should describe his sample (whether light or dark, whether the texture is fine gravel, coarse sand, clay, etc.). He should also describe the place where he obtained it and what kind of plants grew there.

Make a chart on which is put the name of the child who brought the soil sample, the texture of the soil (sandy, clay, etc.) the color of the soil, the plant cover of the place from which it came, and a description of the place from which it came.

Take the class out to look at different types of soil in and around the school yard. Collect samples and add this information to the chart.

### **Procedure**

1. Activity 1; Dig a soil pit in a grassy spot at least 30 cm. deep (or deeper if the digging is easy) and wide enough to allow observation. (Or take the class to a fresh excavation – along a ditch or a road project). Point out the different layers in the soil. (These are called horizons but this technical term need not be introduced). These layers are called the soil profile. Have the class make a diagram of the soil profile, describing each layer and measuring how deep it is. On the surface are grass stems mixed with litter (dried, undecayed leaves and twigs and perhaps animal matter). Material which was once living organisms (either plant or animal) is dark and has much partly decayed organic matter (such as leaves, roots, small animals) as well as living plants and animals. The decomposed organic matter is called humus. Ask the children if they think plants grow well where there is not this layer of top soil with much humus. The effect of this humus will be investigated in the next activity. Have the children dig out some of the top soil so that they can study it in more detail in order to see what it contains. Look for the various insects, larvae, and worms living in it. Study its constituents with the magnifying glass. Notice the pieces of partially decomposed organic matter.

Below this top dark layer is a lighter layer where much of the organic material has been washed away by water seeping down through the soil from the surface. How much of this has taken place depends on the rainfall and drainage. This process is called leaching. The washed off material usually accumulates in a lower layer (which is therefore darker). It gradually is chemically changed into inorganic material. As one goes lower there is less humus. Finally there is the parent material or rock from which the soil has been developed. These lower layers may not be seen easily if the excavation is not deep enough, but an eroded hill side or a road project should show these layers.

As the pupils observe the roots and small animals in the soil, ask them how these animals could breathe under the ground. Also how does water move down through the ground? Help them see that between the soil particles are spaces through which air and water move. Which would be better for growing plants, loose or tightly packed soil? (Loose). Why do farmers plow before planting? (To loosen up the soil so that air and water can get in more easily). How do some insects help in loosening up the soil? (Worms in burrowing for food loosen it up).

Repeat the digging of a soil pit in another spot where there is much less plant cover and the soil seems poorer. Construct the soil profile diagram and compare the appearance and thickness of the different layers. Discuss the relation between the plant cover and the depth of top soil layer.

2. Activity 2; Collect a sample of top soil that is very rich in humus (perhaps from the first soil pit) and another sample of top soil that is much more sandy (perhaps from the second soil pit). Put the samples into two large cans with holes punched in the bottom so that water can drain out. Place each can over a separate pail and pour the same measured amount of water into each sample. The amount of water should be enough to wet both samples thoroughly.

Have the children observe and record how rapidly the water drained through each sample, what amount of water was absorbed by each sample, and which sample had more matter washed out of it by the water (leached out). Why is humus in top soil vital to plant growth? (It enables the soil to hold the water longer, thus making it available to the plant between rains. It also supplies nutrients that plants need as well as making soil less sticky and tightly packed). Why will the soil become poorer for

plant growth if all the plants growing on a farm are harvested or eaten by animals? (If no plant material is left to rot and form new humus, leaching will remove the humus from the soil).

3. Activity 3; A discussion on the development of soil should follow after the pupils have recognized the general structure of the soil. How are the rocks broken into smaller bits? Climate acts upon the rock; the alternation of heat and cold, wind and water movement break large boulders and grind them into small bits. Is ground-up rock all there is to soil? If possible have some of the children break up some fairly weak rock, crushing it into fine pieces. Does this look like the top layer of the soil? (No) Is fine sand the same as soil? (No). In nature as the rock is broken up the minerals then that make up the rock material are dissolved by water and made available to plants. How do the plants help in the process of making soil? Find a plant which is growing on a large rock. Have the class look closely at where the roots grip and penetrate the rock. If necessary, point out to them the crumbled rock and soil around the roots. The roots give off acid which speeds the disintegration of the rock into fine pieces. Also the roots grow into the ground and take up water and minerals. These materials and the carbon dioxide from the air are combined by the plant to produce new organic materials by means of photosynthesis. Thus it grows. The plant, in turn, may be used as food by animals. When the plants and animals die their remains go back to the soil and serve as food to micro-organisms. These are the bacteria that change the litter of plant and animal matter to decomposed organic matter. It is the same process that we see when fruit spoils or meat rots. The children should be made to realize that these are the same type of organisms (bacteria) considered harmful when they attack humans or living animals (or cause spoilage in plant or animal matter we wish to use for food). They play a very important, constructive role when they convert dead plant and animal litter into useful humus which is a vital part of soil. It makes the organic matter available for new growth. Fungi and larger insects like earthworms and termites also play an important part in this. To study the decay and decomposition of plant matter dig a hole about 30 cm. deep in a shaded part of the school yard. A somewhat damp place would be best. Fill the pit 2/3 full of fresh leaves and grass (or other fairly soft plant matter). Cover with dirt and assign some children to water the pit daily so as to keep it damp. At the end of two and then four weeks remove the soil covering and inspect the plant matter. Try not to mix the soil with the plant matter in so doing. Have the children describe the changes and relate them to the humus they found in the top layer of the soil in Activity One.

Some plants produce and return to the soil much organic matter each year, while some return just a little. It is a slow process for plants to build up humus in the soil. Aside from the kind of parent rock, climate, and plants, the slope and drainage modify the kind of soil in a place. On mountain sides, the surface is easily washed off by rain if there are no plants to protect it. On flat land a swamp may develop if the drainage is poor. The plants that grow in these places also differ. Thus, swamp and well-drained areas may have different kinds of vegetations and soil structure even in a region where the climate and parent rock are the same. Have the class try to relate the kind of soil obtained in the samples collected in Originating The Problem with the vegetation of the area where they were collected. Was the top soil richer in humus where there was a thicker vegetation cover? Why? (More vegetation produces more humus). Why might the top soil be thicker and richer in a region poorly drained than one well drained? (Good drainage often means more leaching).

### **Appraisal:**

Some questions that might be raised are:

1. What kinds of soil are best for growing most plants?
2. Why are chemical fertilizers needed in some soil?
3. Why do farmers sometimes mix manure with garden soil?
4. Why will rich soil not develop in a very dry place such as a desert?
5. Will rich soil develop faster in a tropical or a cold climate if the rainfall is the same? Why?

6. How do small animals like earthworms help in the development of the soil?
7. How do bacteria help in soil development?

## LESSON 2

### THE ROLE OF SOILS IN THE DEVELOPMENT OF VEGETATIONAL AREAS LIKE FORESTS, GRASSLANDS, AND DESERTS

Having learned the parts of a soil and a brief description of its development, the pupils should now be ready to learn that with different climatic conditions especially rainfall, the soils and the vegetation that develop are also different. Previous lessons on the atmosphere will give the student the necessary background for the understanding of the different climates at various altitudes, latitudes, and their favorable and adverse effects on plants, animals, land forms, etc.

#### Objective:

To learn the factors that bring about the development of forest, grassland, deserts.

#### Materials:

1. A diagram showing the relations of types of biomes to variations in temperature and precipitation. (The diagram is given below. For a definition of biome see Background Information.)
2. Several pictures of different biomes; a region of perpetual snow and ice; a tundra; an evergreen forest; a grassland; a forest; a desert.
3. Soil cover map of the Philippines.
4. Rainfall map of the Philippines.
5. A grass plant.
6. A cactus plant or any other succulent.
7. A woody shrub.

#### Vocabulary:

tundra  
grassland  
desert  
forest  
biome

#### Originating The Problem

Show the class some of the pictures of the different biomes without giving them any names. Ask what is the difference between two of them – perhaps a picture of a grassland and a forest. If they went to such a place would they expect to find different animals as well as different plants? Group the pictures into different types; ice covered, tundra, evergreen (coniferous) forest, grassland, forest, desert. Ask for the children's ideas on what to call each type. Do introduce the terms – grassland, forest, desert.

The names for the other ones are not important as long as they are reasonably descriptive. Explain that a region together with the kinds of plants and animals that live together in it is called a biome. Thus a forest, with all the trees, shrubs, and animals is one type of biome. The grassland is another. Get the children thinking about what it is that makes a place be a certain type of biome. Why is one region a grassland and another a forest? Tell them they are going to study this. Also have them discuss the kind of vegetation of places that they are familiar with.

## Instructional Procedures

1. Activity 1; First discuss the desert since the relation between climate and type of plants is quite easy to see. Describe, using pictures as much as possible, the desert vegetation and the desert climate (See Background information).

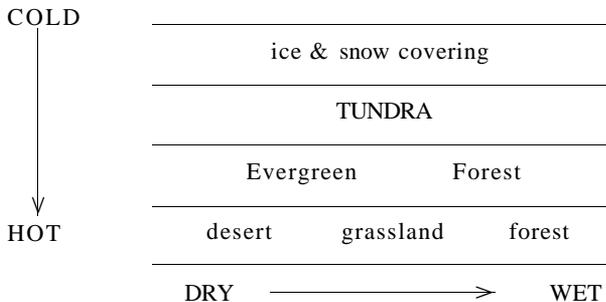
Show a cactus plant (or any other succulent) and ask the child to describe its peculiarities; no leaves (or very small deciduous ones) for most succulents; fleshy green stems with plenty of water storage tissues; thick spines for protection against browsing animals, and against water loss from large surface areas. Have the children discuss why they think this plant could more easily live in a desert than the plants they are familiar with in wetter climates. Why are plants in the desert so scattered? (Because each plant uses all the water in a relatively large area.) Why do some plants in the desert have very short life cycles – growing up, flowering, and dying out in just a few days or weeks? (So they can reproduce during the brief rainy periods). Why is desert soil so sandy and does not have much humus? (Because there is little vegetation to decompose and form humus.)

2. Activity 2; Show the class pictures of natural grassland and forests. (The forest land should be fairly level, not mountainous). Explain to the class that most of the Philippines is naturally forested and that the existing grass areas are due to cutting and burning of trees by man to clear land for crops. However, there are areas (the American prairie, the African veld, the American pampas, etc.) which have about the same temperature as the Philippines but which are naturally covered with grass and have few trees. Get their ideas why grass grows naturally in one place, but trees grow naturally in another.

Pull gently from previously watered, loose soil a grass plant taking care not to destroy the roots. Wash off the soil carefully and then ask the pupils to compare the roots and the shoot. Which has the greater bulk, the shoot or the root? Which has the greater surface area?

Compare also the root system and the shoot of a shrub (or an uprooted tree). The tree roots are larger and go deeper into the soil than the grass roots, but they are less extensive (less surface area on less bulk) in proportion to the size of the plant. If there was little rain which would do better in getting water, the grass or the tree? (In dry conditions the grasses have the advantage over the trees because grass roots, being more extensive, can quickly absorb the moisture seeping down through the upper layers of the soil after a light shower, before the water reaches the roots of the shrub or tree which are way below). If there is sufficient rain for both grass and tree which plant will do better in terms of getting the sunlight necessary for photosynthesis? (The trees will grow up and shade out the grass). Trees, however, grow slowly compared to grass. What would you expect to happen after a forest is burned over or the trees cut down? What would grow first? (Grass will grow first, then bushes. It will take many years for the trees to take over again, especially since trees do not reproduce or spread as fast as grass). The children should be able to give examples of this kind of man-made grassland. If the class is interested, the discussion can be continued into why in grasslands the soil has a large amount of humus; (grass, being short-lived returns a large amount of organic matter to the soil annually) while in forests there is much less humus (the larger precipitation causes excessive leaching of the soil).

3. Activity 3; Introduce the diagram which gives the relation between type of biome and variations in temperature and precipitation.



Have the class review what has already been discussed about desert, grassland, and forest relative to precipitation and relate it to the diagram. Since the arctic conditions are so completely outside of the students' experiences, they will mainly have to be described by the teacher without much participation by the class. (See Background Information). The main point should be that even in the most inhospitable and extreme climate there are forms of life well adapted to those conditions.

Present the soil cover map and the rainfall map for the Philippines. Get the children to find what relations they can see between the two. Ask them what other things besides rainfall might determine whether a region is forest or grassland. (Rough mountains, sandy or poor soil, man's activities which remove trees, marshy areas).

### Appraisal

1. Why are most of the big grasslands of the world far away from the oceans? (Near the ocean the rainfall is usually high which produces forests).
2. Show a picture of a land which is a mixture of grass and trees (not evergreen). Ask the children to describe what the climate is like. (Warm or hot with a medium rainfall).
3. Show a picture of a thick jungle (tropical rain forest). Ask them to describe what the climate is like. (Warm with a large amount of rain).
4. Why can't polar regions have vegetation like the tropics?
5. Why are the grasses in the open field healthier or greener than those growing (if there are any) under the trees?

### Background Information

Biomes are the largest (worldwide) ecological units generally recognized; the tundra, coniferous forest, the temperate forest, the tropical forest, the grassland and the desert. They are named after the major climax vegetation that has maintained itself in the region over a long period of time. Since vegetation reflects the major features of climate and determines the nature of the habitat of animals, it provides a basis for ecological classification. The term 'biome', thus expresses the relationship between climate, vegetation and animal life.

The types of vegetation found in any given area are the result of the action of the environment upon the plants. They reflect closely the sum total of all the environmental factors like rainfall, temperature, light, mineral content of the soil and other physical factors, aside from human factors.

In the cold high latitudes the region of perpetual frost, the tundra and the coniferous forest occur. In warmer, mid- and low latitudes, the deserts, grasslands, and forests (and other intermediate forms) occur.

1. In region of perpetual frost the temperature is so low that the ground is covered with ice and snow at all times. No soil is visible. But life is not entirely absent. Mosses and lichens may be present on what seems at first to be bare rock.
2. Tundra is an arctic grassland. It is found where climatic conditions are extreme. The vegetation consists of mosses, lichens, grasses, sedges, and hardy low shrubs (no trees). With very low temperatures most of the time, the ground remains frozen except for the upper few inches during the brief summer. When the surface thaws out during this brief period, the water does not drain away but is absorbed by the spongy vegetation. Drainage is very poor. Bacterial action is very slow due to low temperature so there is an accumulation of undecayed vegetation.
3. Evergreen (coniferous) forests are found in regions where temperature is slightly higher than tundra conditions but fluctuates within a greater range. There is alternation of long severe winters and short cool summers, a marked seasonal contrast. Great temperature ranges are experienced. Rainfall is low and most of it comes during the short summer; the winters are dry and clear. When rainfall is light, fog satisfies the water requirements.

Soil development is slow because the land remains frozen for so long. Humus is not thoroughly mixed with the soil and remains as a highly acidic accumulation. The needle-leaved evergreen trees like the pines, firs, spruces, predominate. There may be a well-developed growth of short trees as well as mosses. In drier areas, the trees form a dense shade resulting in a poor development of shrubs and herbs.

4. Vegetation reaches its maximum development in the middle and low tropics latitudes where temperature and moisture conditions are favorable for plant growth. Depending on the amount of precipitation, an area will support any of the three forms of vegetation – forest, grassland, or desert.

There are different types of forests; tropical rains forest, deciduous forest, and thorn forest, depending on moisture conditions. Thorn forests contain small hardwood trees which are often twisted and thorny with small leaves which are shed during the dry season. Where there is greater precipitation with a definite dry season a deciduous forest develops. Part of the year the leaves are off the trees and the herb and shrub layers therefore develop at this time.

The tropical rain forests are found where rainfall may exceed 80 or 90 inches annually with no prolonged dry season. In most of the tropics the dry season is but a season of less rain. A tropical rain forest supports a variety of plant and animal life. While a coniferous forest might have only two or three kinds of trees per acre, a tropical rain forest may have a hundred or so.

Tropical forests supply a large amount of dead twigs and leaves but bacterial action is rapid due to high temperatures. With heavy rainfall which causes excessive leaching, humus accumulation is kept at a minimum on forest soils. Leaching occurs where there is percolation of water and is at a maximum in hot and rainy climates. (In cooler climates, bacterial action is not rapid, and with less rainfall as compared to the tropics, accumulation of humus is greater, as in grasslands). Thus tropical soils are not very fertile; they get worn out, i. e., lose fertility, after a few years use.

5. Natural grasslands occur in places with an annual rainfall of 10 to 30 inches. The following factors are characteristic of grassland areas:
  - (a) Relatively level surfaces; There is not much erosion and the soils show well-developed layers.
  - (b) Moderate rainfall; There is not much leaching and the soil is not heavily robbed of its soluble constituents.
  - (c) Large amount of humus; Grass, being short-lived, returns large amounts of organic matter to the soil annually. These areas, therefore, are rich in humus, retentive of moisture and very productive. Some of the most fertile soils of the world are found in grassland areas.
6. A desert region results when moisture is extremely deficient, the rainfall hardly exceeding 10 inches annually. Most of the time it is dry and hot. Air picks up its moisture while moving over the ocean. Deserts often occur behind mountains because the air loses its moisture when cooled in passing over the mountains. When rain does come to the desert regions it is usually sudden and intense, washing away the surface soil. The abundant sunlight causes rapid evaporation of the water. Also strong winds blow away fine soil particles due to poor vegetation cover. This leaves mainly the larger rocky material. The soil has no well developed rich upper layer.

The characteristics of desert vegetation are:

- (a) No complete cover; Although few parts of deserts are entirely barren; vegetation is scattered to reduce competition.
- (b) Low hardy shrubs and grasses between dunes where water seepage brings moisture near the surface.
- (c) Animals; Short life cycles to be able to reproduce during the short periods when rain occurs.

Perennials; Succulent plants with thick cuticles, roots that store water, thick barks, narrow or spine-like leaves so that they can withstand drought and reduce evaporation.

## ANNEX B

### MAJOR BIOLOGICAL THEMES<sup>1</sup>

1. There is a continual interaction between each organism and its environment; the environment affects the organism, and the organism affects the environment.
2. There is homeostasis throughout the biosphere; communities fluctuate, but the tendency is always toward balance – dynamic equilibrium.
3. There is a great diversity among living things, but it is possible to find patterns within this diversity.
4. Living things have changed through time and are changing today.
5. The structure of an organism can be understood only in relation to function; conversely the functioning of an organism is dependent on its structure.
6. Through the mechanisms of heredity, one generation is linked to the next; thus all living things of the present have a continuity with the organisms of the past.
7. What an organism does – its behavior – is a reflection of its heredity and its experience in its environment.
8. Biology – like any other science – is a process of seeking, an inquiry into the nature of the universe about us. It is always in a state of change, because as new knowledge is acquired, old concepts and theories must be reconstructed.
9. Our present understanding of life and of the biosphere is the result of long history of observation, experimentation, and thought; many men of many nations have contributed in many ways to the building of biology.

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<sup>1</sup> Biology for Philippine High Schools; the Relationships of Living Things, pp. 564-565.

# What is the Status of World Conservation Education?

by

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## SUMMARY

Nature conservation has become a major subject in education because of the rapid rate of destruction of our natural environment. The IUCN, and particularly its Commission on Education, plays an outstanding role in the field of conservation education. Resource ministers and educators feel a special concern that the subject of wildlife conservation be taught more effectively in the schools. Other groups share this concern and the author points out some specific examples of what has been done, both in the school and university curricula and in the education of the public.

## INTRODUCTION

Education was once a natural family function directed to preparing the young for life. It had to do directly with the environment. Gradually, however, it drew itself away until its main subject became the communication arts. But now a new worry arises, and we must come back to the living natural environment as a major subject in education, for the new worry is nothing less than the loss of our natural environment. The protection of the environment cannot be postponed despite the present and eternal pre-occupation with man's traditional problems of hunger, war, and poverty. It is important to go forward on both fronts at the same time. We cannot ignore or deny the hungry of today, but we must see their needs in relation to the productive earth of tomorrow. We must develop the education and training which will enable us to husband our living resources so that seed stocks will not be consumed and representatives of successful evolution in the diverse environments of our earth will not be destroyed.

## CONSERVATION EDUCATION TODAY

For over 50 years in North America, in Europe, in Asia, and in the other continents, biologists have looked at the problem of, and initiated effort to improve and sustain nature conservation education. But today, suddenly, the technology of destruction has reached such proportions that the voices of education simply must galvanize their strength to match.

Outstanding among them is that of IUCN with its several commissions all devoted to rescuing and sustaining the structure of nature in its natural form. The IUCN's specific permanent Commission on Education seeks to compile what is being done throughout the world, to synthesize the information, and to interpret and make practical the example from one region for another. This year the Commission on Education produced the first compilation of abstracts of conservation teaching aids, textbooks and related articles. Forty-five books and leaflets are listed.

Many countries feel that the economics of resource use should be more clearly presented in the school curricula than they have been and that the needs of wildlife and wild habitats and wild vegetation should be taught to the child in the school. How, when, and what should be taught are questions that are still under discussion.

Without doubt the properly-trained teacher is the vital element but the teacher needs tools – textbooks, guides, aids – which are in short supply everywhere. Even more important, the teacher needs land reference areas near the school where the flora and fauna of a natural environment may be studied, their beauty admired, and their existence revered. A child's greatest need is a natural, easy exposure in a nature preserve to the friends of his environment, to their needs and requirements for living together, and his need to deal carefully with their mutual habitat.

Some groups are especially focused on conservation education; the Conservation Education Association, the National Science Teachers Association, the American Association of Biology Teachers, and the American Nature Study Society are professional groups pooling their interests and their questions for improving conservation education. Universities offer summer and regular training courses. Other individual and group efforts offer training, and some groups, such as Resources for the Future and the Conservation Foundation are specially concerned with establishing through research and study the basic facts on which education and legislation are eventually based. UNESCO and FAO produce particularly valuable resource information.

### **MEETING OF NORTHWEST EUROPEAN COMMITTEE**

A Northwest European Committee of the IUCN Commission on Education meeting in Stockholm in September 1965, recommended that demand be made for environmental education in schools, in higher education, and in training for the land-linked professions. The Committee drew attention to several deficiencies which continue to persist and suggested that teachers be exposed to some training in using the resources of the countryside and especially the techniques of organizing and conducting field studies and of obtaining teaching materials. It noted the value of ecology in striking proper balance between the highly specialized aspects of biology and general field aspects of the earth's sciences. It called attention to the need for educational systems to provide a wider understanding of the natural environment as a contribution to liberal education and asked that regard be paid to the impact of urban and industrial projects and new agricultural techniques and to the impact of man himself in his search for recreation. Finally the Committee emphasized the importance of infusing into the activities of youth movements an appropriate knowledge of wise use and enjoyment of environment as well as a code of behavior for the countryside. A textbook is planned on the theme of environmental education in Northwest Europe.

### **OTHER MEASURES**

Other steps that have been taken include the Mar del Plata Ministers' Conference in October, 1965, an outgrowth of the activities of the IUCN Latin American Committee on National Parks which discussed the conservation of renewable natural resources; increasing attention at the university level to an analysis of the environment as a whole; increasing the ecological approach in the curricula of those students who will be concerned with wildlife either as public servants or administrators; and the creation of such centers as the Study of Conservation Policy at George Washington University.

These events on the conservation front show a widening and vigorous interest in learning but they need to be pushed and more firmly established. In educating for the survival of man we need to know and teach the practical aspects of perpetuating the survival of the living forms which share with us our limited environment.

### **SOME RECENT SAMPLES OF TEACHING AIDS FOR CONSERVATION EDUCATION**

Anon. Animal Tracks. Reprinted from Michigan Wildlife Six Sketches.

Conservation Education Association;

Conservation Quickie: Conservation Anagrams

Conservation Quickie: Nature Study Riddles

Conservation Quickie: Our Need for Water

- Conservation Quickie: Toward Safer Hunting  
 Developing a Program for In-Service Training on Conservation Education for the Public Schools.  
 Selected References on Conservation Education for Teachers and Pupils.
- Conservation Education Association;  
 Conservation Education at the Grass Roots... How Can We Do It Better? Montana College, Billings, Montana
- Department of Public Instruction;  
 Conservation Tips: Christmas Tree Safety  
 Conservation Tips: Contours on the Land  
 Conservation Tips: The Living Chart
- Evans and Tostlebe. Conservation Activities for South Dakota Schools.  
 Midwest-Beach Publ. Co., Sioux Falls, South Dakota.
- Kentucky Department of Fish and Wildlife Resources.  
 Teaching Kentucky's Natural Resources Through Science. Frankfort, Kentucky.
- National Audubon Society (1130 Fifth Avenue, New York City, N. Y.);  
 Manual of Outdoor Conservation Education for Nature Centers,  
 Outdoor Laboratories, Outdoor Education Classrooms,  
 Special Park and Forest Areas, Nature Preserves and Sanctuaries, Natural or Semi-Wild Areas, Camp Reservations.
- Planning a Nature Center.
- Shaner, Richard. Keeping the Forest Primeval. Reprinted from Petroleum Today, Committee on Public Affairs, American Petroleum Institute.
- U.S. Department of Agriculture. Conservation of our Renewable Natural Resources, Suggestions for Science Fair Projects in Jr. and Sr. High Schools. (Washington, D.C.).
- U.S. Department of Agriculture, Soil Conservation Service. An Outline for Teaching Conservation in High Schools. PA-201.
- U.S. Department of Agriculture, Soil Conservation Service, Education Section. An Outline for Teaching Conservation in Rural Elementary Schools.
- U.S. Department of Health, Education and Welfare, Office of Education. Conservation Experiences for Children.
- U.S. Department of Interior, Fish and Wildlife Service. Conservation Notes.
- Wyoming Game and Fish Commission;  
 Our Big V Wild Friends.  
 Our Feathered Friends.  
 Our Finny Friends.  
 Our Furry Friends.

# Report on Conservation Education and Training in Thailand

by

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## SUMMARY

This paper reports on:

1. public education in conservation from elementary through the high school level, and
2. conservation training in teachers' colleges, universities, and agricultural schools.

At the present time in Thailand there is a lack of adequately trained teachers and a lack of texts, and planned field activities of all grade levels.

## PUBLIC SCHOOL EDUCATION IN CONSERVATION

Conservation, though limited in scope, has been part of our school curriculum for many years mostly through religious, science, and social studies courses. These emphasized conservation of temples and other religious places, taking care of animals and their habitats, and conservation of national forests.

In 1950 a small group of people in Thailand began to work to make conservation principles more widely known to the public. They tried to have a law passed to protect wildlife and wildlife habitats. Although their efforts met with little success they did form themselves into the Wildlife Association, the first conservation association in Thailand, and this association was able to introduce conservation education formally into the curriculum of the public school system in 1960.

At the early elementary level the student is taught about the natural resources of the country and particularly his own rural area. In grades five, six, and seven students learn about the conservation of natural resources; in the eight grade the conservation needs and problems of Thailand are taught; and in the ninth grade conservation programs in neighboring countries and general conservation principles are stressed.

In senior high school the courses cover conserving specific resources such as soil, water, forest, minerals, and wildlife, and the student is taught how to use such resources wisely.

Despite the fact that these courses have been introduced into the school system there is dissatisfaction with the present status of conservation education. Teachers are not well enough trained in the subject; there are only one or two texts available for all grades rather than one for each level; and there are few field trips or first-hand activities and observations. Although such education goes slowly at the present time there is hope for future success.

## TRAINING FOR EFFECTIVE CAREERS IN CONSERVATION

The teaching of conservation centers around three types of institutions in Thailand:

1. teachers' training colleges;
2. universities; and
3. agricultural schools.

A one-term course in soil, wildlife, forest, mineral, and water conservation is required of all students in the teachers' training colleges. This is, however, a lecture course and the student has no opportunity to make field trips to stations or projects or places where conservation principles are put into action. Furthermore those who teach have had no direct experience in conservation.

There are several departments at Kasetsart University and one at Chulalongkorn University which give conservation courses, and the students who take these have opportunities to work in the field. The School of Forestry at Kasetsart University has been particularly notable in producing foresters for the country, and graduates of this university have been the leaders in pilot projects started by the government for soil and water conservation. The pilot projects have not been adopted eagerly by the people as a whole because they have been difficult to follow and understand, but when the directions are simplified it is hoped that more will be interested in this program.

It is unfortunate that many graduates of these universities who should be the leaders in the conservation movement chose to work in offices rather than in the field.

The third class of training, that given in special agricultural schools, emphasizes farming and efficient use of soils and fertilizers. The boys have enough time for field work and after their graduation they often work as helpers on the pilot projects. Because many of them stay and work in the rice stations throughout the country they are often most effective in setting a good example to the people of their region.

## **SUGGESTIONS**

For several years I have been thinking about conservation education in Thailand, and I think if only a few of these suggestions could be worked out, it would improve our educational system.

1. Despite conservation education at almost every grade level in Thailand the teachers do not have adequate guides in teaching this subject.
2. Public schools in Thailand lack conservation textbooks at every level. The text itself should have activity guides for teachers and must stress more methods of conservation in each kind of natural resource.
3. There should be time in the class schedule for field trips.
4. How to conserve our natural resources should be added to the curriculum, the details of the course depending on the background and age of the students.
5. Teachers' training school should emphasize more conservation education and the students should have more actual practice than they do now.
6. The government ought to undertake a program of public conservation education through radio, television, newspapers, and magazines.

# Problems of High School Biology Teaching in Indonesia

by

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and

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## SUMMARY

In Indonesia up to now biology has been a neglected science due to lack of understanding of the nature of biology and the role of biology in the development of the country. This is caused mainly by the unsatisfactory method of teaching biology in the high schools. The authors describe:

1. the problems involved,
2. the first major corrective step that has been taken, i. e. a two-week course for high school biology teachers at the National Biological Institute; and
3. future plans for ameliorating the situation.

## INTRODUCTION

Strictly speaking the topic of high school biology teaching is out of place in a conference on nature conservation. However, after consultation with Dr. Lee M. Talbot it was agreed that such a discussion would benefit future plans and practices of nature conservation.

## NEED FOR BIOLOGISTS

Indonesia is a very large country and many parts of it are still uninhabited. Despite this and because of increasing population, the opening up of new lands for cultivation, shifting agriculture, and smuggling, the protection of many kinds of animals, plants, and their habitats is already a problem. Immediate steps should be taken to protect our wildlife. In order that these may be effective they should be based on sound biological knowledge. However, for the most part we still lack this knowledge. In a large country such as ours there are less than a hundred biologists. Therefore if we want to safeguard our wildlife effectively, steps should be taken for the training of more biologists.

Biology is not attractive to our youngsters. They prefer to choose law or medicine – a fact which we think is not peculiar to Indonesia. Not only therefore is the number of prospective biological students small but the quality of those who do study biology often is poor. They are generally people who are forced to do so since they were not accepted in any other school, due to their inferior scholastic performance.

The main factors which influence the attitude of our young people towards biology are:

- (i) the higher social status of lawyers and medical doctors in comparison with biologists,
- (ii) lesser opportunity for biologists to make money, and
- (iii) lack of understanding of the nature of biology as well as of the role of biology in the development of the country.

It is of course very difficult for us to change the two first mentioned factors, but it is well within our reach to remedy the third one. We trace it as mainly being caused by the unsatisfactory method of teaching of biology in the high schools. The problems involved are as follows:

1. Biology is taught as a set of facts to be memorized, not as a science.
2. Lack of demonstration material due partly to shortage of teaching aids and partly also to the ignorance of the teachers.
3. Shortage of modern textbooks. Those in use now were written before the war.
4. Theoretical lectures with little indication of the practical uses of biology.
5. Biology is regarded as of minor importance by education officials.

## **TEACHING BIOLOGY**

From the discussion above it seems clear that the teaching of biology forms a bottleneck in our efforts for the development of the biological sciences in our country. As a first step in correcting this a workshop for high school biology teachers was held at National Biological Institute last September (1965). The workshop lasted for two weeks with 23 participants who were housed in the Botanical Garden thus ensuring that they were exposed maximally to the biological influence. The teaching staff was drawn from staff members of government institutes and colleges making a co-operative effort in which research scientists and teachers worked together.

The aim of the course was to teach the students to use nature as a laboratory. We concentrated our lectures on biological phenomena in the tropics and taught the students that teaching materials were abundant in their surroundings. Laboratory exercises were given, excursions organized, and recent developments in biology were introduced by means of lectures and films.

It is too soon to tell if the teaching of biology can be improved by this means but the results of the course seem heartening and the enthusiasms of the biology teachers has been aroused.

## **CONCLUSION**

As a result of this first experience we plan to proceed as follows:

1. It seems justified to hold the course at least once a year in order to up-grade the high school biology teachers. Because the number of teachers is large and the facilities of the National Biological Institute are limited we will not try to up-grade all high school biology teachers, but rather serve as a nucleus to disseminate new findings and stimulate other institutions to take similar steps.
2. Produce better teaching aids.
3. Publication of a more popular scientific journal for teachers to keep abreast of new developments in biology.
4. A new textbook should be compiled as soon as possible, based perhaps on the American BSCS.

## Part 2

### Training in Conservation

#### Training Asian Students in Resource Management

by

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#### SUMMARY

The author points out the obvious needs for and problems related to training in resource management in general and for Asian Trainees in particular. Trainees are likely to be already in government service and lack university training and both time and funds for lengthy programs of study. A minimum of 4 months and preferably 1 year is required for any comprehensive study period abroad. The author presents a 6 month to 1 year program consisting of 3 component parts: institutional affiliation, internal travel, and operation of public agencies. He discusses and outlines the important aspects to be covered within each of these component parts.

#### INTRODUCTION

At a time in earth's history when the pressures of human numbers challenge our abilities to sustain and to enhance wise utilization of natural resources, it becomes a truism to say that effective training in resource management is both good and desirable. No one can oppose the purpose. Yet even in technologically advanced countries resource training is not generally available in organized programs of study. Various expedients within university curricula and governmental agencies have been followed to satisfy the obvious need.

The need to train conservation and resource officers in South East Asia is equally obvious, but in this area too certain expediencies are required. The major differences between candidates for intensive training in resource management in South East Asian countries and in the United States, for example, are two. First, in the United States there are far more students educated at the university level in curricula basically related to resource analysis. Hence, a sizable body of well-trained people adaptable to specialized resource training is available. Secondly, specialization in public agencies and the corollary awareness of the desirability of continued education within specialized capacities are a well established custom in governmental administration. These differences between the United States in this instance and most South East Asian countries render particular meaning to my belief that, initially at least, expediency is the rule in training Asian resource-oriented officers.

#### BACKGROUND OF TRAINEES

Asian candidates for specialized training are apt to be already in government service, lacking in university training (relevant at least to resource management), and lacking in both time and funds for lengthy programs of study. It may be assumed that such candidates are able, interested in the technical aspects of resource management, and have sufficient educational and practical experience to undertake further study. It may be further assumed that the governmental agencies concerned will grant sufficient leave time and make available such funds in support of the candidate as is possible. Very likely, however, funding under the control of various international organizations must be depended upon in good part if a period of training abroad is required.

## **PROGRAM OF STUDY**

In my opinion four months is the minimal period required for any comprehensive study period abroad. Only a senior official with special problems requiring resolution in mind will profit by shorter stays. Preferably a study program should be at least one year. Where the site of study is to be depends on many factors. I shall discuss only a program adaptable to study in the United States and Canada. The program discussed below requires six months to a year for its execution. It has three major components; Institutional affiliation: internal travel: and operations of public agencies.

### **1. Institutional affiliation**

The basic choice here is between an established college or university offering resource-related programs of study and public agencies already operating in resource management. There are advantages to each type of affiliation. Generally, affiliation with public agencies is a better choice for experienced candidates with only a short stay in mind. For longer periods university affiliation is preferable for it offers not only the contact with public agencies but several other advantages as well. A trainee might be expected to accomplish the following program at a university in six months to one year's time.

- (a) Attend formal lectures on the biology, geography of management of natural resources. Major universities all have relevant curricula; several universities and colleges in the United States and Canada have administratively separated resource programs.
- (b) Learn to use the facilities of a research library. It is imperative that a trainee know well the sources of published information upon which he will draw in the future.
- (c) Associate with other students and trainees. Informal association with others interested in resource problems is an invaluable source of information and judgment and it, of course, provides pleasurable social contacts. There are as well on many campuses local student or professional organizations that formalize these interests.
- (d) Prepare formal reports on progress. As a measure of the candidate's application and knowledge, a supervisor or sponsor might expect written reports on selected topics. Ordinarily these reports will concern specific topics of need or interest appropriate to the country of the trainee.
- (e) Prepare detailed research or organizational plans for specific operations in the home country. This last phase is the most significant and should be reserved for the last months of the candidate's stay. It constitutes a measure of the candidate's learning and a prediction of the likely effectiveness of the candidate upon return to his own country.

### **2. Internal travel**

Normally a trainee will have a fixed base in his host country. It should not be expected, however, that the trainee remain only at his base whether university or governmental agency. Planning the candidate's program of study must include both time and funds for internal travel. The purposes of such travel are inspection visits, consultations, and attendance at professional meetings. The nature of visits will vary with the candidate's interests. They might include inspection of the operations of specific agencies, particularly of national or regional headquarters. Visits to special sites such as national parks, management areas, refuges, and research stations are certainly desirable. Consultations will normally be within agencies related to the candidate's direct responsibilities in his home country and will preferably devolve upon particular individuals professionally known for their specific abilities in the area of the candidate's interests. Attendance at national meetings (e. g., the North American Wildlife Conferences) has the value of contact with leaders in the resource field and of listening firsthand to reports on the current status of many resource problems. The value of personal contacts made at these meetings for the professional future of the candidate can not be minimized.

### 3. Operations of Public Agencies

Proper use of natural resources requires governmental regulation. In the United States and Canada a great many agencies of government are charged with the administration of resources. Since an Asian candidate for resource training very likely will return to government service, it is imperative that he understand the manifold aspects of resource administration in countries where it is highly developed. Needless to say, the candidate upon return to his own country will need to decide what aspects of administration and management are most suited to his own situation.

Rather than list specific agencies, let me outline the general categories of administration common to all such agencies. I need also to emphasize that the practical student, whether university or agency based, must consider the operations of public agencies as a prime interest of his studies.

- (a) Administration – the selection of personnel; the structuring of the agency; the relationship to other resource agencies.
- (b) Sources of support – the sources of funding and the manners by which funds are acquired and allocated.
- (c) Law enforcement – the legal basis of resource administration and the manners of enforcing regulations.
- (d) Education – the techniques of public education in conservation and the manner of 'in-service' training for specialists in governmental employment.
- (e) Research – the methods of management research; determining priority of research programs; the problems of policy-directed research.
- (f) Management in operation – the immediate problems and effectiveness of resource management programs in practice.

### CONCLUSION

The foregoing program is demanding and only the best, self-disciplined candidates can expect to profit by it. Nor is the program the ideal! Yet I believe from my experience in South East Asia and in training Asian students in the United States it constitutes a reasonable approach to resource training at this time. We might expect a concerted effort to train many Asians in the methods of resource management to lead naturally to local educational programs particularly adapted to the individual countries of South East Asia.

# Specialist Wildlife Training from the Standpoint of an Asian Trainee

by

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## SUMMARY

The author, a trainee from a Malayan Game Department, highlights some of the important factors in his own overseas training program in the U. S. and Canada and gives a summary of what he has gained from the experience, including his conviction of the value of wildlife management and what it involves. He discusses various aspects of wildlife management and training that are particularly applicable to South East Asia in general and Malaya in particular – including the necessity of selecting interested and appropriate personnel to do wildlife work and presents suggestions and recommendations.

## INTRODUCTION

As a member of the Perak Game Department I was exceedingly interested in the procedures for carrying out research on the larger mammals of Malaya in order to obtain quantitative data for use in making administrative decisions. The opportunity to study in the United States as a Fulbright exchange scholar made it possible to begin my technical studies.

It was decided that on the academic side I should spend as much time as possible studying in the library and working with departments and students engaged in research related to my desire for practical knowledge; second, that I should work in the field, in laboratories, offices, and with the staff of the State Fish and Game Department, National Park Service, and Zoos; third, that I should attend as many conferences on wildlife as possible.

## OBSERVATIONS

A period of eight months has gone by and I have derived a good understanding of the following principles of wildlife management:

1. The welfare of birds and mammals depends on complete protection at the time of nesting and breeding and on a limited harvest of the annual crop so that the losses to a game population through hunting and natural destruction are offset by natural reproduction.
2. A combination of biological management, law enforcement, and the formation of game refuges and sanctuaries to provide breeding grounds to preserve rare or vanishing species is necessary to ensure the survival of wildlife.
3. Wildlife departments should be responsible for making surveys of game populations for effective management measures. These would indicate where population control was necessary or point out where refuges or other protection was needed.
4. Related departments such as fisheries and forestry should integrate their practices to develop and maintain game populations.
5. Biologists should be invited to participate in proposed timber sales or logging operations, and in planning for forest improvement so that an interspersion of plant species beneficial to game animals can be achieved.

6. Intensive management units should be established. Areas are needed where dense populations of important species can be established in order to provide breeding stock which could populate neighboring areas.
7. Administrative decisions should be based on the results of research findings recommended by the biologists.

## **CONFLICT BETWEEN WILDLIFE AND AGRICULTURE**

It often appears that wildlife managers and agriculturalists are in direct conflict, the former interested only in land use as it pertains to game species and the agriculturalist wanting land only for his own direct purposes. However, co-operation for the benefit of both can be achieved in several ways. I will discuss only those methods I feel to be most effective in South East Asia.

In Malaya small plots of land scattered throughout the country have been given out to families for agricultural purposes. Many of these are in remote areas close to game herds which are often stranded in patches of forest. They then break out with consequent damage to crops and the resultant human demand to exterminate the herd. Had these plots been grouped together in one large development, crop deprivations by wildlife would have been easier and cheaper to control.

Prior to deciding that land should be put to agricultural use the government should consult with the wildlife manager to avoid such errors as clearing land for agriculture in places particularly attractive to game, as between natural salt licks, with the resultant wildlife deprivations.

## **TRAINING FOR WILDLIFE MANAGEMENT**

I strongly feel that the correction of problems depends on experienced officers and that intensive training more speedily renders an officer capable of understanding the varied problems he faces. Basic problems remain the same whether in the United States or Malaya, and wider experience enables quicker identification of those problems unique to an area.

The study program for a trainee with limited time and/or education should be tailored to his abilities. He should be taught basic principles of wildlife management and suitable procedures for carrying out research on important aspects of wildlife.

Fully qualified wildlife management personnel should attend to more difficult biological problems such as disease, poisoning, parasites and things of similar nature. Expert big-game biologists would make excellent advisors in many of the South East Asian countries and each completed research project would be an important contribution.

In Malaysia at the present time a research division should be set up consisting of one big-game biologist with one or two assistants. Objectives should be to obtain quantitative data which could be used in making administrative decisions relative to control programs on the habits, populations dynamics, habitat relationships, and ecological relationships of animals. An annual report should be prepared to include research findings, a summation of management programs and a suggested program for the following year. Technical publications should be prepared on the completion of each project.

Wildlife officers should be carefully selected for their suitability for wildlife work. Many applicants for these positions have no aptitude for the work at all and apply upon leaving school simply because there is a vacancy. To overcome this, members of the wildlife department should sit in on the selection board. Scholarships and other grants for special training should be distributed on the basis of individual merit and not on status. Those returning from study abroad should be required to prepare a detailed report of their training and to pass on their newly gained knowledge to others in their fields of interest.

I have personally been fortunate in the way that my training was planned in the United States and Canada. It has given me a clear picture as well as practical knowledge of the problems in North America and I have been able to compare these with those of Malaya. There is no doubt in my mind that research is very urgently needed in Malaya in order to solve the pressing problems before us. Information thus obtained when applied within existing law enforcement practice would greatly help solve the immediate and pressing problems before us in Malaya.

# Education and Goals in Wildlife Conservation

by

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## SUMMARY

The value of wildlife as a resource may be realized in several ways, recreational, economic, and scientific. In order for the government to discharge its obligation toward conservation of the wildlife resource it must rely on well-trained staff. The nature of wildlife training and the general scientific background required are discussed in this paper. A national wildlife conservation program needs to be developed in several stages starting with an initial survey, going through a phase of research and experimental management and having as a goal a continuum of land-use and wildlife conservation practices extending from remote wilderness to urban lands.

## WILDLIFE VALUES

Wild animal life represents a natural resource of great value to any nation fortunate enough to possess a rich and varied animal fauna. If properly preserved and managed the wildlife of a nation can be of direct economic value as well as contributing to the enrichment of the aesthetic life and scientific knowledge of its people. A nation that allows its wildlife resource to be depleted or destroyed wastes its heritage and impoverishes the life of its people. Fortunately, however, wild animals, like all other living things, represent a renewable resource. With protection and care, depleted wildlife populations will recover and regain abundance. Mistakes of the past can therefore be corrected through present care. So long as the wild animal species remain, and the soil and vegetation of their habitats persists, there is hope for the future.

The value of a wildlife resource can be realized in many ways. In countries such as the United States the recreational and scientific values are paramount. Hunting, fishing, and vacationing in wild areas are all major recreational pursuits. Research on wild animals is a continuing endeavor which has contributed to knowledge of fundamental biology and ecology, and has been of great value to land-use and behavioral sciences.

Countries that possess an abundant and varied population of large, wild grazing mammals, can realize a direct economic benefit through careful exploitation of this resource. Game cropping of native wild mammals can yield more meat and other products than if the same area of land were used for imported domestic livestock. However, as in East Africa, countries with such large and varied game populations can often obtain even a greater income through the protection of these animals and their habitat for the benefit of tourists. The nations of tropical Asia have the opportunity to develop both national parks of great interest to visitors, and wildlife cropping areas from which direct economic returns can be realized, if they act to conserve and increase the varied populations of wild mammals that exist within their boundaries.

## WILDLIFE EDUCATION

In most countries the conservation of wildlife is recognized as a proper function of government. In order for a government to discharge its obligation toward conservation of the wildlife resource it must employ people who are trained in wildlife biology and

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management, including scientists, administrators, technicians, and law-enforcement officers. To provide this man-power it must develop universities and technical schools to provide the proper knowledge and training.

Wildlife scientists and administrators can best be trained at the post-graduate level in a university. Technicians including those involved with law-enforcement need not necessarily have a university background. A technical school such as the College of African Wildlife Management developed at Mweka in Tanzania can turn out capable technicians able to gather data in the field and to enforce wildlife protection regulations. Since it is important in the early development of wildlife conservation to train large numbers of field men as rapidly as possible it is usually necessary to forego the otherwise desirable background of a university education.

The question of how to provide the best wildlife education in college or university is one for which there is no generally acceptable formula, but there is nevertheless, a broad area of agreement. General training in botany, zoology, and chemistry is emphasized in all institutions. Building on these general sciences it is also agreed that the wildlife biologist should have a knowledge of plant taxonomy and identification, plant physiology, plant ecology and become thoroughly familiar with the local flora. Vegetation provides the habitat and the food upon which animals depend, and without the knowledge of how to conserve vegetation there can be no maintenance of wild animal populations. Further knowledge of the environment can be provided through training in geography, geology and soil science.

In zoology education must go beyond the general level to more detailed training in animal anatomy, physiology, genetics, and taxonomy. An essential part of animal ecology is education toward understanding the dynamics of populations and the factors limiting rates of increase. In the area of wildlife management the student is trained in techniques for managing the vegetation and natural environment in such a way as to produce or maintain an optimum abundance and variety of wild animals, and in the direct management of animal populations.

Since the success of wildlife conservation depends upon its acceptance by people it is also worthwhile for the wildlife scientist or manager to be trained in the social sciences which will enable him to fit a program of wildlife conservation into the economic and cultural framework of his society. Obviously the ideal individual who is both broadly and deeply educated in all of these areas is rare. However, the university-trained scientist or administrator should know how to enlist the aid of specialists with more concentrated training in each of these various fields.

## **WILDLIFE PRACTICES**

The first job to be performed by any wildlife organization is a survey and inventory of the region involved to determine the distribution and abundance of wild animals, the status of their habitats, and the identification of any wilderness or natural areas that still exist. Preservation of these areas – in which a natural balance exists between wild animals, vegetation, and environment – for future study will prove invaluable to an understanding of the ecology of wild populations of plants and animals.

Following the survey, the first management steps can be taken which may involve initially only the passage and enforcement of regulations protecting wild animals and their natural environments. Where species are abundant these steps can include the limited cropping of some wild animals for the purpose of determining both biological information and economic values. Research should continue on the life history, behavior, and ecology of individual species and populations of animals. In this research it is important to begin to identify factors of the environment that might serve to limit the increase of wild animal populations.

The next phase in both research and management usually involves the experimental management of both habitat and species in efforts to determine how best to maintain a stable balance among species populations in these areas to be protected, or how best to obtain the highest productivity and yield in areas to be exploited for hunting or cropping.

From continuation of investigations and experimental management and integration of their results with land-use planning for a region, it is to be hoped that eventually a continuum of land use, vegetation management and wildlife conservation will be developed throughout a region extending from remote wilderness to urban lands. The development and maintenance of such a land-use and wildlife continuum representing an optimum balance between wild nature and human use can be regarded as the final goal of wildlife conservation.

# Conservation Training Needs in Tropical South East Asia

by

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## SUMMARY

The public in South East Asia must be educated to understand and conserve their natural resources and to understand the complex ways in which nature works. A description is given of the ways in which public sentiment for conservation, particularly among the young, can be achieved. The training of full time government wildlife personnel is urged as well as the setting up of local wildlife training schools. The author gives specific suggestions for the curriculum of such a school. He also thinks experts from South East Asia might visit nearby countries to train needed personnel locally.

## INTRODUCTION

Throughout the centuries man was, is and will be the greatest threat to nature. Before it is possible to make him co-operate in the preservation of nature, he must be educated and made to understand what nature is. Unfortunately in most South East Asian countries, conservation is merely a name to the public. To them an explanation is necessary, and it is imperative that they be informed that conservation not only means the caring for and the intelligent use of land, water, plant and animal life with the aid of scientific research, but that it also means attempting to understand the complex ways in which nature works. This knowledge has to be utilized to aid man to work with nature instead of against it. By unwisely tampering with his environment man has created problems such as soil erosion, dust bowls, water pollution, deforestation, creation and spread of pests, and losses of shade and scenery. In his foolishness he has caused the extinction of several species of birds and mammals, and Nature certainly extracts a heavy toll for his mistakes.

## PUBLIC SENTIMENT

Without the aid and co-operation of the public, very little can be achieved in the field of wild life conservation. The creation of public sentiment among young and old is important and can be achieved in several ways.

The interest of young people can be aroused through films, posters, photographic and essay competitions, lectures illustrated with slides, junior zoological societies, zoological outings and junior warden's clubs and camps.

Boy Scout camp or camps of a similar nature are not suggested. The camps should be for youths 15 years and above; sponsored by adult zoological societies or other interested bodies, and run by responsible and qualified persons. Camps should be conducted for a set period in a pre-selected national park, sanctuary or some suitable area, where accommodation is available. Fees should be levied to cover food and transport costs. During the camping period campers should be given conducted tours to various places of interest like water holes, salt or mineral licks etc. Lectures in elementary forestry, tree identification, map reading, the study and identification of insects, birds, animals, and practical demonstrations in bird banding and taxidermy should be given. At the conclusion of the camp proficiency tests can be conducted and prizes awarded.

The interest of adults can be stimulated with the aid of films, public lectures with slides, photographic and poster competitions, zoological societies and conducted tours in national parks or sanctuaries.

The interest of people must always be maintained by some sort of activity. Wildlife propaganda must be launched with the aid of newspapers and other interested bodies like the Shell Company who have devoted a great deal of their time, energy and money on wildlife propaganda. Wildlife protection societies can be formed to stimulate public interest, and a magazine published regularly.

### **ZOOLOGISTS' CLUBS OR JUNIOR WARDENS CLUBS FOR YOUNG PEOPLE**

These clubs should be for young people from 10 - 19 years of age. Qualified zoologists should provide lectures and arrange for discussions and brain trusts. Demonstrations should be given on animal care and animal photography. The club can run a weekly column in a newspaper and answer questions on wildlife. Field collecting trips and study courses should be encouraged.

A wildlife magazine – for young people is, I think, a necessity.

### **SCHOOLS**

Educational institutions can and will play an important role and available opportunities should be harnessed and made to cater to conservation training needs. Students and trainees can be made enthusiastic through zoological or natural history societies, and lectures, preferably illustrated, can be given by qualified persons. If possible after consultation with educational authorities conservation training should be introduced into the regular curriculum. Activities like bird banding, outdoor observation of birds, animals and insects, wild life photography and taxidermy should be encouraged. Periodic visits to zoological parks and natural history museums would be beneficial.

### **TRAINING OF TEACHERS/LEADERS**

An enthusiastic teacher is a good and capable leader. The training of school teachers must not be overlooked or neglected. Nature conservation lectures can be introduced into training schools for teachers by arrangement with the local education authority.

### **TRAINING OF FULL TIME PERSONNEL IN GOVERNMENT BODIES ENGAGED IN WILDLIFE CONSERVATION**

In most South East Asian countries wildlife protection is undertaken by the Forest Department, usually through an understaffed game branch, lacking in experts and well-trained men. Although large tracts of land comprise national parks or sanctuaries in each State, the local authority is hard put to find interested men to join the service, and available men have little or no education. Why educated men are unattracted by the service is a matter which will not be discussed here. If national parks, sanctuaries and wildlife conservation measures are to succeed then something must be done to train available staff.

### **NEED FOR REGIONAL WILDLIFE TRAINING SCHOOL**

It will not be practical or economical for each State to have its own wildlife training school. Furthermore, if selected men are sent for training abroad they will study problems which may perhaps prevail only in the country where they study, and will therefore be alien to South East Asia. On their return trainees will probably be baffled by the problems prevailing in their own countries. As various aspects of nature such as geography, climate, fauna, flora, political and financial aspects are more or less

common to almost all South East Asian countries, the establishment of a South East Asian Wildlife Training School is suggested in some country where the political situation is stable. Such a scheme would certainly have advantages such as:

1. The training program would be more applicable to conservation programs in South East Asian territories.
2. The cost of training will certainly be less than if undertaken in countries with completely different ecological problems and a higher cost of living.

### **CURRICULUM FOR PROPOSED WILDLIFE TRAINING SCHOOL**

A curriculum for this school has to be formulated after deliberation, and the syllabus should cover subjects such as:

The duties and responsibilities of game officers to the public and the State;

Wildlife management, protection and control;

The establishment and maintenance of national parks, game and bird sanctuaries;

Prevention and detection of poaching, the collection of evidence and the questioning of witnesses;

Ethics involved in hunting, and the necessity to minimize suffering caused to animals;

The dangers of overstocking land, and the destruction that can be caused by it;

Control of animal populations – planning and carrying out shooting schemes;

Elephant driving techniques, methods of trapping birds, animals and taxidermy;

Game barriers such as electric fences;

The control of predators and diseases, the marking and release of animals, handling, caging and their transport;

The natural history of mammals, birds, reptiles, their habits, reproduction, survival and mortality rates;

Instruction should also be given in legal and court room procedure, government methods and organization, the care and maintenance of weapons, supervision of subordinates and the necessity for close liaison with other government departments.

As game officers have frequently to carry out constructional work without the aid of qualified men, this subject should not be overlooked. Trainees should be taught how to build huts and camps, make and repair roads, wells and small tanks.

The interpretation and drawing of maps and elementary surveying is necessary. The ability to draw a good sketch map and to use a compass are considered very important. The sighting and marking of boundary lines should be taught. Lectures in first aid, the use of specialized equipment and the use of radio communication should also be given.

These suggestions may tend to make the course predominantly academic but half the time should be spent in the field and every opportunity taken to make the course realistic.

### **ALTERNATE OF A 'TRAVELING FACULTY'**

In connection with the South East Asian training school the most benevolent of governments sometimes encounter difficulties financial or otherwise, and may not be able to send their officers to training schools abroad, and at the same time lack facilities to set up proper training establishments within their own countries. It is, I think, reasonable to suggest that a scheme be drawn up whereby experts from South East Asia could visit countries where the need for training exists and conduct training courses. A suitable syllabus covering a wide range of subjects should be drawn up after consultation with the heads of departments of the various states.

The panel of experts should comprise people from South East Asia, who would be in a better position to cater and appreciate the training needs and problems of South East Asia than for instance experts from outside who would only know the problems and difficulties which exist in their countries.

# Conservation Training in Parks and Recreation Management in the Philippines

by

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## SUMMARY

There is a critical need in the Philippines to offer training in parks and recreation management in particular and conservation education in general. Such education should be emphasized from the elementary level through the university.

Currently, the College of Forestry of the University of the Philippines is the best qualified institution to initiate conservation education in the country. Proposals for an initial program are described.

## INTRODUCTION

The Philippines is pre-eminently an agricultural country with a newly developing economy and a rising standard of living. With increased mobility and decreased number of working hours, people have more leisure time to engage in varied outdoor recreational activities, but at the same time industrialization, technology, population increase, and overall economic advancement eat up large tracts of lands and will gradually push back the forest lands to the hinterlands. National parks and other nature reserves may be steadily sacrificed to the inevitable demands of progress.

A giant task of park development, rehabilitation, and reconstruction will have to be launched if the growing outdoor recreation needs of an expanding middle class are to be satisfied. Furthermore, if tourism is to increase its dollar earnings national parks and other unique natural features will have to be developed.

## THE NEED FOR A CONSERVATION EDUCATION IN THE PHILIPPINES

Although the percentage of literacy in the Philippines is one of the highest in the world, it is considered to be one of the lowest in conservation education. Of all the public and private secondary schools, colleges, and universities in the Philippines not one offers a curriculum in natural resource conservation. The few students who go to agricultural and vocational schools are offered some subjects directly or indirectly geared towards conservation, but these programs are pitifully inadequate to take care of about six million students in the entire country.

In a country like the Philippines where the natural resources are being exploited at an alarming rate, conservation education will play a major role in the proper husbandry of these resources. Kaingins (illegitimately cleared areas), unregulated logging, timber smuggling and other forms of wasteful forest exploitation all aggravate the country's denudation problem. However, these activities can be minimized if not controlled, through conservation education.

Conservation indoctrination has to start from childhood and should be initiated in the schools from the elementary level through college, for these children in school now will be the future government leaders.

Nationwide curriculum revision in all public and private elementary and high schools is needed if the integration of the conservation concept to the present curricula is to be

accepted and fully implemented. This will require the concerted effort and interest of highly competent educators, planners and policy makers, law makers, and die-hard conservationists.

The various agencies responsible for the administration and management of the various outdoor recreational areas are with the exception of a few, staffed with men who lack training in conservation. National parks and reserves are poorly and inadequately designed and developed and extensive areas of land lie idle which could be utilized and developed for recreational purposes and tourist attractions. There is an urgent need for training in management and conservation if national parks and reserves are to be scientifically and realistically planned and managed.

### **ROLE OF THE UNIVERSITY OF THE PHILIPPINES COLLEGE OF FORESTRY IN INITIATING CONSERVATION EDUCATION IN THE PHILIPPINES**

The only school in the Philippines which offers courses directly or indirectly geared to conservation is the College of Forestry, University of the Philippines. This is the only forestry school in the country and is among the better known ones in South East Asia drawing students from throughout the area. The greatest percentage of foreign students is from Thailand.

The faculty of the college is relatively young but highly competent, trained abroad largely in the United States and also to a limited extent in Australia and Germany. Three curricula are offered at present:

1. a two-year sub-professional Ranger Course;
2. a four-year undergraduate curricula in Forest Resources Management, and
3. a four-year undergraduate curricula in Wood Science and Technology.

It is in the Forest Resources Management curriculum where training in conservation fits in. Most of the courses offered deal with aspects of forestry where conservation is directly and indirectly emphasized. Watershed, range, recreation, and timber management are covered in basic terms.

Some of the other courses basic to conservation and management of the natural resources are offered at the adjacent sister institution, the College of Agriculture of the University of the Philippines.

At present there are two faculty members of the College of Forestry who have trained abroad directly along the line of conservation, one in watershed management and the other in parks and recreation management. The latter individual is not used advantageously by the College at present as a teacher but the training abroad has broadened his outlook, his critical analysis of problems and has helped him in the formulation and preparation of the conservation curriculum.

However, training abroad is expensive for a developing country and local training would be cheaper and more easily oriented to local conditions. The College of Forestry, University of the Philippines, would be in a position to train students scientifically with but a few additions to its present teaching staff.

To start a conservation curriculum with a major in parks and recreation management the following fields of specialization are deemed necessary in addition to those that the college already offers; (see Annex A).

1. Parks Planning and Design (this would need two additional people trained abroad).
2. Parks and Recreation Management.
3. Natural History Interpretation.
4. Natural Resource Economics.

The College of Forestry, as a pioneering institution in forestry and related fields should take the initiative in attracting more and better quality students to take up forestry or recreation management as a career. It should produce enough graduates to both fill the jobs with private lumber firms and to adequately and competently man the parks and reserves.

## **TECHNICAL ASSISTANCE AND FACULTY TRAINING PROGRAM SOUGHT**

In terms of physical plant, the College of Forestry is capable of expanding its present program to initiate conservation education or training in the Philippines, but technical assistance and faculty training are needed to start. In view of the pressing needs of the country for trained conservationists to administer and manage the country's rapidly dwindling forest resources, the College has acted upon Dr. Lee Talbot's recommendation to the Philippine Government for 'expanded training in the management and conservation of natural resources'. A five-year training program calls for five foreign technicians serving two-year tours to advise in different fields of conservation. The program also calls for the training of at least five Filipino faculty members in various fields of specialization in conservation. This proposal is intended to be submitted to various international educational organizations for possible technical and financial assistance.

If finally approved, this will be the first technical assistance granted purely for the promotion of conservation education in the country. The program's goal is not merely the training of forestry students who will major in conservation, but also in-service training for employees in related government offices and teachers in both public and private, elementary and secondary schools who do not have training in conservation. Workshops or short courses are also planned to suit the specific and urgent needs of recreational agencies.

The success or failure of the initiation of conservation education in the Philippines rests with the handful of conservation-minded citizens who have the interest and energy to carry the work forward. Implementation of the above program would be a major step forward in a co-ordinated national recreation effort. The training in parks, and recreation management in particular as one phase of conservation, will greatly revitalize and staff the different agencies with conservation-oriented men.

## ANNEX A

The following courses with descriptions are recommended or proposed for teaching for students majoring in Parks and Recreation Management. These will be in addition to basic subjects offered by the U.P. College of Forestry.

1. Natural Resource Economics –  
Economic principles, practices, and problems associated with the administration and management of public forestry resources.
2. Principles of Outdoor Recreation –  
The beginning course in a series of recreational management courses. The importance of outdoor recreation from economics, social, and cultural standpoint will be emphasized. The tangible and intangible benefits or values derived from direct and indirect participation in outdoor recreational pursuits will be discussed.
3. Parks and Recreation –  
A survey of park and recreation development around the world with emphasis on tourism will be expounded. Tourism activities and promotions in the Philippines will be covered.
4. Recreational Use of Wild Lands –  
This is a basic study of the recreational use of forest and wild lands. The history of recreational interest in the outdoors, the administration, and management of varied recreational lands. Visitation to park and other recreational agencies will be conducted at the latter part of the course.
5. Parks Administration and Policy –  
Park administration and personnel organization. Organization of park and recreation departments. Fundamentals of public park and recreation policy.
6. Parks Development and Management –  
Field study of park construction and management practices. Construction and maintenance of structures and facilities used in recreation areas. Development and use of roads, trails, and interpretive facilities.
7. Graphics –  
Lettering, orthographic and auxiliary projection, sectioning and dimensioning methods. Detailed working drawings and technical sketching.
8. Parks Planning and Design –  
Plan and design of recreational areas and facilities based on modern park practices and standards. A person trained in landscape architecture will handle this.
9. Natural History Interpretation –  
A detailed study of interpretation of park features and interpretive facilities on varied recreational lands. Emphasis will be made on museums, roadside, trail exhibits, self-guiding trails, park libraries, and related interpretive facilities.
10. Ecological Foundations of Resource Use –  
Principles of general and human ecology applied to the administration and management of forestry resources.  
These are courses basic to conservation with emphasis on parks and recreation management.

# Middle Grade Conservation Training in Africa

by

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## SUMMARY

Africa is a continent of great natural resources. Some of these have been conserved through age-old practices and taboos and others have been squandered and misused. To prevent catastrophes from occurring more education and training is needed.

The author describes the assistance that has been given to African countries with special emphasis on that provided by FAO (for medium grade technicians) in the field of fisheries, wildlife, and forestry.

## INTRODUCTION

Africa's natural resources reside in its lands, soils, vegetation, fauna, waters, seas, and in its human populations. From time immemorial, man's efforts have been directed towards carving a niche in the environment of these natural resources.

On the one hand techniques, however primitive they may be considered in terms of modern technology, have been evolved for utilizing part of this resource without jeopardizing it. A homely example is the common snail which sometimes forms the only 'meat' element in the diets of many Africans. It has long been the practice to beat the 'talking drums' to announce the advent of the snail collecting season. This harvesting coincides with the maturity of the snail – a very highly developed tenet of conservation of a natural resource.

The conservation concept of the harvesting of the maximum yield of the maximum potential is written large into the taboos and customs of African life and lore. On the other hand the list of abuses and misuse of the resources is likewise long. Consider for example, over-grazing of domestic animals, the virulence of annual 'bush' fires, overcutting of forest produce, 'shifting cultivation' on precarious watershed, etc. The lessons of conservation which have their foundations in ecology appear not to have been learned in the colonial era; even today, most African states in their bid to grow more food, are embarking on large scale mechanized agriculture without stopping to take a leaf from the experience of the United States in the creation of the Dust Bowls in the midwest. Resource conservation is only appreciated by states after the catastrophes induced by the negligence of their own citizens have occurred.

The recurrence of these catastrophes is bound to continue. Resolute national policies based ideally on the total evaluation of the ecology of the areas and the sociology of their peoples need to be enunciated. These should form the basis of national development plans in agriculture with sensible land-use programs. All this calls for training and education for the rural population, government executives, and planning, advisory and supervisory personnel at all levels.

## EDUCATION IN CONSERVATION

In this decade of achieving political independence, almost all African states have rightly given high priority to education, formal and informal, drawing on the technical assistance provided by both bi- and multi-lateral inter-governmental bodies. Nor have the non-governmental bodies been passive in their efforts. For example, the IUCN, (under whose auspices we meet at this Conference) through its commissions has made governments aware of the problems that may confront them in the conservation of their natural wealth.

The United Nations and its specialized agencies have been in the forefront of assisting African states in the resolution of some of their problems in conservation and natural resource management. FAO in 1962 started a special program for education and training in Africa with the aim of assisting member-countries in the planning and development of a sound, properly integrated, and economic structure of education and training in the fields of food and agriculture. A number of seminars and training centers have been organized, fellowships for study have been granted to Africans; agricultural advisors have been posted to different parts of Africa.

To my mind the most important aspect of technical assistance is in the in-service training that is given on the job to the local counterparts of international expert personnel. This has caught on very well and is the more desirable as the countries cannot easily afford the withdrawal of personnel from the field in order to give them formal education in classrooms. Examples of efforts in three fields,

1. fishing,
2. wildlife, and
3. forestry are given below:

### **FISHERIES**

In order to cope with training needs two seminars – one in Accra for English-speaking countries (1963) and one in Abidjan for French-speaking countries (1965) have been organized. A special FAO consultant has recently visited some West African countries to study existing training facilities and needs, and EPTA and Special Fund Fisheries Experts are giving training on the job to local personnel in marine and freshwater fisheries-. This has helped to directly raise the level of operations of the fishermen and to instruct them so that the knowledge may be disseminated to other parts of the country.

### **WILDLIFE**

With the spectacular increase in interest in African wildlife and the importance of revenue from national parks, game cropping schemes, and other ways of utilization there has been a corresponding need for trained medium grade game wardens. To fill this need – for English-speaking students – the College of African Wildlife Management at Mweka, Tanzania was established with bi-lateral aid. The school has a senior diploma course, two years, for game wardens, and a junior certificate course for game assistants lasting nine months. For French-speaking Africa the formation of a medium-grade school at Garoua in Cameroon is proposed with United Nations Special Fund aid. These schools will provide a nucleus of trained game wardens on whom it will be possible progressively to build more efficient management of animals in national parks and reserves and all marginal lands.

### **FORESTS**

Twenty-three per cent of the total land area of Africa is in forest. For sustained yield management and preservation in perpetuity it is essential that there should be a continuous supply of highly trained and efficient foresters. It is essential to have an efficient professional university educated staff in a forest service, but such a staff cannot be effective unless it is supported by an adequate number of well-trained field executive technicians who can deal with all forestry operations of a technical nature, execute plans of operation, and train and supervise the labor force under their control. The training must be essentially practical with sufficient theory for a general background knowledge of vegetation and forestry.

Technical level forestry schools in fourteen African countries have a combined capacity of some 500 students.

The primary objective of these schools is to provide a supply of well trained technicians to fill government posts in the forestry service. A secondary objective is to provide technical training at a higher level to fit experienced rangers for the wider responsibilities of the post of forester. Other aims of the school include bringing in-service

rangers up-to-date through periodic refresher courses and through short extension courses given to other government officials to make the latter aware of the role of forestry in the national life.

FAO endeavors to give every possible assistance necessary for the improvement and development of forestry education and training in Africa in accordance with changing patterns and techniques in forestry.

## **CONCLUSION**

The agricultural development problems of Africa are legion. To tackle them needs battalions of trained personnel, doing the rounds of the villages and rural areas, bringing the fruits of local research, or exotic research proved under local conditions to the farmers who must be intimately involved in all Governments' plans for raising agricultural productivity. The road to success is long and the battalions of agricultural instructors at the medium level must be given time to march. As their numbers must be large in order to make an indelible impression on the rural agricultural communities, it is heartening to see the high priority that Governments give towards providing this institutional framework for its agricultural development. They deserve well of assistance that can be provided from bilateral or multilateral sources.

# Training for Effective Careers in Conservation in Thailand

by

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## SUMMARY

This paper presents the curriculum of the Department of Conservation, College of Forestry,<sup>1</sup> Kasetsart University for the training of professional conservationists upon whom the preservation of Thailand's rich natural resources depend.

## INTRODUCTION

Thailand has an extensive area of rich wildland that contains some of the kingdom's most valuable resources. Exploitation of the natural resources, especially forest and wildlife, has been wasteful and inadequately controlled in the past, and it is indeed regrettable to state that national conservation programs (except forestry) have started only recently. Realizing the importance of utilizing these natural resources wisely with the least possible waste and the greatest permanent yield, the Government of Thailand has taken the responsibility for formulating and organizing conservation practices to maintain the country's resources.

As the success of this policy depends largely upon a well-trained professional staff, Kasetsart University considers it a pressing need to supply qualified professionals to undertake the heavy task. A conservation curriculum was offered in the College of Forestry in 1965 and the Department of Conservation was established soon afterwards. The writer would like to point out that since conservation education in Thailand has just begun and is not yet clearly defined, this paper lacks many important conclusions.

## OBJECTIVES OF CONSERVATION CURRICULUM

The conservation curriculum has been set up with the following main objectives;

1. To give technical advice and assistance to students in line with the principles or organizational procedures and management methods and to guide the students' professional conduct towards the key role of conservation.
2. To furnish a comprehensive academic syllabus with reference to modern scientific and technological methods in accordance with conserving the country's natural resources.
3. To stimulate investigation on all facets of conservation and to establish a sound conservation research program, suitable to contemporary conditions.
4. To educate the public in conservation thus enlisting their support for the various conservation measures taken by the Government.
5. To collaborate closely with other governmental and public agencies concerned with natural resource conservation.

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<sup>1</sup> Throughout this paper the term 'College of Forestry' has been substituted for the Thai usage 'Faculty of Forestry' since the former term is more readily understood in other parts of the world.

6. To prepare graduates for advanced regional training courses leading to a master's degree in conservation.

(There is a proposal for such a course at Kasetsart University to be open to students from all South East Asian countries.)

### **CURRICULUM OF DEPARTMENT OF CONSERVATION**

A bachelor's degree in conservation is awarded upon the completion of the approved five-year undergraduate course. The first three years center on forest management; the last two on multiple-purposed forestry. The complete curriculum offered by the College of Forestry is given in Annex 1.

To strengthen the faculty and staff of the College of Forestry it is anticipated that promising instructors will be sent abroad to study and/or for educational tours to observe conservation technology in advanced and developing countries. Students majoring in conservation may find employment opportunities in education, government and industry. Professional advancement and increased income will come with more detailed specialized knowledge in the subject. The role of conservation is becoming more widely understood by the Thai public; among the five major departments in the College of Forestry the Department of Conservation has about half of the total number of students.

### **EMPLOYMENT OPPORTUNITIES**

Employment opportunity for students majoring in conservation may well include:

1. Educational employment – college teaching, extension service, public school teaching, etc.
2. Public employment – many governmental agencies need more and more conservationists.
3. Industrial employment – conservationists are needed to plan sound utilization of the resources used in industry to avoid shortage and disappearance of raw materials.
4. Professional advancement – in developing a detailed specialized knowledge in conservation, one may get better employment opportunities and increased income.

## ANNEX 1

### COMPLETE CURRICULUM IN CONSERVATION NOW BEING OFFERED AT FACULTY OF FORESTRY KASETSART UNIVERSITY

#### FIRST YEAR

##### First Semester

		Cr.	Lect.	Lab.
Eng. 111	Elementary English	2	1	3
Chem. 111	General Chemistry	4	3	3
Math. 113	General Mathematics	2	2	-
Soc. 111	Principles of Sociology	2	2	-
For. Mgt. 111	Introduction to Forestry	3	3	-
For. Engr. 111	Geometrical Drawing	2	1	3
Hyg. 111	Principles of Hygienes	1	1	-
Phys. Ed. 111		1	1	-
		<u>17</u>	<u>14</u>	<u>9</u>

##### Second Semester

		Cr.	Lect.	Lab.
Eng. 112	Elementary English	2	1	3
Chem. 112	General Chemistry	4	3	3
Math. 114	General Mathematics	2	2	-
Hum. 111	Social Developments	2	2	-
For. Mgt. 112	Forest Mensuration	3	3	-
For. Engr. 112	Surveying	3	1	6
Bot. 112	General Botany	3	2	3
Phys. Ed. 112		1	1	-
		<u>20</u>	<u>15</u>	<u>15</u>

Note: At the end of the first semester, the orientation tour to observe forest types is required for 15 days (no credit)

#### SUMMER CAMP

(9 weeks)

During April to June

		Cr.	Urs.
For. Biol. 111	Ecology	2	10
For. Biol. 112	Dendrology	2	10
For. Engr. 201	Forest Surveys	2	10
		<u>6</u>	<u>30</u>

SECOND YEAR

First Semester

		Cr.	Lect.	Lab.
Eng. 201	Reading and Writing	2	1	3
Chem. 201	Organic Chemistry	3	2	3
Zool. 111	General Zoology	3	2	3
Soc. 201	Rural Sociology	3	3	-
Silv. 111	Foundation of Silviculture	3	3	-
Phys. 114	Principles of Physics	3	2	3
Soils 111	Elementary Soil Sciences	3	2	3
Phys. Ed. 201		1	1	-
		<hr/>	<hr/>	<hr/>
		21	16	15

Second Semester

		Cr.	Lect.	Lab.
Eng. 202	Reading and Writing	2	1	3
Chem. 202	Organic Chemistry	3	2	3
Zool. 112	General Zoology	3	2	3
Soc. 221	Thai Society	3	3	-
Silv. 201	Practice of Silviculture	3	2	3
Phys. 115	Principles of Physics	3	2	3
Phys. Ed. 202		1	1	-
		<hr/>	<hr/>	<hr/>
		18	13	15

SUMMER CAMP

(9 weeks)

During April to June

		Cr.	Hrs.
For. Biol. 201	Field Dendrology	2	10
Silv. 202	Forestation	2	10
For. Mgt. 201	Forest Mensuration	2	10
		<hr/>	<hr/>
		6	30

### THIRD YEAR

#### First Semester

		Cr.	Lect.	Lab.
Eng. 220	Speech Laboratory	2	1	2
For. Prod. 111	Wood Identification	3	2	3
For. Engr. 301	General Construction	3	2	3
For. Mgt. 301	Forest Laws	3	3	-
For. Biol. 301	Forest Entomology	3	2	3
For. Biol. 302	Forest Pathology	3	2	3
Econ. 113	Elementary Economic Principles	3	3	-
		<u>20</u>	<u>15</u>	<u>14</u>

#### Second Semester

		Cr.	Lect.	Lab.
Eng. 250	Report Writing	2	1	2
For. Prod. 112	Introduction to Forest Products	3	3	-
For. Prod. 302	Wood Properties	3	2	3
For. Mgt. 302	Principles of Forest Management	4	3	3
For. Mgt. 303	Forest Rules and Regulations	2	2	-
Silv. 301	Forest Protection	3	3	-
Cons. 111	Principles of Conservation	3	3	-
		<u>20</u>	<u>17</u>	<u>8</u>

Summer Training; As suggested by the Department

### FOURTH YEAR

#### First Semester

		Cr.	Lect.	Lab.
Stat. 403	General Statistics	3	3	-
Soc. 400	Introduction to Public Administration	3	3	-
Electives		11	-	-
		<u>17</u>	<u>6</u>	<u>-</u>

#### Second Semester

		Cr.	Lect.	Lab.
Stat. 410	Research Methodology	3	3	-
For. Mgt. 402	Forest Economics	3	3	-
Electives		12	-	-
		<u>18</u>	<u>6</u>	<u>-</u>

Summer Training: As suggested by the Department

Field Trips: As suggested and conducted by the Department

FIFTH YEAR

First Semester

		Cr.	Lect.	Lab.
For. Mgt. 597	Seminar	1	1	-
Electives		14	-	-
		<hr/>	<hr/>	<hr/>
		15	1	-

Second Semester

		Cr.	Lect.	Lab.
For. Mgt. 598	Seminar	1	1	-
Bus. 301	Business Organization and Management	3	3	-
For. Mgt. 503	Forest Policy	3	3	-
Electives		8	-	-
		<hr/>	<hr/>	<hr/>
		15	7	-

PRESCRIBED ELECTIVES FOR CONSERVATION-MAJOR STUDENTS

Cons. 401	Conservation of Land and Water Resources	3 credits
Cons. 402	Forest Land Management	3 credits
Cons. 403	Forest Hydrology	2 credits
Cons. 404	Forest Influences	3 credits
Cons. 501	Forest Recreation	2 credits
Cons. 502	Wildlife Management	2 credits
Cons. 503	Watershed Management	3 credits
Cons. 504	Range Management	3 credits
Cons. 596	Special Problems in Conservation	1-3 credits
Cons. 597-598	Seminar in Conservation	2 credits
Cons. 599	Thesis	6 credits

# Training for Effective Careers in Conservation in Indonesia

by

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## SUMMARY

For effective conservation of wildlife Indonesia's greatest need is for more trained scientific and technical workers. The author gives a list of what has been accomplished from 1961 to date (1965).

The problem of nature conservation in Indonesia must be approached with other problems in mind – such as increasing population, and industrialization, urban growth, tourism, etc. The Division of Nature Conservation and Wildlife Management, Directorate of Forestry, needs the following if it is to carry out its task of conserving our natural resources:

1. Central and local organizations attached to the Division.
2. Scientific and technical workers.
3. Adequate financing and equipment.

A lack of scientific and technical workers is the most serious shortage.

Indonesia is a country with more than 110 nature reserves and to adequately staff them many rangers and wardens are needed. Biologists are also needed in the headquarters offices.

To meet this shortage the following steps have been taken since 1961:

1. A special course in wildlife management was given in the forestry police school in Salatiga from 1961 through 1963. (There were about 40 candidates a year.)
2. In 1963 a special course in nature conservation was established in the forest school at Bogor, starting with the second form.
3. Starting in 1964 a curriculum in nature conservation was introduced in the Academy of Agriculture in Tjiawi (Bogor).
4. Since 1964, 50 graduate students in the Academy of Architecture and Landscaping in Djakarta are taking a course in nature conservation.
5. This year (1965) the College of Biology at the 'Pedjajaran' University has accepted nature conservation in its curriculum.

It is clear then that each year more candidates are interested in the knowledge of nature conservation and wildlife preservation. We hope soon that there will no longer be a shortage of personnel.

The Institute of Forest Education has been responsible since 1964 for the education and training of technicians. Due to the lack of funds and equipment this Institute has not yet been able to function. It is hoped that in 1966 the Forest Academy with four departments can be opened at Bogor. Assistance in the form of lecturers and equipment is needed from the IUCN. The Directorate of Forestry hopes that in four or five years it will have the necessary experts as well as high and medium grade technicians for its conservation program (see Annex 1).

## ANNEX 1

## HIGH AND MIDDLE RANKING FOREST OFFICERS IN CHARGE WITH NATURE CONSERVATION

1. Technicians needed	High r.	Middle r.	Expert
(a) Head Office	10	20	4
(b) Sections (Provinces)	36	36	12
(c) Sub. sections (Regencies)	-	72	-
Total	46	128	16
2. Present staff level			
Head office and Sections	6	40	2
3. Staff deficit	40	88	14

# The Role of Agricultural Extension in Conservation Education

by

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## SUMMARY

A brief discussion is given of the meaning of agricultural extension and of extension teaching methods used. Examples from East Pakistan and Taiwan are cited as illustrations of the group approach that has been found to be very effective. Agricultural extension, as a process of informal education, has a vital role to play in conservation education.

## INTRODUCTION

Agricultural extension may be defined as an informal education for farm people so that their knowledge and skills are increased and so that they may acquire new points of view. Unless the people themselves develop and change physical and economic accomplishments are sterile.

In South East Asian countries agricultural extension is administered by a Ministry of Agriculture through its extension services.

## TEACHING METHODS USED

In South East Asia the overwhelming majority of the people live in rural areas and have received little education. The question is how to reach these people with agricultural extension.

All useful teaching methods are employed and these may be grouped as follows:

1. Mass contacts; radio, press, posters, etc.
2. Group contacts; study tours, method demonstrations, meetings, discussion groups.
3. Individual contacts; farm and home visits, result demonstrations, office calls, personal letters.

Of these methods, demonstration is considered the most effective if it is well planned and satisfactorily carried out. An interesting example may be cited from Taiwan: Trying to improve tea production the Government selected 200 farmers to try out four improved farm practices, pruning, fertilizing, spraying and plucking. The government provided free supplies to the farmers. The first year there was an average increase in tea leaf production of 43.5 per cent; the second year, 49.9 per cent; and the third, 80.61 per cent. After three years the demonstration was discontinued. Over 5,000 farmers who wanted to adopt these improved practices registered with the government and applied for loans.

Once the farmer's confidence is gained other extension activities can be easily introduced. Group approach and local leadership development should receive increasing attention in Asian countries with their teeming rural populations. Two examples utilizing the group approach are given below;

## **THE COMILLA APPROACH**

Developed by an academy for rural development in Comilla, East Pakistan, over a period of six or seven years, this is a system of continuous education to train villagers in co-operative efforts so that they can become more efficient producers and better citizens.

The experiment was first carried out in one thana with an area of 100 sq. miles and a population of 150, 000. In this area about 130 village co-operatives have been organized and federated in a Central Co-operative Association with its head office at the Thana Training Center. This Association is to provide;

1. credit,
2. production requisites such as seeds and fertilizers,
3. farm machinery services, and
4. marketing facilities to the co-operative.

The Thana Training Center provides training for the officers of the village co-operatives so that they can discharge their duties satisfactorily. Each week about 600 come to the Center for training and this goes on continuously. This experiment has been so successful that it has been extended to other thanas and there is now a plan to extend it on a province-wide basis with the assistance of the International Bank for Reconstruction and Development (IBRD).

## **THE TAIWAN APPROACH**

The farmers' associations in Taiwan are now in advanced stage of development and have become active partners with the government in the increase of food and agricultural production and the betterment of rural life. They are organized on three levels: one Provincial Farmers' Association, 22 county and city associations and 324 township associations. Each of the latter has an average of 2, 400 members and serves its members by providing agricultural advisory, credit, production supply, marketing, and processing services. The whole process of election and performance of duties by the elected officers constitutes a most effective way of developing local leadership.

## **CONCLUSION**

Agricultural extension has a vital role to play in the field of conservation. Although the extension services in many South East Asian countries are still in the early stage of development, they are nevertheless the single government organization that has officers stationed at the village level to assist the farming population in the use of land and water resources for increasing agricultural production and improving rural life. The framework is there. What is required is to provide the village level extension workers with;

1. additional training in some fundamentals of conservation, and
2. assistance by conservation specialists at a higher level.

## **Part 3:**

### **Public Education**

## **Elements of an Effective Nationwide Conservation Education Program**

by

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#### **SUMMARY**

An appreciation of nature and conservation on the part of the public can best be brought about by educating the children, beginning at the elementary level, in these subjects. The author describes the different methods by which this education may be brought about, in and out of school.

#### **INTRODUCTION**

Nature education should start with children if the public is to have a better understanding of nature and nature conservation. Children should have their interest in biology, conservation, and ecology aroused not through dry books, but by alert teachers who have an eye for nature close at hand. Studying biology is more than learning the dental formulae of the animals. The instruction given by teachers during elementary education is the pivot on which everything revolves. In turn teachers' training colleges must provide more conservation training in their curriculum with a program aimed at promoting understanding of the importance of the country's natural resources and their conservation.

It is gratifying to see that in some cases special conservation courses - fortnightly lectures or special excursions organized by different specialists - were appreciated by the students in training colleges even though these courses were given after the regular school hours.

#### **ELEMENTARY EDUCATION**

A few methods of improving instruction at the elementary level are given below:

1. Instructive gardens. These offer small landscapes containing as many samples of natural vegetation as the circumstances permit in order that young people can learn to distinguish and know the various types of vegetation. The curator should be able to give explanations to the children, and simple exhibitions can be arranged.
2. School working gardens. These complement the instructive gardens. They show the children both wild and cultivated vegetables and flowers and teach them how to cultivate these plants. They also provide illustrative material for biology and drawing lessons.
3. Annual tree planting day. The children, accompanied by their teachers, plant trees in the public parks and are in the future responsible for those trees and for the park as a whole. Nature conservation and the effects of erosion can be introduced into the studies of the children if the latter take part in reforestation projects.

## **SECONDARY AND UNIVERSITY LEVELS**

At the secondary school level biology already has a permanent, if too limited, place in the curriculum. It should be taught by specialists who are well versed in their subject. The institution of 'working weeks' and special projects might draw attention to the questions of management and conservation of natural resources.

So that university students may have a proper appreciation of ecology and conservation, emphasis will be on a working period at a Biological Research Station. This is important not only for biologists but also for the agriculturalist and the forestry expert.

## **OUT-OF-SCHOOL EDUCATION**

For education out of school youth organizations are of great significance. Leaders of these organizations, such as the Boy Scouts, can be trained at field study centers in one or two week courses conducted by the staff and invited specialists. These courses are usually for 6th form pupils and university undergraduates specializing in biology, geography, and geology, but special courses could be arranged for youth leaders.

Other organizations and institutions, such as the university extension classes, all have the same object, i. e. to enrich the knowledge of man, to bring man nearer to the treasures of his culture, and to stimulate his concept of responsibility in relation to nature.

## **PUBLIC EDUCATION**

What good can be accomplished by the founding of national parks, taking active conservation measures, attempting to pass legislation for the protection of rare animals if the basic idea of nature conservation has not entered the mind of the public?

Very often nature societies have no time beyond their tasks in the field of direct conservation. In such cases a special Institute for Nature Conservation Education could be promoted:

1. to arouse and promote interest in nature and scenery and to convince the public of the need to make proper use of nature and scenic beauty; and
2. to prevent and counter the destruction of nature and scenic beauty by the action of others.

These aims can be realized by organizing nature walks, issuing leaflets, appointing nature wardens and having nature guides trained and available. Nature trails enjoy an increasing popularity with all groups; everyone participates and thus the contact with nature is more intense and valuable.

Young people in their spare time or on their holidays might give voluntary help in the management of nature reserves and other biologically important sites. Typical tasks include cleaning scrub and undergrowth, making footpaths, and digging and planting vegetation on the banks of ponds.

School broadcasting can provide a program of natural sciences, especially focused on nature conservation. Not only school children but adults will listen. Other audio-visual methods can be of importance in enlarging the knowledge of man in the field of nature conservation.

With these examples of conservation methods I have tried to give an idea of what has been achieved up to the present, without pretending to draft a complete report on what could be done and what is going on in this field.

# The Contribution of Interpretive Programs in National Parks to Popular Conservation Programs

by

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## SUMMARY

This paper traces the development of interpretive programs in United States National Parks. These began as a groping struggle to instill visitor appreciation of park features and evolved into a highly sophisticated organization exerting considerable influence on national and international levels of conservation education.

The history, methods, and objectives of four techniques of the Interpretive Service:

1. popular lectures,
2. guided field trips,
3. museums and special exhibits, and
4. self-guiding trails

are described.

## INTRODUCTION

The birth of the Yellowstone National Park idea 95 years ago is generally regarded as the beginning of the current concept of National Parks and Equivalent Reserves. This constituted a major step towards conservation of scenery and natural resources. Many hold as equally significant, in the dust-and-ashes history of public domain, the formulation of interpretive services in National Parks based on the presentation of conservation concepts within a natural setting.

Undergoing random but serious thought for a half-dozen years prior to 1920, naturalist, or interpretive services attained substantive materialization in Yellowstone and Yosemite National Parks in that year. A park naturalist was appointed to each; nature walks, talks, popular periodical leaflets, and a crude museum were established.

As the wisdom behind the movement became evident and as benefits have continued to accrue, the Interpretive Service has prospered, and public support behind its program has grown strong. The locally oriented unit within the park has become part of a nation-wide organization, whose influence and assistance now extends into the international field. At home it has become the pattern to be adapted by other outdoor agencies, both in and outside the Federal Government; abroad it extends information, technical assistance, and other co-operation both to 'old' and 'new' nations upon receiving their requests.

## TRAINING

For training, the National Park Service has established two training centers:

1. the Stephen T. Mather Center at Harper's Ferry, West Virginia, which specializes in interpretation and research, and

2. the Horace M. Albright Center at Grand Canyon National Park which emphasizes the administrative, protective, legal, and planning phases of conservation training.

In addition, many in-service schools, workshops, training, and refresher courses are conducted in which the Interpretive Service plays a major role. All reflect Naturalist Service methodology and employ naturalists as instructors and trainers. Participants in these programs include international trainees and observers, representatives from private conservation organizations and universities, and employees from other government agencies, federal, state, and municipal. Some of the early planners of the Military Information and Education Program had been rangers or naturalists in parks. Applications always far exceed the capacity of facilities; long waiting lists are the result.

## TECHNIQUES

In addition to the concrete demonstration of the effectiveness of the Interpretive Service system in its stimulation of interest and enthusiasm, a most important contribution of the naturalist program to conservation education has been the development and refinement of methods and techniques employed in the satisfactory attainment of its goals. The means available to the Interpretive Service include popular lectures, guided field trips, museum and special exhibits, self-guiding trails, visual aids, popular literature, and similar devices. Attention will now be directed to the evolution of scope, methods, treatment, and objectives of the first four of these.

### Popular lectures

It was early recognized that the word 'lecture' smacks of a stiffness and formality that are not in harmony with the casual atmosphere of the out-of-doors. The term has been largely replaced by the simpler word, 'talk'. Talks are regularly scheduled for camp-fire circles, auditoriums, hotel lobbies, and museums; they constitute an important part of the naturalist program. But, in addition, many more unscheduled talks are given – whenever and wherever time, place, and opportunity dictate.

This quality – effective speech – is a hallmark of the Interpretive Service. Great care is taken in adequate preparation and in looking after the physical comfort of the audience. The presentation must be orderly and coherent; the narration, colorful and dramatic; and the material used, germane to the subject. Long lectures are taboo in the parks, and speakers are cautioned to use plain language and to avoid talking down to the group. The use of slides or movies is avoided until the neophyte naturalist can demonstrate he can hold an audience by unassisted effective speech alone. Audience participation is encouraged, and except for times when personnel cannot reasonably be provided for an occasion, pre-recorded talks are avoided.

### Field Trips

The field trip is regarded by some as the most effective of all tools for conservation education. On a trip the importance of individual contact with an astute leader, direct personalized experience with nature, and active participation by field party members in the outdoor venture, becomes evident.

The conduct of field trips has reached a high degree of refinement in the National Parks. Instead of old objectives, such as the compilation of a list of fifty birds encountered on a two-hour walk or a hike from here to there, the members learn intimate details about a few subjects (although the list of subjects that might come under observation is endless). In place of the meaningless listing, 'robin, *Turdus migratorius*', the party learns the importance of observing, 'Where is the bird and what is it doing?'. They learn to recognize silhouette and habits. They learn the answers to key questions, 'How do you know it to be a robin?', 'When and where can I best look at it?', 'How will I know it to be a robin when I see it again?'.

So it is with plants and flowers; where they grow, what they need for food, their ecological relationships, their growth, development, maturation, even the evolution of the species through the ages.

The effectiveness of direct experience, the use of the senses, questions and answers, and the encouragement of party members to share their knowledge and enthusiasm with others, are all key attributes of successful field trips. The efficient use of these techniques is demonstrated to field trip leaders and instructors of natural sciences and conservation, whether professional or amateur, who are encouraged to adapt them for their purposes. Many university professors and others, employed as naturalists on park staffs to become trained and skilled in park methods, use their attainments elsewhere and teach them to others in their respective fields.

### **Museums and Special Exhibits**

At the turn of the century, museums in general could only by extenuation be described by the term derived from 'the place of the Muses' or 'a place for musing'. Rather, they bore the atmosphere of a morgue with endless collections of curiosities, of butterflies or geological 'rocks' or study specimens, ill prepared and mounted, or, often worst of all, of 'treasures' assembled by some influential sponsor who no longer wanted to be bothered with them. Aching feet, endless verbose labels, and fatigue were the images conjured up by the museum visit.

Much more revolutionary and exciting has been the development of the museum concept within the National Park Service. Starting with a simple tent, lit by sunlight or gasoline lanterns, in Glacier National Park in the nineteen thirties, museums have evolved and expanded in our Park Service so that they have become models for others outside that Service, as in the Bernice P. Bishop Museum in Hawaii.

The park is itself a museum. The building labelled thus should be like an alluring story book in colorful attractive format that tells the story of the particular park, historical monument, or wildlife area. The chapters are the various exhibits presented in systematic order; e. g., geological background may be followed by the treatment of the plants and animals of the region, then something of human history.

Many park visitors have limited time available; many will never be able to return for a second visit. This means that the impact of the museum must be instantaneous, overwhelming, and lasting. The contribution of every item in the exhibit is weighed before its acceptance as part of that exhibit. Only the most essential, impressive, and dramatic material is used and the labels and story are worked over to be as clear, concise, and emphatic as possible. Study is also given to all accessory attributes – lighting, ventilation, circulation of traffic, etc. – nothing is overlooked. But with all this the ultimate test remains; how much has a visitor gained and what has he retained after he has walked out of the door?

### **Self-Guiding Trails**

In parks, self-guiding trails have grown from mere labelling of features to a facility that gives significant information with the names noted only indirectly. Take for example this label in Glacier National Park 'These tent-caterpillar larvae are blind. They retrace their way back to the web by following silken threads, spun while feeding'. That particular label was the spark for a news release by a national press agency that travelled around the globe.

The scheme of using a particular trail to develop a particular theme was instituted in the parks; 'Follow this trail and read the story of glaciers that fashioned this wonderland for you and me'. 'This trail tells you how life is determined and influenced by its environment. This is the story of a sphagnum bog'.

The development of better techniques has also been a contribution; the use of guide leaflets with key numbers along the trail; devices for adapting use of the trail to changing seasons and conditions; production of better and more durable labels that blend into the surroundings while still being plainly visible and legible.

### **CONCLUSION**

The contributions of the Interpretive Service of the United States National Park Service to the cause of popular, public conservation education are many. Among the most important, the following loom big; demonstration of the importance of taking conservation

education outdoors; development of reverence for life and the wonders of creation; development of a sense of responsibility towards nature and natural resources; development and sophistication of methods employed; the use of conservation education and popular naturalist activities as administrative tools; the development of a spirit of teamwork between instructor and pupil, between park and park visitor.

# Education and Publicity for Resource Conservation in Sabah

by

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## SUMMARY

A short review is given of the production of literature and leaflets on nature and general conservation in Sabah.

## INTRODUCTION

Resource conservation is not merely a matter of legislation and the running of national parks, but to be successful it must have the backing of the people behind it. This means that a long-term and widespread propaganda campaign is required to influence not only the leaders in a community but also the general mass of the population. In the understandable desire of the underdeveloped countries to catch up quickly, this is often relegated to the background for many reasons.

Firstly, there are language difficulties; in Sabah for instance Radio Malaysia, Sabah, broadcasts in six languages at present, English, Malay, Kadazan, Chinese, Murut and Indonesian; and any posters or leaflets prepared for the Kinabalu National Park to be effective should also be in several languages. Secondly, resource conservation rarely has one master and it is often spread between several ministries and departments and co-ordination is difficult. Thirdly, its long-term importance is often underrated and adequate funds are not available. For these reasons the propaganda campaign is casually run by amateurs in their spare time, rather than by people who by their training are qualified to do so.

## CONSERVATION IN SABAH

In Sabah this has been especially the case. North Borneo must have been one of the places in South East Asia which suffered most severely during the Second World War. Not only were nearly all the towns pattern-bombed but in many coastal areas 16 per cent of the male population lost their lives. In the years following, emphasis had to be placed on reconstruction, and what little money and manpower was available was needed for schools, hospitals and administration.

By the middle of the 1950's one could start to look forwards rather than backwards and by 1960 it was possible to start a Sabah Society which had the following objectives;

1. To stimulate a wider interest in and knowledge of the history, natural history and geography of Sabah and the cultures and customs of its peoples.
2. To encourage and assist the recording of knowledge of the history, natural history and geography of Sabah and the preservation of examples of the cultures and customs of its peoples.

Although the number of members was not great, the first journal was issued in 1961 and in the past five years seven journals in all have been produced.

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<sup>1</sup> New title and address; Secretary General, IUCN, 1110 Morges, Switzerland.

In addition, in 1963 the Borneo Literature Bureau, in association with Longmans Green, produced three sets of colored wall-charts, a set of six of the Birds of Borneo, a set of three of the Butterflies of Borneo, and a set of four of the Wild Flowers of Borneo. In 1964 the same Bureau issued a series of seven charts with black and white drawings of fish common to Sarawak and Sabah, prepared in association with the Agricultural Departments of Sarawak and Sabah.

At the same time steps were being taken to form National Parks; the National Parks Ordinance was passed in 1962, and the Kinabalu National Park of 275 square miles was gazetted in February, 1964. Mountain huts for the convenience of climbers were erected by the end of 1964. In early 1965 a series of information leaflets was produced to act as a basis for something more ambitious which it is hoped will be issued early in 1966.

In 1964, the Sabah Society published a pocket sized booklet, 'An Introduction to the Mammals of Sabah' by Professor J. L. Harrison, mainly aimed at arousing the interest of school children and it is now hoped to continue the series with booklets on the birds, insects, flowers and trees of Sabah. Also in 1965 the Sabah Museum was opened, admittedly in temporary quarters, and on a very amateur basis, but this also arouses interest and curiosity, among both adults and children.

In Sabah a start has been made but there is a long way to go, especially in the production of vernacular leaflets.

# Contribution of a Nature Society to Public Conservation Education

by

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## SUMMARY

A nature society hoping to instill conservation consciousness amongst the people in a developing country must adopt different approaches for people with different social, economic, and educational backgrounds. With this in mind the author discusses the different approaches to;

1. the planners, administrators, and politicians;
2. the students; and
3. the rural people,

and gives instances of what the Malayan Nature Society has done in this respect.

## INTRODUCTION

I am starting off with the assumption that 'people who know and value natural resources will not destroy them' (Gilliland 1961) and the substance of this paper is to examine the possible ways of making people know and what a nature society can do in this respect.

The key to solving the problem is to know who the people are. In a developing country the standard of education and literacy is tremendously varied. At one extreme are the highly educated and at the other, are the illiterate. Any nature society which hopes to be successful in its approaches must bear in mind such vastly different social and educational circumstances.

## THE ADMINISTRATORS, THE PLANNERS, AND THE POLITICIANS

It is extremely important to win the support of this group for they are the people who make the final decisions. A nature society must try to win these people as members and to appeal to them on aesthetic, scientific, recreational, and economic grounds rather than through the use of technical jargon.

The nature society can also make its presence felt by offering help to the planners and administrators in solving their problems. To cite an actual example, the Malayan Nature Society recently heard of a scheme to convert an area of reserved forest into a bird sanctuary complete with a walking aviary as a tourist attraction. The Society offered its help and it was enthusiastically received. It has been consulted at every stage of planning, and a member of the Committee of the Society sits on the Planning Committee. In serving this Committee the Society not only imparts principles of conservation to the planners, but also serves conservation in a practical way making sure that there is the minimum of disturbance to the eco-system.

To the educated group in general the nature society can act as an informer pointing out the endangered species, the threatened national monuments or the bad agricultural or other land-use practices through films, radio, and television. The Malayan Nature Society has in the past few years taken an active part in the preservation of special habitats through direct negotiation with the State Governments or various Government

Departments. Due to the efforts of the Society the State Government of Selangor is backing the preservation of Batu Caves – a unique limestone massif just five miles from Kuala Lumpur – on the grounds of its tourist potentials and scientific values; and the Trengganu State Government is similarly backing the conservation of the Giant Leathery Turtle. The Forest Department has, on the advice of the Society, agreed to leave a three chain wide strip surrounding the quartz ridges with their specialized vegetation (Wyatt-Smith 1959). For the conservation of Batu Caves a special film was made with the co-operation of the Malayan film unit to inform the public of the fauna and unique formation within the caves.

### **THE STUDENTS**

The students represent the greatest single hope of any nation for conservation. Unfortunately, speaking for Malaya in any case, a drive on nature conservation has not started until recently. Perhaps the destruction of natural habitats and natural resources was not seen or felt until the rapid development of the post-war period. There is certainly an urgent need to include the subject of conservation in formal teachings in secondary schools and institutions of higher learning. A nature society can perhaps help in the formulation of courses in these institutions and also take part in giving lectures.

The Malayan Nature Society is organizing special indoor and outdoor meetings for school children to kindle interest in natural history. The success of these depends on local branches of the society in various localities or the availability of members to travel about and give talks. Perhaps if such talks can be oriented to cover certain aspects of the curriculum there may be more success.

### **THE RURAL FOLK**

It is to this group of people who live largely at a subsistence level that it is most difficult to appeal. Protected animals are killed for food and large areas of forest are illegally felled for cultivation because the people do not know or understand. The final solution rests more perhaps with social and economic uplift which will lead to education.

Nevertheless the Malayan Nature Society is trying by simple posters to teach these people not to disturb or destroy threatened animals. It is hoped to distribute these posters to rural schools, community halls, and the village headman's office.

These are only a few cursory ideas based on what the Malayan Nature Society is doing. I am sure there are many more which members of the Conference will mention and discuss.

### **LITERATURE CITED**

- Gilliland, H.B. 1961. Conservation and Education. *Malayan Nature J.* 21st anniversary special issue. P. 26.
- Wyatt-Smith, J. 1959. Nature Reserves. *Malayan Nature J.* 14 (1);40.

# Some Notes on Campaigns and Propaganda on Behalf of Conservation

by

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## SUMMARY

The author presents the problems of putting conservation across both to the general public and to specialized groups. The two main aspects of conservation propaganda dealt with are;

1. its content, and
2. the media used to spread it.

Under *the content*, the specific and the more general definitions of conservation are discussed, and six concrete points of conservation are presented. Under *the media*, the major means for spreading propaganda are presented.

## INTRODUCTION

These notes are confined to problems of putting conservation across, both to the general public and to specialized groups, and do not cover fund-raising on behalf of conservation. Important advice on this specialized field of conservation propaganda will be found in the first report of the World Wildlife Fund, recently published in England under the title of 'The Launching of the New Ark'.

The two main aspects of conservation propaganda dealt with here are therefore,

1. its content, and
2. the media used to spread it abroad.

Both will, of course, vary with the nature of the audience addressed, whether it consists of the general public, school children, university students or members of specialized groups who may or may not start with an initial interest in conservation.

## THE CONTENT OF CONSERVATION PROPAGANDA

Conservation is a term to which various meanings have been attached, so it is desirable to make clear at the outset of any particular campaign or other initiative exactly what is meant by conservation. In these notes conservation will be taken in the broadest sense of the maintenance and management of wildlife resources or, to use the words of President Kennedy 'the wise use of our natural environment... the prevention of waste and despoilment while preserving, improving and renewing the quality and usefulness of all our resources'.

However, conservation also has a quite specific and quantitative meaning; in the terms used by Fraser Darling, the maximization of the energy flow through any given biotope. This is not an easy concept to get across to lay audiences, which tend to recoil from it as 'scientific jargon'. Indeed, except in the broadest terms that amount almost to a truism, the general idea of conservation seems much harder to get across to non-scientific audiences than some of its specific aspects. Some concrete points that can be projected are;

1. Conservation is not just sentimentalism, but a question of good housekeeping with the natural resources on which mankind, and each nation individually, depends for its future welfare. The economic arguments for conservation are as powerful as the scientific, aesthetic and moral ones, and more readily understood. Properly farmed wildlife may be a valuable food resource, e. g. whales, seals, with other products such as oil and fur thrown in; as a tourist attraction wildlife, both animals and plant, may be a vital revenue earner, as e. g. in East Africa. In some areas natural forests or grasslands may be more productive than the land would be under cultivation; in others the preservation of forest is vital to preserve water resources and soil, e. g. on watersheds.
2. The danger of extinction of rare animal and plant species; this is an aspect of the problem that appeals especially to the imagination of audiences which are unimformed about conservation. It should not, however, be overstressed, or it may provoke the criticism that this is putting animals before humans. The scientific and economic arguments for preserving rare species must be presented alongside the moral and aesthetic ones.
3. The threat to rare and vanishing habitats; it is becoming increasingly understood even by lay audiences, that you cannot conserve animals and plants without conserving the whole biotope.
4. The general destruction of biotopes with their associated animals and plants, which can become rare in an alarmingly short time.
5. The overharvesting of animal and plant populations, and the consequent waste of valuable food and other resources, the classic instances being the extinction of the passenger pigeon, the near extinction of the American bison and the current excessive drain on the Antarctic whale stocks.
6. The widespread and increasing pollution of the environment by pesticides, oil spillage, sewage disposal and similar agents.
7. The positive aspects of conservation, by successful management, on a renewable basis, both of animal populations such as the Pribilof fur seal and various ungulates on farms in southern Africa, and of plant communities, such as well managed natural forests in various parts of the world.
8. The consequences of too successful protection of a single species, so that it either starts to destroy its own habitat, as the hippo and elephant have done in various parts of East Africa, or the white rhino might do in Natal if the authorities did not disperse the surplus population; or become so numerous as to threaten human economic interests, as the grey seal has been accused of doing on the east coast of Great Britain. Sometimes even a decreasing species, such as the Ceylon elephant, may be regarded as an economic threat. Conservation therefore implies management and control.

### **MEDIA FOR CONSERVATION PROPAGANDA**

1. Personal contact with people in positions of influence, e.g. by special mission, such as those of Ambassador Crowe and Lord Soulbury to the Far East and Ceylon respectively on behalf of the World Wildlife Fund, or by special letter from another influential person.
2. Lectures, illustrated by posters, slides or films;
  - (a) in schools or to other audiences of young people.
  - (b) to specialized audiences, either of those already interested in conservation or consisting of specialists in other subjects.
  - (c) to general audiences.
3. Broadcasting and TV
  - (a) straight talks are mainly for use for making already fairly well informed opinion better informed.

- (b) films or feature programs on TV; these can be a very powerful means of bringing conservation problems to the attention of the general public, e. g. very many more people have become aware of the Galapagos Islands and their problems as a result of programs in Peter Scott's 'Look' series on TV than ever did so as a result of reading Darwin's *Origin of Species*.

#### 4. Written and Pictorial Material

- (a) pamphlets and leaflets may be of value in drawing attention to a specific, fairly limited problem.
- (b) books are important background material and for influencing people in positions of importance, but only the exceptional one such as Joy Adamson's 'Elsa' makes a mass impact.
- (c) Articles, especially illustrated articles, in magazines are chiefly useful in creating a background of informed opinion.
- (d) Newspapers. It is most important to keep up a steady flow of news including photographs about conservation, and this can be facilitated if one central organization in each country makes itself responsible for the supply of such news. Articles, letters to editor, and inspired editorials are also of value.

# The Australian Conservation Foundation

by

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## SUMMARY

This paper describes the Australian Conservation Foundation presenting its background, organization, and objectives. It details the Foundation's program with particular regard to various forms of public education in conservation.

## INTRODUCTION

The Australian Conservation Foundation is a private body that has been established to promote the understanding and practice of conservation throughout Australia and its territories. The suggestion of H.R. H. The Duke of Edinburgh in 1963 that Australia should become a contributing member of the World Wildlife Fund put the spotlight on our lack of any national organization capable of co-operating with an international effort of this kind or of speaking for Australian conservationists as a whole.

The Foundation is being incorporated as a non-profit making association and will have an office and secretariat in Canberra. It has a Governing Council made up of businessmen, professors, government leaders etc. which will be replaced in due course by one elected by Ordinary Members. The Constitution provides for four classes of membership; Ordinary Member; Associate Member; Life Member; and Benefactor Member. In addition various groups that want to be associated with the Foundation can become Member Bodies, nominating a representative who has the same rights as an Ordinary Member.

## THE AUSTRALIAN SITUATION

Australia is one of many countries to have reached a stage in its development where conservation demands recognition as a practical policy as much a concern of the nation as a whole as the paramount responsibilities of the country's defense or the education of its youth. This also can be said about conservation – its principles, and the effects of its neglect, will be more and more important to each succeeding generation. In Australia there are a number of government departments or special services concerned with conservation, but our country differs from others having a federal political structure in that in Australia, conservation has been regarded as almost exclusively a State responsibility. The weakness of support, at the national level, for conservation in Australia was very much in the minds of those who sponsored the establishment of the Conservation Foundation. They felt that if a national interest could be roused, support for intensified government effort would be forthcoming – and not only that, but financial support from public appeals for urgent projects which caught the popular imagination.

## THE NEED FOR EDUCATION

In framing its program, the Australian Conservation Foundation has been mindful of the experience of similar bodies in other countries which have often started off with rather specialized objectives and then found themselves having to pay more and more attention to education – education in the broadest sense. The Foundation realized

from the start that education would be one of its most important activities, and that behind educating people in the nature of conservation problems lay the simple need to get them interested in the sort of things with which the problems deal.

One of the main functions of the Foundation will always be the collection of facts for presentation to the public and governments in the hope of stimulating some desired line of action, and winning popular support for that action. It will also set itself up as a reference center for information on conservation problems and achievements, both in Australia and overseas. It is hoped also that the Foundation will be accepted as a suitable body to represent Australia at international conferences on conservation, something which no Commonwealth department or other private body could appropriately do at present.

## THE PROGRAM OF THE FOUNDATION

It will take a little time for the Foundation to become geared for effective action, but it has been decided that the following should be included in the initial program of activities over the next year or two. Some projects will be handled by the Foundation's staff; for others, help will have to be called in; and one or two will necessitate a special appeal for funds.

1. Survey of Australia's National Parks and Reserves. The proposed survey is intended to lead to the publication of a popular book explaining what our national parks and reserves contain and wherein lies their special interest and value to the community, and suggesting ways in which they might be improved to meet future needs and the demands of our rapidly increasing population.
2. Booklet on the A. B. C. of Conservation. From an understanding of what happens when man interferes with natural systems certain basic principles of conservation have been developed which guide workers on practical problems whether they relate to forests or grazing land, water catchments or wild animal populations. A well-illustrated booklet explaining these principles in simple language should help ordinary people to start thinking sensibly about conservation.
3. Field Studies Centers. Starting in Britain some fifteen years ago the Field Studies Centers, as they are called, have been outstandingly successful in interesting and educating people in the outdoor aspects of geology, botany, zoology, geography, and allied sciences. They supplement the work of educational institutions and stimulate or renew the interest of city dwellers. This success story from Britain provides a lead which is clearly worth following up.
4. Cape Barren Goose (*Cereopsis novaehollandiae*). This is an Australian endemic and one of the world's rare birds with no close relative. Its breeding is restricted to certain islands between Bass Strait and Southwestern Australia, and the most important of these should be set aside as a sanctuary. To achieve this, money will have to be raised.
5. Field Guide for Bird Identification. No one with a feeling for the bush can fail to have some interest in birds. Unlike the native mammals, which are mostly nocturnal and avoid mankind, birds are accommodating and parade themselves in their fascinating variety. Australia badly needs a well-illustrated pocket-sized guide to bird identification, and the Foundation proposes to sponsor the preparation of such a book.

## CONCLUSION

There are signs everywhere that thoughtful Australians are becoming more and more concerned with conservation – some perhaps only in rather limited aspects, but some now seeing clearly that its various facets are parts of the one big problem of the wise use of our natural resources for the long-term benefit of the community as a whole.

The Foundation is setting out to discover where assistance and action are most needed, and how they can best be given and stimulated. It must complement, not compete with other bodies already active in the conservation field. The Australian Conservation Foundation believes that it can meet an important need; but in a country of three million square miles it can only be effective, and justify the confidence of the public, if it can command adequate resources and the time of first-class men.

# The Role of Zoological Gardens in Creating Public Awareness of Wildlife Conservation

by

MR. I. MADE TAMAN

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## SUMMARY

Zoos, formerly used chiefly by children, have drawn increasing public attention and support. In addition to their recreational values, zoological gardens through their exhibits dramatize among other things threatened species; they also give students a chance to observe animals at first-hand. The Government of Indonesia should support the zoos in their program for wildlife conservation.

Formerly, zoological gardens in Indonesia were considered as recreation areas only for children. No attention was paid to them by the government. But, gradually through the many accomplishments of the zoos, such as breeding animals in captivity, the interest and appreciation of the public was awakened.

The Division of Nature Conservation and Wildlife Management, Directorate of Forestry, is responsible for natural resources in Indonesia including the supervision of zoos, gardens, and parks. In Indonesia we have about ten zoos of varying sizes, the largest and best one being the Surabaya Zoo in East Java. This zoo, one of the few modern ones in Asia, has been especially successful in the breeding of siamangs (*Hylobates syadectylus*) and proboscis monkeys (*Nasalis larvatus*).

In a country such as Indonesia with its rich fauna it is important to draw the attention of the public to this resource. The best way to accomplish this is the establishment of good zoos near the large cities.

Many students in high schools and universities visit the zoos to get first-hand knowledge of the animals and rare species.

Since many attempts to breed animals in zoos are successful the zoological parks in Indonesia play an important part in the preservation of animals, increasing the animal population and avoiding unnecessary capture in the forest. The government should support this work by giving grants to those zoos which are active in this movement.

Displays of threatened species giving information about their origin, food, habits, habitat, and reason for protection, indirectly prevent the slaughter and persecution of the species in the wild.

Through zoological gardens people learn to appreciate wild animals for their usefulness to science and mankind. Furthermore students are thus attracted to the field of zoology which in turn increases the number of wildlife experts who can prevent illegal hunting and aid in wildlife preservation.

In addition to the general objectives above the Zoological Gardens in Indonesia have certain specific objectives;

1. To prevent illegal trade in animals through the legal exchange of animals with institutions at home and abroad.
2. To purchase animals from dealers and to take care of them in the zoos.
3. To report to the government those individuals who are in illegal possession of protected animals.

4. To collect funds for expeditions and research on rare fauna and their habitats; to enlarge the collections in the zoos for visitors at home and from abroad (tourism).
5. To make observations regarding the diseases of animals in the zoos.
6. To enrich the museum – as a part of the zoo – with exhibits for the education of the public. It is very important to show the public the most threatened species.
7. To provide, through the botanical garden, a green belt for the protection of birds in large cities such Djakarta, Bandung, and Surabaya.

Considering the above points the government of Indonesia should give full support to the zoo officials to encourage them and enable them to accomplish their aims. Zoo directors in Indonesia and abroad should co-operate in the exchange of information for the benefit of wildlife conservation. In this way and in creating public awareness zoological gardens will help in the preservation of the fauna of the world.

# **A Background Report to the Series of Nature Study and Conservation Programs Produced by the Schools Broadcasting Service and the Sarawak Museum**

by

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and

MR. MICHAEL FOGDEN

*Sarawak Museum, Kuching, Sarawak, Malaysia*

## **SUMMARY**

A brief description is given of a nature study and conservation program to be broadcast to the secondary schools in Sarawak. This is planned and produced jointly by the Schools Broadcasting Service and the Sarawak Museum. Color slides based on local materials will be shown simultaneously with the broadcast.

## **INTRODUCTION**

During 1965-66 a series of Nature Study and Conservation programs to be broadcast to Secondary Schools in Sarawak is being planned and produced jointly by the Schools Broadcasting Service and the Sarawak Museum. To preface this brief report on the series it should be pointed out that in Sarawak, Malaysia, programs produced by the Schools Broadcasting Service are used in all schools throughout the country, both primary and secondary. Broadcasts to secondary schools began experimentally in 1964 and have provided successful support programs for the first three years of secondary education. The programs are devised to follow the syllabuses as closely as possible.

## **NATURE STUDY SERIES**

However, this new Nature Study series, along with its counterpart in history, breaks new ground for Sarawak in being in sound and vision; the broadcast lessons are illustrated in the schools by color slides shown simultaneously with the broadcast. The use of photographs in this way serves to illustrate points in a broadcast lesson and provides our teachers, often young and inexperienced, with a valuable prop to their teaching. The photographs can be shown to the students again and again after the broadcast is over, thus reinforcing the content of the program and assisting the teacher in his extension or development of the topic. It is also planned that eventually schools will be provided with tape recordings of the programs so enabling them to be seen and heard, complete, as often as desired.

The series is regarded as a valuable extension to the existing science syllabus taught in the schools, but probably the most important aspect of the series is that it will serve to create an interest in the natural history of the country. All the photographs and animals seen in the series are from in and around Kuching, the capital. All can be found by observant teachers and students in the near vicinity of their schools and homes throughout the country.

The subject matter of this series of Nature Study programs concerns the animal in relation to its environment and, in particular, the ways in which it is adapted to live

in its environment. A knowledge of the ecology of plants and animals is absolutely fundamental to a proper understanding of the reasons for the need for conservation.

The introductory program, which was seen and heard at the conference, introduces the concept of adaptation – the idea that animals are adapted to their environment and that there are good reasons for the form, color and behavior of animals, no matter how strange and inexplicable these might appear to be at first sight. Later programs deal simply with evolution and natural selection, and also consider in more detail some of the adaptive themes introduced in the first program, notably those dealing with adaptive coloration which are perhaps the most striking and easily understandable of adaptations.

A later program introduces the idea of food chains or food webs and emphasizes the disastrous results which can accompany the disruption of these chains or webs by indiscriminate and unplanned eradication of pests by non-biological methods. Another program deals with those animals, such as snakes, spiders and scorpions, which are normally killed on sight. Their essential role in the general scheme of things, and the considerable good that most of them do, is emphasized. The final program is a summary linking the lessons already learned to the idea of the need for conservation of all natural resources for economic as well as scientific, ethical and aesthetical reasons.

For these plans to mature, enthusiasm, technical skills, and money are needed. Schools Broadcasting has a limited budget and an enthusiastic staff with ideas, but the venture could never have got off the ground without the help of the Sarawak Museum. Thanks are due to the Curator of the Sarawak Museum, Mr. Tom Harrison, who has shown great interest in the project and kindly gave permission for Museum staff to script the programs and take the photographs.

#### **WILDLIFE ASSOCIATION FOR THE SECONDARY SCHOOLS**

Plans for the formation of a wildlife association for the secondary schools are also being formulated. When the series is under way it is hoped that the science masters will encourage their students to form school societies and so bring together young people who will collect, identify, record and study aspects of plant and animal life in their own areas. It is hoped that the Association, with its headquarters at the Sarawak Teachers' Center, Kuching, will be able to produce a bulletin containing the reports, observations and photographs received from the school societies.

## Technical Session IV

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### THREATENED SPECIES

This Session considers many of the species of South East Asian flora and fauna that are rare or threatened with extinction. Following the Highlights and Summary of the Session, the papers are grouped into six major sections:

1. Mammals
2. Birds
3. Reptiles
4. Fish
5. Plants
6. Collecting

# Highlights in the Discussion in Technical Session IV – Threatened Species

by

SESSION CHAIRMAN

PROF. DIOSCORO S. RABOR

*Head, Department of Biology, Silliman University, Dumaguete City, Philippines*

The extinction of organic species is nothing new. It has proceeded side by side with organic evolution for the last one-and-one half to two billion years since life evolved on our planet. Since the origin of life the phenomenon of extinction of organic species has been a consequent accompaniment and result of organic evolution. In fact, as we well know, more species have become extinct throughout the millions of years of evolution than are now extant.

In the last 200 years, however, Man, directly or indirectly, has increased the rate of extinction of organic species by 16 times. Normally, Man does not cause the extinction of species, plant or animal, on purpose. Extinction is often accidental. With forethought and ingenuity, Man can avoid this accident. It is noteworthy at this point to recognize the fact that Man, himself, may even be the main cause of his own extinction as an animal species.

There are four pillars supporting the conservation of threatened species:

1. Ethical
2. Aesthetic
3. Scientific
4. Economic.

The 'Action Treatment' is a checklist of the steps which can be taken to avert the extinction of any species. The list should be carefully considered and the item or items in it should be selected in the context of each species that will be treated.

In South East Asia, already, 14 mammal and 24 bird species are at present regarded as threatened with extinction. The marine turtles were mentioned among the endangered reptiles, and a few Amphibia. There was mention of the danger of depletion in some freshwater fishes due mainly to pollution of one kind or another.

The threat to plant species is almost entirely a problem of threatened habitats. However, the publicity and public relations significance of individual rare or endangered species was pointed out by the discussants.

Papers were discussed dealing with the orang-utans, rhinoceroses, seladang, and various small mammals, on the Monkey-eating Eagle and other birds, on the netting of birds, and on the trade of live birds which seems to have reached alarming proportions. We have heard reassuringly that the numbers of Komodo Dragons are being well maintained. We did not have the time to discuss the present critical situation of certain species of crocodiles, whose

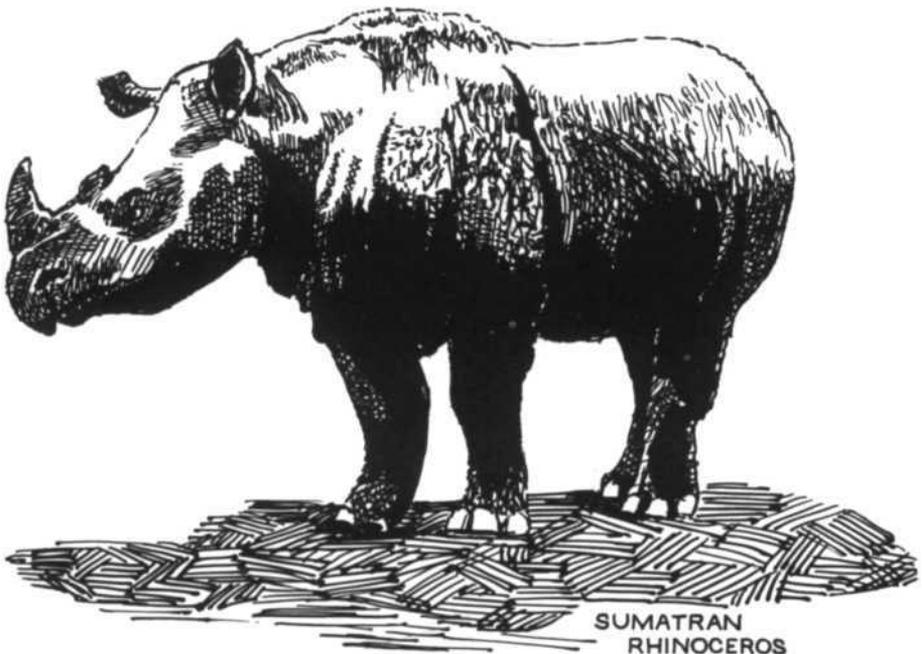
hides are being utilized extensively as articles of commerce in many places in South East Asia. We had papers on turtles, on fish, and on plants. We had general papers on the best form of approach to the people living in the areas where the various threatened species occur. We had discussions on the danger to species of both plants and animals, caused by scientific collection.

Most of the papers that were presented called for more scientific research into the biology and ecology of the threatened species; many pointed to the necessity for specific protective legislations and the provision of reserve areas.

There was discussion on the artificial and captive propagation of these threatened and rare species. There was a general agreement that education was the long-term solution to the survival of these threatened species.

It was recognized that human over-population was the root cause of all the problems of conservation, significantly so, here in South East Asia. It was also agreed that Man, himself, was a part of evolution, and was himself still evolving. It was an encouraging sign, however, that this same evolution had evolved the 'conservationist' among other human types.

We conclude with the note that the present situation for threatened species is bad, but not hopeless. It is desperately urgent but it is not really a lost cause.



# Summary of Papers and Discussion of Technical Session IV – Threatened Species

## Mammals

Mr. E. P. Gee stressed the necessity of co-operation and assistance from the local inhabitants in the area of a sanctuary protecting rare species. He cited as an example the Kaziranga sanctuary in Assam where the buffer zone is inhabited.

Dr. Boonsong described the rich wildlife resources of Thailand, reasons for their decline, and listed the threatened species of mammals, birds and reptiles, and those which should be watched carefully.

Prof. Rabor reported on the status of small land mammals in the Philippines, seven of which should be considered threatened species.

Mr. Hislop brought together his 20 years' experience and information on the Sumatran rhinoceros and seladang in Malaya.

Dr. Schuarte presented the most recent reports on the status of the three species of Asian rhinoceros.

Mrs. Harrisson stressed the urgent need for:

1. reserves to protect the orang-utan,
2. cessation of the illegal trade in these animals, and
3. research.

Mrs. Harrisson reported on the creation of the orang-utan Recovery Service (OURS) and its activities.

Mr. deSilva gave a detailed description of the East coast experiment where young orang-utans which have been confiscated from illegal traders are cared for and encouraged to live a natural life in the wild.

## Birds

Mr. Ripley deplored the increasingly large trade in wild birds and urged the need for research. There are only a few South East Asian bird species that are known to be endangered.

Dr. McClure reviewed the status and problems of bird population in South East and East Asian countries, including Taiwan, Philippines, Thailand and Malaysia.

Prof. Rabor explained the plight of the rare Monkey-eating eagle, outlined its life history resulting from a recent study, and made recommendations for its conservation.

Mr. Alcasid gave a complete account of the method of catching birds with light as practiced by the Igorots and other tribes in the Philippines.

## Reptiles

Dr. Balasingam reported on the program to conserve the economically important green and leathery turtles in Malaya.

Dr. Somadikarta reported on the results of a questionnaire on sea turtles in Indonesia and recommended needed conservation measures.

### **Fish**

Mr. Alfred gave a detailed report on the threatened species of freshwater fish of Malaya and Singapore and explained the reasons for their decline.

Prof. Chote Suvatti and Mr. Dheb Manasveta reviewed the fauna preservation and conservation legislation, reported on the species of Thai fish which have become rare or disappeared, and presented specific problems and recommendations for these resources.

### **Plants**

Dr. Chew Wee-Lek described the three most important forest habitat types in the Malay Peninsula: lowland dipterocarp, montane, and limestone forests and urged the need to protect plant communities.

Dr. Anne Johnson discussed plant communities and the abundance, density, frequency and fidelity of species in a community with mention of some rare species and communities.

Dr. Tem Smitinand explained how plant species are threatened due to habit, habitat, geographic distribution and commercial exploitation.

### **Collecting**

Mr. Nicholls reviewed the factors supporting the control of collecting expeditions and proposed a mechanism for regulating collecting in Thailand.

## **DISCUSSION**

In the discussion Mr. Riney related that in several African countries it was unsuccessful to return tourist and other income to local officials. Now schools, hospitals, etc. are being given to the local people so that they can directly relate the benefits of the park to the new facilities they have received.

Mr. Daley emphasized that tourists provided not only a source of income but security in assuring the preservation of park areas.

Dr. Soemarwoto added that wars and rebellions had a detrimental effect upon orang-utan populations.

Mrs. Harrison described local laws and suggested a draft resolution on draft laws that could be adopted by small states and provinces.

A Thai delegate recommended attention to the threatening species, such as cows and goats.

Mr. Dusit corrected Dr. Boonsong's remarks and stated that the Forestry Division of Thailand lacks sufficient funds and personnel to administer parks and reserves adequately.

Mr. Riney commented on the need to select technical aid experts who have had specific experience with the same problems elsewhere.

Dr. Wycherly explained the efforts being made to codify laws of Malaysia and suggested that efforts be made to increase the national priority of codification of conservation laws.

Following the discussion on Komodo lizards, Mrs. Harrison stimulated a discussion of and recommended a resolution on the distribution of rare species to zoos.

Dr. Soemarwoto described a decree issued by the head of the Indonesian Armed Forces preventing destruction of animal life especially bird of paradise in West Irian during hostilities there.

Dr. Darling commented on the high activity in limestone forests and the rapidity with which disturbance produces sterile situations.

Dr. Somadikarta suggested that governments consult with conservation bodies before construction of roads and other facilities.

Dr. Talbot recommended a resolution cautioning against the dangers of using immobilizing drugs especially on threatened species and if use must be made, then only by highly qualified persons.

# Part I

## Mammals

### Threatened Species of Large Mammals in Tropical South East Asia and the Importance of Sanctuaries (Including National Parks and Reserves) in their Conservation

by

MR. E.P. GEE

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#### SUMMARY

Due to pressure from human populations and ever insistent demands for more land, sanctuaries in South East Asia are of inestimable importance for preserving rare and endangered species. With poverty, hunger and often illiteracy as prevalent as they are, the main emphasis should be on the economic or tourist value of wild life. The co-operation and assistance of the local inhabitants are vital if any progress is to be made in nature conservation. Some practical methods of ensuring this co-operation are discussed, including buffer zones, publicity and education, and provision of local amenities.

While legislation protecting endangered species is necessary the difficulties in enforcing such legislation in emergent and developing countries makes it imperative to preserve these rare species in sanctuaries. Pressures from human populations in the countries of Asia are much greater generally than in North America and Africa. Consequently sanctuaries in Asia are usually smaller in size and require more management and greater protection. The Javan and Sumatran rhinos, the brow-antlered deer, the anoa, the tamarau, the orang-utans, and to a lesser degree the seladang, kouprey, and Malayan tapir are animals of South East Asia that urgently require protection if they are to be preserved from extinction.

Where poverty, hunger, and often illiteracy are prevalent among the local people, it is of little avail to stress the importance of wild life on aesthetic, cultural and scientific grounds. The main emphasis should always be on their economic value; in other words, rare animals are of infinitely greater value to the local villagers if kept alive in their natural habitat than if killed and eaten. Rare wild animals will attract visitors from nearby cities and tourists from abroad and thus provide the sorely needed revenue for development.

The problem of preserving rare species of wild life in existing or proposed sanctuaries in South and South East Asia is largely political and administrative. It depends ultimately on the careful drawing up of laws and the full co-operation of the local villagers.

Drawing on experience gained at Kaziranga Sanctuary in North East India, where the Great Indian Rhinoceros is preserved, it has been found that the creation of a buffer zone of varying width around the sanctuary in which no firearms or other weapons may be carried except by bona fide inhabitants of the zone for the actual protection of their own crops from vermin, has done a great deal to keep away poachers.

Anyone from outside caught inside the buffer zone with a firearm can be immediately arrested, while those living within the zone can then be more carefully watched and

controlled. An ideal buffer zone would be devoid of human activities, but, as in the case of Kaziranga, it can contain villages, cultivations, grazing grounds, etc.

To ensure the co-operation and assistance of the inhabitants living and working in the vicinity of a sanctuary, the importance of publicity and education cannot be over-estimated. The inhabitants must be convinced of the monetary value of wild life; the local members of the legislature who live near the sanctuary must be convinced of the long-term economic advantages of the wildlife resource and must themselves spread the gospel of nature conservation among their constituents. Basically the animals belong to the local people and they could well be regarded by them as living money earners, particularly if there is some concrete proof of the profit from tourism to the country as a whole in the form of a special school or water supply. Some special project (in addition to the normal work of development) publicly proclaimed as being the result of funds derived from the rare species or sanctuary concerned, should create a very favorable impression on the local people.

Local human populations adjacent to a rare species of wild life should be induced to take a pride in their accidental trusteeship – protectors of this valuable natural resource rather than destroyers of it. It is significant that poachers of the rhinoceros in Kaziranga are forced to do their illegal killing secretly and in the remote interior away from and unknown to the local inhabitants who would resist such interference from outsiders.

In the event of a rare species having to be transported to a new area more suitable for its supervision and protection, as might happen in the case of the Sumatran rhinoceros, it is even more important to have previously enlisted the support of the local population. To create new conditions of wild life as potential crop-raiders might arouse resentment in a new area unless the inhabitants of the neighborhood could be previously persuaded to accept the new situation with its land requirements and risks, in their own and in the national interest.

It is on the co-operation of the local villagers that many of the endangered species and their sanctuaries depend, and it is mainly by such simple and practical methods that under-developed peoples can be persuaded to become conservation-minded.

# Threatened Species of Fauna of Thailand

by

DR. BOONSONG LEKAGUL

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## SUMMARY

The author describes the rich wildlife resources of Thailand and gives the reasons for their steadily dwindling numbers. He lists the seriously threatened species and those that should be watched among the mammals, birds, turtles, and other reptiles.

## INTRODUCTION

Thailand in the old days was one of the richest countries in wildlife resources. Mr. John Bradly wrote in his book, 'A Narrative of Travel and Sport In Burma, Siam, and the Malay Peninsula', that when he and his friends travelled on foot from Rangoon to Bangkok in 1876 that they often saw rhinoceros on their way. Elephants and buffaloes (possibly gaur and banteng) were numerous and found in herds of varying numbers many times a day. Even before and during the last World War, game animals were still very numerous in every part of the country. In one day's hike, one usually saw a few herds of elephants and banteng, and one or two herds of gaur. The sambar and barking deer were found often. The calls of big game animals were heard very often especially in December and January when most of them were mating.

The rich wildlife resources of this country began to be depleted very seriously after the end of World War II when surplus transport and fire-arms became easily available to the people. Game animals were slaughtered by shooting from jeeps with spotlights using rapid rifles and machine guns. Not only was wildlife destroyed wantonly but the forest habitat was cleared and burned at an alarming rate to expand areas for cultivation. Squatters did not hesitate to move in and settle even in reserved forests.

## CONSERVATION EFFORTS

In 1950 a number of people, mostly old hunters, alarmed at this destruction of animal and forest formed 'The Association for the Conservation of Wildlife'. Ten years later (1960) they succeeded in getting the government to pass a game law, but this law is only letters printed with black ink on white paper unless it is properly enforced. Most important are:

1. well trained and dedicated wardens,
2. an adequate budget for proper patrolling,
3. co-operation between various government departments, and
4. public education.

The first three of these are sadly lacking in Thailand, the lack of money for proper patrolling being the most outstanding. Without such patrolling in the near future forest and wildlife resources will be doomed. All countries in South East Asia badly need well trained forest wardens. The best remedy for this would be if some international organization such as the IUCN could provide training facilities such as wildlife experts to teach and train in rotation in countries in this region.

Public education in Thailand is more promising. Conservation education has been introduced into the teaching curriculum of all classes in the schools, and the Association for the Conservation of Wildlife is active in giving lectures and arranging 4 or 5 trips

a year. The Asia Foundation is very co-operative in providing funds and printing bulletins on conservation news. It is hoped that with the coming generation conservation education will have progressed greatly.

#### MAMMALS – SERIOUSLY THREATENED SPECIES

- 1 and 2. Javan and Sumatran Rhinoceros (*Rhinoceros sondaicus* and *Didemcerus sumatrensis*) were once common in many parts of the country but they have been killed for their horns. It is not too pessimistic to say that they have already been wiped out although a very few may still survive in secluded corners on the Tenasserim Range. Karen hunters have brought horns and parts of their carcasses for sale at Karnchanaburi market each year during the past few years. To make a survey there would disclose their presence to the villagers, especially the Karen hunters, and would send the animals to their doom more quickly.
3. Kouprey (*Novibos sauveli*) were once found in the northeast, north of Dongrak Range in the areas of Burirum, Surin, Srisakes, and Korat. The last herd was seen at Dong Eo-jan Forest southwest of Korat in 1950.
4. Thai Eld's Deer (*Cervus eldi siamensis*) used to be plentiful in the open plains and dry forest in every part of Thailand north of Petchaburi. Because of its curved antlers it could not flee into dense forest so after the end of World War II it was wiped out quickly by hunting in jeeps. There may be a few small herds left.
5. Hog deer (*Hyelaphus porcinus annamiticus*). Its habitat is high grass on open plains. When this is burned the deer is easily shot at night. There may be a few individuals left in remote areas at Chiengrai and the northeast.
6. Wild Water Buffalo (*Bubalus bubalis*). At present these have been lost to every part of the country save one area at Ban Rai Forest at Udhai Dhani. They are easy to kill because they habitually return to muddy pools to wallow. Their survival will not be long there because the Karen hunters are moving into this territory from Burma. This area at present is one of the best habitats for the big game animals of the country. Thailand should immediately set this area aside as a reserve with adequate funds for patrolling before it is too late.
7. Dugong (*Dugong dugong*) were once often seen along the coast of the inner gulf of Thailand from Sriracha to Rayong. They are often caught accidentally in fishing nets and drowned; if caught alive they are killed at once for meat. The Game Law Committee has suggested putting this sea mammal on the protected list of the fisheries and it is only hoped that this will be done before it is too late.

#### MAMMALS – SPECIES THAT SHOULD BE WATCHED CAREFULLY

1. Serow (*Capricornis sumatraensis*) was once found on most of the mountains and many of the islands of Thailand. Nowadays there are only a very few on some steep hills and on a few islands. Although this animal is in the strictly protected category it is much feared that the law cannot protect them unless they are in a national park or reserve because the villagers value their oil and bone marrow for curative properties for arthritis, fractures, and rheumatism, and then kill them wherever they are found.
2. Goral (*Nemorhedus goral*) was occasionally reported from some steep mountains along Mae Ping River. The number has never been estimated.
3. Elephants (*Elephas maximus indicus*). Once abundant in every part of the country the number of elephants has been reduced drastically especially since World War II through the clearing of forests and hunting for ivory and meat by villagers who find them easy prey, in spite of the 'Elephant Preservation Law'. Females and the young are killed first because they are more tender. Elephant meat is often sold as gaur or banteng meat. One elephant can provide meat for a whole village for many weeks.

4. Gaur (*Bos gaurus*) is the most magnificent game animal in the world, once found in abundance in jungles throughout the country. It has been much hunted and its habitats disturbed so it is found now only in small herds in remote forest.
5. Banteng (*Bos banteng*). Before the end of the war the banteng were rather abundant in every part of the country and were found as far as Surat Dhani in the peninsula. At present they are found in small herds in very remote areas. Originally plains-loving, diurnal animals they have changed their habitat to dense forest and become nocturnal in order to survive.
6. Malayan tapir (*Tapirus indicus*) are found now mostly in the south and west of the country. They are decreasing in numbers very rapidly because of trapping for export to zoos and shooting for fun and meat.
7. Leopard and Black Panther (*Panthera pardus*). The skin of this animal (both the black and the spotted forms) is in great demand and a good spotted one sells for 2000 baht (\$100 U. S.). The animals are also sought by animal dealers for the zoo trade.
8. Clouded Leopard (*Neofelis nebulosa*). It is usually rather rare in Thailand, but when it is found it is trapped for zoos.
9. Binturong (*Arctictis binturong*) is found widespread in dense forests. It is timid and easily caught alive or killed. It is also wanted by zoos.
10. Gibbons (*Hylobates* spp.). The common gibbons in this country are the common white-handed gibbon (*Hylobates lar entelloides*) found mostly in the west and south of the country and the crowned gibbon (*Hylobates lar pileatus*) found in the east. Gibbons are much in demand for zoos and as pets for both Thai people and foreign visitors. Felling of forests destroys their habitat so nowadays they are found only in deep forests. Because they are difficult to catch the villagers usually shoot the mothers in order to catch the baby and very often both die from the wound, or from falling from high trees, or from malnutrition when in captivity.
11. Monkeys (*Macaca* spp.). Tens of thousands of monkeys have been exported yearly to the United States for making polio vaccine in the last decade (1955-65) and some kinds have already been wiped out from parts of the country. The Thai government has now restricted the export to 700 animals a month which helps a little.  
 They are also trapped and shot for meat and sometimes sold smoked in the market at 4 or 5 baht (about 25 cents U.S.) a piece.  
 The easily caught Crab-eating monkeys, which stay in the mangroves near the seashore, have suffered the most, then the Pig-tail and Stump-tailed monkeys in the south; the Rhesus and Hill macaque in the north have fared somewhat better than the others. Since monkeys are still known to raid crops, they have not been put on the protected list to avoid adverse public criticism.
12. Langurs or leaf-eating monkeys (*Presbylis* spp.) are dwindling in numbers very quickly, because the villagers believe that their fresh blood, when mixed with liqueur and taken orally, possesses some property in giving strength to the body and in curing some diseases. Langurs are hunted for their blood and their flesh, smoked and served as food. They are now found only in some remote areas far away from habitation.

#### **BIRDS – SERIOUSLY THREATENED SPECIES**

All big birds in the stork family are threatened by:

1. shooting for sport;
2. the draining of marshes; and
3. the lack of natural havens where they can feed and roost peacefully.

The following birds are rarely seen at present and all are seriously threatened species.

1. Sarus Crane (*Grus antigone sharpii*). This beautiful big bird is very rarely seen at present in this country. Six birds were seen in Phu Kadung National Park six years ago, four were shot later on and only two were seen last year. Four birds came to roost at the Open-billed Stork Sanctuary at Wat Phai Lorm, Pathum Dhani in January last year. Two were shot by poachers and the other two had to fly away to save their lives.
- 2 and 3. The Giant Ibis (*Pseudibis gigantea*) and Davison's Black Ibis (*Pseudibis papilosa davisoni*). There may still be a few of these birds in remote areas but they have neither been seen nor reported in the past ten years. Recently Giant Ibis were reported at some deep jungle ponds in northeast Cambodia.
4. The Black-necked Stork (*Renorhynchus asiaticus*) and the White-necked Stork (*Ciconia episcopus*) are now very rarely seen in this country, although they are more common in neighboring Cambodia.
5. The Greater Adjutant Stork (*Leptoptilos dubius*) is also very rare in Thailand nowadays, although the lesser species is still found occasionally in certain areas.

### **BIRDS – SPECIES THAT SHOULD BE WATCHED CAREFULLY**

1. The White Ibis (*Threskiornis melanocephalus*). A small flock of six or eight birds are still seen from time to time at the Open-billed Stork Sanctuary at Wat Phai Lorm but they are very rarely seen anywhere else nowadays.
2. The Painted Stork (*Ibis leucocephala*) has become scarcer in the past ten years. However, big flocks may be seen feeding in mud flats and rice fields near the seashore between Tachin and Meklong Rivers at the end of the rainy season.
3. The Spotted-billed Pelican (*Pelecanus philippensis*) has also become scarcer in the last decade. A few dozen are seen at widely scattered lakes, mud flats, and rice fields.
4. Argus Pheasant (*Argusianus argus argus*) is found only in the peninsular provinces. Many of them have been trapped in the past ten years for export to zoos and animal dealers in other countries although the Government has restricted the number of birds to be exported.
5. Burmese Peacock Pheasant (*Polyplectron bicalearatum*) and Malayan Peacock Pheasant (*Polyplectron malacense*). The former is found north of the Isthmus of Kra and the latter south of that isthmus. The birds are being trapped and exported in large numbers every year for zoos.
6. Green Pea Fowl (*Pavo muticus*). Once it was abundant in every jungle, but now it is very rarely seen. It is hunted intensively by trappers for sale as pets and by villagers for its excellent meat.

### **TURTLES**

There are no seriously threatened species, but species which should be watched carefully as their numbers are dwindling are the river turtles and the sea turtle.

1. River Turtle (*Batagur baska*). This species has dwindled very rapidly because its habitats (river banks) have been occupied by people, and fishermen hunt the turtle and its eggs for meat.
2. *Platysternum megaciphalum*. This species is usually found in mountain streams, three to four thousand feet or higher. It is strange looking and is heavily collected for sale in the pet market.
3. Sea Turtles. Of all four species in the Thai seas, the Green Turtle (*Chelonia mydas*) is the most common one, the Hawksbill Turtle (*Eretmochelys imbricata*) comes next. These two are of economic importance to Thailand because the Thai people like to eat their eggs. The Government has given concessions for

egg collecting at different places along the seashore. The concessionaires have to hatch certain numbers of eggs of these two turtles and release their hatchlings back into the sea. According to the regulation of the Fishery Department, 21, 350 hatchings of the Green Turtle and 2, 525 of the Hawksbill should be released every year. Such an excellent regulation should be quite enough to preserve these two species of sea turtles from being depleted, but it needs some honesty on the part of both official inspectors and concessionaires.

4. The Leathery Turtle (*Dermochelys coriacea*) is found, but not in large numbers, on the Indian Ocean side of the Thai peninsula and very few in the Gulf of Thailand. This turtle should also be included in the hatching regulation as the above two are.

## **OTHER REPTILES**

There are no seriously threatened species but the three varieties of crocodiles – false gavia, brackish water, and fresh water – should all be watched carefully as their skins are in great demand by trappers. Fresh water crocodiles are found nowadays in Bung Borapet Lake of the Fishery Department at Nakon Sawan. Brackish water and false gavia crocodiles may be found but only in small numbers at the mouth of rivers in the south of Thailand where they are covered with mangroves. They are no longer found as they were in their old habitats, but they may be saved from extinction by the crocodile farms which raise them for their skins. It is difficult to put crocodiles on the protected list because people are afraid of them.

# Threatened Species of Small Mammals in Tropical South East Asia

## The Problem in the Philippines

by

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### SUMMARY

Small land mammals constitute about 76.4 per cent of the entire land mammal fauna of the Philippines. Certain species – cloud rat, macaque, civet and leopard, flying lemur, scaly ant-eater, and mouse deer – face extinction with the destruction of their natural habitat due to ruthless deforestation and human utilization as articles of diet or for certain articles of commerce. Recommendations are made to reverse this process.

Annex 1 consists of a summary of the Philippine Land Mammal Fauna, and Annex 2 lists those which should be considered threatened species.

### INTRODUCTION

There are about 7100 islands in the Philippine archipelago and their sizes vary widely, but almost all of them possess certain species of land mammals, chiefly small mammals. Out of approximately 242 species and subspecies of land mammals listed, only 18 are larger forms (tamarau, deer, and pigs). Bats, rats, and mice together form 76.4 per cent of the entire land mammal fauna. A summary of the fauna appears in Annex 1 (page 3) and small threatened mammals, Annex 2.

### Present Status in the Conservation of the Philippine Land Mammals

It is safe to generalize that at present the large Philippine land mammals are all either being threatened with total extinction as in the case of the tamarau (*Anoa mindorensis* (Heude)) or are showing definite trends towards depletion of their numbers as in the deer (*Cervus* spp.) and wild pigs (*Sus* spp.).

The small land mammals of the Philippines include the following groups listed below in descending order based on the number of forms representing the various groups, the present abundance of the members of each group, and on the commonness of occurrence of the members of each group on their respective islands of distribution.

1. Bats. Bats occur in almost all types of vegetation and other types of habitat, including close proximity to man. Many Filipinos living in remote villages consider bats part of their diet, but these are in the minority. The main cause of depletion of population of bats in certain localities is the destruction of forests, their natural habitat. However, bats of all species are still in normal numbers and they are in no danger of depletion.
2. Rodents. Rats and mice occur in almost all types of habitat in the Philippines. By excessive deforestation and the consequent planting of crops which are attractive to rats, an imbalance of the ecosystem has occurred resulting in a great increase in the population of the common field rats (*Rattus rattus mindanensis* and *Rattus exulans* subspp.) especially in Mindanao. This has caused very great loss in crops and thus far has proven impossible to control.

Most rats and mice endemic to the Philippines live in special habitats such as high mountain tops or dense forest and their numbers have remained normal. One species of rat, however, the cloud rat, [*Crateromys schadenbergi*

(Meyer)J already rare is threatened with extinction as it is hunted both for its pelt and for food.

The squirrels, pygmy (*Nannosciurus* spp.), tree squirrels (*Callosciurus* spp.), and flying squirrels (*Petinomys*, *Hylopetes*), are all still holding their own on the various islands where they occur.

3. Primates. The smaller members of this group, including the tree shrews, (*Tupaia*, *Urogale*), lorises (*Nyctwebus*), and tarsiers (*Tarsius*) are not usually hunted by the average Filipino. The only factor that may cause depletion in their number is destruction of their forest habitat by man.

The macaques (*Macaca* spp.) widely distributed in the Philippines have been greatly depleted due to the demand for them in the United States. The ruthlessness with which they were hunted and the government's apathy in enforcing proper conservation practices have been responsible for this decrease. Trade has practically ceased because of the radical depletion of the animals.

4. Carnivores. The civets (*Viverra tangalunga* Gray), palm civets (*Paradoxurus* spp.), and leopard cats (*Felis* spp.) have suffered from hunting because of the belief that these animals destroy poultry. In rural areas their meat is also relished. The dwarf otter [*Amblonyx cinerea cinerea* (Illiger)], teledue (*Mydeus marchei* Huet) are uncommon species restricted to Palawan. The mongoose (*Herpestes brachyurus parvus* Jentink), and binturong (*Arctictis whitei* Allen) are rare. They are not threatened with depletions in numbers.
5. Flying lemurs. The flying lemur (*Cynocephalus volans* Linnaeus) used to be very common on Samar, Leyte, Bohol, and Mindanao, but now shows a definite decrease especially on the latter island. It is much sought for its fur. Another factor may be that the monkey-eating eagle (*Pitkecophaga jefferyi* Ogilvie-Grant), in the absence of the macaques, feeds upon the flying lemurs. But as the eagle is itself rare, this does not seem to be of much importance.
6. Pangolins or Scaly Anteater. The scaly anteater (*Manis culionensis* Elera) is uncommon even on Palawan and the other adjacent islands where the species occurs. Although the meat is relished in rural areas the main reason for a depletion in numbers is to be found in the clearing of forests, the natural habitat of the anteater.
7. Insectivores. The gymnure (*Podygymnura truei* Mearns) occurs only in the highlands of Mindanao, in the vicinity of high peaks such as Mt. Apo and Mt. Katanglad. The musk shrew (*Crocidura* spp.) are found mainly in mountain forests often the mossy type of the larger islands. Both are seldom met with by man. The thick-tailed shrew (*Suncus* spp.) frequently mistaken for a rat, is found near human habitations and cultivated areas. None of these species, however, seems to show any depletion in numbers.
8. Mouse Deer or Chevrotains. The mouse deer (*Tragulus nigricans* Thomas) has a very restricted distribution being found only on Balabac Island, a very small island south of Palawan. Although the meat is relished by the inhabitants of the island, the deer has thus far kept safely to the forests. With the quest for additional room for crops, the deer is faced with a gradual loss of natural habitat and therefore with the threat of extinction, and protective action should be taken immediately.

### **Causes of Population Decreases of Small Philippine Land Mammals**

There are two main causes for the depletion in numbers of some small Philippine land mammals:

1. Destruction of natural habitat through excessive logging and burning or illegal clearing of virgin forest for crop planting.
2. Human utilization of the species concerned as articles of diet or as raw materials for certain articles of commerce.

The island condition of the Philippines is one factor in favor of survival of species since a species becomes extinct on one island but may yet be extant on another. Nonetheless proper measures should be adopted by the government to ensure normal conservation of all the species of the small land mammals found in the Philippine Islands.

## **RECOMMENDATIONS**

The following measures should be taken to conserve small land mammals in the Philippines:

1. Systematic study of the biology and ecology of these animals to serve as basis for a conservation program.
2. The capture of certain species should be totally prohibited.
3. There should be strict enforcement of existing conservation laws.
4. Conservation education should be included in the science instruction in all grade levels of the schools – elementary, secondary, and university.
5. A program of conservation education should be undertaken by the government aimed at the people in the rural areas.

**A SUMMARY OF THE PFIUPPINE LAND MAMMAL FAUNA**

- (a) Order Insectivora – The Insect-eating Mammals.
  - 1. Family Erinaceidae – Gymnures.  
1 genus; 1 species.
  - 2. Family Soricidae – Shrews.  
2 genera; 12 species.
- (b) Order Dermoptera – The Flying Lemurs.
  - 3. Family Cynocephalidae – Flying Lemurs.  
1 genus; 1 species.
- (c) Order Chiroptera – The Bats.
  - 4. Family Pteropidae – Fruit Bats.  
10 genera; 35 species.
  - 5. Family Emballonuridae – Sheath-tailed Bats and Tomb Bats.  
2 genera; 6 species.
  - 6. Family Megadermatidae – False Vampires.  
1 genus; 1 species.
  - 7. Family Rhinolophidae – Horseshoe Bats.  
1 genus; 11 species.
  - 8. Family Hipposideridae – Round-leaf Horseshoe Bats.  
2 genera; 11 species and subspecies.
  - 9. Family Vespertilionidae – True Insect-eating Bats.  
7 genera; 27 species.
  - 10. Family Molossidae – Mastiff Bats or Bulldog Bats.  
2 genera; 3 species.
- (d) Order Primates – The Lemurs, Monkeys and Apes.
  - 11. Family Tupaiidae – Tree Shrews.  
2 genera; 5 species and subspecies.
  - 12. Family Lorisidae – Lorises.  
1 genus; 1 species.
  - 13. Family Tarsiidae – Tarsiers.  
1 genus; 3 species.
  - 14. Family Cercopithecidae – Old World Monkeys.  
1 genus; 5 species and subspecies.
- (e) Order Pholidota – The Pangolins or Scaly Anteaters.
  - 15. Family Manidae – Pangolins or Scaly Anteaters.  
1 genus; 1 species.

ANNEX 1—contd.

- (f) Order Rodentia – The Rodents or Gnawing Mammals.
  - 16. Family Sciuridae – Squirrels.  
4 genera; 18 species.
  - 17. Family Muridae – Rats and Mice.  
13 genera; 72 species and subspecies.
  - 18. Family Hystricidae – Old World Porcupines.  
1 genus; 1 species.
- (g) Order Carnivora – The Flesh-eating Mammals.
  - 19. Family Mustelidae – Otters and Teledus.  
2 genera; 2 species.
  - 20. Family Viverridae – Civets and Mongooses.  
4 genera; 5 species.
  - 21. Family Felidae – Cats.  
1 genus; 2 species.
- (h) Order Artiodactyla – The Even-toed Ungulates.
  - 22. Family Suidae – Pigs.  
1 genus; 9 species and subspecies.
  - 23. Family Tragulidae – Mouse Deer or Chevrotains.  
1 genus; 1 species.
  - 24. Family Bovidae – Cattle and Buffaloes.  
1 genus; 1 species.
  - 25. Family Cervidae – Deer.  
1 genus; 8 species.

TOTALS:

- Orders – 8.
- Families – 25.
- Genera – 64.
- Species and subspecies – 242.
- Number of species of large mammals – 18.
- Number of species of small mammals – 224.

**THREATENED SPECIES OF PHILIPPINE SMALL LAND MAMMALS**

1. *Crateromys schaderibergi* (Meyer) – Cloud Rat
2. *Macaca* spp. –Macaques
3. *Viverra tangalunga* Gray – Civet
4. *Paradoxurus* spp. – Palm Civet
5. *Felis minuta* Temminck – Leopard Cat
6. *Cynocephalus volans* Linnaeus
7. *Tragulus nigricans* Thomas –Mouse Deer or Chevrotain

# Rhinoceros and Seladang–Malaya's Vanishing Species

by

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*Singapore*

## SUMMARY

The necessary rural expansion in Malaya during the past five years has created and is creating very serious problems in the field of wildlife conservation particularly for the Sumatran rhinoceros and the seladang. The distribution and location of individual rhinoceros are reviewed based on the author's personal knowledge gained from extensive experience over the past twenty years in Malaya. Seladang, although numerically greater than rhino, are just as vulnerable because their habitat is that land most suitable for cultivation.

Distribution maps of rhino and seladang are presented.

## INTRODUCTION

During the past five years the face of Malaya has altered considerably in more ways than one, but the expansion of rural development, necessary as it may be to a growing nation, has created very serious problems in the field of wildlife conservation. The two most threatened species are the Sumatran rhinoceros (*Dicerrorhinus sumatrensis*) and the seladang (*Bos gaums*). I am of the opinion that only one species of rhinoceros now exists within the limits of the Malay Peninsula, there being no evidence of the continued presence of the Javan one-horned (*R. sondaicus*).

## THE RHINOCEROS

There is little enough positive information on the rhinoceros at all and that contained in this paper is all that the writer has been able to collect over the past twenty years or so. Details of known habitats are undoubtedly correct, but it has not been possible to ascertain the exact number of animals existing therein, and any estimate given is conservative.

Commencing our survey in the south of the peninsula, the last known rhino in the State of Johore was shot in 1947 although a few may still exist in the swamps.

Currently, the first rhinoceros to be found – about three in number – are located in north Selangor on the banks of the Bernam River where I found two adults and one young in 1949. A sanctuary of some 10,700 acres was created for their total protection by the Selangor State Government a few years ago; this is now surrounded by cultivation on three sides. It is unfortunate that no corresponding reserve has been made in Perak in the extensive swamp forest across the river which the rhino are known to cross.

Continuing northward, in 1949 the hind quarters of a solitary rhino were seen in the steep foothills of Gunong Bubu.

It is in the Bintang Hijau Forest Reserve in northern Perak and the contiguous Gunong Inas Forest Reserve in south Kedah, that we find the highest concentration of rhinoceros known in Malaya. The rocky inhospitable terrain, containing a series of precipitous 4000 to 6000 foot mountains, is well-watered and has frequent wallows and a number of

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fine salt licks, which when I inspected them in 1956 were regularly visited. The wide game trails were much used by both rhino and elephant. In fact the Assistant Game Warden of Perak photographed a rhino at a salt lick a year or so later.

No estimate of the rhino population there can be made without considerable research, but at the present time the whole area is relatively undisturbed apart from logging at some places and tin mining at Klian Intan.

In the upper reaches of the Perak River in the hilly country bordering Thailand there seem to be some rhino but it has not been possible to fix their number; the tracks of one mature animal were seen in 1964.

In the remote hilly bamboo forest of north Kedah bordering Thailand we heard an unknown number of rhinos and found a number of fresh wallows and dung heaps in April 1941.

We now turn our attention to the States of Kelantan, Trengganu, and Pahang. Trengganu, I am convinced holds a few animals in the relatively unexplored hinterland although it has not been possible to verify this. The former King George V National Park, now known as Taman Negara, contains large tracts of land in all three of the above-mentioned states, and there is irrefutable evidence of the presence of rhinoceros within that part of Pahang and also in a high remote region in South Kelantan. Last year a solitary adult was seen in Tembeling valley near Park Headquarters and was seen again some weeks ago. To the east and south east of the park (in the upper reaches of the Sungei Tekai and the foothills of Gunung Irong and Gunung Tapis) there is a great sweep of unexplored difficult country which could very easily contain rhinoceros.

The Krau Game Reserve in Central Pahang is also imperfectly known since no exploration has been done there since before 1941 at which time an adult rhino frequented certain salt licks in the southern quarter. Aborigines inhabiting these regions have told me of the presence of a few rhino on the western slopes of Gunung Benom and at a frequently used salt lick high up in the Ulu Klau Ketchil.

We are now left with southeast Pahang which for the greater part is a vast area of swampy jungle, mainly unexplored and unknown insofar as wildlife is concerned. From this area there periodically emerge migrations of the Bearded Pig (*S. barbatus*) which the aborigines slaughter as they swim the rivers. Apart from these migrations, this animal is practically unknown in Malaya, and it would certainly not be too far fetched to expect to find rhinoceros somewhere in that wild region, especially in the upper valley of the Sungei Endau.

From the available information, then, we can be sure that a few rhinoceros still exist in Malaya, but we cannot say how many, and we do not know where they all are. The summary in Annex 1 is an attempt to estimate the population from the knowledge at our disposal.

## THE SELADANG

The seladang (*Bos gaurus*) while numerically in a much stronger position than the rhino, is, because of its habits, just as vulnerable, if not more so. It is a creature of the lowland river valleys seldom going even as high as 2000 feet. It grazes and browses on grass and low-growing vegetation on islets and river banks and in clearings made and abandoned. Since such country is the most easily developed, being accessible and with the best soil, the seladang is very easily left homeless. Once a herd is broken up and scattered they fall prey to carnivores and hunting, the breeding cycle may be interrupted and a steady decline in numbers sets in until the whole herd ceases to exist. In some areas of Pahang herds of 30 or more that existed in 1941 – 18 years ago – have disappeared. It is certain that seladang populations currently living in areas due for rural development are doomed unless some means of saving them can be found. At present these magnificent animals are still to be found throughout the country (except in Malacca, Perlis, and Selangor) occurring in greatest numbers in Pahang, parts of Upper Perak, and South Kelantan.

(As a matter of interest while on the subject, it has been reported to me that a small herd of Banteng (*Bos sondaicus*) still exists in a certain very remote part of Kedah although there has been no positive record of the presence of this animal for many years).

Salt licks so important to wildlife have been destroyed by cultivation and now a series of dams for hydro-electric power to be constructed on the Perak River and the Sungei Muda in Kedah will submerge the greatest known concentration of salt licks in Malaya. The development of a vast area of 150, 000 acres in Pahang known as the Jengka Triangle now inhabited by both seladang and elephant, and the building of roads into hitherto inaccessible country, populated only by aborigines and wildlife, show that the problems of conservation are becoming progressively more acute.

## ANNEX 1

## ESTIMATED POPULATION OF RHINOCEROS IN MALAYA

Locality	Number Definitely Known	Probable
Johore	Nil	2
Selangor/Perak (Ulu Bernam)	3	4
Selangor (U. Kenaboi)	Nil	1
Gunong Bubu	Nil	1
Perak/Kedah	2	4
Ulu Kedah (Thai border)	2	4
Perak/Kelantan border	Nil	2
National Park	2	4
Ulu Trengganu	Nil	2
Krau Reserve	Nil	2
Southeast Pahang	Nil	2
Ulu Perak/Thai Border	1	2
	<hr/> 10	<hr/> 30

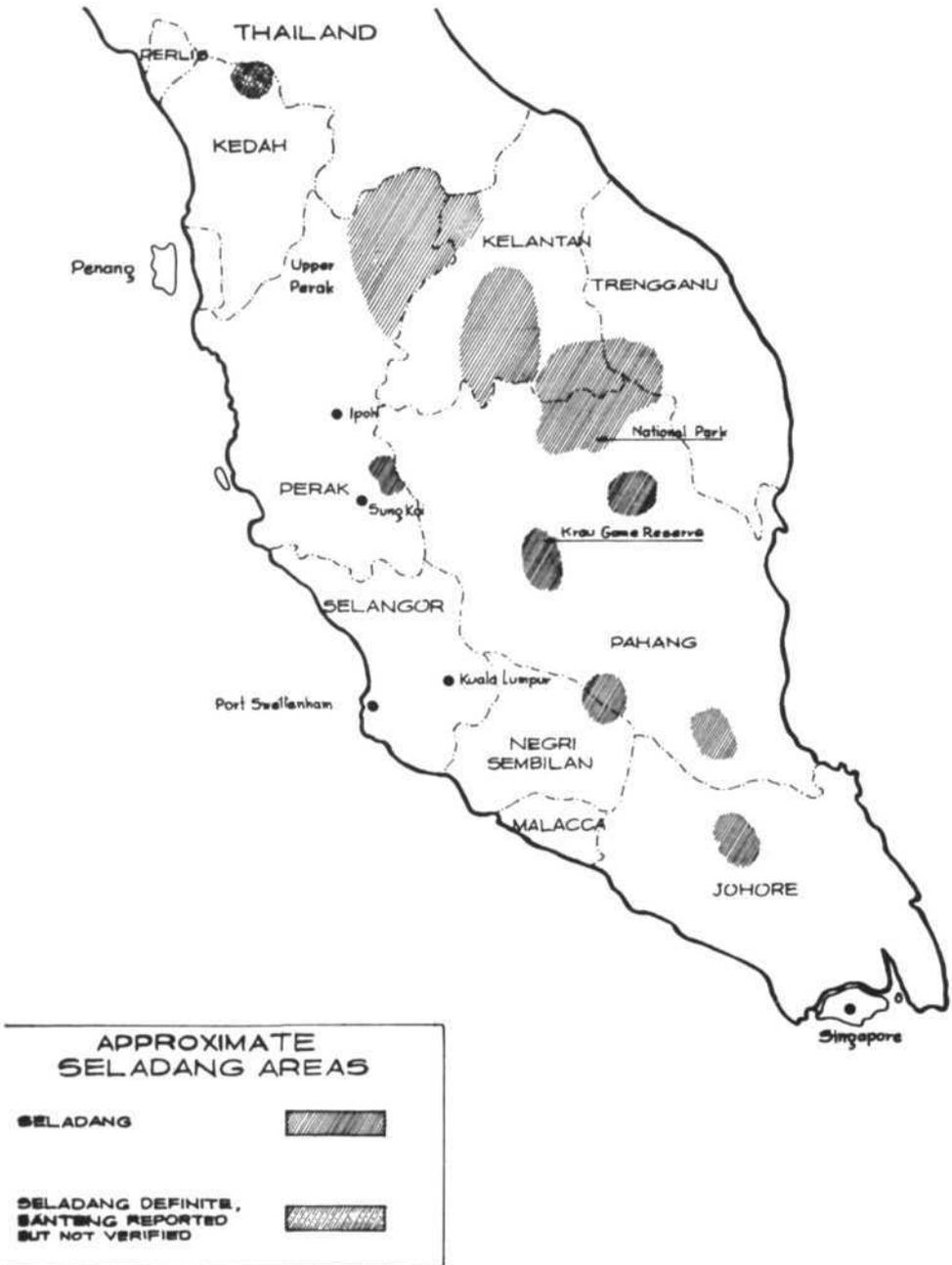
FIG. 6

## Areas in Malaya where Rhinoceros have been Reported



FIG. 7

### Areas in Malaya where Seladang are Found



# Threatened Species of Rhinoceros in Tropical S.E. Asia

by  
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## SUMMARY

The author presents the most recent reports on the status of the three species of Asian rhinoceros – Javan, Sumatran, and Great Indian – and reviews the reasons for the decline in their numbers. While the World Wildlife Fund conservationists appreciate the need for urgency in the rhino projects, they have regrettably made little progress thus far, due to lack of funds.

An extensive annex presents illustrations, and a refutation of the belief in the aphrodisiac qualities of the rhino horn.

## INTRODUCTION

There are in all five species of rhinoceroses two of which live in Africa and three in Asia. The following report deals only with the latter – the Great Indian rhino (*Rhinoceros unicornis*) the Javan rhino (*Rhinoceros sondaicus*) and the Sumatran rhino (*Dicerorhinus sumatrensis*). (See Annex 1.) Since we know of the actual situation of these rhinoceroses in Asia only by hearsay, part of this paper may be incorrect; we would appreciate any suggestions for improvement.

## HISTORY

It should be pointed out that although the African rhinos are relatively young compared with the Asian ones, all rhinoceroses can be traced far back into the Tertiary, the Great Indian and Javan to the Upper Pliocene (approximately 5 to 7 million years B.C.), and the Sumatran rhino, even to the Upper Oligocene (approximately 30 million years B. C.) (In comparison the African rhinos date only to the early Pleistocene - approximately one million years B. C.) There are few other mammals, as far as we know, that can be traced back continuously to such a date. This fact alone justifies all efforts to prevent the extinction of the Asiatic rhinos.

We know so little about the biology of these unique rhinos that we are in no position to say if the population has reached a figure below which we cannot save the species. There is no doubt, however, that it is a seriously threatened species as the following figures of existing Asiatic rhinos deduced from reports show:

Javan rhino	40	
Sumatran rhino	150	- 170
Great Indian rhino	675	

## REASONS FOR DECLINE

There are several reasons for the alarming decline in the numbers of the Asiatic rhinoceroses which has occurred in the last hundred years.

## **Poaching**

Poaching still goes on to a very large extent! There is a tendency for people to think that poaching is an insurmountable problem. It is, of course, nothing of the kind, for good management on the part of conservation personnel together with the encouragement they deserve from higher authorities can bring about an entirely satisfactory level of control, as has been shown in southern Africa.

The most appalling drain on the Asiatic rhino population has come through the wanton killing of the animal for its horn, believed by the Chinese and other Asiatic populations to have powerful aphrodisiac properties. The amount of money received for one horn can be more than a lifetime's normal wages of an ordinary worker. The failure by western conservationists to break down these erroneous beliefs may be because we do not understand the correct way to go about the conversion. It is hoped, therefore, that the proper method of halting these flights of imagination will be put into effect by conservationists who live in the East. In view of the importance that is being attached to the rhino horn, I have considered it necessary to add a short paper on its uses which may help towards a better understanding of the problems involved. (see Annex 2.)

## **Technical Improvement of Firearms**

As recently as 175 years ago the rhinoceros was considered invulnerable and the only mammal without enemies. (See Buffon, 1750 and 1804). The improvement of firearms during the last century has now made the rhinoceros one of the easiest of the big game animals to kill.

## **Increase in Human Population**

The explosive increase in human population results in constant demands for increasing farmland. This in turn leads to a considerable reduction of the natural habitat of the rhinoceros with all its implied consequences. Some pessimists say that the increasing human population and what it entails means the inevitable loss of the species. This of course is plain nonsense and entirely overlooks such vital factors in the development of a country as proper planning for recreation and tourism. Selected areas of natural habitat should be set aside in perpetuity as natural reserves and in these the retention of the rhinos presents no problems. There are many examples in Africa of animals and reserves bringing immense revenues to the countries fortunate enough to possess them.

## **Insufficient Nature Conservation Control**

Control in many wild life sanctuaries at the present time is inadequate, largely because insufficient sympathy, understanding, and encouragement are given to the conservation officers. Control is not difficult when it is in the hands of men dedicated to the protection of wild creatures, and men of that caliber come readily to the fore when a wildlife department is being properly administered. There are some who consider that the considerable sums necessary to maintain a sound conservation organization represent money badly spent. Little thought, or regard to the lessons which can be learned from others, is needed to appreciate that few investments result in such great return, much of it often of a quite imponderable nature. In tourism alone it has to be remembered that those who flock to see wildlife in its natural habitat contribute immense sums to other branches of the country's economy during the course of their stay.

## **ACTUAL SITUATION OF THE THREE ASIATIC RHINOS**

### **Javan Rhinoceros**

Dr. Lee Talbot (1965), in carrying out a survey of the Ujung Kulon Reserve at the request of the Indonesian Government with particular attention to the Javan Rhino, reported that there were still rhino, probably several dozen though the number might well be less, living in the reserve. At the time of the survey no young were found, but since that time one juvenile rhino at least has been seen. What is urgently needed is a distribution and status survey, for it is impossible to develop sound plans for the future without possession of precise facts. There has been some poaching and neglect in the Reserve but all things considered it is still in remarkably good condition.

To assure the survival of the species:

1. reproduction must be assured, and
2. the Reserve must received adequate protection,

### **Sumatran Rhinoceros**

Lord Medway (1965) reported that a small number of Sumatran rhinos survive wild in the hilly regions of north and north central Malaya and in addition a small group, including a juvenile, have lived for five years in the Ulu Bernam Forest Reserve in Selangor. The small population of rhinoceroses is severely threatened and only immediate action can save them.

In the case of this species also, the vital thing is for an early biological survey which happily the Malaysian authorities have already embarked upon.

### **Great Indian Rhinoceros**

Mr. E.P. Gee (1964) reports that there are 185 rhinos in Nepal, 65 in Bengal, and 375 in Assam, a total of 625 (see Annex 3.).

Although the rhinos in India are completely protected, they are constantly under great pressure from a rapidly increasing population. It is encouraging to learn from a report by Mr. Richard Willan, Katmandu, Nepal, with regard to a rhino sanctuary there, that all the villages in the area were moved out, involving a resettlement of some 4000 people so the whole place is free of settlement. There have been no reports of poaching, and rhinos have been seen in some numbers there recently.

It is up to the conservationists to assist the Government in convincing the people that the rhinos alive are a great asset as a tourist attraction and thus can help to increase the country's revenues considerably.

## **WORLDWIDE CONSERVATION EFFORTS**

The dangerous situation which is facing virtually all of the rhinoceros species is well known at IUCN headquarters, and it has been the subject of much discussion at repeated meetings of the SSC. The urgency of the problems associated with the various rhinos has also been conveyed to the WWF, with the result that various projects have been prepared for inclusion in what is known as the Green Book. There are numbers of projects detailed in the Green Book and six are listed in Annex 4.

Although the various rhino projects have for the most part been granted an 'A' priority, because Trustees of the WWF fully appreciate the urgent need for carrying them out, it has regrettably to be reported that they have not yet made much progress. WWF has many commitments and it has so far proved most difficult to obtain those very considerable contributions necessary to fulfill them all. Many organizations have been very helpful and it should be put on record that among them the Fauna Preservation Society has been most positive and generous in its assistance: its Hon. Secretary, Mr. Fitter, has also been most helpful and interested in all problems associated with saving the rhinos.

### **Acknowledgements:**

I am much indebted to Col. Jack Vincent for his assistance in the preparation of this paper. My thanks are also due to the various members of the Rhinoceros Group who have regularly given important information, in particular to Mr. E.P. Gee, Lord Medway, and Dr. Lee Talbot.

## **LITERATURE CITED**

- Buffon, G.L. L. 1750 and 1804. *Histoire Naturelle, Générale et Particulière, avec la Description du Cabinet du Roy ...* Paris de l'Imprimerie Royale. 44 vols.
- Gee, E.P. 1964. Report of November 29.
- Medway, Lord. 1965. Report of April 10.

- Simpson, G.G. 1945. Principles of classification and the classification of mammals. Am. Museum of Nat. Hist. Bull. Vol. 85.
- Talbot, L.M. 1965. Confidential report to the Survival Service Commission on the Javan Rhino study. South East Asia Project Report No. I-SR-15. June. 4pp. (typewritten).
- Willen, Richard. 1965. Report of August 8 to Mr. McPhail of World Wildlife Fund, British Appeal.

**THE CLASSIFICATION OF THE RECENT RHINOCEROSSES**

after G. G. Simpson, publ. 1945

Order PERISSODACTYLA

Suborder CERATOMORPHA

Superfamily RHINOCEROTOIDEA

Family RHINOCEROTIDAE

Subfamily RHINOCEROTINAE

Genus RHINOCEROS Linnaeus

Species *Rhinoceros unicornis* (Linnaeus 1758), Great Indian Rhinoceros

Species *Rhinoceros sondaicus* (Desmarest 1822), Javan Rhinoceros

Subfamily DICERORHININAE

Genus DICERORHINUS Gloger

Species *Dicerorhinus sumatrensis* (Fischer 1814), Sumatran Rhinoceros

Genus CERATOTHERIUM Gray

Species *Ceratotherium simum*

Subspecies *Ceratotherium simum simum* (Burchell 1817), Square-lipped Rhinoceros (South African typical race)

Subspecies *Ceratotherium simum cottoni* (Lydekker 1908), Square-lipped Rhinoceros (Northern subspecies)

Genus DICEROS Gray

Species *Diceros bicornis* (Linnaeus 1758), Black Rhinoceros

### THE RHINOCEROS HORN

The horn of the rhinoceros differs considerably from all horns that can be found in other mammals. This can readily be seen from Fig. 1.

The Rhinoceros Horn is actually no horn at all, but is made up similarly to the skinhorns (Cornu Cutaneum) (see Fig. 2) that are found as pathological growths frequently in other mammals including *Homo sapiens*.

This alone is ample proof that it cannot act as an aphrodisiac since the horn is comparable to the epidermis which definitely can never contain sexual hormones such as testosterone. The widely spread belief in the mechanical effects of the ground horn and the very sharp small hairy parts it contains is based on an absolutely false theory. When taken in any form, the ground horn therefore being discharged as urine through the penis, will have been completely dissolved on passing through the stomach into the kidneys and from there into the gall bladder. All hairy parts that may have been contained in the original food will on their long way be chemically dissolved.

The conclusion to be drawn is this – that from all scientific considerations it is clear that the rhinoceros horn cannot act as an aphrodisiac. This holds true for the horns of all rhinoceros species. The known difference in price between the horn of the African and the Asiatic species is without any foundation.

ANNEX 3

**ESTIMATE OF NUMBERS OF GREAT INDIAN RHINOCEROS**  
**(from Mr. E.P. Gee, November 29, 1964)**

Nepal		185
Bengal Jaldapara	60	
Gorumara	<u>5</u>	65
Assam Kaziranga	275	
Laokhowa	25	
Orang	12	
Manas	15	
Sonarupa	5	
Elsewhere	<u>43</u>	<u>375</u>
Total		625

ANNEX 4

WWF Project Book (Green Book)

C Asian Series

No. 11/1964 (Potential)

Title of Project:

Asiatic Rhinoceros species

A study trip to Assam, Nepal, Sumatra,  
Borneo and Java

No. 47/1962 C/I/9 (Full)

Great Indian Rhinoceros

Ecological survey in northeast India

No. 73/1963 C/I/12 (Full)

Sumatran Rhinoceros

Ecological study in Malaya

No. 87/1963 C/II/3 (Full)

Rhinoceros Sanctuary, Chitawan dist., Nepal

Purchase of a jeep and a motorboat

No. 120/1964 C/II/4 (Full)

Ujung Kulon Nature Reserve, Java

Purchase of vehicles and equipment for the  
Javan Rhinoceros Conservation Program

No. 145/1964 C/I/15 (Full)

Javan Rhinoceros

Ecological survey of the species and its habitat

No. 173/1965 C/I/18.1

Wildlife of India

Surveys of the Great Indian Rhinoceros, the  
Kashmir Stag and the Fauna of the Corbett  
National Park, India

# The Various Horns

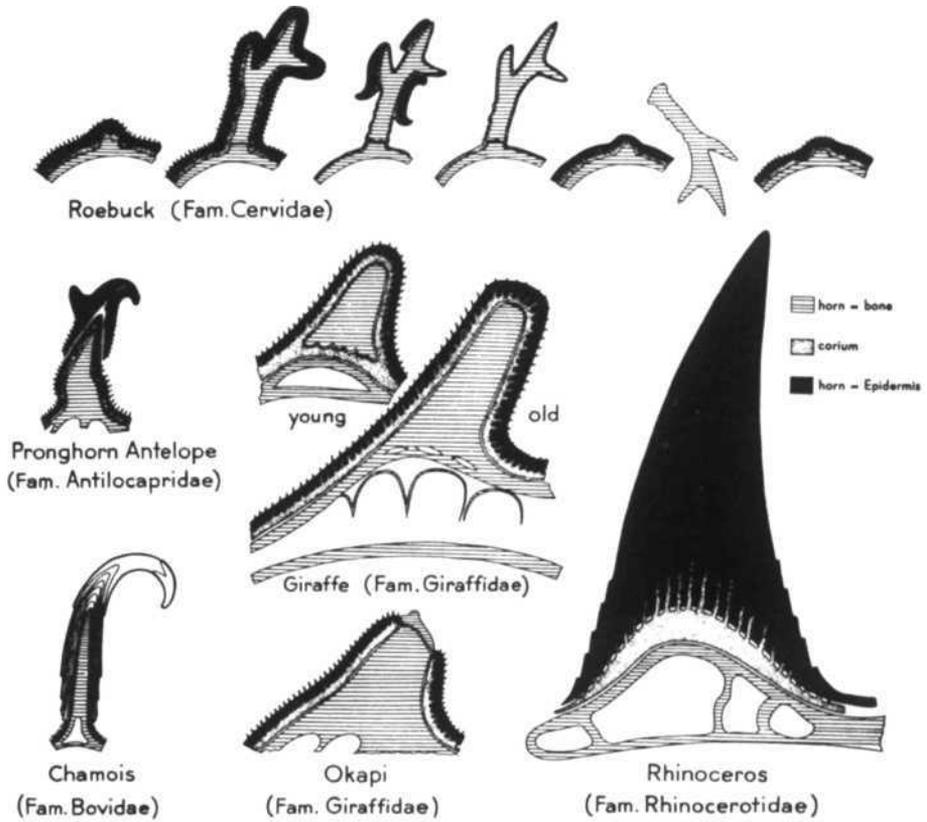


Fig. 8

# Cross Section Through Rhinoceros Horn

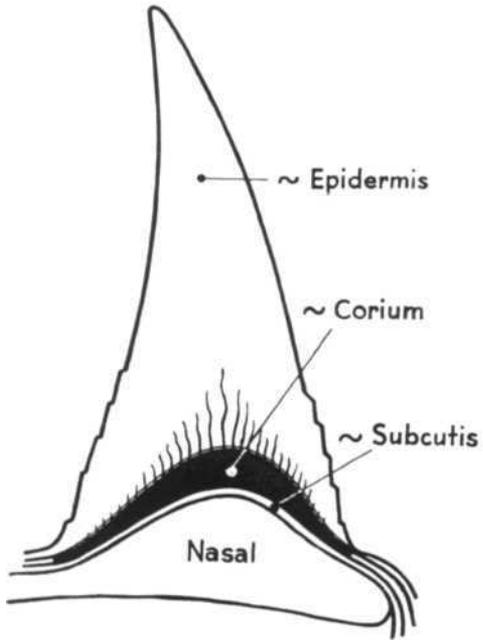


Fig. 9

# Conservation Needs of the Orang-Utan

by

MRS. BARBARA HARRISSON

*Sarawak Museum, Kuching, Sarawak, Malaysia*

## SUMMARY

The orang-utan is threatened with extinction within the next decade unless large, absolutely protected reserves are created, illegal traffic in orang-utans is stopped, and more research on the status of the wild orang-utan is carried out.

The Orang-utan (*Pongo pygmaeus* syn. *Simia satyrus*) is threatened with extinction, probably within the next decade (Harrisson, 1961) because of

1. the threat to the animal's habitat, and
2. the drain on the remaining wild populations through the indiscriminate trading of captive babies.

Legislation, publicity and previous resolutions of the IUCN have so far had little effect. The following are suggestions to remedy the situation.

## PROTECTED RESERVES

The first suggestion must be to create a safe space – that is, protected reserves – where a good number of wild orang-utans will be permitted to live undisturbed into the future; where no firearms may be carried and where the habitat itself is unexploitable by man. Logging, no doubt, disturbs the animals and puts them under pressure even if fruit trees are left standing (Schaller 1961; Harrisson 1963). Orang-utans subsist on a great variety of vegetable and animal matter which is collected from undisturbed rain forests by extended migrations throughout the seasons.

The main difficulty in planning for an orang-utan reserve is the requirement of a large area. From nest-counts first executed by Schaller (1961) in Sarawak we know that an average 1.5 square miles of forest is required for each individual. Unfortunately also, the animal has been scattered over the past centuries and decades of centuries within Borneo and Sumatra and survives mostly in small groups in widely separated areas. Large rivers – which are not crossed – and mountain ranges over 5000 ft. provide additional barriers.

If we look for areas large enough to provide security for an approximate number of between two and three hundred orang-utan in territories which are occupied by him to date, we must look towards Indonesian Sumatra and Malaysian Sabah. This we have done since 1963 when these same issues were discussed by IUCN in Nairobi. The Loeser Reserve of Sumatra is firmly on the map for several years but lacks effective security. The Sabah government was approached in 1963 with a request for help in providing a sanctuary for the orang-utan in largely uninhabited and inaccessible areas in the Ulu Segama of eastern Sabah. In spite of the vast resources of exploitable and accessible timber elsewhere in Sabah and the fact that no population pressures operate in the country or are likely to become operative, the promotion of the proposed reserve has been slow.

## ILLEGAL TRADE

Selfish considerations which have blocked the proposed reserve in Sabah have also dominated the illegal collection of babies and their trade abroad. The Malaysian States of Sabah and Sarawak have effectively prevented this trade in their own territories by

placing all orang-utan babies which become available in official care. They cannot be exported through traders or by individuals for money. Most of those taken care of over the past decade survive and some have bred in good zoos.

The illegal trade of orang-utan babies is largely concerned with those illegally collected and smuggled out of Indonesian Sumatra and Kalimantan to Singapore, to Malayan ports and recently also to Bangkok from where they are sold to zoos and laboratories overseas who offer large profit incentives to make these operations more than worthwhile.

These sores can only be eliminated through international co-operation and goodwill, through better legislation and public relations – but most important, through the elimination of commercial profits in the trading of threatened species by private individuals.

A beginning has been made in this respect by the formation of the Orang-utan Recovery Service (OURS) run under the auspices of the Survival Service Commission of IUCN. This Service aims to help all local governments of the region in enforcing existing legislation to advise and help in the care of requisitioned infants, and to provide permanent places for the animals in selected zoos with good ape-houses and where breeding in captivity will be ensured.

## RESEARCH

One other requirement is that of more research. A start was made locally in Sarawak where with Government help and supported by the World Wildlife Fund, several orang-utans were released and support-fed in a natural habitat with the intention that they should be guided back to wild living (Harrisson, 1963). Three years work indicate that this method can be successful provided the animals are closely supervised and cared for over a number of years, provided they can make contacts with wild orang-utans and provided there is no danger of conflict with human interests or traffic, once the animals grow to a size dangerous to man. The experiment is being continued in Sabah since 1965, under the auspices of the Game Department.

However successful the work may turn out to be in the future, it is most important to realize that it will only rescue a limited number of youngsters (those of Sabah). The important task inquiring into the status of the wild orang-utan and the best ways and means to protect him has not even been started. Time is running out fast for man's closest biological relation, in Asia.

## LITERATURE CITED

- Harrisson, Barbara. 1961. Orang-utan, what chances of survival. *Sarawak Museum J.* 10; 17-18.
- 1963. Education to wild living of young orang-utans at Bako National Park, Sarawak. *Sarawak Museum J.* 11:21.
- Schaller, G.B. 1961. The Orang-utan in Sarawak. *Zoologica* 46.

# **OURS: The Orang-Utan Recovery Service Two Years of Activity 1963/5**

by

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## **SUMMARY**

The background of the Orang-utan Recovery Service (OURS) is discussed and the work of the organization in Singapore, Malaya, Sabah and Sarawak is described.

## **INTRODUCTION**

OURS, the Orang-utan Recovery Service, started its activities in May 1964, under the general guidance of the IUCN Survival Service Commission (SSC), and the Chairman of the Orang-utan Group within the Commission. It is administered and promoted by Mrs. Barbara Harrisson on a voluntary basis. Its aim was to curb illegal trading of captured young orang-utans in Malaysia and Singapore and to co-ordinate local agencies and conservation efforts towards this aim. As a result of a decision taken by the Zoo Directors Union sixteen places for the orphans were found in good zoos with experience in breeding and raising orang-utans.

## **MALAYA AND SINGAPORE**

The main center of illegal trading, Singapore, was tackled first. In accordance with the legislation then valid it was only possible to fine offenders if caught in the act of importing or exporting an orang-utan without adequate documentation while the mere possession of the animal was no offense.

A part-time representative was engaged to assemble a background file on the main dealer offenders and to establish a working relationship with customs and police authorities. Two test cases failed because the dealers were warned beforehand, but these cases did help to convince the authorities of the need to revise legislation. At the same time owing to the political 'confrontation' between Malaysia and Indonesia imports especially from Sumatra practically stopped while prices for the declining numbers of available orang-utans in Singapore went up.

A young orang-utan was received by OURS as a gift from a Singapore citizen and was ready to be shipped to an OURS contributor zoo when the export license was declined by the local Ministry on the grounds that confiscated or otherwise stranded Singapore orang-utans were better off at the Malaysian National Zoo in Kuala Lumpur where they would be an asset to the country and could live in a climate naturally suited to them. Mrs. Harrisson then approached the Kuala Lumpur Zoo and an agreement was reached whereby the Zoo would co-operate with OURS, feeding and taking care of all orang-utans sent from Singapore, and OURS would finance travel if travel were necessary. Two animals were needed by the Zoo to augment its own orang-utan colony, but all others would be taken into temporary care only and sent on to various OURS donor zoos in accordance with OURS recommendations. It was also agreed that any surplus funds available to OURS as a result of these operations should be devoted to building a new orang-utan compound on the Zoo's premises. The agreement still stands and a method of getting a license for legal exportation of orang-utans from Kuala Lumpur Zoo has thus been established.

The legal position in the various states of Malaya is confusing in view of the fact that each state has its own laws covering animal protection, and the game departments hardly co-operate. Direct contact with officials concerned will become necessary in the future, but should be undertaken in conjunction with wider issues, preferably as a follow-up of the Bangkok Conference.

One major success was the publication of a new ordinance (No. 5, dated July 2, 1965) in Singapore which enables the Ministry concerned (the Primary Production Department) to provide for the registration and license of any species of wild animal. After consultations at the Bangkok Conference, Mrs. Harrisson is to submit a report on the status of the orang-utan generally and suggestions on how licensing regulations should be formulated to avoid abuse.

The political scene changed during August, 1965, when Singapore broke away from the Malaysian Federation to become independent. The Director of Primary Productions said that although he was still willing to send all the animals to the Kuala Lumpur Zoo he saw little point in doing so if they were to be sent on to other zoos from there. He also stated that a new animal quarantine station was at present under construction in Singapore where requisitioned animals could be cared for and from where they could go to donor zoos direct. He would, further, like recommendations from Mrs. Harrisson regarding the possibilities of creating a permanent establishment for orang-utans in Singapore itself, the principles by which orang-utans are at present distributed to OURS contributors abroad, which zoos qualify as contributors, and what standards and supervision should be exercised in granting temporary licenses to private owners of orang-utans in Singapore.

#### **STATES OF SARAWAK AND SABAH**

No difficulties present themselves to OURS in Sarawak where Mrs. Harrisson resides and where a long tradition of co-operation exists between the Chief Game Warden (the Conservator of Forests) and the Curator of the Sarawak Museum (who is also the Chairman of the Orang-utan Group of the SSC). All captive orang-utans obtained by the state are automatically placed into Mrs. Harrisson's care. Those which cannot be incorporated into the Sabah jungle scheme are cared for in Sarawak until they are fit to be exported to OURS contributors. There is no difficulty in exporting these animals provided they are sent non-commercially and through government channels. However, the documentation needs revision by the forestry authorities as the license is very easy to reproduce.

The Sabah Government established a new game department (as part of Forestry) in 1964 which became active in orang-utan affairs by continuing (with the co-operation of Mrs. Harrisson) the Sarawak Orang-utan Jungle Scheme of Bako at the Sepilok Forest Reserve near Sandakan. This Reserve is to give the young, captive orang-utans the natural background for re-adaptation to living wild. Only those animals which do not adjust will be considered for export to zoos abroad. The authorities agreed to offer such animals to the Secretary of SSC and OURS would then name a zoo as recipient. No orang-utans have yet been offered due to an outbreak of melioidosis in the immediate environment of the animals near Sandakan.

#### **FINANCIAL ASPECT**

The first year of activities in Singapore involved costs of part-time representation which were discontinued after a working agreement with Kuala Lumpur Zoo was reached. Owing to the fact that Sarawak and Sabah cared for their captive orang-utans mainly under government auspices, only a small sum was spent for a year's care of one animal in Singapore. Air fares (only) of trips undertaken on behalf of OURS by Mrs. Harrisson were charged to the fund. Fourteen contributions to the scheme not yet matched by delivery of animals to participating zoos (i. e. US\$ 11, 200) remain in credit as at November 1965, with a small sum over and above, all expenses of the past two years paid.

## **FUTURE PROSPECTS AND PROBLEMS**

Although OURS activities have been frustrated by outside events and local difficulties the overall effect has been encouraging as the public and responsible organizations have become conscious of the need for support. What is now needed is a vigorous follow-up with local governments and responsible bodies. Even more efforts are **needed** to curb indiscriminate imports of orang-utans without adequate documentation especially in Thailand, Holland, the United States, and Japan where considerable numbers of orang-utans illegally exported from Singapore or Indonesia have been cleared for import or transit during the past two years thus encouraging hunters and smugglers.

OURS can survive and serve effectively by rescuing individual youngsters and channelling them to good zoos but it can only do so with the support of conservation-conscious local governments. It is hoped that as a follow up of conservation promotion generally at a high level, more active local support will result from the responsible government agencies.

# The East Coast Experiment

by

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## SUMMARY

This paper briefly describes the aims, and the organization of the East Coast Experiment. The objective of this experiment is the conservation of threatened species particularly the orang-utan through the confiscation of illegally captured animals, and the attempt to return them to a free, wild life in the forest.

## INTRODUCTION

The State of Sabah (29, 388 square miles) formerly known as British North Borneo lies within the equatorial belt, and over half the total area of the state is covered with dense, evergreen, tropical rainforests. As the country is under-developed it is still rich in wildlife, notably primates both large and small. In recent years conservationists became interested in Sabah, which is one of the remaining strongholds of the orang-utan (*Simia satyrus* syn. *Pongo pygmaeus*). Visual records, illegal captures and killings indicate that this species is distributed throughout the state, but the opening up of land for alienation has adversely affected their survival. Even though strict laws have been enacted to protect the orang-utan, during jungle clearing operations female apes are either shot or killed, and the babies captured. All illegal captures and killings are investigated; the offenders prosecuted; the orang-utan confiscated by order of court, and handed over for disposal to the Chief Game Warden, who is also the Conservator of Forests.

Prior to 1963, all confiscated orang-utans were exported to foreign zoos as it was impossible to keep them here. Up to the end of 1963, twenty apes were exported – nine to the United Kingdom, seven to Australia and four to Denmark. Some animals were maintained voluntarily by private individuals for and on behalf of the state. Since writing this paper all animals cared for by these persons have been taken over. In 1964, with the formation of a Game Branch within the Forest Department it was decided not to export any captured orang-utan to foreign zoos, and with a view to returning the animals back to the wild a small scale experiment was started in a Forest Reserve on the East Coast. The task is an onerous one as very little is known about the ecology and behavior of wild orang-utan. At the same time it is also appreciated that the behavior of the animals absorbed into the experiment may be governed by the presence of or contact with persons working in the establishment. Provided with their natural surroundings, and encouraged to climb, make nests, and move freely in the forest it is hoped to awaken their dormant natural instincts and their incentive to feed, roam and survive on their own.

## SITE OF EXPERIMENT

The experiment is conducted in a forest reserve on the East Coast of Sabah. The reserve is approximately ten thousand acres in extent and comprises:-

1. Mature lowland dipterocarp forest on flat alluvial and slightly undulating country, well stocked with large timber trees particularly majau (*Shorea leptoclados*) and belian (*Eusideroxylon zwageri*).
2. Broken ridges with a lot of keruing (*Dipterocarpus* sp.)

3. Kerangas type forest on very poor ridge soils with much banjutan (*Shorea multiflora*) and some pelawan pelawan (*Tristania* spp.).
4. Some small areas of swamp forest behind the mangrove. Only 8, 296 acres of forest are primary, and the rest has been selectively logged and partly poison girdled before the area was strictly protected for research purposes. Within this old logging area, plantation and silvicultural treatment and thinning experiments are going on.

The normal range of jungle fruit trees such as durian, terap (*Artocarpus*), rambutan and maritam (*Nephelium*), mangosteen, mata kucing (*Euphoria*) etc., which are so esteemed by orang-utan, are quite well distributed throughout the area.

### AIMS OF EXPERIMENT

The aims of the project are:-

1. To rehabilitate orang-utan into the wild by giving animals gradually more freedom in their natural surroundings,
2. to revive their survival instincts, and encourage self reliance in the forest, so that they may return back to the wild or form a semi-wild breeding colony to enhance the depleted stock in the state.

As and when they are able to survive on their own they will be released in groups in forests, remote from habitation and timber operations. There is a block of several hundred square miles of forest in the Upper Segama which would be suitable and may be constituted a game sanctuary for this purpose.

Eventually it is hoped it will be possible to enlist the aid of trained zoologists to undertake behavior studies, and studies of the parasitic infestation of orang-utan; their nutritive feeding methods, weight and growth rates according to age groups et cetera.

### ANIMALS, METHODS, AND OBSERVATIONS

At the time of writing, nine orang-utan are maintained in the establishment. Details are as follows:-

Name	Sex	Approximate age
'Simbo'	Male	13 months
'Spencer'	Male	15 "
'Henney'	Female	12 "
'Jippo'	Male	13 "
'Paul'	Male	23 "
'Merah'	Male	18 "
'Molly'	Female	22 "
'Joan'	Female	6 years
'Cynthia'	Female	6 "

The animals come from various parts of the state, and all were received in very poor condition, usually with heavy hookworm (*Ankylostome*) infestation. On arrival they are quarantined at the veterinary station, Sandakan, where they receive a complete check, and once veterinary clearance has been obtained the apes are taken to the forest reserve. It is realized that after an animal has been domesticated it simply cannot be turned loose in the forest, and expected to survive or adjust itself quickly to living in the wild as if it had been there all along. Their introduction into the forest, therefore, has to be gradual.

On arrival at the center, the young animal is placed with other apes of the same age group, its reactions observed, fed, and exercised daily under supervision. After a fortnight, when it has become used to the company of other animals and attendants, the new arrival is permitted to exercise itself on its own, climb trees, and feed with the other apes. It soon learns the routine and adjusts itself accordingly.

Every morning, at 6.00 a. m., the game ranger in charge of the establishment checks all animals for any signs of illness, and records rectal temperatures on a form. They are fed, and allowed to roam about in trees under supervision of the attendants. At 10.00 a. m. they are given a drink of Haliborange. They usually come down from the trees when called. They are fed at noon, 3.00 and 6.00 p. m., after which their temperatures are again recorded. The animals have nearly twelve hours of unfettered freedom every day, during which period they climb trees, build nests and roam about.

Out of the youngsters, 'Jippo', a thirteen month old male, which was found on a Japanese oil tanker, is the most active. He started to climb trees and build nests immediately on arrival and continues to do so with the utmost vigor. 'Paul', a 23 month old male takes after 'Jippo'. 'Spencer', a fifteen month old male, sometimes prefers to sleep in his nest, made on a tree situated close to his cage and comes down only for his food. Recently he has stayed in his nest for two consecutive nights. Whenever these apes prefer to stay in their nests they are not discouraged, but, the ape, the tree, and the nests, are kept under close observation.

'Cynthia', a six year old female was released in the Forest Reserve by Mrs. B. Harrison in April, 1965. In September she disappeared into the forest. Although an intensive search was conducted, the ape could not be traced. On or about 15th October, 1965, 'Cynthia' was observed on the fringe of the forest by a Chinese farmer. It appears that she can look after herself.

The case of 'Joan' an adult female about 6 years old must be mentioned here. The writer 'rescued' her from Sukau in the Kinabatangan in 1964. When 'Joan' was found she was chained by her neck, and kept underneath a house. Her history is interesting. She was captured when quite young and brought up as a pet for many years. When her original owner passed away, she was taken into the forest and released. After a lapse of about 12 months she was rediscovered in the forest by a man from Sukau, who offered her some food. The ape followed him back to his kampong where it again lived in captivity. In the kampong 'Joan' was given limited freedom as she had a habit of raiding cultivated land. When she was discovered by the writer she was under-nourished and emaciated, and several months were spent in nursing her back to health. With care and attention she put on weight, and acquired a beautiful coat. Later she was taken to the forest reserve and given a great deal of freedom. 'Joan' then vanished, but returned to her cage after three days, and appeared to be in good condition. Since then, she has on several occasions gone off on her own and returned back to the base camp after three or four days. Once she was taken about three miles into the forest and released. She turned up after a week at a timber camp close by to the forest reserve none the worse for her absence. It is hoped to use this animal to train the others.

## CARE AND MAINTENANCE

All apes are fed according to the undermentioned routine.

### Baby Orang-utan

- 6 a.m. Fruit, green vegetables and milk.
- 10 a.m. Haliborange.
- 12 noon Fruit, Sweet potatoes, or Indian Corn and milk.
- 3 p.m. Green vegetables (washed in salt water), Fruit and 1 egg – par boiled.
- 5-6 p.m. Milk and porridge as much as they will eat.

### **Adult Orang-utan**

- 7 a. m. Milk with porridge and fruit.  
12 noon One egg. Green vegetables (washed in salt water). Sweet potatoes or Indian Corn, Haliborange.  
5 p.m. Fruit, green vegetables, and milk.

Cages are scrubbed clean twice a day and disinfected. Clean bedding (sacks) is provided in the evening. Used sacks are washed, disinfected and dried every day. All baby orang-utan are weighed on the 1st and 15th day of every month and their weights recorded.

The veterinary surgeon visits the establishment once a week; inspects all animals and treats them if necessary. Faecal samples of all apes are examined by him once a month. Sometimes the apes have to be treated for hookworm (*Ankylostome*) and occasionally for round worms (*Ascaris*). The animals were also subject to periodic bronchial infections, and this was countered with the administration of ABDEC and Haliborange. Compolan is given to supplement minerals, vitamins and trace elements. It was also observed that Compolan gives the animals an increased appetite, makes them more active, and improves the condition of their coats. An average weight increase of one pound a month has also been noticed. Orang-utan have been found to be susceptible to malaria and one case of meliodosis (*Pfeifferella whitmori*) proved fatal.

### **STAFF**

The project is supervised by a game ranger, and in his absence by an assistant game ranger. None of them has any specialized training. Partially trained staff with at least some basic veterinary knowledge of hygiene and animal care are urgently required for the rehabilitation project. I would like to appeal to IUCN for help in getting better trained staff, and if possible to get an experienced zoologist to visit us for three or four months.

### **CONCLUSION**

The project is still in its infancy and it is not possible at this juncture to arrive at any conclusions. It will take considerable time for results to be obtained.

## Part 2

### Birds

# The Position of the International Trade in Wild Birds as a Factor Affecting Threatened Species of Birds in Tropical South East Asia

by

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#### SUMMARY

There are several reasons for guarding a nation's bird population which may be threatened by indiscriminate destruction of habitat and/or the international bird trade. Birds of prey may be endangered by misguided local killing. Education in the long run is the only answer for conservation of a nation's wildlife, but this takes time. To ameliorate the pernicious effect of the international wild bird trade sound domestic legislation must be enacted and enforced at once.

So far as we know few bird species in South East Asia are seriously endangered at the present because they are comparatively wide ranging and survive in one area if forced out of another. This could change quickly and further immediate study is needed to ascertain which species may be threatened. Ducks and pheasants would fall into this category. The international trade in wild birds is assuming increasingly alarming proportions because of the ease with which rare species may be obtained from newly independent countries unaware of their priceless wildlife heritage.

#### INTRODUCTION

In discussions on wildlife conservation there is a tendency to think in terms of large mammals because a catastrophic reduction in their population is usually obvious to see. However, bird species become similarly threatened by the march of civilization, the follies of man, and the present unparalleled increase in human population. It is just as important, if not more so, to prevent the extirpation of any of the birds.

#### WHY GUARD AN AVIAN POPULATION?

The following may be included among the reasons why countries should jealously guard their avian populations:

1. Birds express much that is beautiful. Watching them probably gives more pleasure and relaxation to more people than any other similar pursuit.
2. Bird study is an easy diversion which costs nothing and can provide lifelong enjoyment particularly during the autumn years. Some of the greatest men, including hunters, have found solace in birds. E. Selous, the incomparable big game hunter in Africa, devoted his declining years to bird study and said that nothing had given him so much pleasure and interest.
3. A knowledge of birds brings with it the realization that living creatures depend on what we choose to term 'the balance of nature.' Because of this there are very few wild creatures which bring so much benefit to mankind.

4. The study of birds breeds a profound love of the natural world and indirectly leads to an appreciation of all natural resources, and hence to their conservation.
5. No harm can come from knowledge of ornithology – a pure science.

The future of many bird species is easily threatened, because those in the international bird trade are always on the look out for rare species, as well as for the more handsome and attractive ones which persuade people to pass through the money collecting turnstiles of zoos, museums, and private aviaries.

Usually as soon as a bird becomes rare or is believed to be declining in numbers, it is sought after by collectors and the trade.

It must ever be borne in mind that even though a country's birds may not be threatened by the wild bird traders at the moment, it takes very little neglect to bring about a rapid change.

However, the international bird trade is not necessarily the only factor which affects the status of a rare or threatened species. The often glib talk that uncontrolled export practices *alone* are endangering a creature tends to hide the fact that initially local practices, beliefs, or evasions of the laws are just as responsible for its depletion.

### **BIRDS OF PREY**

A careful watch needs to be kept over the birds of prey. All over the world raptorial birds are threatened, not only by the current indiscriminate use of pesticides and insecticides, but by persistent destruction by people who are ignorant of the benefits these birds confer. Few compare with their ability to control populations of crop-destroying small mammals, especially disease-carrying rodents. It is admitted that the large raptors sometimes prey on domestic poultry, but usually it is to feed their voracious young in the nest; it is well to remember that the parent birds have earned their keep by doing so much good at other times of the year, and that they should be forgiven for their petty pilfering.

It is impossible to leave the subject of birds of prey without reference to the monkey-eating eagle (*Pitheophaga jefferyi*) of Mindanao and Luzon in the Philippines. It is a typical example of a bird severely menaced by both the trade and ridiculous local beliefs. It is the latter which the conservationists of the country must overcome quickly if the species is to survive.

### **LEGISLATION AND EDUCATION**

The international trade in wild birds is often a pernicious thing. The importance of having good domestic legislation together with sound export laws cannot be over-emphasized. Even in the case of the commonest birds, if they are attractive enough, the demand can quickly become so great as to deplete their populations before the authorities can be alerted.

Legislation is no substitution for education. But education takes time, and it is regrettable that for a while yet we must rely mainly upon the legislation which of course is a vital prerequisite for a nation to become enlightened about the benefits of its wildlife.

Such being the case, ordinances and regulations must be drafted and promulgated, and they should provide for every likely contingency. They should afford comprehensive protection and full control over exports and imports, but allow for the issuance of special licences or permits for sound scientific investigations. Provision is necessary for such things as prohibited methods of taking birds, as well as the many detailed regulations without which it is difficult to compete with cunning operators.

The speed of air transport and present skills in aviary feeding have made it feasible to catch and export birds which a few years ago could not be handled at all. There are many unscrupulous tricks to the profitable and well-organized wild bird trade. Movement of bird consignments through ports and airports at night, when species cannot be properly identified and false cages detected should be prevented.

It takes dedicated men to compete with suppliers of the trade and their malpractices. But they will come forward if the conservation department receives the encouragement

it so richly deserves, from those in the highest authority. Good personnel are the key to success and they are less difficult to find than so many pessimists would have us believe in these days of ever increasing threats to wildlife and natural habitats.

## DESTRUCTION OF HABITAT

Habitat destruction is one of the main causes for depletion of bird species. In many countries it has brought about their extirpation or near extinction quicker than any other cause. Practically wherever one looks there is an appalling desiccation of indigenous vegetal cover, particularly forests, without any consideration being given to the disastrous long-term results – not only in the loss of irreplaceable and valuable wildlife, but also in the depletion of essential water resources.

Because of the widespread and indiscriminate nature of this destruction it becomes all the more important for countries to give attention to overall planning. This should include provision for national parks or equivalent reserves as sanctuaries representative of all types of the country's habitats.

Some South East Asian countries possess small islands which contain unique, much sought after species; many of these are disappearing very rapidly. In some cases urgent biological investigation is required to determine the reasons for the decline, but in others the causes are obviously the result of sheer exploitation.

## THREATENED SPECIES

So far as we know there are comparatively few bird species in tropical South East Asia which are seriously endangered by the wild bird trade at the present time. This, perhaps, is because so many birds in tropical areas are comparatively wide ranging, and survive in one area even though in others they may have been forced out by industrial and land development. But this is no cause for complacency, for the existence of any uncontrolled dealings in wild creatures can and will, as already described, quickly alter the overall picture. Prevention is wiser and more efficacious than cure, and to be forewarned now is indeed to be forearmed in the future.

The operative words in the last paragraph were its first five words, 'so far as we know.' It is important and pertinent here to remark upon the importance of status surveys of all those bird species thought to be declining in numbers. The list should include all pheasants, eagles, large hawks, large water birds. Notable among these are:

- |             |  |
|-------------|--|
| Burma       | <i>Lophophorus sclateri</i><br><i>Syrnaticus humiae humiae</i><br><i>Syrnaticus humiae burmanicus</i>  |
| Cambodia    | <i>Thaumatibis gigantea</i>  |
| Indonesia   | <i>Muscicapa ruecki</i><br><i>Leucopsar rothschildi</i>  |
| Laos        | <i>Lophura edwardsi</i><br><i>Lophura imperialis</i>   |
| Malaysia    | <i>Polyplectron malacense schliermacheri</i><br><i>Muscicapa ruecki</i><br>Also the local representatives of the genera<br><i>Lophura</i> and <i>Houppifer</i> |
| Philippines | <i>Pithecophaga jefferyi</i><br><i>Polyplectron emphanum</i>   |

	<i>Ducula mindorensis</i>
	<i>Otus gurneyi</i>
	<i>Pitta kochi</i>
	<i>Copsychus niger cebuensis</i>
Thailand	<i>Syrnaticus humiae burmanicus</i>
Vietnam	<i>Lophura</i> genus
Christmas Island	<i>Sulaabbotti</i> <i>Accipiter fasciatus natalis</i>

A first need in sound bird conservation is for factual information; without it there is obvious difficulty in suggesting the best methods to be adopted in order to ameliorate the position. There must be a number of South East Asian birds in need of urgent protective measures, but regrettably we do not yet know of them because there has been such a dearth of investigational work.

### INTERNATIONAL WILD BIRD TRADE

One of the reasons for the immense growth of the trade in wild creatures is the mushrooming increase in small, roadside zoos which number into some hundreds. Although some may be under scrupulous management, others keep their mammals and birds under shocking conditions. They have no lack of money to pay or bribe those who are willing to supply rare and endangered species in defiance of local regulations.

Within the vast land area represented at this conference, certain duck, pheasant and eagle species are probably most endangered by the international wild bird trade. It is not unlikely that some sunbirds and finches are also endangered. It is important to be particularly watchful over all the spectacular small birds which trappers may be handling. Nowadays even the most specialized feeders and generally delicate birds can be moved about and kept alive when wrapped in wadding in small boxes as we have seen in the case of hummingbirds.

The showy and magnificent pheasants should be the main cause for concern at the present time. They tend to be locally decimated for food, are always in demand for aviaries, fetch high prices, and are not difficult to maintain in well managed zoos. The international trade must be a very real factor affecting the future of all Asian *Phasianidae*. Indubitably some species are sliding slowly towards extinction and all those interested in the survival of these fine birds would be well advised not only to investigate and halt the shocking methods by which they are so often trapped, but also to keep a watchful eye on numbers and species exported.

There are many collections of waterfowl and although the needs of the better collectors cause no harm there can be sudden demands or popularities among birds which sell as readily as do the ducks. It is perhaps relevant to mention the need to heed the lesson of the pinkheaded duck (*Rhodonessa caryophyllacea*) which has been a comparatively widespread bird in our time, but is now utterly extinct.

In conclusion the international trade in wild birds is growing all the time and has already assumed alarming proportions. It is encouraged by the ease with which rare creatures can be obtained from some of the newly independent countries. These are necessarily so occupied with essential economic and social development problems that they have not yet had time or inclination to turn to questions of control over the illegal, undesirable, and dangerous export of their priceless wildlife heritages.

# Some Problems Concerning Endangered Birds in South Eastern Asia

by

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## SUMMARY

Conservation in South East Asia is dependent upon:

1. communities reaching a level of sophistication which permits an understanding of principles and needs;
2. universal education wherein conservation principles are taught at all levels;
3. an economic level high enough that additional protein provided by wildlife is not needed or is uneconomical;
4. high moral standards among government officials enforcing game laws and managing natural resources.

Some or all of these conditions are lacking in most South East Asian countries. Specific problems concerning over-shooting and habitat destruction are discussed. Solutions to these problems must be developed effectively and humanely and should be acceptable to current popular demands as well as to future needs.

## INTRODUCTION

The purpose of this discussion is to present some of the problems facing endangered avian species in Eastern and South Eastern Asia and to offer suggestions for their solution. I hope to avoid platitudes and generalities but to dwell on specific problems as examples of overall needs.

## BACKGROUND OF ENDANGERED BIRD SPECIES

Historically from the Arctic Circle to the equator original environments of eastern Asia have been or are being altered. For many centuries in the temperate climates of this vast area dense human populations have exerted pressure against birds through continuous habitat alteration and through heavy hunting. Most birds that inhabit these areas have had to adapt to these conditions or failing this they have become greatly restricted in numbers or in distribution. To the north and south of the temperate climates habitat destruction or alteration is a more recent thing. Only in past decades has it become extensive enough to bring serious pressure upon the avifauna. For example, in the face of heavy netting in Japan, thrushes of Siberia were able to replenish their numbers each year because of vast nesting grounds. At present these nesting grounds are becoming more and more altered through man's activities. This can result in a reduction in the flights to Japan where these birds are now protected.

In the tropics the situation is more acute. Local specialized fauna are being displaced by rapid and accelerating habitat destruction. Now a migrant leaving the north each year finds its southern habitats being replaced by man-made ones; fields, towns, and deforestation replacing dense continuous forests. The adaptable migrants can accept this but much of the local fauna cannot. In Malaya the avian population has shown a continuous infiltration of forms like the mynas, bulbuls, and orioles which thrive where

man has opened the forests. A study there revealed that less than 5 per cent of the local species could adjust to the change from forest to non-forest conditions. (McClure, *Bird-Banding* Vol. 36, 1965).

So to the cranes, bustards, ibises, and storks we must now expect to add the hornbills, broadbills, trogons, pheasants and others as endangered species.

### **FACTORS WHICH CONTRIBUTE TO A CONSERVATION CONCEPT**

There appear to be four fundamental factors which contribute to the conservation concept in any community:

1. Conservation cannot exist as a function of a community unless the populace has reached a level of sophistication which permits an understanding of and indulgence in conservation.
2. This presupposes a system of universal education in which conservation principles are part of the curriculum.
3. Coincident with a sophisticated society the economic level must be such that the average man or family is well fed and the use of wildlife for additional protein is unnecessary or uneconomical.
4. Lastly the moral standards of governmental officials must be such that they will enforce statutes in spite of remunerative or social temptations.

In recent conservation and recreation conferences other Asian nations have expressed disbelief or amazement at the reports of conservation programs in Japan, but here all of the above requirements are fulfilled. During the past winter and spring one community in southern Honshu spent millions of yen building a large flight cage, acquiring land, capturing a pair of storks, and hiring caretakers for them in a frantic effort to save the few remaining storks by producing healthy young to release. This activity achieved nationwide publicity and sympathy. Earlier in the winter the newspapers reported that Japanese Crane in southern Hokkaido were fed each winter by local farmers who saved part of their grain to do so, but this year they had no surplus so they feared that the cranes would go hungry. Money and rice poured into newspaper offices and to the Yamashina Institute of Ornithology to aid these farmers and birds. Popular imagination is caught by specific publicized plights, but constructive conservation efforts involving whales and salmon are less easily supported or enforced. This is understandable since the economics of groups, companies, or communities are affected by whaling and fishing but the public can be indulgent toward a few cranes, deer, or trees.

When we leave Japan we are immediately faced by the lack of some or all of the above requirements. In much of Eastern and South Eastern Asia there is political unrest, strife, economic instability or insufficiency, inadequate diet, and/or official immorality. Let us review some examples of conservation problems with which I am acquainted and offer suggestions for the protection of the species that are being endangered. I freely admit that in many instances I have no suggestions and see little hope of constructive gains without radical changes in social structure which we cannot anticipate for a long time to come.

### **CONSERVATION PROBLEMS IN ASIA**

Throughout eastern Asia there is widespread netting and snaring of birds for food and pet shop sales. Although unlicensed bird netting in some countries is illegal and in others licensed netting is poorly regulated and widely practiced, the excuse for permitting this is the need for protein and additional income. Any effort to apprehend offenders is met by resistance on the grounds that it is creating a hardship. The solution to this problem is one that has been suggested for other kinds of game control. It demands first that local officials understand and respect the principles of conservation and that they enforce the regulations concerning licensed netting. Bird netting can then be brought to a close over a period of years if no licenses are issued to new netters, and if no licenses are handed down from father to son. The regulation could

permit continued netting by licensed men who had been doing so for a period of five years or longer. Gradually the old-timers drop off or stop netting and the practice closes with no real hardship to families or individuals.

## **TAIWAN**

We have little information concerning the extent and amount of bird netting in Taiwan except that in many areas it is seasonal, associated with the spring harvest of winter wheat. At this time munias and finches enter the fields to feed and the netting offers both a control method to protect the grain and a seasonal income from food and pet shop sales.

One of the most severe drains upon Taiwanese birds and mammals is from the preparation of and sale of skins. It is a status symbol to have a glass-eyed spiny anteater, deer, green pigeon, barbet, bittern, pitta, hawk or any colorful species, staring from a table centerpiece or mantle top. This fad is particularly damaging to populations of spectacular species which have low reproductive rates and which cannot regain numbers as quickly as munias or fringillids. Resort communities such as those about Sun-Moon Lake and hot spring areas have families and individuals who are dependent upon this means of livelihood. The losses to local populations are staggering. A recent survey at Sun-Moon Lake revealed over a thousand specimens of 50 species of birds for sale, and at a hot springs four shops alone totalled 450 birds of 55 species and 250 mammals of 14 species, including two of the rare Formosan Serow. Any enforcement of regulations to control or abolish this use of valuable birds would be resisted by both shop keepers and local law enforcement officials. Since it is social prestige and the style to have such specimens on display, this is the most effective approach for control. Conservation officials or nature societies, where they exist, should deride and ridicule the practice in newspapers, magazines, and radio programs. As quickly as a person is subject to ridicule for displaying a bird mounting the bird will be relegated to the attic or museum and the demand for such specimens would disappear. When public opinion has changed, then protective regulations can be passed and enforced.

## **THE PHILIPPINES**

Conservation in all of its aspects is an acute need in the Philippines and is being widely ignored. Impending extinction of the Monkey Eating Eagle is well known and the extirpation of species or sub-species from several islands, especially Cebu, has been documented. All of the remaining specialized rain forest species are equally endangered as the forests are being indiscriminately cut and/or burned.

A large percentage of the farmers and townspeople have guns of some caliber (air rifle to automatic pump gun) and hunting is indiscriminate and uncontrolled. All birds are considered game, even large numbers of hawks and egrets are killed each year for sport and food.

Two situations which could be controlled and which might point the way to further conservation are at Dalton Pass in Luzon and Quezon in Palawan. Dalton Pass at about 3500 feet in the Sierra Madres of Central Luzon lies across a migratory pathway for numerous species of local and migratory birds. Many years ago the mountain people noted that birds flew into torches or fires lighting houses or camps on foggy moonless nights in the months between September and May. They capitalized on this by building small huts lighted with bonfires and facing the line of flight, north in the fall and south in the spring. During each migration a few birds were taken by hand nets as the catchers stood beside the huts out of the glow. Now the local inhabitants can afford pressure lanterns with reflectors to throw a brilliant light. On moonless foggy nights so many people arrive with these lights that the whole ridge is aglow. It has not been possible to learn the total catch on any one night but literally thousands of birds are now being taken. In one evening in February the bird banding team of the Philippine National Museum bought 150 birds of 22 species from the few netters that they could contact and it was estimated that 2000 Painted Quail alone had been slaughtered and sold at food shops in nearby villages. Similar situations occur further north and at higher altitudes.

Astride an important flyway, unregulated and indiscriminate catching, uncontrolled numbers of netters and this situation can have a detrimental effect on whole breeding areas to the north. It is a very serious situation and rivals that of Hawk Mountain in Pennsylvania where hawk slaughter was reducing the northern populations.

Here is a good opportunity for the Philippine Government to demonstrate its understanding of avian conservation. This indiscriminate kill must be controlled. In a sophisticated society it would be stopped completely. The museum staff is making a study of the flights and will soon be in a position to recommend what species could be taken and in what reasonable numbers. Then limited numbers of permits should be issued for the taking of these species only. Poaching would not be easy since the light is readily seen for miles and poachers could be apprehended.

Another area for a conservation demonstration in the Philippines, one where the habitat can still be saved, is in Palawan. Palawan has one of the few extensive forests remaining in the Philippines. In the southern part of the island at the village of Quezon is a limestone bluff penetrated by the Tabon Caverns which are of great archaeological interest. The museum has been making diggings here under the guidance of Mr. T. C. Fox and the area has been declared a national monument. The word Tabon is the local name for the megapode that inhabits this and an adjoining small island along with Nicobar Pigeons, Hornbills, and White Cockatoos. Heavy hunting and eggging by local people is rapidly eliminating these, especially the megapode and Nicobar Pigeon, and the Palawan Peacock Pheasant has already disappeared. The megapode and Nicobar Pigeon can be expected to be extirpated in the next few years. Deforestation in the immediate vicinity is going on rapidly. Only by placing a naturalist-warden here with effective patrolling and protection can this fauna be saved.

The Palawan Peacock Pheasant alone is reason enough for effective protection of Palawan's exotic species over the whole island, but such an action can only happen where there is an aroused and interested public which Palawan cannot have since its people are unaware of and would probably be unsympathetic toward such problems. This is an opportunity for the local governor to make himself internationally famous through an effective conservation program. The island supports a large population of Imperial Green Pigeons which are now heavily hunted by sportsmen from Manila. Contact with these hunters indicates that they do not hesitate to shoot anything. Pressure from these hunters and indifference of local people will make any constructive program difficult.

## **THAILAND**

At this point I find myself more apprehensive of the future of the larger mammals than of birds. It is the rhinoceros of Burma, wild cattle of Cambodia, and other mammals which are endangered in the war-torn habitats of South East Asia that need constructive protection and management. Too little is known of the status of the birds. Dr. Lekagul Boonsong has pointed out problems related to the conservation of the open-billed stork which can be seen at the Wat Phai Lom Sanctuary and of other species. Herbert Deignan has listed the species that occur here but the status of most groups is practically unknown. Deforestation in Thailand has probably reduced the hornbills, frogmouths, pheasants, and other specialized species but what should be done and where effective management programs should start remain unknown until an effective evaluation of management needs can be made. South East Asia is the overwintering ground of a vast horde of birds that pour out of Asia. We are just beginning to learn where they come from and what routes they take. What their needs are and where we can inaugurate effective conservation programs remains to be explored.

## **MALAYSIA**

It is from Malaya and Borneo (Malaysia) that we have the most pertinent data. Generations of interested and active British ornithologists have listed the species present and much is known concerning their abundance and ecology. Here too effective preserves have been established and conservation laws written into the statutes. In most areas these preserves and regulations are being respected because they are managed by powerful forestry departments and dedicated conservation officials.

Because the remaining forests are extensive I know of no species that need to be classified as endangered yet. However forces are at work which may create conditions which in the near future may result in the rapid loss or diminution of avian species. I would like to call attention to some of these for which there may or may not be immediate remedies. Hornbills are large birds requiring nesting sites in very large hollows which occur in overaged trees. It is a common forestry practice to eliminate large overaged trees upon the pretext that they shade out the more valuable seed and timber producing individuals, thus in many areas it is becoming increasingly difficult for hornbills to find nest trees. Forest managers should be urged not to remove all overaged trees and snags.

There is a conflict of interest between aborigines departments, forestry departments, and conservationists. Departments for the welfare of the aborigine are striving to stabilize and increase his economy but still permit him his shifting cultivation or wildlife utilization heritage. Shifting cultivation conflicts with good forest and soil management and his harvest of wildlife can endanger rarer species. These conditions become more critical as better medical facilities permit higher infant survival and thereby a rapid population increase.

The Argus Pheasant is highly specialized in its demands for a stamping ground and it is especially vulnerable because of this need. Cocks are easily snared and an increasing aborigine population in a decreasing acreage of forests can mean rapid extirpation of this species. There is a cul-de-sac of interests here which will take much wise counsel and broad understanding to avoid.

Vast areas of Sabah remain in virgin timber and a strong forestry department permits lumber companies to log only on a 70 year rotation basis. Wildlife laws are being enforced and animals confiscated from unlicensed holders. The wild animals include orang-utans and gibbons which are being retrained at a 10,000 acre forest reserve to re-establish themselves in the wild. The 275 square mile magnificent Mt. Kinabalu national park is being managed in such a way as to be a model for all other parks in South East Asia. Sarawak has equally enlightened forest, park and game management.

A very small percentage of the tropical forest avifauna can exist outside of the forest in man-made habitats. Foresters point out that in Malaya all land above 1000 feet has been designated as timber producing areas which will be retained in forest cover and offer permanent protection for these sensitive species. A quick glance at a topographic map will reveal that if this policy is adhered to most forests will be broken up into patches of different acreage and altitude. No one as yet can say what effect this intermittent forest will have upon avian populations. It has already been suspected as contributory to the reduction in rhinoceros, guar, and elephant populations. Many of the forest pigeons are wide ranging and this breaking of the forest continuity could be very detrimental to their populations and breeding.

## CONCLUSION

This then is a brief resume of some of the problems of avian survival in South Eastern and Eastern Asia. Wildlife, habitat, and human conservation are acute needs that must be intelligently and humanely reviewed and hopefully solved if the world is to retain some of its finest heritage.

# The Present Status of the Monkey-Eating Eagle, *Pithechophaga Jefferyi* Ogilvie-Grant, of the Philippines

by

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## SUMMARY

The monkey-eating eagle is a large endemic bird of the Philippines facing extinction. It is now found only in Luzon and Mindanao.

A year's study of a pair of monkey-eating eagles was made in Mindanao and the salient features of the bird's life history are outlined. Possible causes for the decline of the bird and recommendations for its conservation are presented.

## PRESENT DISTRIBUTION OF THE MONKEY-EATING EAGLE

The monkey-eating eagle, *Pithechophaga jefferyi* Ogilvie-Grant, the large endemic eagle of the Philippines has been recorded on the eastern islands of Luzon, Samar, Leyte, and Mindanao. At present it is supposed to exist on Mindanao and Luzon.

Over the past thirty years there have been no confirmed reports of the bird in Luzon either by the natives or by members of the Silliman University research and survey expeditions. The monkey-eating eagle is a large bird, indulging in soaring flight and often hunting in pairs so that its presence should not be missed were it there. Consequently it was feared that the species was extinct in Luzon until two years ago when a specimen was brought to the Parks and Wildlife office purportedly coming from the forests of Isabela-Nueva Vizcaya provinces. While the bird is thus extant in Luzon, it is certainly very rare. It may exist in the forests of the Sierra Madre Mountain Range, especially in the eastern coast of Luzon, in the provinces of Quezon, Isabela and Nueva Vizcaya.

It is probable that the reason it has survived at all in the eastern part of the island is due to the really wild state of the forests in this area, the sparse human population, and the presence of head-hunting natives and of the HUK (Filipino Communists) remnants who have discouraged hunters and eagle collectors from penetrating the region.

The eagle has not been seen, as far as we know, for the last thirty years on the islands of Samar and Leyte; it is, however, still found in the mountainous regions of Mindanao.

I have seen the species either in soaring flight or inside the forests in several localities of Mindanao: On the Zamboanga Peninsula in western Mindanao where many people report having seen this large eagle, I observed it in Mt. Malindang (1959 and 1961), in Mt. Dabiak locality (1952), and in the forests of Sigayan, Katipunan (1950). I have met with the species in Mt. Katanglad, Bukidnon Province in north central Mindanao (1959); in Mt. Hilong-hilong of the Diuata Mountain Range, between Agusan and Surigao Provinces in northeastern Mindanao (1963); in the highlands of Malalag and Malita Municipalities in southern Davao (1963); in Mt. Matutum, Cotabato Province (1963); and more recently, in Mt. Mayo in the Pacific Coast region of southeastern Davao (1965).

It is safe to say, based on these personal observations and reports that the Monkey-eating Eagle is at present still extant on Mindanao Island. However, the species is at

present represented only by a few individuals which are living in the large mountain masses. Due to ruthless hunting and the catching of these birds alive I estimate that the present number, conservatively, is between forty and fifty pairs.

### SALIENT FEATURES IN THE BIOLOGY OF THE MONKEY-EATING EAGLE

A study was made on the habits and life history of the monkey-eating eagle by Mr. Rodolfo B. Gonzales as Field Associate under my supervision as Project Director. This study, lasting a year, was based on a breeding pair in forested mountains of Sitio Kibawalan, near Malungon, in southern Davao, Mindanao Island. This study was supported by grants from both the World Wildlife Fund under the auspices of the ICBP, and the American Museum of Natural History.

The study yielded the following summarized observations:

1. The monkey-eating eagle prefers the lowland and medium elevation primary forests, 500-4000 feet, as its natural habitat.
2. A breeding pair stays in a definite territory, about 40-50 square kilometers, preferably containing some virgin forests and cleared areas.
3. The nest, a huge affair of branches of varying sizes, is placed in tall trees in dipterocarp forest, about 90-100 feet from the forest floor. Old nests may be repaired and strengthened and used again and again by a pair, and several old nests may be found in one nest tree.
4. One pure white egg was laid about the middle of November and incubated soon after it was laid.
5. The incubation period lasts about 60-61 days and is shared by both parents although the female spends more time doing it.
6. Both parents help in brooding the chick but the male spends fewer hours than the female.
7. The young bird leaves the nest after about fifteen weeks or 104-105 days of brooding.
8. The male does most of the hunting of food for the family during both the incubation and brooding periods.
9. At present the main food of the species are flying lemurs, *Cynocephalus volans*. It is hard to say without further study whether this is because flying lemurs are much easier to catch than monkeys and naturally more abundant in Mindanao or because the great depletion of the monkey population (due to the demand for them in the United States in connection with the preparation of Salk vaccine) has forced the eagle to modify its natural diet. Monkeys, *Macaca philippinensis mindanensis* form only about six per cent of the total diet composition. Other food items include flying squirrels, *Petinomys mindanensis* (?) and tree squirrels, *Callosciurus* spp.
10. The worst enemies of the eagles are the rufous hornbill (*Buceros hydrocorax mindanensis*) and the common large billed crow, (*Corvus macrorhynchus philippinus*) who are very aggressive and noisy when the eagle alights in their vicinity, although the eagle seems to ignore their reactions.
11. It appears that the monkey-eating eagle attains sexual maturity three years after it has hatched from the egg, and normally breeds once a year thereafter. The present study does not show if there is a regular breeding season for the species.

The results of this study are preliminary in nature; it is hoped to study the bird in another area of Mindanao and to compare those findings with these.

### POSSIBLE CAUSES FOR THE CONTINUED DEPLETION OF THE SPECIES

Among the factors that are at present working towards the radical extinction of the monkey-eating eagle, the following may be mentioned:

1. The continued procurement of the eagles for the zoo trade abroad despite the total prohibition imposed by the Parks and Wildlife Office.
2. The continued capture of young birds from the nest to be kept as pets on exhibit in Mindanao homes, frequently by prominent families.
3. The continued capture of birds for exhibition in local zoos.
4. Killing of the bird for a parlor trophy for display as a status symbol or to establish one's prowess as a hunter.
5. The indiscriminate destruction of large areas of lowland and medium elevation primary forests both on Luzon and Mindanao.
6. The total lack of enforcement of whatever conservation laws have been promulgated by the government for the eagle as protection. The Parks and Wildlife Office has been ineffective because of lack of personnel.

#### **RECOMMENDATIONS FOR THE CONSERVATION OF THE MONKEY-EATING EAGLE**

1. Selective logging and reforestations should be strictly followed and practiced, if the natural habitat – lowland and medium elevation primary forest – of this rare species are to be conserved.
2. Logging should be prohibited in national parks, and the practice, legal or illegal, totally stopped.
3. Exportation of the bird to foreign zoos should be stopped entirely, and its exhibition in local zoos should also be prohibited.
4. The capture of the bird, and/or its possession, either alive or dead, should be considered a crime against the conservation laws and severely punishable by a large fine, imprisonment, or both.
5. The monkey-eating eagle should be designated the national bird of the Philippines and as such it should be accorded the fullest protection by law.
6. There should be strict enforcement of the conservation laws by all government agencies concerned.
7. The school curricula should be changed to emphasize the conservation of all natural resources and wildlife including of course the monkey-eating eagle.

# Catching Birds with Light

by

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## SUMMARY

In the search for possible flyways in the Philippines in connection with the MAPS project, members of the Luzon team observed the method of catching birds with light practiced by the native mountain peoples in northern Luzon in the areas of Sinipsip and Dalton.

Some of the conservation problems are discussed and a series of recommendations made.

## INTRODUCTION

This study resulted from a grant extended by the Migratory Animals Pathological Survey (MAPS), U.S. Armed Forces Institute of Pathology to the Philippine National Museum for the promotion of a bird-banding project.

In the search for possible flyways in the Philippines in connection with the MAPS project, the Luzon team members recalled a very old, yet effective, method of catching birds with lights – practiced by the native mountain people of northern Luzon, the Igorots. In order to learn the details of the method it was necessary to conduct close and protracted observations. At present no less than nine sites have been counted in Sinipsip, Benguet, each with three to twelve lighting huts; in the Dalton area in Nueva Vizcaya five sites are known with from six to ten lights each. There are also reports of birding with lights in several other places, which are not yet visited and verified by us.

## HISTORY

It is believed that this practice of catching birds with light originated among the Igorots since those used in other areas are basically the same, and the terms used are identical with the Igorot terms. The Igorots in Benguet call this method 'Pangkikan', meaning, 'sharing with the gods'. The oldest man in the village recalls having caught birds this way since childhood and remembers the stories and legends being told by his parents and grandparents concerning the same practice.

The ancient Igorots lived in the highlands of northern Luzon, their dwellings made of grass huts. To keep themselves warm during the cold nights they built open fires. Those in the very remote areas still live this way. It was observed that birds came to these fires. Some would stop and huddle around close to the fire, and could be caught with bare hands. Others would fly into the fire directly thus getting killed. Bigger fires attracted more birds. Having tasted the delicious bird meat, deliberate birding followed. The Igorots learned the necessary set of conditions by trial and error.

With the introduction of the 'Coleman' or similar lamps, (pressurized kerosene lights with silk screen capable of producing as much as 500 candle power), the people noted that at certain times birds would enter their dwellings or bump into their glass window panes. These lamps are now in general use replacing the open fires in the huts. Nets are now employed, a very effective combination indeed.

## THE SINIPSIP METHOD

The method as practiced in Sinipsip has been proved to be very effective on high ridges. Sinipsip is situated on the highest ridge along the Baguio-Bontoc road with an elevation of 7,200 feet. The original vegetation was pine, remnants still visible in the gullies, but now largely converted to vegetable patches. The abandoned clearings are now grasslands. This ridge is dotted, at suitable locations, with groups of birding huts, 'agikan', each constructed with front-leaning roof in such a way that when the lamp is hung from the rafters, it gives a glow directed downwards. The lamp is not exposed. During the birding season the hillsides are lighted up like a city – the glow visible for miles and miles away.

On moonless nights, between 7 and 8, birdmen light the lanterns and wait in the dark just outside the huts, their long-handled nets, 'tawang' ready in hand. Oftentimes two netters work together one on each side of the hut.

The net is made of ordinary fish netting about a half inch mesh and 20 gauge thread. Two thin bamboo poles about ten feet long provide the framework in the form of a 'V' by being loosely tied together at the base. When a bird flies by, the birdman raises the net in its path, lowers it to the ground and pins the bird. If the bird is flying overhead it is enclosed with the same net. When the bird is beyond his reach the net is thrown at it. When bird flight is heavy every minute is precious and sometimes the birdman discards the net picking the birds by hand from the ground. Also, instead of putting the birds in the bag, the operator just bites the skull to kill it then drops it to the ground, the idea being to get as many birds as one can.

## THE DALTON METHOD

Like Sinipsip, Dalton Pass is also on the highest divide on the highway in the Caraballo Mountains separating Cagayan Valley on the North from the Central Plain of Luzon on the South. Its elevation is only 3,500 feet, but it has a variety of habitat types. Towards the north most of the mountain tops as far as the eyes can see, are denuded of trees and are now occupied by cane grass (*Saccharum spontaneum*), and associated grasses, the gullies still retaining part of the rain type forest. On the southern part is a better protected watershed still covered with the original rain type trees. Some areas are cultivated while the abandoned portions are now reeds or cane grass. Many resident bird species are found here so that while Sinipsip is being operated only from September to December each year, Dalton is in operation almost throughout the year.

The Dalton method is essentially the same as that used in Sinipsip. Although of more recent introduction, it is more improved because of its mobility. In Sinipsip the birdmen's operations are confined to the vicinity of the huts but in Dalton the shading effect is in the lamp itself, and the birdmen, mostly non-Igorots, easily move from one site to another. If huts are constructed at Dalton they are mainly for the birdmen's protection.

## HOW OR WHY DO BIRDS COME TO THE LIGHT

In the absence of proper statistical data this report will only state the observations on what the birdmen actually do and the practices they follow.

1. Season: In Sinipsip operation is limited from September to December each year although there are also dark, foggy nights in other months.
2. Moonlight: The birdmen do not bother to put up their lights from the first quarter phase of the moon to the last quarter.
3. Fog: Even on the dark nights if there is no fog, catches are few. When it is clear and starry they would not go up. There are cases when not a single bird is taken for the night's work.
4. Wind: Even on dark, foggy nights fewer birds are caught if the wind is very strong, of changing direction, or coming from where the birds are supposed to come. Birders consider moderate wind coming from their back as ideal.
5. Species: Not all species of birds, observed in the daytime to be present in the area, are caught by the lights. Some species are not caught at all.

The foregoing may thus suggest that birds in their seasonal migration fly also at night. When it is clear as on moonlit nights they can easily recognize landmarks. But when it is dark and foggy they may be confused and fly into the lights or fly low enough within the reach of the long-poled nets. Another point which suggests itself is that both at Sinipsip and Dalton the autumn migration coincides with the prevailing monsoon while the spring migration coincides with the east wind. The birds are therefore flying into the wind. They have to fly low on the lee side of the ridge to minimize wind resistance and thus come up along the ridge to within the netter's reach. The problem on the resident species has yet to be learned.

### **POSSIBLE EFFECT ON THE BIRD POPULATION**

Based on the extent of the lighting areas, each successful night could account for about 90 per cent of the moving species at the time. In Sinipsip alone, on the basis of fifty lights actually counted, and allowing an average of a hundred birds per light, no less than 5,000 birds are being killed each favorable night. This quantity of birds is a tremendous drain on the species that use this area as its flyway. Consequently very few are able to return to the breeding grounds to renew themselves. It is not surprising to hear the complaints of the Igorots that they no longer catch as many birds as they did a few years back. Then, they said, each man used to get a sack full of birds each night.

The only redeeming feature of this method is its being self-regulatory, that is, no catch is made when the factors are not so favorable.

In Sinipsip every single bird is taken however small; while at Dalton the birdmen do not take those smaller than the quail (*Coturnix chinensis* Linn).

Eighty-four species of birds have been taken, and most of the migratory species harvested are of small size ranging from the shrikes to the warblers and flycatchers, none are recognized as game species. Consequently it takes many birds to fill a family's pot. These species taken are largely insect eaters and therefore a great help to agriculture. A study is being undertaken of the resident species, mostly quails and pigeons, to determine fluctuations in population due to birding.

### **THE IGOROT'S POINT OF VIEW**

This method of catching birds has been with the Igorots since time immemorial, the habit has been deeply rooted and they consider it their right to continue it. Their diet is low on protein and therefore they welcome the opportunity and eagerly await the time for birding. They even consider any bird meat a delicacy. It takes a lot of arguing before anyone can make them keep the birds alive, even for a fee, for bird banding purposes. Even after witnessing our releases they could not believe that we could do it. We must be out of our minds!

### **WHAT CAN BE DONE?**

Of course the situation is far from hopeless. One possibility could be a reorientation of the school curriculum to emphasize love for living things and more directly, conservation of natural resources. As it is, even among those supposedly well-informed, there are few who think of these natural resources as the national patrimony.

With the present bird banding project going on the team can try to purchase and release as many birds as can still fly and at the same time follow fluctuations in population. But this is only a small number and the project may last only a few years.

A more permanent program should be planned and implemented:

1. Conduct population surveys, per species, to determine just how much may be safely harvested without depleting the bird population; determine endangered species.
2. Conduct biological studies on food habits, life histories as bases for intelligent planning.

3. Recruit and train able young men in wildlife management. Special courses could be offered at the University of the Philippines or elsewhere.
4. Conduct intensive educational campaigns oriented towards conservation consciousness both for adults and school children. Impress on them the ill effects of indiscriminate destruction of wildlife.
5. Enforce a total ban on the use of lights for birding.
6. More intensive policing of the wildlife sanctuaries, parks and hunting in general in order to regulate the activities of the birdmen and hunters. Other destructive methods should also be studied and controlled.
7. Seek the advice of the U. N. game development experts.
8. Follow through implementation of such recommendations as may be given by the U. N. Experts.

#### LIST OF BIRDS TAKEN WITH LIGHT

	Sinipsip	Dalton
1. <i>Acrocephalus arundinaceus</i> (Linn.)	x	x
2. <i>Acrocephalus sorghophilus</i> (Swinhoe)	-	x
3. <i>Alcedo atthis</i> (Linn.)	x	x
4. <i>Amaurornis olivaceus</i>	-	x
5. <i>Anthus hodgsoni</i> Richmond	x	x
6. <i>Anthus lugubris</i>	x	-
7. <i>Aplonis panayensis</i> (Scopoli)	-	x
8. <i>Brachypterix montana</i> Horsfield	-	x
9. <i>Butastur indicus</i> (Gmelin)	-	x
10. <i>Butorides striatus</i> (Linn.)	x	x
11. <i>Cacomantis merulinus</i> Scopoli	-	x
12. <i>Cacomantis variolosus</i> (Vigors & Horsfield)	-	x
13. <i>Capella megala</i> (Swinhoe)	-	x
14. <i>Centropus toulou</i> (Muller)	-	x
15. <i>Cettia diphone</i>	x	-
16. <i>Chalcophaps indica</i> (Linn.)	-	x
17. <i>Chrysococcyx malayanus</i> Raffles	-	x
18. <i>Coturnix chinensis</i> Linn.	-	x
19. <i>Cuculus canorus</i> Linn.	-	x
20. <i>Cuculus fugax</i> Horsfield	-	x
21. <i>Cuculus sparverioides</i> Vigors	-	x
22. <i>Ducula carola</i> (Bonaparte)	-	x
23. <i>Egretta garzetta</i> (Linn.)	-	x
24. <i>Egretta intermedia</i> (Wagler)	-	x
25. <i>Erithacus calliope</i> (Pallas)	-	x
26. <i>Eudynamis scolopacea</i> (Linn.)	-	x
27. <i>Eurostopodus macrotis</i> (Vigors)	-	x
28. <i>Eurystomus orientalis</i> (Linn.)	-	x
29. <i>Gallixrex cinerea</i> Gmelin	-	x

	Sinipsip	Dalton
30. <i>Gallinula chloropus</i> (Linn.)	-	x
31. <i>Gorsakius goisagi</i> (Temminck)	-	x
32. <i>Halcyon coromanda</i> (Latham)	-	x
33. <i>Halcyon smyrnensis</i> (Linne.)	-	x
34. <i>Ixobrychus cinnamomeus</i> (Gmelin)	-	x
35. <i>Ixobrychus eurythmus</i> (Swinhoe)	-	x
36. <i>bcobrychus sinensis</i> (Gmelin)	-	x
37. <i>Lanius cristatus</i> Linn.	x	x
38. <i>Lanius schach</i> Linn.	-	x
39. <i>Lanius validirostris</i>	x	-
40. <i>Locustella certhiola</i> (Pallas)	x	x
41. <i>Locustella lanceolata</i> (Temminck)	x	x
42. <i>Locustella ochotensis</i> (Middendorf)	x	x
43. <i>Macrophygia phasianella</i> (Temminck)	-	x
44. <i>Mirafra javanica</i> Horsfield	-	x
45. <i>Monticola solitaria</i> (Linnaeus)	x	-
46. <i>Motacilla cinerea</i> Tunstall	x	x
47. <i>Motacilla flava</i> (Linn.)	-	x
48. <i>Muscicapa cyanomelana</i> Temminck	x	x
49. <i>Muscicapa griseisticta</i> Swinhoe	x	-
50. <i>Muscicapa panayensis</i>	-	x
51. <i>Muscicapa narcissina</i> Temminck	x	x
52. <i>Muscicapa rufilata</i> (Swinhoe)	x	x
53. <i>Ninox scutalata</i> (Raffles)	-	x
54. <i>Pericrocotus divaricatus</i> (Raffles)	x	x
55. <i>Phylloscopus borealis</i> (Blassius)	-	-
56. <i>Phylloscopus olivaceus</i>	-	x
57. <i>Pitta erythrogaster</i> (Temminck)	-	x
58. <i>Pitta sordida</i> Muller	-	x
59. <i>Porzana cinerea</i> (Vieillot)	-	x
60. <i>Porzana fusca</i> (Linn.)	-	x
61. <i>Porzana pusilla</i> (Pallas)	-	x
62. <i>Porzana tabuensis</i>	-	x
63. <i>Ptilinopus leclancheri</i> (Bonaparte)	-	x
64. <i>Ptilinopus occipitalis</i> (Gray)	-	x
65. <i>Puffinus leucomelas</i> (Temminck)	-	x
66. <i>Rallina eurizonoroides</i> Lafresnaya	-	x
67. <i>Rallina fasciata</i> (Raffles)	-	x
68. <i>Rallus striatus</i> Linn.	-	x
69. <i>Rallus mirificus</i> Parks	-	x
70. <i>Rallus philippensis</i>	-	x

	Sinipsip	Dalton
71. <i>Rallus torquatus</i>	-	x
72. <i>Sarcops calvus</i>	-	x
73. <i>Sturnus philippensis</i> (Forster)	-	x
74. <i>Surniculus lugubris</i> (Horsfield)	-	x
75. <i>Saxicola caprata</i>	-	x
76. <i>Sterna fuscata</i> Linn.	-	x
77. <i>Treron pompadora</i>	-	x
78. <i>Turdus chrysolaus</i> Temminck	-	x
79. <i>Turdus obscurus</i> Gmelin	-	x
80. <i>Turnix ocellata</i> (Scopoli)	-	x
81. <i>Turnix suscitator</i> (Gmelin)	-	x
82. <i>Turnix worcesteri</i>	-	x
83. <i>Zoothera cinerea</i>	-	x
84. <i>Zoothera dauma</i>	-	x

## Part 3

### Reptiles

#### Turtle Conservation in Malaya

by

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##### SUMMARY

This paper deals with the current conservation measures for the leathery and green turtles in Malaya as well as the prospects for the future.

Since 1961 the turtle conservation program has transplanted approximately 10,000 leathery turtle (*Dermochelys coriacea*) eggs to a hatchery in Trengganu and the emerging hatchlings are released at sea. A similar program for the green turtle (*Chelonia mydas*) began in 1965.

##### INTRODUCTION

There are four species of marine turtles which nest along the east coast of Malaya. They are the Green Turtle (*Chelonia mydas*), the Leathery Turtle (*Dermochelys coriacea*), the Ridley (*Lepidochelys olivacea*) and the Hawksbill (*Chelonia imbricata*). The last mentioned occurs infrequently in Malayan waters and its contribution to the total egg production is negligible. The Ridley nests in somewhat larger numbers (approximately one to every 10 Green) but shows no tendency to congregate in particular areas for nesting. The Leathery and Green Turtles nest in large numbers, in well defined areas and are economically very important. This paper deals with current conservation measures for these two species in Malaya, as well as the prospects for their future.

##### Leathery Turtle (*Dermochelys coriacea*).

This is the world's largest known species of living turtle. It weighs well over 1,500 pounds and measures as much as 8 feet from tip of snout to posterior end of carapace. In Malaya this species nests almost exclusively on a stretch of beach approximately seven miles long in central Trengganu. This is known to be the largest breeding population left in the world today. Surveys carried out in recent years indicate that the population is dwindling. This is possibly due to exploitation of eggs in the past. In 1960, the Malayan Nature Society in a memorandum submitted to the Trengganu State Government, warned of the population decline and urged conservation measures. An official government hatchery was set up the following year under the jurisdiction of the Department of Fisheries, and has been in operation since then. This conservation project is supported by annual State and Federal grants of Malaysian \$2,000.00 (U.S. \$666.00) each.

Approximately 10,000 eggs are purchased annually, at market price, from the licensee at Rantau Dalam for transportation in the hatchery. During the first four years (1961-64), the eggs were replanted in their original clutches. Throughout the period of stocking the hatchery and until such time as hatchling turtles emerge, a watchman (employed by

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<sup>1</sup> The taking of sea turtle eggs in Malaya is controlled by law. Exclusive rights to collect turtle eggs on specified area of beach are granted by government licences, tenders being accepted annually and the licences usually going to the highest bidders.

the Department of Fisheries) remains there to ensure against disturbance to the hatchery or poaching. Hatchling turtles emerge from the nests in about 55 days and are released at sea at once. So far (1961-64), 474 nests (41,511 eggs) have been transplanted and 19,382 hatchling turtles have been released at sea, giving the gross average percentage hatch of 46.7 per cent. An analysis of the hatchery results<sup>1</sup> for the past four years (1961-64) indicates that original clutches of eggs containing 46-60 eggs yield the maximum percentage hatch (Table 1).

With increase in clutch size the percentage hatch appears to decrease. The indications are that the clutch size as determined by the number of eggs contained might be an important factor in influencing the percentage hatch. Thus from the point of view of conservation as well as efficient and economic operation of the hatchery it appears that clutch sizes of approximately 50 eggs would give the maximum yield. Experiments are in progress this year to determine if this is so.

Of the marine turtles, the leathery turtle deserves the most conservation attention because the Trengganu population is the largest now known in the world and may be the species' last stand before extinction. Although conservation measures have already begun, the size of the nesting population has not been determined. It is not known for certain whether the same female turtle nests annually and if so how many times. Very little is known of the beach and off-shore biology of the species. Thus a great deal remains to be studied. The basic information obtained from such studies could serve not only in the proper implementation of conservation measures but also in the future development and expansion of the Leathery Turtle industry.

### **Green Turtle (*Chelonia mydas*).**

This species is very widely distributed and is perhaps the most abundant sea-turtle in South East Asian waters. Those nesting on Malayan shores measure slightly more than 3 feet in carapace length and weigh about 200-300 pounds. On the east coast of Malaya, the beaches north and south of the leathery turtle nesting sites are used predominantly by green turtles. However, the highest nesting concentrations are to be found on small east coast islands, particularly Perhentian and Redang Island off the coast of Kelantan and Trengganu. The species has also been reported to be nesting infrequently along the west coast and on some of the west coast islands.

The implementation of conservation measures for the green turtle in Malaya began only this year, with the setting up of a hatchery in Semarak, Kelantan. The project is financed by the Kelantan State Government. The hatchery set-up and operational methods are similar to that of the Leathery Turtle Hatchery in Rantau Dalma, Trengganu. In all, 39 nests (3,704 eggs) were transplanted this year, and 1,971 hatchling turtles were recovered and released at sea. Although the number of nests planted is small, the gross yield of 53.62 per cent obtained is very encouraging and a more extended permanent conservation program is being planned for the future.

While leathery turtle conservation is chiefly a Malayan responsibility, the conservation of the green turtle is perhaps a South East Asian problem. The species is widely distributed in our region from west of China southwards. This being so, the adoption of conservation measures in only a few countries is of no avail, if the species is to suffer uncontrolled exploitation elsewhere. The author is therefore of the opinion that conservation measures for the green turtle are best formulated and implemented on a regional basis.

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<sup>1</sup> Made available to the author through kind courtesy of the Director, Department of Fisheries, Malaya.

TABLE 1: TRANSPLANTED NESTS OF LEATHERY TURTLES GROUPED ACCORDING TO CLUTCH SIZE SHOWING RELATIONSHIP WITH PERCENTAGE HATCH

Group	Clutch size	Number of Nests 1961-64	Average percentage hatch 1961-64
A	Less than 46 eggs	8	49.3
B	46 - 60 eggs	32	63.5
C	61 - 75 eggs	78	54.1
D	76 - 90 eggs	137	52.0
E	91 - 105 eggs	138	47.3
F	106 - 120 eggs	68	44.7
G	121 - 135 eggs	10	40.9
H	More than 135 eggs	3	37.2

# Sea Turtles in Indonesia

by

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## SUMMARY

The author describes the results of a questionnaire on sea turtles sent to 150 heads of regions in Indonesia. He lists conservation measures that might improve the food resource derived from turtles.

The first step in finding out about sea turtles in Indonesia was the distribution of a questionnaire to 150 heads of regions (Kepala Daswati II), which are adjacent to the sea.

Within one year 87 (58 per cent) answers had been received; 34 regions reported the presence of beaches where sea turtles nest, predominantly green turtles (*Chelonia mydas*). The number of nesting beaches varies from 1 to 30 from region to region. Among these:

1. Four regions (Batang Hari in Djambi, Sukabumi in West Java, West Lombok and East Lombok) forbid the gathering of eggs in certain months, varying within each region from September to July, during 3 to 8 months.
2. One region (Berau in East Kalimantan) forbids the capturing of sea turtles.
3. One region (Djember in East Java) forbids both the gathering of eggs in certain months as well as the capturing of sea turtles.
4. Two regions (Sambas in West Kalimantan and Riau) have their nesting beaches for rent without any regulations (total egg yield about 4 million a year).
5. Three regions (Sukabumi in West Java, Djember in East Java and Berau in East Kalimantan) have their nesting beaches for rent (total egg yield about 5 million a year).
6. One region (Berau in East Kalimantan) indicates having special hatchery places.
7. The giant leathery turtle (*Dermochelys coriacea*) is reported from two regions (Jogjakarta in Central Java and South Sumatra) which do not have any regulations so far for their protection. However, the turtles seldom appear on the beach.

Conservation measures are promulgated locally by the head of the region concerned unless the nesting beach is located within a nature reserve in which case it would come under central government regulations for nature protection in Indonesia.

The application of appropriate conservation measures could probably substantially improve food resources derived from sea turtles. The following proposals are to be submitted to the government through the Institute for Nature Conservation:

1. To establish regulations for Indonesia to prohibit the capturing of sea turtles, especially the Giant Leathery Turtle, and to forbid the gathering of its eggs.
2. To have the same regulations applicable to the entire country especially with regard to hatcheries on those nesting beaches which are rented out.
3. To order that a minimum of seven per cent of the total number of eggs taken from the rented beaches must be hatched, and that the hatchlings be returned to the sea.
4. Heads of local regions should not be prevented from imposing additional regulations in their areas if it seems desirable.

## Part 4

### Fish

# Rare and Endangered Fresh-Water Fishes of Malaya and Singapore

by

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#### SUMMARY

Effective consideration for the protection of Malayan fresh-water fishes is said to have taken place with the setting up of the Wild Life Commission of Malaya in 1930. The Report of the Commission is strongly commended.

The changing fresh-water fish fauna of Singapore is discussed. Out of 54 indigenous species only 35 are recorded as surviving today, in addition to 11 species of established exotics. Of the former, 8 are now rare.

*Probarbus jullieni* Sauvage is said to be a threatened species in Malaya.

The major factors that have led to the depletion of the fish fauna in Malaya and Singapore are described.

#### INTRODUCTION

Although conservationists have devoted much attention to the terrestrial vertebrates, aquatic forms, especially fishes, have been mostly ignored. This is a natural consequence of the absence of any normal visible contact between man who lives on land, and animals that live submerged in water. By comparison mammals and birds are easily observed and have a wide and popular following.

#### HISTORICAL BACKGROUND

Consideration for the conservation of riverine fishes in Malaya and Singapore may be said to date back to 1896 with the submission of a paper before the Legislative Council entitled 'The Fisheries of the Straits Settlements and the Protected Native States' (Skinner et al., 1896). Although primarily concerned with marine fisheries, the paper is of interest since it includes a recommendation for the total prohibition of fishing with explosives and with tuba root (*Derris* sp.). At that time such destructive fishing methods were prohibited only in the State of Selangor. In Negri Sembilan tuba-fishing had been controlled by law since 1890 but the sanction of the British Resident could be obtained for it for recreational purposes. Elsewhere in Malaya fishing by this method was a common practice, mainly for the sport that it afforded.

By due process of legislation fishing with explosives and tuba became illegal; although the law was diligently applied to the marine fisheries, little was done to check the fishing in inland waters. Thus it was that when the Wild Life Commission of Malaya was set up in 1930, Mr. Theodore R. Hubback who was appointed as Commissioner immediately saw the need for affording protection for the riverine fishes. The commission's 3-volume report (Hubback, 1932), stands even today as a most significant contribution to wildlife conservation in Malaya and I wish to strongly commend this publication to your attention. Unfortunately the report is out of print and copies are extremely rare even in Singapore. Considerable reference to fresh-water fishes is included in the

Commissioner's Interim Report (vol. 1, pp. 19-21) and in the Assessor's Report on the evidence that was gathered (vol. 1, p. 26). As a result, the draft legislation that was submitted (vol. 2, pp. 47-49, 85-86) gave ample provision for the protection of fresh-water fishes. These recommendations were however never adopted in toto although an immediate clamp was put down on destructive fishing. Today, tuba-fishing is practiced as a royal prerogative and only rarely in certain states. Only in the Taman Negara (National Park) and other game and nature reserves is commercial fishing totally prohibited.

## SINGAPORE

It is significant that even as early as 1930 decreasing fish populations had already been noted in certain areas. However, good documentary evidence for this is not easy to obtain. The only area where adequate collections have been made, to indicate the changes that have taken place, is in Singapore. In March 1934 the late Dr. Albert W. Herre collected 53 species (Herre and Myers, 1937), bringing the total number of recorded species to 54, including 2 established exotics. During 1963 and 1964, I made intensive and extensive collections (Alfred, 1966) but recorded only 35 of these species, in addition to 2 new records of native species and 6 new records of introduced exotics (Table 1). Of the 35 surviving native species, 34 occur in, and 18 are confined to the impounded headwaters of the Seletar, Whompoe and Kallang Rivers. Here, most of them appear to have a fair chance of survival especially if the area continues to serve as a nature reserve and the Catchment Area for Singapore's domestic water supply. I should however point out that the Singapore populations of at least 6 species which were previously known in the Catchment Area, have now disappeared. They are *Rasbora cephalotaenia* (Bleeker), *Osteochilus spilurus* (Bleeker), *Puntius dunckeri* (Ahl), *Ompok leiacanthus* (Bleeker), *Pristolepis fasciatus* (Bleeker) and *Channa orientalis* (Bloch & Schneider). The future of the 8 species which are now listed as rare (Table 1) is therefore not encouraging.

*Rasbora bankanensis* was first collected in 1934 and again in 1938. It was presumed exterminated after that but was re-discovered in 1963. The estimated population is about 100 individuals. *Rasbora maculata* was fairly common until 1956. Since that date I have been unable to collect a single specimen although there are reliable sight reports. The depletion of the species is very likely due to excessive (and illegal) collecting by aquarium fish enthusiasts. The existing population is probably less than 1,000 individuals. *Acantophthalmus kuhli* was first collected sometime in 1868-70. Recently it has been re-discovered; estimated population less than 1,000. *Mystus gulio* was recorded for the first time in Singapore from a single fish in 1963 and repeated collectings have failed to unearth further specimens. However, since it is a species tolerant of brackish water there may be a sizable local population in the mangrove swamps in the coastal areas of the island. *Glyptothorax major* is a torrent-adapted form characteristic of lowland riffles in Malaya. Today the species is restricted to two slow-flowing streams with a population estimated at less than 500. Similarly, *Parakysis verrucosa* is characteristic of fast-flowing streams in south Malaya and in Singapore it is represented by two isolated populations totalling less than 2,500. *Nandus nebulosus* was first recorded in 1860 and later in 1901. There were no other records until it was taken again in 1962 and 1963; existing population probably less than 2,000 individuals. *Osphronemus goramy* previously a popular pond-culture fish now has an estimated population of less than 1,000.

Also worthy of note is the Singapore Minnow (*Rasboraichthys altior* Regan), which is virtually restricted to the catchment area of Singapore Island. The only other species of the genus that is known occurs in Sumatra and Borneo. Its estimated numbers at present are quite large (including several in ponds and aquariums) and the species is by no means rare. However, there is the ever increasing threat of habitat alteration and of introduction of exotics into its very limited range.

## MALAYA

At the present time we lack information about threatened species in Malaya. In fact a complete inventory of the fresh-water fish fauna has not yet been attempted. Our main

consideration there is for the commercially important species. Among these is one which merits concern.

The giant cyprinid, *Probarbus jullieni* Sauvage, which is known locally as Ikan Temoleh or Ikan Temelian, is restricted to the Perak and Pahang Rivers. Even in the past the species has never been reported as abundant. The fact that it migrates upstream to spawn at certain times of the year is well known to the local inhabitants and this has resulted in large losses of gravid individuals.

As was pointed out by Hubback (vol. 1, p. 19) the construction of the Chenderoh Dam on the Perak River in 1930 hindered the upstream migration of the species. Until ten years ago it was common below Chenderoh. Reliable verbal reports indicate that last year, very few mature individuals were seen. The situation in the Pahang River is not known. The Malayan Fisheries Department is currently carrying out investigations into the possibility of breeding and rearing the fish.

## MAJOR FACTORS INVOLVED

### Singapore

The major factor leading to the depletion of fish in Singapore was the destruction of the original vegetation over much of Singapore which took place in the last century, mainly as a result of shifting cultivation. By 1880 more than half of the forests had been destroyed (Wee, 1964). Removal of this protective cover not only promoted rapid run off but also resulted in increasing water temperatures. Forest insects, which are known to constitute an important source of food for many species of fishes, became no longer available.

The increasing demands for water supply brought about by the fast increasing human population, is an important factor which has periodically led to lowering of the water table in the Catchment Area in Singapore. Especially during periods of exceptionally dry weather, such as were experienced in 1959 and in 1963, the three reservoirs were drained almost empty while the inlet streams were reduced to trickles and pools. It is possible that such extreme conditions were responsible for the extermination of the species which previously occurred in the Catchment Area.

As a result of the rapid urbanization and industrialization, pollution from human and factory wastes is another decimating factor in Singapore. Today, most of the streams outside the Catchment Area support a depauperate fauna consisting mainly of air-breathers such as *Clarias batrachus*, *Anabas testudineus*, *Trichogaster trichopterus*, *Trichopsis vittatus*, *Channa striata* and *Fluta alba* (Figure 1). In many localities the streams are canalized with concrete to serve as open sewers, and support no fishes except the ubiquitous *Lebistes reticulatus*.

### Malaya

Some of the major factors that have lead to the depletion of the fish fauna in Malaya are outlined in Hubback (vol. 1, p. 26). Of these the most serious is pollution and silting from tin mining operations and from clearing of hilly land and river banks for cultivation. Tin is highly toxic. In addition the vast volumes of silt that pour out from tin mine effluents, and the larger solid material that originates from hill erosion, not only increases turbidity and interferes with the respiratory mechanism of fishes, but also causes sedimentation in the river bed, modifying and destroying the fish habitats. The depauperate fish fauna of much of Selangor and Perak is due to tin mining. The Pahang floods of 1926 were doubtless caused by improper cultivation. Today, legislation does exist to control the proportion of silt in mining effluents. There is also control of cultivation on hilly land and on river banks.

Excessive trapping of food fishes and aquarium fishes may be of some importance in certain areas. At the present time there is no planned exploitation of natural fresh waters for food, and fishing is carried out without much regard to the age or breeding condition of the fishes. Nevertheless, apart from the single species I have mentioned, viz., *Probarbus jullieni*, most of the other food fishes do not appear to be threatened. Much more serious however, are the activities of aquarium fish dealers who, during the last 5 years, have caused a serious depletion of the fish fauna in southern Malaya.

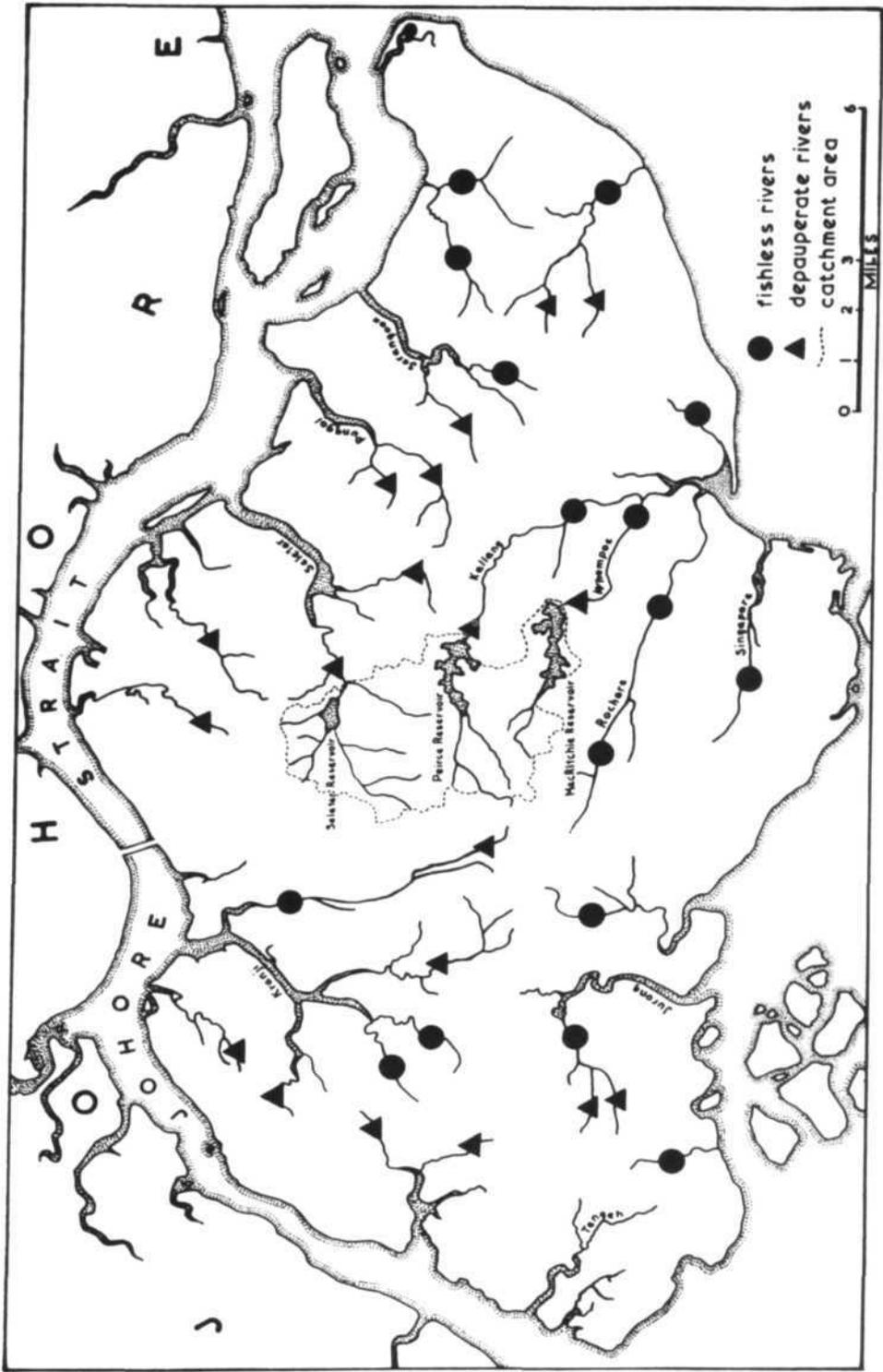


Figure 10. Map Showing Extent of Depauperization of the Freshwater Fish Fauna in the Major Stream Drainages of Singapore.

Today, a day's field-trip to any one of the streams in the famous Mawai district of Johore rarely yields more than 10 species. In 1957 it was usually possible to record at least 30 species from the same streams.

## INTRODUCED EXOTICS

Finally, there is the problem of introduced exotics. In Malaya and Singapore none of the established aliens appears to have affected the native species. Besides, *Trichogaster pectoralis* and *Tilapia mossambica* are valuable food fishes, while *Betta splendens* and *Barbus semifasciolatus* are much sought after as aquarium fishes. However, in Singapore, the vast growth in the aquarium fish trade poses a serious threat if there is indiscriminate release of more exotics into local fresh waters.

## REFERENCES

- Alfred, E.R. 1966. The fresh-water fishes of Singapore. *Zool. Verhand. Leiden*, 78: 1-67.
- Herre, A.W. C.T., and G.S. Myers. 1937. A contribution to the ichthyology of the Malay Peninsula. *Bull. Raffles Mus. Singapore* (13): 5-75.
- Hubback, T.R. 1932. Report of the Wild Life Commission, Malaya, vol. 1, 421 pp., vol. 2, 289 pp., vol. 3, 379 pp.
- Miller, R. R. 1961. Man and the changing fish fauna of the American Southwest. *Pap. Mich. Acad. Sci., Arts and Letters*, 46: 365-404.
- Skinner, A.M., et al. 1896. The Fisheries of the Straits Settlements and the Protected Native States. Paper laid before the Legislative Council by Command of His Excellency the Governor, Thursday, 2nd April, 1896, 71 pp.
- Stead, D.G. 1923. General report upon the fisheries of British Malaya with recommendations for future development. 371 pp.
- Wee, Y. C. 1964. A note on the vegetation of Singapore Island. *Malayan Forester*. 27 (3): 257-266.
- Wyatt-Smith, J., and P. R. Wycherley. (ed.). 1961. Nature conservation in western Malaysia, 1961. 261 pp.

TABLE 1: THE CHANGING FRESH-WATER FISH FAUNA OF SINGAPORE  
(+ = present; - = absent; brackets denote presumed occurrence; R = rare)

Species	1934	1964
Indigenous species:		
<i>Chela anomalura</i> van Hasselt	...	+
<i>Rasborschistys altior</i> Regan	...	+
<i>Rasbora bankanensis</i> Bleeker	...	+
<i>Rasbora cephalotaenia</i> (Bleeker)	...	+
<i>Rasbora einthoveni</i> (Bleeker)	...	+
<i>Rasbora elegans elegans</i> Volz	...	+
<i>Rasbora heteromorpha</i> Duncker	...	+
<i>Rasbora maculata</i> Duncker	...	+
<i>Cyclocheilichthys apogon</i> (Valenciennes)	...	(+)
<i>Labiobarbus festiva</i> (Heckel)	...	+
<i>Hampala macrolepidota</i> van Hasselt	...	+

Species		1934	1964
Indigenous species:- cont.			
<i>Osteochilus melanopleura</i> (Bleeker)	..1	-	-
<i>Osteochilus spilurus</i> (Bleeker)	...	+	-
<i>Puntius binotatus</i> (Valenciennes)	...	+	+
<i>Puntius dunckeri</i> (Ahl)	..2	-	-
<i>Puntius halei</i> Duncker	...	+	-
<i>Puntius lateristriga</i> (Valenciennes)	...	+	+
<i>Puntius pentazona johorensis</i> Duncker	...	+	+
<i>Puntius schwanenfeldi</i> (Bleeker)	...	+	-
<i>Tor tambroides</i> (Bleeker)	...	+	-
<i>Acantophthalmus kuhli</i> (Valenciennes)	...	(+)	R
<i>Acantophthalmus muraeniformis</i> de Beaufor	...	+	+
<i>Noemacheilus selangoricus</i> Duncker	...	+	+
<i>Kryptopterus micronema</i> (Bleeker)	...	+	-
<i>Ompok bimaculatus</i> (Bloch)	...	+	-
<i>Ompok leiacanthus</i> (Bleeker)	...	+	-
<i>Silurichthys hasselti</i> Bleeker	...	+	+
<i>Wallago miostoma</i> Vaillant	...	+	-
<i>Mystus elongatus</i> (Gunther)	..3	-	-
<i>Mystus gulio</i> (Hamilton)	...	(+)	R
<i>Mystus nemurus</i> (Valenciennes)	...	+	-
<i>Clarias batrachus</i> (Linnaeus)	...	+	+
<i>Clarias meladerma</i> Bleeker	...	+	-
<i>Clarias teijsmanni</i> Bleeker	...	+	+
<i>Bagarius bagarius</i> (Hamilton)	..4	-	-
<i>Glyptothorax major</i> (Boulenger)	...	+	R
<i>Parakysis verrucosa</i> Herre	...	+	R
<i>Dermogenys pusillus</i> van Hasselt	...	+	+
<i>Hemiramphodon pogonognathus</i> (Bleeker)	...	+	+
<i>Aplocheilus panchax</i> (Hamilton)	...	+	+
<i>Oryzias javanicus</i> (Bleeker)	...	+	+
<i>Nandus nebulosus</i> (Gray)	...	+	R
<i>Pristolepis fasciatus</i> (Bleeker)	...	+	-
<i>Stigmatogobius poicilosoma</i> (Bleeker)	...	+	+
<i>Anabas testudineus</i> (Bloch)	...	+	+
<i>Belontia hasselti</i> (Cuvier)	...	+	-
<i>Betta pugnax</i> (Cantor)	...	+	+
<i>Osphronemus goramy</i> Lacepede	...	+	R
<i>Trichogaster trichopterus</i> (Pallas)	...	+	+
<i>Trichopsis vittatus</i> (Cuvier)	...	+	+

Species		1934	1964
Indigenous species:- cont.			
<i>Luciocephalus pulcher</i> (Gray)	...	+	+
<i>Channa lucius</i> (Cuvier)	...	+	+
<i>Channa orientalis</i> Bloch & Schneider	...	+	-
<i>Channa striata</i> (Bloch)	...	+	+
<i>Macrognathus aculeatus</i> (Bloch)	...	+	-
<i>Mastacembelus perakensis</i> Herre & Myers	...	+	-
<i>Mastacembelus maculatus</i> Cuvier	...	+	+
<i>Mastacembelus armatus</i> (Lacepede)	..5	-	-
<i>Fluta alba</i> (Zuiew)	...	+	+
Introduced species:			
<i>Barbus semifasciolatus</i> Gunther	..6	(+)	+
<i>Cyprinus carpio</i> (Linnaeus)	...	R	R
<i>Puntius gonionotus</i> (Bleeker)	...	-	R
<i>Tilapia mossambica</i> (Peters)	...	-	+
<i>Tilapia zilli</i> (Gervais)	...	-	R
<i>Betta splendens</i> Regan	..7	(+)	R
<i>Channa micropeltes</i> (Cuvier)	...	-	R
<i>Trichogaster pectoralis</i> (Regan)	..8	+	R
<i>Lebistes reticulatus</i> (Peters)	..7	(+)	+
<i>Mollienisia sphenops</i> (Valenciennes)	...	-	+
<i>Gambusia affinis</i> (Baird & Girard)	...	-	R
Total indigenous species	...	54	35
Total introduced species	...	5	11

1. Last collected during 1868-1870.
2. Last collected in 1922.
3. Known only from the nolytype collected sometime before 1855.
4. Recorded from a single specimen collected in 1927.
5. Known from a single specimen collected sometime before 1883.
6. First collected in 1912.
7. First collected in 1937.
8. Introduced in 1898.

# Threatened Species of Thailand's Aquatic Fauna and Preservation Problems

by

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## SUMMARY

Thailand is rich in varieties of both terrestrial and aquatic fauna, some of which are important to the economy of the nation. With the rapid increase in population and the expansion of civilization into formerly remote areas, many species have become rare and some have disappeared.

The authors present the general problem, list the species of aquatic fauna which are threatened and which are under protection and preservation programs, and point out specific problems in the preservation and conservation of certain species of Thailand's aquatic fauna.

## INTRODUCTION

Thailand is rich in varieties of both terrestrial and aquatic fauna, some of which are important to the economy of the nation. However, with the rapid increase in the population of the country and the expansion of civilization into once remote areas, many species of animals have become rare. Some species have disappeared from their normal habitats. Some are threatened with extinction in the very near future.

In this paper, we use the term 'preservation' for those animals which may or may not be of economic value but which are threatened with extinction. The term 'conservation' is used for those animals which are of economic importance. We will use the concept of conservation stated by Schaefer (1959), 'Conservation, in the modern sense, does not mean simply the preservation of a resource for the future, but also encompasses its use for man's benefit both in present and future time'.

## THE PRESERVATION OF SELECTED SPECIES OF THAILAND'S FAUNA

The Wild Elephant Preservation Act was first promulgated in 1900 under King Rama the Fifth and revised in 1960 and 1964. Since all elephant in Thailand belong to the King by law, the Act forbids hunting of wild elephants without permission from an authorized officer.

In 1960, the Government established a new act called the Wild Animals Preservation and Protection Act B. E. 2503 (Premrasmi, 1964). Under this act, wildlife is divided into two groups: wild animals under preservation, and wild animals under protection. The latter group is divided into two categories. The first category of wildlife includes, those the flesh of which is not usually used as human food, those not usually hunted for sport.

The wild animals of the first category must not be killed, except for educational purposes or scientific research, and permission must be obtained from the Director-General of

the Forestry Department. Wild animals of the second category may be hunted, but one must obtain a hunting license from an official appointed by the Minister of Agriculture.

In this act, no person shall hunt the animals under preservation except for educational purposes, scientific research or for zoological gardens. A permit for the hunt must be obtained from the Director-General of the Forestry Department.

Certain species of marine animals are protected under the Fisheries Act of B. E. 2490, which forbids one to catch the following species:

1. Green turtle (*Chelonia mydas*)
2. Loggerhead turtle (*Caretta caretta*)
3. Hawksbill turtle (*Eretmochelys imbricata*)
4. Sea cow (*Halicore dugong*)

## CONSERVATION OF FISHERIES RESOURCES

During 1962-63, Thailand harvested approximately 450,000 tons of marine and fresh-water fish amounting to approximately 1,950 million baht (Anonymous 1963). Clearly the development of fisheries contributes to the betterment of the national economy. During the past decade, fishing has increased tremendously, especially in marine fisheries.

A good example is the rapid development of the trawl fisheries in the Gulf of Thailand which began in 1961 when a series of fishing demonstrations of the otter-board trawl fishing were made by the Thai Department of Fisheries in the presence of many Thai fishermen coming from various coastal provinces (Isrankura and Ruamraksa, 1965). The expansion can be seen from the following statistics:

Year	Number of trawlers	Number of purse seiners
1960	99	174
1961	201	134
1962	669	118
1963	2,327	130

Realizing that the trawling as well as the fisheries in the Gulf of Thailand have expanded very rapidly during the past decade, and that there is a pressing need to regulate the fishing to ensure the maximum sustained yield harvested from the Gulf's fishing ground, the Government has initiated a program to explore fishing in waters adjacent to the Gulf of Thailand and the Indian Ocean.

Meanwhile, programs for conservation of important fresh-water and marine resources have been initiated, in particular, for the Indo-Pacific chub mackerel (*Rastrelliger neglectus* Van Kampen) resource (Menasveta, 1965) which yields approximately 200 million baht (U.S. \$ 10 million) annually.

In the program for conservation of fish resources, regulations have been temporarily set up under the authority of the Fisheries Act, B. E. 2490. In fresh-water fisheries, a closed season is imposed annually, from the 16th of May until the 15th of September. At present in marine fisheries, regulations are imposed only on the Indo-Pacific chub mackerel fisheries, with a closed season during the spawning period between the first of January and the 31st of March and during the larval and juvenile period between the 15th of April and the 14th of June, during which no fishing gear other than gill nets with an average mesh size not less than 4.7 centimeters is allowed.

## THREATENED SPECIES OF AQUATIC FAUNA OF THAILAND

A threatened species, according to the Survival Service Commission, is a species which (a) has for any reason declined or is in the process of declining to a level at which the continued survival of that species appears to be jeopardized, (b) is likely to be endangered

by a recent or proposed introduction of an exotic predator or competitor particularly where the species concerned has a low reproductive potential or requires a specialized diet or (c) has had (or will have) its habitat modified or destroyed (in whole or in part) to the extent that it is no longer capable of supporting a sufficiently large population to insure continued survival.

Three species of fresh-water fishes of Thailand fall under this definition and they were forwarded to the Chairman of the discussion group on threatened species. They are:

1. *Scleropages formosus*
2. *Pangasius sanitwongsei*
3. *Pangasianodon gigas*

Myers (1965) writes, 'In the canals of Bangkok, Thailand, the common native *Aplocheilichthys panchax* is now rare and the unique little *Phenacostethus* (known only from there) has disappeared; *Gambusia* is common'.

A list of threatened species of Aquatic Fauna of Thailand is shown in Table 1.

### PROBLEMS IN PRESERVATION AND/OR CONSERVATION OF AQUATIC FAUNA

Though the concepts of conservation of fauna of economic value and preservation of rare species have long been under consideration by various conservation agencies of Thailand, they are still practically unknown to the majority of Thai people. This is mainly due to the lack of background information on the part of the population concerning the composition of fauna of Thailand, their values, their relations to other animals in the same habitats, etc.

Ecological succession is operating in many natural bodies of water in Thailand. Many swamps have become shallower; peasants have turned these swamps into farm lands for rice growing and other agricultural purposes. With the population expanding at the alarming rate of about three per cent per annum, once remote areas are being utilized. The marine fishing which was once confined only to coastal areas has been expanded into deeper seas. It is obvious that the population of a species is upset by these environmental changes induced by man or other interdependent factors. Increased fishing of one species may upset the wellbeing of another species since this action may increase the number of predators of that species or decrease the amount of food for the population in question (Nikolsky, 1963).

The laws for the preservation and protection of fauna and the conservation of fisheries resources have already been stated in this paper. However, in practice, the enforcement of these laws is not adequate. The conservation agencies empowered to enforce these laws receive a limited budget annually; hence, the lack of personnel and facilities is evident.

The management of some marine fisheries, with the goal of stabilizing the yield from the fisheries at the maximum sustained level, has also faced some difficulties. In the program to properly manage the mackerel resource in the Gulf of Thailand, Menasveta (1965) points out various problems:

1. The majority of the people and fishermen do not recognize the importance of a conservation program, which would eventually enable them to harvest the resource with maximum efficiency. They do not understand that if the resource is properly managed they would reap the benefit from fishing at their minimal investment with the highest return, since this resource is a self renewable resource.
2. Lack of co-operation between government officials and fishermen seems to be another obstacle to the conservation program.
3. As a result, accurate production and statistics, which are essential in the evaluation of the resources, are not obtained.

## RECOMMENDATIONS

We would recommend that the Government direct attention to conservation education. The knowledge and information pertaining to the rare species of Thailand's fauna and the species of economic value should be integrated into the science curriculum of both elementary and secondary schools. The concept of conservation should be the highlight of this program.

The establishment of a national reference collection center, where rare species found in Thailand are well kept and demonstrated, is very essential. This center should disseminate information with regards to the life history, the general morphology, etc. of rare species to the public.

Moreover, information with regards to the rare species of Thailand's fauna, the conservation of important aquatic resources should be regularly disseminated through mass communication media.

## EFFICIENCY OF LAW ENFORCEMENT UNITS MUST BE INCREASED

Increased collaboration among various governmental and private agencies concerning the conservation programs must be sought.

TABLE 1: LIST OF SELECTED SPECIES OF AQUATIC FAUNA OF THAILAND BEING THREATENED WITH EXTINCTION

Major group of animals	Thai common name	English common name	Zoological name
Fish	Pla ta-pad	Scleropages	<i>Scleropages formosus</i>
	Pla te-pa	Catfish	<i>Pangasius sanitwongsei</i>
	Pla buk	Giant catfish	<i>Pangasianodon gigas</i>
Amphibians	Ma-nam	Salamander	<i>Tylostrotiton verrucosum</i>
	Gob-toot	Giant frog	<i>Rana macrodon</i>
Reptiles	Ta-khong	Long-nosed crocodile	<i>Tomistoma schlegeli</i>
	Tao-ma-pheung	Luth	<i>Dermochelys coriacea</i>
	Tao-pu-lu	Land turtle	<i>Platysternon megacephalon</i>
	Tao-hok	Six-legged tortoise	<i>Testudo emys</i>
	Tao-kra-arn	Freshwater tortoise	<i>Batagur baska</i>
	Tao-ta-le	Loggerhead turtle	<i>Caretta caretta</i>
	Man-lai	Soft-shelled turtle	<i>Pelochelys bibroni</i>

## LITERATURE CITED

- Anonymous. 1963. Agricultural statistics of Thailand, 1963. Division of Agricultural Economics, Office of the Undersecretary of State, Ministry of Agriculture, Bangkok, Thailand. 178 pp.
- Menasveta, Deb. 1965. Program of Mackerel Investigations – Reports on Mackerel Investigations, 1963-1965. Marine Fisheries Laboratory, Division of Research and Investigations, Department of Fisheries, Bangkok, Thailand, Contribution No. 4: 1-13 (In Thai).

- Myers, George S. 1965. *Gambusia*, The Fish Destroyer. *Tropical Fish Hobbist*, Jan. p. 31.
- Nikolsky, G.V. 1963. The ecology of fishes. (Translated from the Russian by L. Birkett.) Academic Press, London and New York. 352 pp.
- Premrasmi, Tanom. 1964. Collections of laws of the Department of Forestry. Department of Forestry. 276 pp. (In Thai).
- Ruamraksa, Sanan, and Andhi P. Isrankura. 1965. An analysis of demersal catches taken from the experimental trawling operations in the Gulf of Thailand. Department of Fisheries, Bangkok, Thailand, Contribution (3): 1-67.
- Schaefer, Milner B. 1959. Biological and economic aspects of the management of commercial marine fisheries. *Trans. of the Am. Fisheries Soc.* 88 (1959): 100-104
- Smith, H.M. 1945. Freshwater Fishes of Siam or Thailand. *U.S. Nat. Mus., Bull.* 188. 622 pp.

## Part V

### Plants

## Conservation of Habitats

by

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#### SUMMARY

Plant species that are in danger of extinction are threatened not directly but through the destruction or disturbance of their natural habitats. Of the numerous forest types found in the Malay Peninsula, the most important are: (a) lowland dipterocarp forest (b) montane forest (c) limestone forest.

The greatest threat to the lowland dipterocarp forest comes from rural development which involves large-scaled felling of species-rich forests. The other threat is through selective felling in forest reserves. This results in the disturbance of the micro-climate of the forest interior detrimental to the numerous 'uneconomic' but botanically interesting species. The montane forest is threatened by hill cultivation as well as by collectors; while the limestone forests are endangered by mines and quarries.

#### INTRODUCTION

No doubt particular species, in danger of extinction, will need special protection, but by and large the danger of extinction comes, not through shooting, but through destruction of the natural habitat.<sup>1</sup>

It is hoped that the above quotation will serve as an excuse for my contributing a paper on 'threatened habitats' instead of 'threatened species'. This is not due to any lack of enthusiasm on my part for the future of rare and interesting plants of Singapore and Malaya. It stems out of my conviction that unless efforts are now made to protect forests, all our endeavours in conserving rare species of plants (and also of animals) will come to nought if their natural habitats are disturbed or destroyed. And it is with this aspect of conservation that my paper is concerned.

The natural vegetation of the Malay Peninsula is Tropical Rain Forest (in the broad sense) which can be defined as a non-seasonal, evergreen forest of tropical climates with high and evenly distributed rainfall. Within this broad formation, the following most important forest types are discernible:

1. Lowland dipterocarp forest.
2. Montane forest.
3. Limestone forest.

#### LOWLAND DIPTEROCARP FOREST

A greater part of the forest cover of the Malay Peninsula is of the first type which is so well known to many of us here that it is not necessary for me to explain the structure of it in any great detail. It suffices to mention briefly that the trees form what are

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<sup>1</sup> J. L. Harrison, 1961. The Value of Small Mammals *Mal. Nat. J.* Special issue. p. 210.

known as strata. The tallest stratum consists mainly of dipterocarps, the crowns of which do not form a continuous canopy. The next lower stratum is a continuous dense canopy of the crowns of trees of dipterocarps as well as other families such as *Meliaceae*, *Leguminosae*, *Anacardiaceae* etc. The third lower stratum, which is often hardly discernible from the second, is also a dense and fairly continuous canopy of trees of mixed elements like *Annonaceae*, *Euphorbiaceae*, *Myrsinaceae* etc. Below these tree strata is a low layer of shrubs, seedlings of the big trees and monocots like palms, ginger etc. On the forest floor is a layer of small herbs, often very fleshy, belonging to many diverse families as well as saprophytes. Over all these, climbers, stranglers and epiphytes fight for living space.

This closed community of life-forms harbors an internal climate (or micro-climate) which has a vertical variation. Just above the highest canopy, the climate is that of the gross land mass with normal diurnal variations. Downward from these exposed tree tops into the forest interior, the micro-climate becomes more and more equable until a few feet above the forest floor, it becomes extremely 'controlled'. Plants have developed adaptations to these various micro-climates at ground level, middle heights, at the level of the dense crowns of the second canopy and in open sunlight at the top of the tallest canopy. Trees of the upper strata, which are mainly dipterocarps, have seedlings adapted to the controlled micro-climate of the forest floors. Most of these seedlings in fact need the shaded and high humidity environment for their development. Even the young plants of *Dryobalanops aromatica*, a dipterocarp, which can actually tolerate almost full exposure, need to have their roots adequately shaded by other plants. Shrubs and small trees of the lowest tree stratum as well as large monocots like palms and herbs of the forest floor are similarly adapted. Not only the seedlings but also the adults of many of these plants cannot tolerate the open or exposed habitat.

The delicately balanced micro-climate of the forest interior can be upset in two ways, viz. vertically and laterally. Most forest reserves suffer from the former. Uneconomic trees are poisoned and eventually felled. So-called useless lianes, climbers and large monocots are cut and left to die. Due to the consequent exposure vertically, though slight, numerous shade loving herbs, epiphytes etc. are gradually dried out of existence. Slowly these reserves become 'estates' of timber trees! Most of these forest reserves are no reserves at all as far as protection of all plant species is concerned.

Forests too small in acreage, though uncut, usually suffer from desiccation laterally. The lowland dipterocarp forest on Bukit Timah Hill in Singapore is an excellent example. Occupying an area of about 184 acres in the center of Singapore Island, it is almost completely surrounded by cleared land or built-up housing estates. Being on a hill (the highest on the island), the forest interior is at the mercy of lateral wind movements. A lot of the ground herbs have been 'dried' out of existence while secondary community elements are slowly migrating into it.

In Malaya, the greatest threat to the lowland dipterocarp forest comes from development projects. Large areas of forests are being felled and the devastated land is being parcelled out to rural people who till their small plots for maize, bananas and other fruit plants which at best barely produce enough for their local consumption. It is still not too late for Malaya to have good sized plots of untouched forests spread all over the country as nature reserves rigidly protected by a Nature Reserve Ordinance as we have in Singapore. Unless this is implemented, the numerous 'uneconomic' but otherwise rare and/or little known plants face decimation. So much for the lowland dipterocarp forest.

## MONTANE FOREST

Regarding the Montane Forest in the Malay Peninsula, the most well known, botanically and otherwise, are those in the Cameron Highlands (up to 6,600 ft.) and the Fraser's Hill (up to 4,300 ft.) on the main range of the peninsula. Other less known ones are those at Gunong Tahan (alt. 7,150 ft.) and Gunong Benom (alt. 6,900 ft.). This forest type differs very greatly from the lowland dipterocarp forest. Here oaks and laurels are the predominant trees which are generally lower in stature compared to the dipterocarps. Not only is the forest lower, but also the forest floor is much richer in herbs and monocots. Fleshy melastomaceous herbs like *Sonerila* and *Medinilla* as well as

balsams and begonias are plentiful. As a result of the abundance of moisture due to the great frequency of mist, fleshy epiphytes that are adapted to such humid conditions are in great profusion.

In terms of temperature tolerance, the plants of montane forests are of two sorts. In the first, there are those that can thrive quite happily from sea-level to about 5,000 ft. in altitude. Numerous species of *Garcinia* and *Calophyllum*, *Urena lobata* and many composites are but a very few examples of this type of plant. Being so widely distributed, these plants are not in any great danger of extinction. In the other group, the plants cannot tolerate the high temperatures of the lowland. Examples of these are *Illicium* species, *Viola serpens*, most of the species of hill *Impatiens*, numerous herbaceous sonerilas and medinillas, most montane begonias and numerous pretty-flowered orchids. Most of these species are not only endemic to the Malay Peninsula, but are also extremely rare and often very localized in their distribution.

The threat to these plants is two-fold. Firstly, there is hill cultivation. Tea plantations, cabbage and other small vegetable gardens seem to be expanding in the Cameron Highlands. A lot of our formerly very accessible montane forests had already been cut down for agriculture. Those that remain have their habitats disturbed by the aborigines through wanton destruction. Secondly, a lot of these plants, particularly those with showy flowers, are being sought after by visitors. This is particularly true of the orchids which are in great danger of extinction. These collectors do not realize that almost all of these plants cannot survive the hot climate of the Malayan lowlands. Conservation of the montane flora is not a difficult problem. Government authorities can easily be made to understand that unless there is vegetation cover on these mountains, serious erosion of the mountains with dangerous consequences for the lowlands will result.

## LIMESTONE FOREST

The limestone flora of Malaya occurs mainly in the northern half of the peninsula if one takes Kuala Lumpur as a mid-point. Most of these hills are concentrated in the Kinta Valley in Perak and in the north-west corner of the peninsula i. e. Perlis, Langkawi Island and Kedah. The others are found in Kelantan and Pahang while a few occur near Kuala Lumpur. Most of the plants of this forest type are 'rockery plants' of which a lot of them are calcicole i. e. plants that can only survive on limestones. Not a few of these calcicole species are endemic and very rare, such as *Milinsa parviflora*, *Orophea cuneiformis* and *hirsuta* and *Popowia velutina* (*Annonaceae*). Of the eight species of *Impatiens* enumerated from these hills by Henderson, seven are confined to limestones. Again, of the nine species of *Boea* (*Gesneriaceae*) listed from these limestones as endemics in Malaya, six of them are rare and confined entirely to such calcareous habitats. Individually, these species are not as threatened as their counterparts are on the hill stations because most of these limestone hills are not very accessible to collectors. The threat is to the forest as a whole and it comes almost entirely from mining and quarry – iron ore mines and lime quarries. B.M. Allen (1961) has already advocated the immediate conservation of some of the most interesting of these hills and it is here hoped that something could be done in the near future.

## CONCLUSION

There are of course other forest types in the Malay Peninsula such as peat and freshwater swamp forests, beach forests, mangrove forests etc. which need the attention of conservationists. These perhaps contain lots of species of plants still new to science. As far as plants are concerned, therefore, conservationists should direct their attention to forests or plant communities rather than to particular species or genera or families for the very simple reason that if the forest is destroyed, all species of plants will disappear be they interesting, rare, endemic or even common.

# Rare Plants and the Community in South East Asia

by

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## SUMMARY

The author discusses plant communities and the abundance, density, frequency, and fidelity of species in a community. Rare plants with a high fidelity for a particular community are always threatened plants, and if their particular community is destroyed they will be lost forever to mankind.

## INTRODUCTION

The fourth session of this conference is concerned with rare or threatened species. It seems appropriate that some consideration should be given to the part plants play in their respective communities in South East Asia.

## PLANT COMMUNITIES

A plant community or phytocenose is a concrete population of plants influencing one another in various ways and to various degrees. A climax community is regarded as one which is in equilibrium with respect to the number of species, floristic composition and number of individuals living together in a more or less homogeneous pattern. The study of plant communities presupposes that plants are distinct species combinations which repeat themselves in a regular manner in nature. The observed fact that only a limited number of taxa combinations occur in vegetation means that the grouping of plant species is not haphazard (Becking, 1957). The complex interaction which exists between individual plants and between plants and their environment has been little studied and understood. Ecological questions may be relatively simple in the Arctic, with few (20-30) species (Haldane, 1960), but they are exceedingly complicated in South East Asia where it may be necessary in the tropical rain forest to consider thousands of species, many as yet undescribed.

Pioneers of plant geography such as Humboldt (1806), Kerner (1863), Drude (1890) and Warming (1896) described vegetation in its broad relation to geographical position and general climate. No special techniques for recording species composition were elaborated and their accounts constituted the descriptive phase of vegetational analysis. Nevertheless some of them tried to give complete species lists which included rare plants. As interest in vegetation grew, floristic enumeration of plant taxa and more precise details of accurate measurement were perfected in temperate regions, but they have yet to be perfected in community analysis in South East Asia.

## ECOLOGICALLY RARE SPECIES

The ideas of the Zurich-Montpellier School under the leadership of Braun-Blanquet have gained the greatest support among ecologists in their classification of *abundance* (plentifulness) on a rapidly estimated scale:

1. very rare
2. rare

3. infrequent
4. abundant
5. very abundant

Density may be defined as the number of individuals on a unit area basis. Not all species with equal densities are of equal importance in the community, nor are they similarly distributed. If the density is low the species will be classified as rare.

Frequency is an expression of the percentage of sample plots in which the species occurs. It may be conveniently grouped into the following classes:

- A. 1 to 20%
- B. 21 to 40%
- C. 41 to 60%
- D. 61 to 80%
- E. 81 to 100%

Raunkaier and numerous other investigators have shown that irrespective of vegetational type class A will normally have a high value because of the numerous sporadic species with low frequency found in most stands. Class E will also be high because these species dominate the community. Many plants with low frequencies may be classified as rare, but abundance does not always follow frequency. If a plant is sparsely and evenly distributed it may have a relatively low abundance but a high frequency.

The amount of cover or space is important in the location of the species. Man classifies as rare what he does not find. Whether the species is in fact rare depends on whether he has been looking for it in the right places and whether it is of sufficient size for him to easily find it. In South East Asia we have placed too much emphasis on the larger mammals and flowering plants and too little on smaller protozoans and cryptogamic plants. Furthermore where rare plants show gregariousness (hyperdispersion) a group of individuals is more likely to be noticed and more likely to survive.

The vitality of rare plants is of fundamental importance if they are to survive. If they have obligatory sexual reproduction, regular completion of the life cycle is essential. However, many lower plants, such as the blue-green algae, may maintain themselves for considerable periods of time without sexual reproduction.

When data has been collected together by the ecologist a synthesis table may be compiled in which a particular plant community is studied in the abstract. The fidelity of a species in a particular community may be broken down as follows:

Fidelity = 1 – strangers are those species which are rare in this particular community and do not truly belong.

Fidelity = 2 – indifferents and occur in many communities without profound affinity for any of them.

Fidelity = 3 – preferents are present in several communities preferring certain types more than others.

Fidelity = 4 – selectives are found especially in one community but are met with occasionally in others.

Fidelity = 5 – exclusives, found only in one type of community and for this reason of the greatest interest to nature conservationists.

If community structure was a completely static complex with a constant proportion of each species, rare species in the community would only be threatened when the community itself was threatened. However, for survival a community is not static nor are all species of equal importance in a community. It might be possible to destroy a certain species without destroying the community since the niches previously occupied by this species could be recolonized by species with a similar function in the community. We might further imagine that rare species would have less fundamental effect on community structure than dominant or more abundant species, since their biomass is usually quite small although this is not necessarily so.

Is a rare plant then a threatened plant? This will depend on a number of factors, not least that of the biotic effect of man who may exploit such a plant for his own use. Rare plants with high fidelity for a particular community or a particular stand are always potentially threatened plants. The part they play in community structure may be quite small, and their elimination will not in any way threaten community survival, but if the community is destroyed the plants also will be eliminated.

Ferns as a group have attracted little attention from the ordinary South East Asian. (See Table I). He has found no economic use for them nor found them so aesthetically beautiful that he has sought to destroy them for their own sake. Nonetheless some are so rare as to have been found only once, and some are restricted in their distribution to be found in one area but not in another. Ferns once found in habitats throughout South East Asia have disappeared with the clearing of natural forest and road making through hitherto undisturbed areas. Other plants, such as orchids, have been threatened because of the interest they have attracted in ordinary people.

In Singapore we are concerned with a sandstone ridge, Gunong Pantii which lies in South East Johore. Here the Malayan slipper orchid *Paphiopedilum bullenianum* is endemic, as too are a number of different kinds of mosses and liverworts, while other plants are of a most unusual kind for so low an altitude. Although the hill is a forest reserve, plans are in operation to clear the lower slopes for timber, only the upper ridge being spared such destruction. Whether the rich and unusual flora of the sandstone ridge will be able to survive when the slopes have become denuded in the absence of tree-cover will have to be seen. In spite of efforts of interested people for the last forty years it seems that nothing can be done.

A nature reserve must be of a certain minimal area to be self-maintaining. Such a community needs to be protected laterally by supporting communities. Bukit Timah in Singapore was once protected by extensive areas of lowland forest in the center of Singapore Island. Now it is an isolated group, threatened on one side by a granite quarry and on others by drying winds passing over built up areas.

The future of limestone hills in Perak is very bleak indeed. The larger outcrops are covered in part or completely by prospecting licences or working mines (Molesworth-Allen, 1961). Yet many species confined to these hills are fast becoming rare.

When a community is destroyed rare plants within that community will be destroyed. If these species have a high fidelity for this particular community they will not be successful elsewhere and will be lost forever to mankind.

## REFERENCES

- Becking, R.W. 1957. The Zurich-Montpellier School of Phytosociology. *Bot. Rev.* 23: 411-488.
- Drude, O. 1890. *Handbuch des Pflanzengeographie*. Stuttgart.
- Haldane, J.B.S. 1960. The Theory of Natural Selection Today. *Proc. Cent. Bicent. Congress Biol.* (Sing.) 1-8.
- Humboldt, A. von. 1806. *Ideen zu einer Physiognomik der Gewächse*. Tubingen.
- Kerner von Marilaun, A. 1863. *Das Pflanzenleben der Donauländer*. Innsbruck. 2nd Ed.
- Molesworth-Allen, B. 1961. Limestone Hills near Ipoh. *Nature Conservation in Western Malaysia*. 68-72.
- Warming, E. 1896. *Lehrbuch der ökologischen Pflanzengeographie*.

TABLE 1: STATUS OF SOME MALAYAN PLANTS

Species	Status	Remarks
<i>Calymmodon gracilis</i>		Collected only twice in Malaya but is abundant on Mount Kinabalu.
<i>Chitita sericea</i>	Becoming rare	Found only on the limestone hills of Perak.
<i>Crypsinus albidosquamatus</i>		Not uncommon although collected only once in Perak.
<i>Cyathae obtusata</i>	Rare	Known only from original collection in Perak, but may be a variety of <i>C. latebrosa</i> .
<i>Dipteris novoguineensis</i>	Rare but not threatened	Found only on high exposed mountain ridges in southern Celebes and New Guinea with one collection from G. Tahan.
<i>Grammitis holltumii</i>	Appears to be rare	Exceedingly rare being known from a single collection from the Cameron Highlands and one plant from Fraser's Hill.
<i>Hymenophyllum johorensense</i>	Restricted	Found once on G. Belumut in Johore, and also in Borneo and the Philippines.
<i>Lygodium borneense</i>	Restricted	Rare in Malaya (only found in S. Sedili district) but quite abundant in Sabah and Sarawak.
<i>Merinthosorus drynarioides</i>	Restricted	Found on Government Hill and in the Main Range from 2,500 to 4,000 feet in Penang.
<i>MicTosorium hancockii</i>	Rare	Distributed from north India to China, but collected in Malaya only from the Cameron Highlands.
<i>Orophea hirsuta</i>	Becoming rare	No longer found on Gunong Idong since the vegetation has been removed. Found on the limestone hills of Perak.
<i>Trichomanes ridleyi</i>	Rare	Collected only once on G. Tahan. Possibly an extreme form of <i>T. palmatifidum</i> .
<i>Schizaea inopinate</i>	Rare	Found only on limestone hills in Malaysia, especially in Pahang and Selangor.

# Some Rare and Vanishing Plants of Thailand

by

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## SUMMARY

Habit, habitat, geographic distribution, and commercial exploitation are factors involved in plants becoming rare and extinct in Thailand. These considerations are discussed in turn. The parasitic plant, *Sapria himalaya*, and the orchids, *Vanda coerulea* and *Paphiopedilum spp.* are species that are especially threatened. Methods of conservation are suggested.

## INTRODUCTION

Owing to its great diversity of latitude and longitude, varied physiographic nature, and seasonal climatic condition, Thailand has a luxuriant vegetation. Some 20,000 flowering species are estimated to exist although, since the study of the flora of Thailand is incomplete, only about two-thirds of them are known.

Even in such a vegetation-rich country as Thailand intensive agricultural and economic development to meet the needs of an ever-growing population have opened up hitherto forested lands to farming and caused certain species to become rare or threatened with extinction. Threatened species may be grouped by habit, habitat, geographic distribution, and commercial exploitation.

## HABIT

The lives of parasitic species depend on host plants; those of epiphytic nature have comparatively much better chance of survival than their terrestrial sisters, which are mostly root-parasites. Epiphytic parasites have wider distribution by means of sticky seeds carried away by birds and by their prolific choice of host plants.

Terrestrial parasites, even those producing quite a quantity of minute seeds, seem to have rather specific hosts and they lose their chance of survival if their host plant is removed, as often occurs in the course of shifting cultivation and the opening-up of new settlements. *Sapria himalayana*, a native of hill evergreen or lower montane forest, feeding only on the roots of a liana of the genus *Tetrastigma* and *Rafflesia patma*, a native of hill evergreen in the Peninsula, are examples of this. Only the conservation of the hill evergreen forest under the Watershed Management Program will help these beautiful root-parasitic species to exist.

*Pedicularis rhynchodonta* and *Pedicularis siamensis*, both feeding on roots of some species of grasses, are considered to be safe as the former is found only on Phu Krading, a flat-topped sandstone mountain in Loei, an area already declared a national park; and the latter is on Doi Chiengdao, a rather inaccessible limestone massive in Chiangmai, to be declared a national park in the future.

Parasites living on bamboo, such as *Aeginetic indica*, *A. pedunculata*, and *Christisonia siamensis*, as well as some members of the genus *Balanophora* have a good chance of survival as bamboo forests are extensive and resistant to fire; although they too are destroyed if the host plant is removed as with shifting cultivation and the opening-up of new settlements.

## HABITAT

Plants existing in limestone formations are in great peril of being totally wiped out as the limestone is currently and heavily exploited for road building and other construction. (See Appendix A.) Destructive fires in the valleys and the foothills caused by shifting cultivation have been responsible for other losses. Limestone formations are widespread in Thailand and it is not possible to conserve all these areas, but Khao Sam Roi Yawt in Prachuap Khirikhan has been declared a national park and Doi Chiangdao in Chiangmai is next on the list. The conservation of these two limestone formations will greatly help in the preservation of many rare and beautiful orchids.

## GEOGRAPHICAL DISTRIBUTION

True endemic species are often rare, tending to be confined to specific areas, from which their removal will terminate their existence. A few examples of these are: *Rhododendron ludwiganum*, *Impatiens kerriae*, *I. psittacina*, *Geranium siamense*, *Senecio craibianus*, and *Veratrum chiengdaoense* of the limestone formation; *Afgekia sericea*, a lotus-pink-flowered climber of the dry deciduous forest; and *Paphiopedilum sukhakulii*, a very recent new species of the hill evergreen forest, *Trigonobalanus doichangensis*, a member of the oak family, of which the other related species is known in Malaysia only. Most of these endemic species are attractive enough, but are of no commercial value, and thus they can be deemed safe. Only *Paphiopedilum sukhakulii* which is subjected to heavy exploitation and *Afgekia sericea*, which produces hardly any seeds outside its habitat at all, are exposed to this danger.

## COMMERCIAL EXPLOITATION

Plants of commercial value protected by law are divided into two categories: timber and minor forest products. Although it is heavily exploited timber is under tight control. Orchid species, always attractive to plant collectors, dealers, and growers, have been subjected to heavy exploitation for decades. *Paphiopedilum spp.* and *Vanda coerulea*, the most wanted plants in the international orchid trade, are becoming alarmingly depleted. These and others (*Vanda denisoniana*, *V. hookeriana*, *Dendrobium scabrilingue*, *D. formosum*, *D. infundibulum*, *D. tortile*, and *Rhyncostylis spp.*) have been declared protected species under a forest law, but it is a law difficult to enforce. The only way to save *Paphiopedilum spp.* and *Vanda coerulea* is to ban their exportation.

ANNEX 1

Some Rare Plants of Limestone Hills of Thailand

*Buddleia macrostachys*

*Delphinium stapeliosmum*

*Dichiloboa acaulis*

*Eria ornata*

*Gentiana australis*

*Habenaria carnea*

*Hemipilia calophylla*

*Impatiens psittacina*

*Luculia gratissima*

*Pandanus obovatus*

*Pandanus calcis*

*Paphiopedilum bellatulum*

*Paphiopedilum godefroyae*

*Paphiopedilum niveum*

*Phyllanthodendron mirabilis*

## Part 6

### Collecting

## Regulation and Co-ordination of Collections of Flora and Fauna

by

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#### SUMMARY

Factors supporting the control of collecting expeditions are reviewed, together with the proposed mechanism for regulating the activities of collectors in Thailand.

#### INTRODUCTION

The need to regulate the activities of collecting expeditions has been discussed by Bezemer (1930) in relation to Indonesia and Talbot (1965a) in relation to Africa. Both make a plea for moderation and for co-ordination of research – both points which still need to be emphasized. Considerable waste of money can result from unco-ordinated collecting, and desirable economies can be effected by ensuring that territories which have already been examined are not visited repeatedly. Over-collecting of a particular species of flora or fauna can significantly reduce the population of a species, e. g. monkeys in the Philippines (Talbot and Talbot 1964), and in extreme cases, can threaten it with extinction.

Bezemer (1930) refers to restrictive measures which were introduced to conserve threatened species in Indonesia and suggests that limitations of this sort should be introduced elsewhere. He considers that biologists must be required to moderate their activities and points out that if they do not do so science will eventually suffer a shortage of material.

Talbot (1965a) has also referred to the need for efficiency in research effort and the most efficient possible use of the animals collected. In research which involves the collection of animals it is clearly desirable to obtain as much data as possible per animal killed. In some research the entire animal is needed. Other kinds of research require only one part of the animal, often a blood sample or a single internal organ. In such cases, instead of each research worker killing a separate animal for the particular material that he wants, one animal could usually provide materials for two or more workers. This procedure would be particularly important in the case of rare animals or those that are difficult to obtain. Co-ordination and co-operation in research involving collections becomes more important as the number of projects and personnel grow, as the research problems become more urgent, and as the flora and fauna involved become increasingly rare.

#### OBJECTIVES IN THAILAND

Thailand is now regulating expeditions within its borders with four major objectives:

1. Limiting the taking of unnecessary quantities of material

2. Co-ordinating collecting activities to ensure as widespread a coverage as possible and to eliminate too-frequent visits to the same area.
3. Ensuring that a representative sample of the specimens collected remain in Thailand.
4. Ensuring that Thailand is kept informed of the results obtained by visiting research workers.

## PROCEDURE FOR REGULATING EXPEDITIONS

The procedure for regulating expeditions has not yet reached its final form, but it is being developed along the following lines:

1. A scientific advisory committee representing the various interests in Thailand will consider any applications for permission to collect material in Thailand. It is to include representatives of the various scientific disciplines and those local institutions which normally have contact with collecting groups. One of the major tasks of the committee is to maintain a record of the activities of expeditions especially the areas visited, the material collected, and its ultimate destination.
2. Applications from potential collectors will be submitted in duplicate indicating the areas of interest to the expedition and the material required and the purpose of collecting it. In considering these applications the committee may have recourse to scientific contacts in the applicant country and to an advisory panel of specialists working in Thailand.
3. Permission will be granted subject to the submission of a report before the expedition leaves Thailand setting out the activities of the group, areas covered and dates when collections were made, the nature of the collections and their disposition. Subsequent reports must give the results of examination of the material by specialists.
4. It will also be necessary for expeditions to leave a share of the material collected in the Thai National Reference Collection being maintained by the Applied Scientific Research Corporation of Thailand. The objective will be to obtain a representative collection of the material taken and at least a holotype of new material.
5. Request for permission to collect must be submitted through the head of the organization responsible for the expedition and must contain an undertaking to comply with the conditions specified above.
6. Permission to collect will be issued in duplicate, one copy to the customs authorities who will control the exit of material.
7. It is expected that this procedure will also extend to the export of live specimens as well as the normal museum material. Contact will be made with the International Union of Zoo Directors and other interested authorities to enlist their co-operation in making contact with all groups concerned in collecting and shipping live specimens.

## LITERATURE CITED

- Bezemer, K. W. L. 1930. Limitation of collecting expeditions as a factor of nature conservation. *Proc. 4th Pacific Sci. Congr.* 3: 127-130.
- Talbot, Lee M. 1965a. A survey of past and present wildlife research in East Africa. *East African Wildlife J.* 3: 61-85.
- Talbot, Lee M. 1965b. Personal communication.
- Talbot, Lee M. and Martha H. Talbot, 1964. Renewable Natural Resources in the Philippines – Status, problems, and recommendations. *Int. Comm. on Nat. Parks*, I. U. C. N. Morges, Switzerland.

## **Technical Session V**

### **National Parks and Reserves**

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This Session considers the development and importance of national parks and reserves in Tropical South East Asia. Following the Chairman's Highlights and Summary, the papers of the Session are grouped into three major sections:

1. Definition and classification.
2. Organization and use.
3. Regional considerations.

## Highlights of Technical Session V: National Parks and Reserves

by

Chairman of Session V

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Before speaking on the highlights of the technical session on national parks and equivalent reserves, I, on behalf of the Chairman and the Discussion Leader, would like to extend our sincere thanks to those who have contributed their experiences and ideas to the session.

Also, I would like to apologize to the several delegates who were unable to share their thoughts and experiences with us during the discussion, because of the limited time.

The highlights of the technical session on national parks and equivalent reserves are as follows:

1. Definition or terminology of 'national parks' normally varies from country to country depending on several factors, e.g. availability of the natural areas, and their extent, the demand of the growing population, the support of the politicians, voters and the public in general, culture and customs of the people. Some delegates recommended that strict nature reserves should be segregated from the national parks so that the areas would be totally protected and be maintained only for scientific research studies. Others voiced the opinion that such areas should be an integral part of the national park and that a zoning system should be adopted. No definite conclusion was made.

However, considering that the biological or ecological studies in our region are generally conducted in the national parks and are so meagre and that the aim of our national parks is not only for the enjoyment of the people but also for educating the public to a conservation consciousness, why then should we not adopt the zoning system, in which we could combine several objectives?

2. Another point of interest which was brought up for discussion was the U.N. List of National Parks and Equivalent Reserves. It was pointed out that the countries which have their parks and reserves recorded in the U.N. List should consider it a mark of prestige, and that once they have appeared on such an 'honor roll' the risk that the parks or reserves will be released for some other purpose is much less. Therefore the U.N. member countries are requested to register their parks and natural reserves with IUCN, and give their full co-operation in maintaining their parks and equivalent reserves.
3. Another highlight was one of the different aims and uses of the national parks. In more advanced countries like the USA in which every park is accessible for public use, the problem is one of overuse of parks

by too many visitors. The U.S. National Park Service does not have to spend a single cent to persuade the public to use their parks. Whereas in the developing countries like those of South East Asia we have to find ways and means to encourage and get the people to our parks.

4. The question of the extent of management of the national parks was also one of the highlights of the discussion. The controversy was to what degree tourism should be encouraged in the park in order that it will not impair the objectives and principles of the national parks.
5. Another point of interest was the approach to be made to the politician, the voters, and general public in order that they may support the creation and maintenance of the national parks.
6. Lastly the participants all agreed that in the long run the national park movement does not interfere with the progress of the national economic development, but on the contrary, is one of its integral parts.

# Summary of Papers and discussion of Technical Session V: National Parks and Reserves

by

Summarizer of Session V  
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The session opened with a definition of terms. Just what is a 'national park'? The designation has meant different things in different countries. It was suggested that the term 'national park' may, in certain circumstances, have political disadvantages. Also the term 'park' does not connote a wild, undisturbed area. Dr. Harroy stated that a national park has three principal purposes:

1. conservation,
2. scientific study,
3. recreation.

Certain parks emphasize one purpose or the other. For example, the main purpose of Kaziranga National Reserve in Assam is to preserve the Great Indian Rhinoceros; the Parc Nationale Albert in the Congo is for scientific study and preservation of the gorilla; many parks offer recreational opportunities to the tourist.

Of course these purposes frequently overlap. Olympic Park in the State of Washington, U. S. A., was founded in part to preserve the Roosevelt Elk and a unique example of temperate zone rain forest. Mount McKinley Park in Alaska was established principally to save the Dall Sheep. Both parks however have been the source of important scientific studies and both offer unexcelled opportunity for wilderness recreation.

Mr. Harroy commented on the importance of the U.N. World List, established in 1958, for exchange of information and co-ordination between countries which have national parks that qualify for the List, and to stimulate action in countries that so far do not. Mr. Coolidge pointed out that inclusion in the World List is also helpful in preventing politicians in certain countries from denationalizing parks that are already in existence.

In his paper Mr. Alvarez reminded us that, if there is a difference in approach, the objective and concept is nevertheless the same. In the Philippines the Government has had to modify the park concept under other pressures, including the use of land for food production. 'A park is best appreciated on a full stomach.' The problem is different in the Philippines from what it is in the United States. Should we have different standards for different nations?

In the discussion that followed Mr. Riney of FAO emphasized the wide range of uses of U.S. parks and said that the term 'national park' has sometimes been a hindrance. We get bogged down in terminology. Mr. Daley agreed:

the important thing is the objective, not the name. In Hong Kong the phrase 'national park' is being dropped. The matter of minimum size for a park was also brought up. It was agreed that a small area may sometimes qualify.

Turning to the questions of Organization and Utilization, the first topic discussed was the selection of the area. Dr. Anderson's paper gave an illustration from Sarawak. The country is still 60 per cent in primary rain forest but, despite a population of only about three-quarters of a million, lumbering and roads are already a serious threat to wild areas. He pointed out that there is surprisingly little undisturbed tropical rain forest left in the world; for example, it is said that none remains in West Africa. In Sarawak, Bako National Park was established in 1957. Nine more national parks are planned and an additional five are under consideration. These should be of considerable economic value to the nation in the future. By far the most important proposed park is Gunong Mulu, covering 239 square miles.

The next topic to be considered was 'Utilization of Parks for Scientific Study'. Dr. Fosberg stressed the importance of parks for study of habitats, for comparisons and controls, as a source of specimens, etc. He noted the difference in the criteria for the tropics and the temperate zones. 'Prime examples of all eco-systems should be preserved.' Lord Medway reminded us that there is great diversity of species in the tropics but fewer individuals of each species. This means that there should generally be a greater minimum size for a park in the tropics. Mr. Choke and Dr. Poore made special mention of Mt. Kinabalu in northwest Sabah, an area of particular value for study of plant ecology, including the effects of altitude on flora and fauna. A new genus of tree was discovered there as late as 1961.

In the discussion that followed, Mr. Riney said that mis-management can destroy the purposes of a park, as he learned from experience in Africa. Park administrators should have a 'management plan' from the beginning. Subsequent comments indicated some confusion over the term 'management.' It was generally agreed, that the best 'management plan' may involve little or no 'management' in the sense of game cropping, controlled burning, and so on. Dr. Talbot urged that, beginning fresh in South East Asia, we try to agree on terminology. 'Hunting management' is absurd in areas of South East Asia already over-hunted. Animals in these areas are often difficult to see, not necessarily because they are naturally shy or nocturnal in their habits, but because they have been made wary by hunters. When protected they may be much easier to approach. He gave some vivid examples from his experience to illustrate this point.

'Utilization of Parks for Recreation' was the subject of a paper by Mr. Myron Sutton of the United States Park Service. He felt that nomenclature was not important. The policy of the Park Service has been to designate three clear-cut categories:

1. Natural
2. Historic
3. Recreational.

Wilderness areas offer a unique form of recreation; they develop self-reliance. Here naturalness is the key. Though driving for pleasure is the number one recreation in the U. S., 95 per cent of the people are satisfied to stay on the road. It is the policy of the U.S. Park Service to withdraw facilities from within the parks, recognizing the dangers of too much recreational development. Mr. Sutton mentioned the need both for public support and for legislation to safeguard the purposes of the parks. He said that the Park Service gave special attention to the opportunities for young people in the parks.

In the discussion that followed, Dr. Boonsong of Thailand asked whether a golf course was to be considered an essential element of a national park! He was given adequate assurance that such is not the case. Mr. Phairot Suranakorn, Chief of Khao Yai, said that Khao Yai National Park has concentrated on wildlife protection, that the animals are becoming tame, and that more students are coming there every year. Mr. Dusit said that the Thai Administration is following the example of the United States and Canada Wildlife Protection Act. But education is necessary if such measures are to be effective. Another Thai participant agreed that in conservation education and awareness there is still a big gap between those of us at the conference and the people at large.

Finally there were brief summaries of four regional papers by:

1. Dr. Wong who stressed the difference between jungle reserves and national parks, and pointed out that in Malaya the lowland was most fertile and therefore most threatened by agriculture;
2. Mr. Basjarudin, whose paper stated that Indonesia has 117 reserves or parks, administered by the Forestry Department, totalling 7½ million acres or 2½ per cent of the land area;
3. Dr. Pat Marshall, who spoke of the urgency in Hong Kong of educating the people to the need for a park before it is too late and who suggested an International Board of Conservation Education to give outside help;
4. Dr. Chanthepha who said that there is much burning and cultivation of opium in the hills of Laos and that the conservation situation is not made any easier by the fact that everyone is now carrying a gun.

In conclusion, two points seemed implicit in everything that was said. The first of these is the urgent need for communication. Though probably all of us at the conference are in general agreement about the importance of national parks and reserves, we must face the fact that the great majority of people in the world simply do not know what we are talking about. Conservationists may not be quite rare enough to be included among 'threatened species' in the IUCN Redbook, but they are definitely a small minority. Unless we can communicate their ideas to the world at large, we shall never accomplish our objectives.

The second point is closely related to the first. We must somehow make clear that conservation is a positive, not a negative concept. We are accused of being anti-progress, anti-development, anti-this, anti-that. On the contrary, the idea of conservation is highly progressive. It is not primitive; it is an important aspect of civilization. In western culture, at least, it is a fairly new idea. In Europe wilderness was once considered the haunt of evil spirits, and wild scenery was ugly. A famous English poet referred to mountains as 'ill designed excrescences'; Mme de Stael was said to have drawn the curtains of her carriage when she came in sight of the Alps. Today we no longer fear the wilderness but we are only just coming to understand it.

It seems to me particularly appropriate that this conference should have been held in South East Asia. For it is the Eastern philosophers, and the Eastern religions, that have from earliest times been most aware of man's essential kinship to the rest of the natural world.

## Part I: Definition and Classification

# United Nations World List of National Parks and Equivalent Reserves<sup>1</sup>

by

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for the Conservation of Nature and Natural Resources*

### SUMMARY

The author describes the United Nations List of National Parks and Equivalent Reserves, giving its background, objectives, present status and future plans.

### INTRODUCTION

The United Nations Economic and Social Council (ECOSOC) reflecting its concern for the wise use of natural resources by its Resolution 713 (XXVII) adopted at its twenty-eventh session in 1959 (Annex 1), instructed the IUCN to collect the necessary documentation and draw up a list of national parks and equivalent reserves. The proposal to establish such a list originated in the Sixth General Assembly of the IUCN in 1958 and was transmitted to the Secretary-General of the United Nations.

It was felt that such a list would be useful for the following reasons:

1. To provide information and documentation.
2. To achieve some co-ordination between the various countries, if not in their activities in the field of parks and reserves, at least in the terms used to designate them.
3. To stimulate and encourage governments to create and to carefully maintain such natural reserves. The U. N. list might be a kind of 'list of honor' proclaiming the names of those areas considered valuable by an important international authority.

As soon as action on the ECOSOC Resolution was started, the Secretary-General of the United Nations tried to clarify the meaning of the terms 'national park' and 'equivalent reserve'. For 'national park' he used the definition established in international conventions (London, 1933 and Washington, 1940). In establishing the limitations of 'equivalent reserve' he ruled out 'reservations set aside purely for the protection of single species of wildlife or plant or for limited purposes, such as the preservation of an historical object or a forest used for commercial purposes'.

### LISTS OF 1961-1962

A questionnaire, drawn up with the help of IUCN, was sent to all governments in September 1959 by the Secretary-General of the United Nations. By February, 1961, it was possible to draw up a preliminary list of 52 countries (E/3436), and just before the First World Conference on National Parks (Seattle, July, 1962) it was possible to issue a supplementary list including 29 new countries and additional information on some countries previously noted.

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<sup>1</sup> Original in French.

These documents were examined at Seattle by a working group and by several delegations; and subsequently by IUCN's Executive Council; and in Nairobi (1963) by the members of the International Commission on National Parks (ICNP). The answers of the various governments to the questionnaire had been very uneven and it was decided to complete and re-orient the answers in order to make a more balanced and more accurate list.

## THE PRESENT PLAN OF THE ICNP

A definition of the plan can be found in the printed note of June, 1963. To be included on the list, a 'national park or equivalent reserve' should meet the following criteria:

1. Criterion of status: This is a difficult notion of 'sufficient protection'. Various interpretations can be given to this criterion depending on whether the reserve is in a densely populated country or in a sparsely inhabited and developing one.
2. Criterion of size: A minimum is required unless and notwithstanding its small size it was deemed advisable to include it, for an especial reason briefly stated in the list itself. This minimum varies with the population density of the country: 500 hectares if the density is more than 50 inhabitants per square kilometer (densely populated country) – 2, 000 hectares if the population density is less than 50 inhabitants per square kilometer.
3. Criterion of effectiveness: staff. A minimum of one person working full time is required per 4, 000 hectares in densely populated countries, per 10, 000 hectares in sparsely inhabited countries.

## SUMMARY DEFINITION

According to the above mentioned criteria and to the comments of June 1963 note, a national park is considered: an area where the necessary measures have been taken by the central government in order to meet the three basic requirements: status, size, effectiveness, and where tourism is admitted and, generally organized.

When tourism is not permitted and when the other requirements are answered, the area is called strict natural reserve (cf. London 1933, Washington 1940). When the status has not been enacted by the central government, it is a provincial, country council, or private reserve. In these cases the area is an equivalent reserve, inasmuch as the three basic requirements are answered.

## INFORMATION INCLUDED ON UN LIST

Once it is felt that an area has met these requirements for inclusion on the U. N. list the following information falling into five general categories is noted:

1. Name of the protected area arbitrarily classified by size. The ICNP is aware that such a classification is not perfect as the value of a protected biotope can, sometimes, largely compensate for a more extensive area, but a better classification could not be found.
2. How the four basic requirements (of status, size, staff, and budget) are applied with precise numbers, if possible, in each area.
3. Further general information including: legal status; kind of administration; land status; general organization of
  - (a) tourism *sensu lato* and
  - (b) scientific research within the area; date of creation of park or reserve; specific details regarding the means of access, accommodations, facilities, etc.

4. A summary description of the protected ecological environment including: general geographic description; principal vegetation formations; most important species of animals; threatened species for which the reserve provides protection.
5. List of the areas which might have been included if the selection had been less severe, but which do not meet the four above-mentioned criteria. Justification of this exclusion.

#### **STATUS OF PRESENT ICNP LIST**

On behalf of the Secretary-General of the United Nations, in 1963-64 the Brussels' secretariat of the ICNP applied to all member governments of the United Nations asking very precise questions on areas believed qualified for inclusion in the list, and also asking their advice as to other areas to be included. When no answer was received a project draft was drawn up for the country concerned based on official and unofficial information. This draft was then submitted to the government in question before being published. The complete set of monographs will be submitted to the United Nations in New York by December, 1965. Every official delegate or participant here at the Bangkok Conference is requested to look at the text prepared for his country and make appropriate criticisms.

This list will contain a number of improvements over those of 1961 and 1962 but it will be far from satisfactory. Moreover since its purpose is to promote the creation of new parks or improve old ones, it is most desirable for it to become out of date within a relatively short time. Therefore, it has been arranged to continue gathering in Brussels all information likely to facilitate the preparation of the next edition of the world list, by correcting the errors, filling the gaps and describing new creations.

#### **INTERNATIONAL BIOLOGICAL PROGRAM (IBP)**

The IBP has created a section on 'Conservation'.

The objective of this section is to draw up a list of the main characteristic biotopes of the world, find out which among these biotopes has at least one sample effectively protected in a natural reserve worthy of this name, then undertake international action to assure that other biotopes – if possible beginning with the most important and most threatened ones – are also the object of such protective measures. The authorities of the IBP are interested in the ICNP list which is likely to serve as their basic document. In order to best meet their requirements, it has been arranged that in 1966 the entire summary description of ecological environments (point 4, above) will be submitted for completion and corrections to the Commission on Ecology and the Survival Service Commission of the IUCN.

ANNEX I

*United Nations World List of National Parks and Equivalent Reserves*

Resolution 713 (XXVII) adopted by the United Nations Economic and Social Council at its twenty-seventh Session in 1959, reads as follows:

*The Economic and Social Council,*

*Noting* that national parks and equivalent reserves have been established in most countries which are Members of the United Nations or the specialized agencies, and that they contribute to the inspiration, culture and welfare of mankind.

*Believing* that these national parks are valuable for economic and scientific reasons and also as areas for the future preservation of fauna and flora and geologic structures in their natural state,

- '1. *Requests* the Secretary-General to establish in co-operation with UNESCO, FAO, and other interested specialized agencies, a list of national parks and equivalent reserves, with a brief description of each, for consideration by the Council at its twenty-ninth session, together with his recommendation for maintaining and developing the list on a current basis and for its distribution;
- '2. *Invites* States Members of the United Nations and of the specialized agencies to transmit to the Secretary-General a description of the areas they desire to have internationally registered as national parks or equivalent reserves; and
- '3. *Furthermore invites* the International Union for Conservation of Nature and Natural Resources and other interested non-governmental organizations in consultative status to assist the Secretary-General, upon his request, in the preparation of the proposed list.'

# The National Park—Its Concept, Standards, and Practices

by

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## SUMMARY

The objectives for all countries interested in establishing national parks and equivalent reserves are the same, i.e. '... to conserve the scenery and the natural and historic objects and the wildlife therein, including birds, fishes, mammals, and other animals and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the benefit and enjoyment of future generations'.

In South East Asia and particularly in the Philippines certain factors such as a rapidly expanding population, food requirements of the people, lack of agricultural land, economic instability, land values, and maturity of the people limit the implementation of programs and projects in national parks and equivalent reserves.

## INTRODUCTION

National parks, as defined, are areas which have been established primarily to protect and preserve superlative scenery, plants, and wild animals of national significance for the general benefit and enjoyment of the public. Use of said areas may be allowed only 'in such manner and by such means so as to leave them unimpaired for the benefit, education and enjoyment of future generations'. UNESCO at a conference in Mexico City in 1959 noted that national parks had been established in most member countries and that they contributed to the inspiration, culture, and welfare of mankind, but that it was difficult to arrive at a universally acceptable definition of the term (national park and equivalent reserve) because the meaning of the term varies from country to country.

The memorandum on the Inquiry of the United Nations on National Parks and Equivalent Reserves states that 'areas which qualify for inclusion as national parks or equivalent reserves shall be confined to those areas which have been accorded a status enabling them to enjoy absolute legal protection against human exploitation of their natural resources and against any form of injury to the integrity of the area resulting from human activity ... while exceptions may, in very special circumstances be made in regard to this principle, it is emphasized that they must invariably be regarded as exceptions'.

Because of certain conditions in South East Asia in general and the Philippines in particular, they seem to fit into 'very special circumstances' rather than the general rule.

## CENTRAL LEGISLATIVE AUTHORITY IN THE PHILIPPINES

As early as 1932, the Philippine Legislature enacted a law creating a national park. The enactment of the law focused national attention on parks. However, besieged by multifarious problems common to a young, growing, and impatient nation, the central legislative authority tended to slacken in the development of national parks and tackle what it considered more pressing problems instead, such as poverty, disease, and illiteracy. In the endless battle with an ever-increasing population for more land and more food the national government has had to modify its stand on national parks.

## CRITERIA FOR A NATIONAL PARK

Adequate protection, minimum size and effective enforcement of status, although they are basic criteria to the concept of national parks, vary from country to country. An island country will have different parks than are found in the United States, Canada or Russia. The people and socio-economic factors will also play a part in altering the criteria.

The Philippines with a land area of 115, 758 square miles is generally mountainous, although it has fertile coastal plains, rolling uplands, and, for the present, rich extensive valleys traversed by large rivers between mountain ranges. The archipelago is composed of 7,107 islands and is divided into three island groups: Luzon, in the north; Visayas; and Mindanao in the south. In general each of the large islands consists of a central core of mountains and plateaus interrupted by riverine basins filled with sediment. These descend gradually to narrow coastal plains which are interrupted by headlands and plateaus. There is a population of about 33 million with an annual rate of increase of 3.4 per cent considered to be the highest in the world. The economy is built on agriculture.

To meet the demands of the soaring population, a program of industrialization was initiated, but this movement inevitably hazarded our renewable natural resources. The geographical areas are limited while the population and their needs for food are infinite.

In a survey undertaken last year on the status of renewable natural resources in the Philippines, Dr. Lee Talbot assisted by his wife, Mrs. Martha Talbot, found that as a people we were destroying our natural resources as fast if not faster than any country in the world. A similar conclusion had been reached in 1959 by a forestry expert when he submitted a 'Forestry Proposal for the Philippines'.

The reason for this is not a lack of trained personnel but rather a combination of factors – social and political and the lack of understanding on the part of the people that national parks and equivalent reserves are a natural resource of great value. The natural resources of the country are the most abused of all the resources and to obviate their total loss, remedial first aid measures have to be instituted. There is an immediate need for our people to understand the value of conservation, particularly of natural resources upon which the country is dependent for survival.

The national parks in the Philippines today, certainly not as yet fully appreciated as they should be, stand as monuments to the folly of our people. Many of our historical and other outstanding areas have been desecrated, not out of pure disregard for the beautiful and the priceless, but out of lack of understanding of the values of those things.

## Part 2:

# Organization and Use

## Park Systems Planning

by

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### SUMMARY

Within any given nation there are a variety of requirements and needs for park and recreation facilities. The areas needed to satisfy these requirements range from easily accessible, heavily used play areas to remote nature reserves. No one area can fulfil all the requirements, so what is needed is a parks system containing areas of many types.

Each nation must decide on its own requirements and needs for a parks system and the place of parks in its development. Careful analysis and planning is involved to satisfy the needs of the present and those of the future.

The author presents the major characteristics required of any effective system of parks and discusses these along with the methods for creating such a system.

### INTRODUCTION

Every man enjoys beauty and nature, and every man loves to play. The strength of these attitudes and desires differs greatly from one individual to another, largely as a result of differing personal characteristics and the variations in cultures or societies. Yet with all the differences among individuals and between groups there are these universal urges for beauty, nature, and play which can sometimes be as strong as those for the more basic human needs such as food and shelter.

In my view, every country or major part of a country should have a system of parks or other areas which will provide beauty, nature, and opportunities for play to those who want them. A park system should have many parts to cater to varying needs, and many different names are applied to the various kinds of areas. There is not a sharp and clear dividing line between these, but rather a continuum in size, location, physical characteristics, and patterns of use of different areas. While most areas will be publicly owned, some may be private.

### CHARACTERISTICS OF A PARKS SYSTEM

A system of parks for a nation (or a major region within a nation) will have certain major characteristics:

1. Each major part should have the capacity to meet the present and near-future demand for its type of activity, use or character.
2. Demand for various kinds of areas will differ greatly depending upon the particular stage of a country's economic and social development. These differences in social and economic conditions affect the acreage and investment in each kind of area within the system. But we believe that some acreage of each major part of a park system is needed in almost every country.

3. If the economy of a nation expands, its society and culture may well change also and these in turn will greatly affect the structure of an adequate park system. The lower income countries may not follow the present patterns of the higher income countries as the former advance. A park system concept should be dynamic, to reflect changes in the total society of which it is a part.
4. The park system should have widespread public understanding and support under whatever system of government; otherwise administrative funds may not be forthcoming, poaching and vandalism may be rampant, and the park will fail to meet its use potentials. People should be encouraged to use those parts of the park system available to them, and must be required to respect the integrity of those parts designed for use by others.

### **WHAT KIND OF A PARK?**

The foregoing characteristics of a park system are related primarily to the demand for various elements. Supply considerations may be equally important. Unusual areas of all kinds should be reserved for parks or nature reserves, or at least seriously considered for such action. A nation may not be able to afford the reservation of all unusual areas; or may not be able to afford the necessary funds for their management. Nonetheless every country should carefully review its finest quality natural areas, and reserve them for its park system if at all possible.

Unique areas will at best, meet the demands for only part of a park system. Many kinds of activities do not require unusual natural areas; much more ordinary ones may serve equally well or better. The playfield or local park might better be level and well-drained than steep or rugged. Location becomes an asset of greater importance, as the more popular and active uses become dominant.

In any case, a nation must balance up the costs of providing each part of a park system with the gains and advantages of each part. For both gains and costs a country must consider alternatives. That is, how else than through a park system could the populace receive equal benefits and enjoyment? The value, to a low income nation, of a national park or wildlife refuge which brings foreign visitors with their foreign exchange, is fairly well recognized. But the value of more ordinary recreation areas – which can often be provided on land otherwise not in intense demand, with otherwise idle labor, and with no foreign exchange – for the use by the citizens of a country is often less clearly seen. We suggest it may be considerable and well worth evaluating in national planning.

### **PARK SYSTEM MANAGEMENT**

The various kinds of units in a nation's park system each have their management requirements also. Some of the rules for good park system management can best be expressed in the negative.

Scarce or unusually valuable natural resources should not be used for those parts of a park system where more common or more ordinary resources would do equally well or better. A unique forest, lake, etc. might make a mediocre or poor playground or park. Even if the forest could be cleared or the swamp drained for the more popular park uses, the waste would be obvious. Yet some countries or localities have encouraged, or have allowed their most unusual scenic and scientific areas to become locations for mass recreation which could as well or better be elsewhere. If the wilderness aspect of an area is to be preserved, then it probably should remain roadless, or at the most have limited access facilities.

On the other hand, suitable improvements must be included in all parts of a park system, but especially so in those parts designed for heavy use – children's playgrounds should be suitably equipped, the local park, planted; playing fields, marked and with adequate facilities etc. Zoning or other means of controlling private actions within or nearby various units of a national park system may be necessary. If certain kinds of improvements are unsuitable for some units of a park system, they may be equally unsuitable immediately outside it, and within a park, some activities may be permitted in some areas and excluded from others.

All of these improvement and control measures require an overall management plan for each unit of a park system. With such a comprehensive plan, specific management and administrative decisions can reinforce one another and lead toward a desired objective; without it, individual actions are likely to be haphazard, unco-ordinated, and even contradictory. If controls on private action are imposed, an overall management plan will help make them rational, consistent, and defensible against criticism. Lastly, and perhaps most elemental of all, planning and execution of plans must be highly integrated within the organization and operation of the management agency not separated and unrelated.

# The Virgin Jungle Reserve Project of the Malayan Forest Department

by

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and

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## SUMMARY

The objects of establishing Virgin Jungle Reserves (VJR) are stated. The rapid land development in the country has added a great deal of urgency to the pursuit of this project especially in the lowland forest, a vast proportion of which will eventually be taken over for agriculture. Some degree of optimism may be entertained because the Technical Sub-Committee on Land Capability Classification of the country, charged with the duties of assessing land potentials and recommending wise land-use, is supporting the idea of VJR. But the country still needs the enactment of proper legislation to confer security on the VJR.

Wyatt-Smith (1950, 1959, 1961, 1963) has already written a good deal on the subject of the Virgin Jungle Reserves (VJR). We do not therefore wish to dwell on the details of the project but merely to re-state the objectives in view of the urgency with which this project must be pursued because of the rapidity with which land development is taking place in Malaya. These are:

1. The preservation of natural vegetation habitats for fundamental scientific study in its widest aspect.
2. The provision of accessible areas throughout the country in which botanical, phenological and ecological studies of natural forest can be carried out.
3. The retention of specimens of all types of natural vegetation to serve as controls for managed forest, i.e. the exploited and regenerated areas.
4. The provision of natural arboreta for the benefit of the staff and interested members of the general public by means of permanent sample (jungle) plots in which trees are numbered and identified.
5. The preservation of outstanding forest or individual trees as a national heritage, e.g. areas containing forest giants or rare species.
6. The provision of wild life sanctuaries within the large tracts of managed forest in order not only to preserve all species of wild life but to provide a sufficient and well-distributed number of undisturbed biological habitats. The presence of such habitats could be the only means of ensuring the success of the surrounding managed forest, viz. being the home of certain essential predators or of agents of seed dispersal in naturally regenerated forest.

In Malaya, unfortunately, agricultural potential is synonymous with lowland topography, and since it is the national policy to re-align the existing six million acres of lowland forest reserves to cater to agricultural development, it is conceivable that in the not-too-distant future, a vast proportion of what is now reserve area will be converted into agricultural lands.

It is not difficult to see the danger which the lowland fauna (especially the larger animals) and flora are facing. We consider, and perhaps not many people realize, that preservation of the plant community in situ is even more urgent than preservation of big game,

for, unlike the latter, the plant community cannot be translocated. Malaya has one of the richest, if not the richest, floras in the world and the exact composition of some of the communities, particularly ground flora and shrub layers, is yet unknown. From this point of view the importance of the VJR cannot be overemphasized. It is encouraging to note that the technical sub-committee on Land Capability Classification of the Economic Planning Unit under the Prime Minister is recommending that special specimen plant communities be set aside in spite of the occurrence of good soil.

The small size of some of the VJRs (100-200 acres) may be sufficient for the plant communities to maintain themselves if they are surrounded by forests, but if a VJR is adjacent to developed areas it has to be much larger. If it is large enough it may also function as a game reserve, but the two need not necessarily coincide. What is good for game may not contain the plant community to be preserved and vice versa.

It is all very well to set aside these areas, but with no proper legislation to confer security of tenure the position of the VJR is precarious indeed. In Malaya today even VJRs within forest reserves have no guarantee that they will not be disturbed. What we need is a nature reserve ordinance which will make VJRs totally immune to disturbance of any kind in perpetuity.

Malaya still has vast tracts of forest in the lowland. With foresight and careful planning and with the rich heritage of the country at heart there is then no reason for posterity to say how wantonly wasteful and thoughtless we are today.

#### LITERATURE CITED

- Wyatt-Smith, J. 1950. Virgin Jungle Preserves. *Malayan Forester* 13: 40-45.  
——— 1959. Nature Reserves. *Malayan Nat. Journ.* 14: 40-45.  
——— 1961. The Malayan Forest Department and Conservation. *Malayan Nat. Journ.* 21st anniversary special issue: 37-42.  
——— 1963. Malayan Forest Records No. 23, *Manual of Malayan Silviculture*. Part III/7/40.

# The Contribution of National Parks to National Recreation

by

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## SUMMARY

It is becoming more and more a basic fact that national parks are fundamental to human existence. Wilderness areas are valuable for national recreation because of the undisturbed natural environment which provides a different and refreshing locale for active sports. These areas build self-reliance, contribute to mental and physical fitness and, as a source of sightseeing pleasure, are especially significant in national and international tourism.

Because of their importance and the growing pressure for land, sound plans on a national basis should be made immediately for the formation of a national parks and equivalent reserves system and for a competent staff to administer them.

## INTRODUCTION

We cannot ignore the fundamental importance of food, shelter, and health in the world, but today, with increasing population pressures, national parks and recreation resources are also becoming fundamental to human existence. They grow more valuable every year. If parks and reserves are not preserved, the people of today and tomorrow are likely to be denied resources that are not only basic to food and shelter but to mental and physical health as well.

We shall confine our attention here to the role of national parks in national recreation – recreation meaning activities that are more or less based on a natural, undisturbed environment – not hunting preserves, municipal parks or areas devoted primarily to high-density recreation. A national park, set aside by a legal governing body and administered under the force of national law provides that a certain parcel of land be used in a specific way; national parks are designed to conserve outstanding natural and historic treasures of a nation, and at the same time make them available for optimum public enjoyment and use.

## WILDERNESS AREAS

Quite often national parks are designed to preserve for public enjoyment a special natural environment kept entirely free of the works of man. This is then referred to as a 'wilderness' (*arrière-pays*).

Such lands have few or no developments by man and they may be reserved anywhere where the land retains the major elements of its original character. We generally consider that 5,000 acres is the minimum size required to sustain a wilderness environment and the larger the size, of course, the better. Whatever their size a special significance arises from the fact that these areas preserve specific characteristics of the natural heritage of a nation. Furthermore the individual engaging in recreation in a natural, relatively undisturbed, milieu has a change of environment and an opportunity through hiking, swimming, and/or camping to develop self-reliance.

In addition a vast number of persons wish not so much to walk or camp in the wilderness as to view it from its edge. They will pay a good price to do so and thus the wilderness area becomes an element of major economic consequence in national tourism and inter-country travel.

Ultimately with the income derived from travel to one wilderness, roadways may be improved to others until a nationwide system of routes connecting wilderness to wilderness, park to park, and parks to cities is established. Since international travel is steadily increasing, the outlook for profits – social and economic – in displaying a nation's 'back country' (without destroying it) are bright indeed. That such procedures improve a national standard of living has been frequently and thoroughly demonstrated. This would suggest, accordingly, that the establishment of wilderness areas of substantial size not be overlooked when systems of national parks are in the planning stages.

## **PARKS AND HISTORIC SITES**

Let us turn now to parks, and portions of parks that are more heavily used. It is true that many national parks contain wilderness areas that remain undisturbed, but in others it may be appropriate to provide public roads and additional facilities. The most heavily visited parks are those within easy driving distance of cities, although certain parks with features of world renown may be heavily used even though they are far from urban areas. Wherever they are, naturalness is the key word; even a few miles from the city they may be kept in a natural state and still bear the burden of heavy use. Every effort should be made to establish park areas close to cities at an early stage before the cost of land becomes prohibitive.

Historic and aboriginal sites also contribute much to national recreation particularly of educational and inspirational value.

## **PLANNING FOR A PARKS PROGRAM**

A number of nations have adopted planning schemes that publicly define the government's policy toward conservation and recreation. These schemes also classify public lands into specific categories of use – they lay out goals to be reached and guidelines to be followed in reaching them. As early as possible in this process it is necessary to adopt a sound and competent administration in order to assure protection and perpetuation of these reserves and to provide for services to the public. Such administration should be a strong and independent legally constituted body and should have the specific task of administering the parks with a corps of well-trained personnel to ensure efficient services. In the United States we have found it most beneficial to establish an 'interpretive' program which contributes a great deal to educational programs as well as park enjoyment.

Training schools are now established or are being established in several nations. The National Park Service of the United States has in full-time operation two training centers where general and specialized courses in park management are offered regularly. In 1965 the University of Michigan and the Park Service offered a jointly sponsored Short Course in the Administration of National Parks and Equivalent Reserves co-operating with other national and international organizations. This course which included an extended field trip, was designed for park administrators and specialists in the world community and was attended by officials of 16 nations. Its success prompted immediate plans for another such course.

## **CONCLUSION**

The greatest urgency of today is to prepare sound national plans for the establishment and maintenance of national parks and equivalent reserves. What we save in the next few years may be all that we ever save. Ideally these plans are based on careful ecological and historical surveys. The knowledge of how to do so is available. It is not too soon for every nation to think seriously about national parks and the contributions they make to national recreation.

Those nations with experience in the field of outdoor recreation are making their services available to other countries who should lose no time in seeking advice in the planning of a national park system. When disease has been conquered and hunger reduced, the parks that are created now will still be there to fill the needs and satisfy the aspirations of generations yet to come.

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<sup>1</sup> The 1966 course was highly successful and a third one is planned for 1967.

# Criteria for the Selection of Areas for National Parks in Sarawak, Malaysia

by

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## SUMMARY

This paper describes the scientific, scenic, recreational, and educational values of proposed national parks in Sarawak. The keynote is conservation of the habitat so that as many vegetation types with associated wild life as possible may be conserved in perpetuity.

Six principal criteria for the selection of areas for national parks are listed and the proposals to constitute ten national parks are given.

## INTRODUCTION

The State of Sarawak in Malaysia lies between one and five degrees north of the equator and covers 48,342 square miles. It has the typical equatorial climate of the humid tropics with a rainfall between 120 and 160 inches per year over most of the area and no pronounced dry season. Primary rain forest still covers over sixty-five per cent of the land area. The population at the last census in 1960 was 744,529 of which the principal races are Ibans (Sea Dayaks), Chinese and Malays. The geometrical rate of increase of the population is about 2.5 per cent per year.

Development within the State increases apace and the two recent development plans emphasize the need for rational land use. An extensive road program is opening up the country for agricultural development and licences are being issued to log large areas of the State. Despite the relatively small population and the large area of primary forest some vegetation types are liable to be completely destroyed and certain animals (especially mammals) and birds are threatened with extinction.

Furthermore although little is known about the ecology of the fauna and flora, it is inevitable that the complete destruction of a forest type is likely to eliminate certain animals and plants. In nature, animals and plants are mutually interdependent. To protect the rich animal life of Sarawak it is essential to protect the natural vegetation upon which it depends. Further, each different type of forest has its own, and equally different, animal population. The keynote, therefore, for the proposed program of national parks is the conservation of the habitat.

## TROPICAL RAIN FOREST

Tropical rain forest represents the optimum of plant growth on this planet and its scientific value is not, perhaps, fully appreciated. Indeed natural tropical vegetation, and the animals that live in it, may hold the key to many biological problems. Mr. E.J.H. Corner, F.R.S., in a recent book on world plant life emphasizes time and again the biological value of rain forest and the danger that it may be destroyed or heavily disturbed before scientists have the opportunity of studying it in detail. It is not generally appreciated how little rain forest, especially at low altitudes, now remains. It has been stated that in West Africa no undisturbed rain forest is now to be found. In Sarawak we are more fortunate though in a few years time the position is likely to be entirely different.

## NATIONAL PARKS

Though the scientific value of national parks is perhaps of greatest importance at present the scenic and recreational value will be greater appreciated in the future. The first objective of the 1964-1968 Development Plan is 'To improve the farmer's livelihood and make the countryside a pleasant place to live in'. As the natural vegetation is destroyed and urban, and settled agricultural, population increases, areas suitable for open-air recreation will become very limited and more distant, unless national parks are planned and constituted as part of the overall land use program. Already in some of the more densely populated areas of Sarawak, especially in the Lower Rejang, there is a demand from the local people for places of recreation and one can envisage a similar demand in other parts of the State in due course.

The economy of Sarawak is, and likely to be in the future, basically rural. The Government is concerned that the urban population does not become entirely divorced from the problems of the rural population and from the countryside itself. It is essential therefore that the urban as well as the rural school children are given an opportunity to work in and learn about the countryside at all stages of their school careers. The educational value of reasonably accessible national parks will therefore be of great importance.

### CRITERIA FOR THE SELECTION OF AREAS FOR NATIONAL PARKS

1. The parks should not be smaller than 1,000 acres, except where there are small isolated remains of vegetation of great scientific interest in areas now entirely cultivated that are in urgent need of permanent protection.
2. As far as possible every type of primary vegetation found in Sarawak should be represented by a total of at least one hundred acres in the parks.
3. The parks should be scattered throughout the State to allow for geographical variation.
4. The parks should be easily accessible by road or river from the principal population centers.
5. Wherever possible they should be chosen to coincide with water catchment areas, land unsuitable for agriculture and other topographic units which it is essential or convenient to maintain under primary forest.
6. Each park should have a suitable site where amenities, such as a rest house and camp site, can be developed.

The National Parks Ordinance was enacted in 1956 and one park (Bako National Park) has been constituted. Proposals to constitute a further ten parks have been approved in principle by the Minister of Agriculture and Forestry and four (Gunong Mulu, Lambir, Sungei Dalam and Niah national parks) are in process of constitution. The total area of all the parks, constituted and proposed, is 364 square miles, which represents only 0.75 per cent of the total land area of the State. A list of the national parks is shown below. By far the largest and most important is the Gunong Mulu National Park which covers 239 square miles. This is a magnificent stretch of country that includes the mountain Gunong Mulu itself – the second highest mountain in Sarawak – with primary forest from the base at about 400 feet to the summit at 7,798 feet. Also included is the precipitous limestone massif of Gungongs Api and Benarat. These two mountains rise to over 5,000 feet and are possibly the highest limestone between north Thailand and New Guinea. Wild life abounds in the proposed park.

The proposed parks include most of the vegetation types to be found in Sarawak and cover areas in most urgent need of conservation. It is expected however, that as communications in the State improve and areas of the interior are opened up for agricultural development proposals for further parks will be necessary.

## LIST OF CONSTITUTED AND PROPOSED NATIONAL PARKS IN SARAWAK, MALAYSIA

1. Constituted
  - Bako National Park. Area: 10.5 square miles.
2. Proposed
  - (i) In process of constitution:
    - Gunong Mulu National Park. Area: 239 square miles.
    - Lambir National Park. Area: 16 square miles.
    - Sungei Dalam National Park. Area: 2 square miles.
    - Niah National Park. Area: 15 square miles.
  - (ii) Approved in principal by Minister, Agriculture and Forestry:
    - Matang National Park. Area: 8.5 square miles.
    - Gunong Gading National Park. Area: 12.8 square miles.
    - Sabal National Park. Area: 5 square miles.
    - Pelagus Rapids National Park. Area: 20 square miles.
    - Simalajau National Park. Area: 15 square miles.

# The Value of the Mount Kinabalu National Park, Malaysia, to Plant Ecology

by

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and

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## SUMMARY

Mt. Kinabalu (13,455 feet) is situated in Sabah, Malaysia. It is built up of four rock types, and it has been an important stepping stone in the migration of temperate plants between Asia and Australasia. A new genus of tree, discovered on Kinabalu in 1961, connects the Northern Hemisphere Fagaceae with the *Nothofagus* of the Southern Hemisphere. The critical change of the dipterocarp forests to the montane oak forests at the 4,000 feet contour and the tree line at 12,000 feet are of particular interest for study. The sequence of soil and vegetation zonation on the east ridge of the mountain, determined primarily by climate alone, is described. The close interrelations between soils and vegetation was investigated on the Pinosuk Plateau where fagaceae, conifers, and myrtaceae dominate. One of the most important trees on the mountain is *Podocarpus imbricatus*, favored on well-drained soils of the granodiorite slopes. The greatest ecological problem of Kinabalu is the history of the vegetation and the way in which species with such diverse geographical affinities have come to live together on a geologically young mountain.

## INTRODUCTION

Mount Kinabalu 13,455 feet high (fig. 12) is situated in north west Sabah, Malaysia, and is the highest mountain between the Himalayas and the Snow Mountains of New Guinea. The findings of many expeditions since the first recorded ascent by Sir Hugh Low in 1851 have shown that Kinabalu is of great scientific importance to biology, geology and soil science and that the area should be preserved intact for further scientific investigations. The Royal Society sent two expeditions, in 1961 and 1964, under the leadership of Mr. E. J. H. Corner, to investigate the general ecology and so provide knowledge to assist the Sabah State Government in creating the Mount Kinabalu National Park. This aim has been fulfilled and a large area including much of Mount Kinabalu became a National Park in 1964.

As the plant ecologists in the Royal Society Expeditions, we present a short account based on our preliminary results and the findings of past investigations of the importance of the vegetation of Mount Kinabalu to plant ecology.

## GEOLOGY

The detailed geology of Kinabalu has been investigated by Collenette (1958, 1964). Only an outline of those geological features that are of significance in vegetational studies are given here.

The rocks are of four major types (fig. 11).

- (a) Sedimentary rocks; these are the oldest (Eocene-Miocene) and form the lower slopes of the mountain. They comprise mudstone, silt-stone and greywacke sandstone.

- (b) Ultrabasic and basic rocks; these are intrusive into the sedimentary strata and are made up of peridotite, pyroxenite and dunite. There is no free quartz. Most of these rocks have been converted to serpentine.
- (c) Granodiorite; these are intrusive into both the sedimentary and the ultrabasic rocks and form the center part of the mountain. Most of the outcrops are above 6,000 feet. The rocks contain feldspar, hornblende and a little free quartz. Kinabalu is geologically a recent mountain, for the intrusion of the granodiorite has a maximum age of  $9 \pm 2$  million years.
- (d) Rock debris and alluvium; these have filled in the valleys on the slopes, the largest deposit being the Pinosuk Plateau. All these rocks as parent materials have given rise to a number of soil types supporting a large number of plant communities.

## PLANT MIGRATION

Kinabalu has been an important stepping stone in the migration of temperate plants between Asia and Australia and New Zealand. Found on Kinabalu are plants closely related to those of temperate Asia (Fagaceae, Lauraceae, *Schima*, *Adinandra*, *Ternstroemia*, *Rubus*, *Pygaeum*) while *Drimys*, *Leptospermum*, *Weinmannia*, *Agathis*, *Dacrydium* and *Phyllocladus* are allied to those of Australia and New Zealand. This situation is also true for fungi, bryophytes and pteridophytes. On Kinabalu are found, for example, *Lentinus edodes*, the popular edible Japanese fungus; the very primitive and remarkable hepatic *Takakia lepidozoides* (the genus has only been recently discovered in Japan and later found also in the Himalayas and South-West Canada); *Dawsonia altissima*, possibly the largest moss in the world, is related to the *Dawsonia* species of New Guinea and Australia and the Cosmopolitan *Racomitrium lanuginosum*, a moss of particular importance on European mountains.

Holtum (1964) stated that the fern flora of the lower altitudes of Mount Kinabalu is related to that of Malaya, Sumatra and Philippines while at high altitudes the relationship is predominantly to that of New Guinea and Australasia. *Blechnum fluviatile* is distributed throughout New Zealand, Victoria, Tasmania, New Guinea and on Mount Kinabalu occurs in exposed rocky places (around 9,000 - 11,400 feet).

Endemism is a characteristic feature of Kinabalu's flora. Both palaeo and neo-endemics are found. The four monotypic endemic genera, the orchidaceous genera *Neoclemensia*, *Nabalua*, *Sigmatochilus* and the rubiaceoous genus *Phyllocrater* are possible neo-endemics, recently evolved from lowland species. *Leptospermum recurvum*, *Dacrydium gibbsiae* and *Weinmannia clemensae* are possible relict species. Because of the large number of endemics it is probable that the mountain flora of Kinabalu is relict. The mountain has also served as a stepping stone for the migration of bi-hemisphere plants (e.g. *Euphrasia*). This migration must be an ancient one.

The paradox of an ancient flora inhabiting a recent mountain could be explained by the fact that Kinabalu received its flora from ancient mountains which have since been eroded away (Van Steenis, 1964).

Kinabalu, or the areas which were the source of its flora, could be the origin or the center of evolution of certain families. The Fagaceae might be an example. Kinabalu has many species of this family. Our collections, which are certainly not exhaustive, contain 44 species belonging to *Trigonobalanus*, *Lithocarpus*, *Quercus* and *Castanopsis*. A few of these species occur in the mountains of the Malay Peninsula.

The discovery, during the Royal Society Expedition in 1961, of the new fagaceous genus, *Trigonobalanus*, having some characteristics of a beech tree, with oak-like leaves in whorls of three and beech nuts in groups of three to seven on acorn cups, suggested the hypothesis that *Trigonobalanus* connects the Northern Hemisphere Fagaceae and the *Nothofagus* of the Southern Hemisphere.

## ALTITUDINAL VEGETATION ZONATION

On mountains in the Asian tropics two altitudes are of prime importance. These are the 4,000 feet contour, when the dipterocarp forests change to the montane oak forests, and the tree line which is around 12,000 feet. Both these limits can be studied on Kina-

balu. A unique situation exists on the east ridge of Kinabalu. From 1, 800 feet to 9, 500 feet the parent material of the soil is sedimentary, consisting of shale, siltstone and greywacke sandstone. Thus it is possible to study the climatic effect alone on the altitudinal zonation of soil and vegetation. We based this account of the east ridge on the vegetation studies of Corner (1962-63) and the soil investigations of Askew (1964).

1, 800-4, 000 feet. Hill dipterocarp forest.

The dipterocarp forest stops around the 4, 000 feet contour. The soil is pale yellow and thoroughly leached. It is acid with a thin mull humus and an absence of litter layer. The upper horizons are very friable and have a well developed, finely granular structure, possibly due to the activities of termites and ants.

4, 000-5, 500 feet. Montane oak forest.

This is the zone of *Trigonabalanus*, *Lithocarpus*, *Agathis*, *Podocarpus neritifolius*, *P. imbricatus*, *Phyllocladus* and *Dacrydium falciforme*. Two species of *Shorea* are found in this zone; One being a new species and the other *Shorea monticola*.

At about 4, 750 feet well-developed podzols occur on the ridge crests and at 5, 000 feet. They also occur on the steep valley slopes. These podzols have a thick fibrous mor humus, thick white sub-surface horizons leached of iron oxides and ill-defined zones of deposition. The soil is acid and has a low base status. Podzolization is presumably favored by the cool and wet climate and it is likely that the leaf litters of conifers, particularly *Agathis*, also contribute towards podzolization.

5, 500-9, 500 feet. 'Mossy forest'.

In a typical mossy forest one may find that *Podocarpus*, *Phyllocladus*, *Drimys*, *Leptospermum*, *Tristania*, *Eugenia* and *Schima* are common and accompanied by *Vaccinium*, *Rhododendron* and *Nepenthes lowii*. Mist is prevalent and bryophytes cover the soil surface and the tree branches. On passing from montane oak forest into mossy forest the Podzols gradually change to peaty gley soils. However, these are mainly confined to the ridge crests, while mull soils develop on the valley slopes. There are about 40 centimeters of peat and the mottled pale grey-brown horizons beneath the peat are leached of iron oxides.

9, 500 feet upwards.

Above the 9, 500 feet contour the sedimentary rocks are replaced by granodiorite and the mossy forest replaced by less mossy oak forest, dominated by *Lithocarpus havilandii* from 9, 500-10, 000 feet. This effect is probably due to the change of parent material.

At about 11, 000 feet the topography of the granodiorite outcrops becomes very broken and rocky, the soil is very thin and the vegetation (fig. 13) is non-mossy scrub about 10-30 feet high, dominated by *Rhododendron*, *Podocarpus imbricatus* and *Schima*. At higher altitudes the granodiorite outcrop is almost completely rocky and the scrub becomes lower and is confined to fissures and sheltered hollows where some soil accumulates.

#### THE INFLUENCE OF THE SOIL'S PARENT MATERIAL ON VEGETATION

A most remarkable situation is present on the three hills, each about 6, 000-7, 000 feet high which are situated east of the Mesilau Cave. The underlying rocks of these three hills are different, respectively granodiorite, shale and ultrabasic and each of them supports a distinct forest type with a characteristic floristic composition. The granodiorite hill is dominated by *Lithocarpus havilandii* together with *Podocarpus imbricatus* (at the top right hand corner of fig. 14). The shale hill is dominated by a very small leaved *Eugenia* together with an *Illicium*, while the ultrabasic hill by a species of *Tristania*. The structure of each of these forests is different and it is possible to distinguish the ultrabasic hill from the granodiorite in aerial photographs. At lower altitudes the forest on the ultrabasic rocks is distinct in composition but the structure is not sufficiently different for it to be detected in aerial photographs.

## VEGETATION OF THE PINOSUK PLATEAU

A large number of vegetation types are found on the Pinosuk Plateau and the interrelations between these and their soils are a fascinating study. The soils vary from gley podzols to podzols and brown earths. Relics of brown earth profiles and earthworm casts are found in some of the podzols of the plateau itself. The vegetation pattern broadly corresponds to that of the soils but there are many anomalies which can be explained only by further and more detailed study. We do not know whether the vegetation is the cause or the effect of some of the soil differences. The following are some of the plant communities distinguished:

(a) On the plateau proper: -

1. *Lithocarpus sp. E* and *Trigonabalanus verticillata* forest. This forest is on well drained podzol and the common trees are *Lithocarpus sp. E* (our code letter for an unidentified species), *Trigonabalanus verticillata*, *Castanopsis kinabaluensis*, *Garcinia*, *Podocarpus imbricatus* and *Phyllocladus*. These trees are over 60 feet high. The common understorey tree, about 40 feet high, is a broad leaved *Ternstroemia*. *Drimys*, 3-4 feet, is a common ground shrub.
2. *Dacrydium* forest (fig. 15). This forest which usually occurs on a less well drained podzol is dominated by a *Dacrydium sp.*, a number of *Lithocarpus spp.*, including *Lithocarpus sp. E* and *Calophyllum spp.* The ground is covered with saplings of a broad-leaved *Tristania* 2-4 feet high. No adult tree of this *Tristania* was found in this forest and possibly it died after the sapling stage.
3. Broad-leaved *Tristania* forest. In wide hollows of the Plateau the soil becomes waterlogged and peat develops. Here the broad-leaved *Tristania* which was only found as sapling in the *Dacrydium* forest now becomes the dominant tree. The forest is about 30 feet high and open. In very open situations climbing palms are found and *Sphagnum* occurs in some pools.

There is a progressive decrease in the height of the trees and in the number of species from the *Lithocarpus sp. E* and *Trigonabalanus verticillata* forest to the broad-leaved *Tristania* forest.

(b) On the valley slopes of the plateau:-

The sequence of vegetation from the edge of the plateau to the banks of the rivers is as follows:

1. *Agathis* forest. An *Agathis sp.*, over 100 feet high, is common on the edge of the plateau.
2. *Podocarpus imbricatus* forest. On the valley slopes the soil is deep yellow and over 20 feet in depth. The forest is dominated by *Podocarpus imbricatus*, over 100 feet in height, together with *Eugenia* and *Sckima*.
3. *Vatica* forest. On the river terrace of the Mesilau River the soil is non-podzolic and many large, granodiorite boulders are found 2-3 feet below the soil surface. The common trees are *Vatica sp.*, *Lophopetalum sp.* and *Ficus treubii*, *Talauma* and *Ardisia* are common understorey trees, about 20 feet in height, and the ground has many *Pilea spp.* and climbing palms.
4. Peeling-bark *Tristania* forest (fig. 16). On the edges of rivers a species of *Tristania* with a characteristic peeling bark is abundant together with a *Duabanga* and *Schefflera spp.* Growing on the boulders in the rivers are *Impatiens* and *Galium*.

## AUTECOLOGY OF *PODOCARPUS IMBRICATUS*

*Podocarpus imbricatus* is absent below 5,000 feet. On the Pinosuk Plateau (5,000-6,000 feet) it is common in the *Lithocarpus sp. E* - *Trigonabalanus verticillata* forest, but is very infrequent or absent in the *Dacrydium* and broad-leaved *Tristania* forests. It is

common on the valley slopes, infrequent on the river terrace and absent on the edges of rivers.

At about 5,500 feet, it is abundant with *Diospyros* on a shale hill, while at 6,000-7,000 feet it is common on the river terrace made up of granodiorite deposits at Mesilau Cave. It is an important component of the vegetation on the granodiorite hills.

At about 10,000 feet it is the dominant tree on the granodiorite slopes accompanying a species of *Eugenia*. Under this forest canopy the main shrub is a *Rubus* about 15-20 feet in height, while the ground vegetation is dominated by *Carex spp.* The general aspect of the forest here is more that of a Himalayan coniferous forest.

At 11,000 feet near the tree line *Podocarpus imbricatus* becomes stunted to about 20-30 feet in height and it is common in the *Rhododendron* forest.

It is quite clear that *Podocarpus imbricatus* is favored on the well drained soils of the granodiorite slopes and it is one of the most important trees on Kinabalu.

## CONCLUSION

The reconnaissance work which we have carried out has helped to answer some of the ecological problems of the mountain. But it has posed many more. We now have a broad idea of the way in which altitude, exposure and soil interact to produce the present pattern of vegetation but the picture is far from complete. We know that very different forests occur on the ultrabasic and the other rocks, but we do not know how these differences arise or are maintained. The mossy forest, too, is not determined only by altitude but seems to depend on situations where mist-laden winds drift across the mountain. It is possible even that the kind of rocks also have an influence. The status of the conifers in the forests is by no means clear, nor is it known whether they contribute to the production of podzols. Perhaps the greatest problem of all is the history of the vegetation and the way in which species with such diverse geographical affinities have come to live together on a mountain which is relatively young. All these problems and the relation of the vegetation to its fauna make the Kinabalu National Park an exciting and important site for fundamental ecological studies.

## ACKNOWLEDGMENT

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## LITERATURE CITED

- Askew, G. P. 1964. The mountain soils of the east ridge of Mount Kinabalu. Proc. Roy. Soc. B. 161: 65-74.
- Collenette, P. 1958. The geology and mineral resources of the Jesselton-Kinabalu area, North Borneo. Mem. Brit. Borneo Geol. Survey 6.
- 1964. A short account of the geology and geological history of Mount Kinabalu. Proc. Roy. Soc. B. 161: 56-63.
- Corner, E.J.H. 1962-63. Zones of altitude and botanical formations. Royal Society Expedition to North Borneo 1961: Reports. Proc. Linn. Soc. Lond. 175: 44-45.
- Holttum, R. E. 1964. Distribution of some of the more primitive ferns of Mount Kinabalu. Proc. Roy. Soc. B. 161: 38-48.
- Van Steenis, C. G. G. J. 1964. Plant geography of the mountain flora of Mount Kinabalu. Proc. Roy. Soc. B. 161: 7-38.





Fig. 12. Mount Kinabalu, Sabah, Malaysia (1964 from Kundasan).



Fig. 13. *Rhododendron* forest on granodiorite outcrops at 11,000 feet. (1964)



Fig. 14. *Lithocarpus havilandii* forest on granodiorite hills at 6,000 feet Mesilau Cave (1964).



Fig. 15. *Dacrydium* forest on Pinosuk Plateau at 5,000 feet (1964)



Fig. 16. Peeling-bark *Tristania* forest beside Mestlau River at 5,000 feet (1964).

# Scientific Need for Parks and Reserves

by

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## SUMMARY

Ecology is a relatively new science and it is only in the last few years that the 'study of ecosystems' has become a valid definition of that science. The author points out that natural areas are urgently needed for ecological study in the same way that laboratories are needed for other sciences. In the tropics the destruction of natural areas is even more rapid than in the temperate zone while the need is greater for ecological research which alone can mean a rise in the standard of living. The International Biological Program (IBP) has provided for a special section (CT) on the conservation of terrestrial communities. It is vital that all countries immediately put under national protection prime examples of their major natural ecosystems for scientific study now and in the future.

For scientific purposes a protected natural area may be defined as an area of natural landscape on which, by legal restrictions, natural conditions are maintained, human interference is kept to a minimum, and natural ecological processes are allowed to predominate. Such areas are indispensable to all branches of science which deal with naturally occurring phenomena; they serve as controls or reference points from which to estimate change or alteration by man or natural catastrophe, as sources of specimens of wild organisms for study, and as habitats for natural populations of organisms to be studied.

Formal ecological research has been going on for not much more than a century, and its earlier stages have been largely preoccupied by investigating relatively simple relationships and the effects of single factors. It has now become evident that in almost all cases we are dealing with the combined and varying influences of an interwoven and interlocking complex of a very large number of factors, influences, and organisms when we study an ecological process. Gradually the concept of the ecosystem, the totality of organisms within a given situation, circumscribed in any way that suits us, plus the totality of environmental factors that influence these organisms has become the central consideration in ecology. Only within the last few years has 'the study of ecosystems' become a valid definition of the science of ecology.

Thus defined, ecology has become an exceedingly difficult science to work in effectively, but a much more important science to Man. Ecosystems normally exist in some sort of dynamic equilibrium - a steady state, one of decreasing entropy, or, more usually, one of increasing entropy. Methods of study of these phenomena as yet scarcely exist. The more promising line, at present, is through the comparison of similar systems in various conditions particularly the most nearly undisturbed available examples of each important ecosystem in comparison with similar ones in various stages of degradation or alterations.

If this sort of study is to be carried on there is an absolute requirement that sufficient examples of such ecosystems be preserved for this purpose and protected from disturbance. This is as necessary as controlling disturbance in laboratories when critical experiments are going on. If we do not protect a reasonable sample of our environmental variations, we cannot expect ever to have a valid basis for understanding of the various ecosystems in which man lives.

That this is not merely a matter of academic or scientific curiosity is shown by the increasing and widespread public concern with the condition of Man's environment. The

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deterioration in the obvious qualities of our surroundings is forcing itself on the attention of all but the most imperceptive of citizens. However, the documentation of such phenomena in scientific terms is not at all adequate. Especially deficient is the state of documentation and even the methodology of documentation of the early stages of the changes of which we are speaking. Ecological research of the most advanced sort, and ecological methods not yet even perfected are urgently needed. For this research, an ample system of natural areas is just as essential as accelerators are to nuclear physics. Furthermore, even with land as expensive as it is, such a system of natural areas would not be nearly as expensive as the accelerators already on the drawing boards.

Ecology, though the most important, is only one of the sciences that requires access to protected examples of undisturbed natural biotic communities. In 1961 the council of the American Association for the Advancement of Science set up a study committee to look into the matter of natural areas as research facilities, and it was found that at least 52 branches of pure and applied science had utilized such areas. In addition to the use of natural areas as examples of the ecosystems actually under study, the areas are used by many sciences as sources of their study materials.

The requirement for preserved areas where scientific studies may be carried out has been established principally in the temperate zone where ecology developed originally, and is far more advanced than in the tropics. In Great Britain and the more advanced European countries there are systems of protected natural areas and active research programs in progress utilizing them. In the United States there are a great many reserves but they are a patchwork rather than a planned system and the research is mostly an individual matter leaving much to be desired in its coverage. Attention is now being devoted to filling in the gaps, both in the network of natural areas and in the research planning.

In the tropics the situation is much less satisfactory. It is well known that some of the changes brought about by human activities are far more rapid and destructive here than in temperate regions and that they have a greater tendency to be irreversible. There are, on the whole, very few preserved areas in tropical countries, and even these are, in many cases, not effectively protected. Too many of them, especially in newly independent countries, are associated in the minds of the people with their former colonial status. Few of them realize that ecological research, upon which their future standard of living depends, is absolutely dependent on the availability of strictly protected natural areas in order to be carried out. Education may remedy this, but it may be too late because of the rapidity of destructive processes in the tropics.

Biological and especially ecological research in the tropics as well as in the temperate zone are due to be greatly stepped up in the near future as the International Biological Program gets under way. The importance of effectively preserved sites in all parts of the world is recognized in the IBP by the provision of a special section (CT) on the conservation of terrestrial communities. It would be ideal if a geographically well distributed series of completely undisturbed examples of all the important ecosystems could be set aside as well as examples of each in several stages of degradation or change. Few ecosystems have escaped alteration and the best we can do is to save the most promising remaining examples, even though they are not in their pristine state.

It is urgent at this stage of world history to bring under protection as national parks or national scientific reserves adequate prime examples of all the major natural ecosystems. This should be done in each country as an insurance that vital ecological and other scientific studies now and in the future will not be crippled by lack of suitable areas and populations of plants and animals for study. The important thing is not to wait any longer, as suitable areas are rapidly disappearing, and many of the smaller or less conspicuous, but often extremely interesting and important plants and animals will become extinct before they are even discovered.

What would not the paleontologist give to find an area where he could study his subjects as whole, living creatures, rather than as badly preserved fragments? Unless we act fast in preserving a significant selection of samples of our biological environment, much of biology will, in a few years, become paleontology.

# Research in Relation to National Parks and Nature Reserves

by

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## SUMMARY

Realistic plans for the establishment and development of national parks and nature reserves must be based on research. Only thorough and continuing research can ensure that the precise requirements for the survival of a particular plant and animal are discovered. Unless such requirements are known, effort will be wasted in setting up reserves which will fail to achieve their intended purpose. The role of research in conservation is that of providing a sound knowledge of facts and a reasoned estimate of the consequences on which to base action.

## INTRODUCTION

To participants attending this I. U. C. N. conference, it is not necessary to stress the importance of National Parks and Nature Reserves. In all countries, the indigenous wildlife and the natural vegetation are integral parts of the national heritage. Both deserve as thorough protection and preservation as do cultural elements. Indeed, in many South East Asian societies, much of the cultural richness is directly related to nature and natural objects, plants and animals. Under modern conditions, true national identity can only emerge if this natural context is carefully preserved. Plans for the establishment and development of National Parks and Nature Reserves therefore deserve to be realistic and as soundly based as plans for other aspects of national development. Successful planning can only be based on research. In the following notes I have attempted to draw together a few ideas on some aspects of research that are important.

The faunas and floras of all tropical South East Asian countries are notably rich and diverse, comprising many different species of great variety. In this diversity, characteristic animals or plants are frequently specialized in their ecological requirements. If precise requirements can be discovered by research, it may be possible to ensure the survival of particular plants or animals, or of whole inter-related animal communities, by setting aside tracts of land fulfilling these requirements.

It is important to stress that the characteristic tropical diversity of species is associated with relative scarcity of individuals of each component species. In other words, although there are many different kinds of plant and animal in any given area, relatively few individuals of each kind will be found. In countries of the temperate zone, there are fewer kinds of animals but more individuals of each kind. Consequently, in Tropical South East Asia, proportionately larger areas of suitable habitat will be necessary to ensure the survival of a given plant or animal population. Research carried out on related forms in the temperate zone will not provide a reliable basis for judgments of the minimum desirable area.

Estimates of the numbers of animals present in an area selected as a potential reserve can be based on direct observation in only a few cases: for instance, birds favoring open habitats (e.g. waders, water-birds, or some raptors), or large mammals ofregarious habit (e.g. elephants or wild cattle). Reasonably accurate estimates of

numbers and distribution can be based on reports of informed local interests. Maps are appended showing locations and sizes of known herds of elephant and saladang or gaur in the States of Malaya.<sup>1</sup>

## TECHNIQUES

Throughout most of our region, forest is the natural climax vegetation. Most genuinely indigenous animals are restricted to the forest in which it is not possible to make direct counts of smaller or non-gregarious animals. However, research programs to establish the numbers present in a selected area are not difficult to devise. Total collection from sample plots is a possible technique, but it is liable to distortion and could be disastrous as well if the species concerned are already rare.

It is preferable to use the mark-release techniques in which animals are trapped, marked in such a way that they will be recognizable on subsequent recapture, and returned to their original home range. The method of marking must not prevent the animal from continuing to behave in a normal manner. Within this limitation a variety of techniques can be used, ranging from dabs of paint or dye, to numbered metal leg-rings or ear-tags. In an area in which a known number of individuals have been marked, it is possible to calculate the total population present from a factor based on the proportion of marked to unmarked animals in any sample.

Continued over a long-term period such research will yield indispensable data on longevity, reproductive cycles and other periodicities such as moult or antler shedding, fecundity, population structure and social relations, local and long-distance movements, and many other aspects of animal biology which are essential background knowledge. Unless such details are known, effort will be wasted in setting up reserves which will fail to achieve their intended purpose.

## RESERVE BOUNDARIES

For example, boundaries may be incorrectly drawn. Unless the full range of a herd at all times of year is totally enclosed within reserve boundaries the animals may be subject to legal hunting at certain points on their habitual route and the effects of partial protection within the reserve can thus be completely nullified.

There may also be natural seasonal fluctuation in numbers of animals, particularly of smaller species. The annual climatic changes in Tropical South East Asia are generally not associated with the marked variation in temperature characteristic of the temperate zone. Nonetheless cyclic variations in rainfall almost everywhere produce distinct seasonal changes which are reflected in the reproductive biology of indigenous wild animals, many of which prove on investigation to have restricted annual breeding seasons. Reserve boundaries drawn on the basis of population densities calculated at the seasonal peak of numbers, could enclose an area too small to ensure the survival of the species through the subsequent drop in numbers.

## MANAGEMENT

Even after the establishment of a reserve, continued research is indispensable to ensure that the reserve fulfills its intended function. At the very least marking and sampling of animals should continue as a check that populations are being maintained at a satisfactory level. It is inevitable that reserves in South East Asia, as in many temperate countries, will require active management. When animal or plant numbers drop below a minimum level, it will be necessary to take action to prevent the extinction of the species concerned. Conversely when the numbers of one plant or animal (even the

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<sup>1</sup> These, Figs. 17 and 18, are based on information gathered by means of questionnaire and/or interview with state and regional game wardens, and are ultimately derived from game rangers working in the district. Full details have been submitted for publication in the *Malayan Nature Journal*, from which the maps are reproduced with permission. Grateful thanks are due to all game department staff who co-operated in this survey.

species which the reserve was designed to protect) increase so that they begin to destroy the habitat, thus endangering associated forms of life or even its own species, research will be needed to discover appropriate remedial action.

**RESEARCH**

In these few examples the value of research in relation to national parks and nature reserves is illustrated. Nowadays 'Research' is a much used word in some disrepute. It should not be. Many of the procedures involved are simple and straightforward and it is not necessary to have intensive training to carry out programs of the kind outlined above. 'Research' in this context merely refers to the systematic collection of information about wild animals and plants. In everyday life we try to take action only on the basis of sound knowledge of facts and a reasoned estimate of the consequences. In relating research to the problems of conservation, I only wish to suggest that in this field we should apply the same rule as we do in everyday life.

Fig. 17  
Location and Size of Known Elephant Herds in Malaya

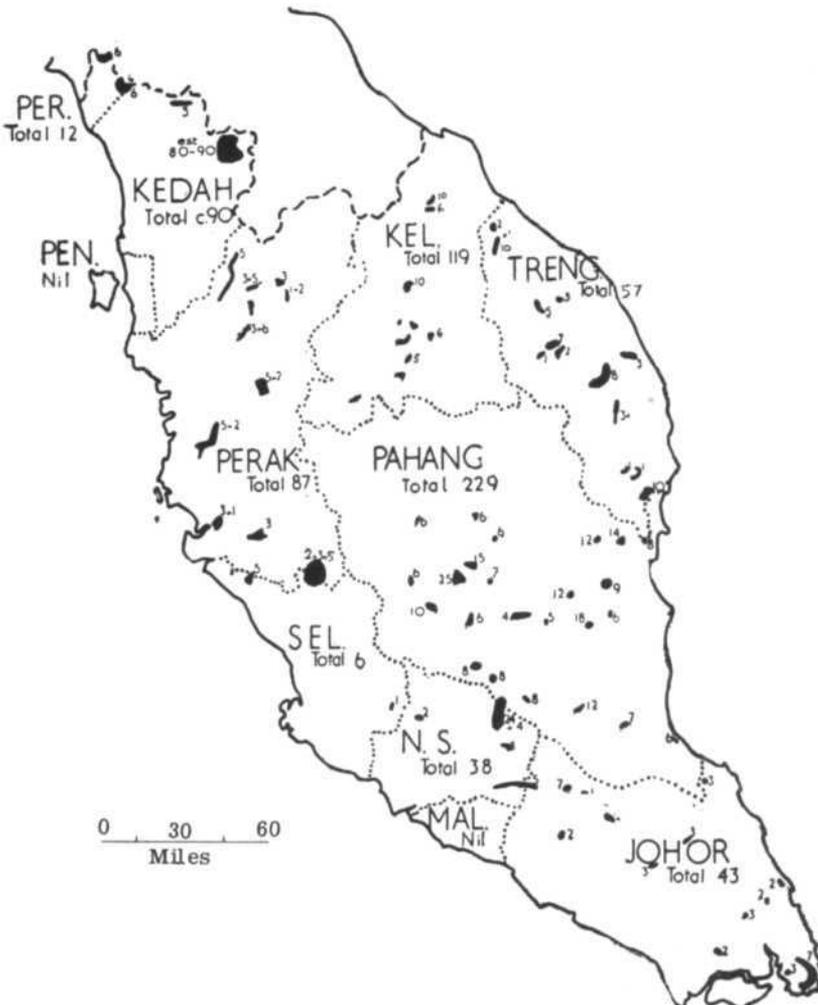
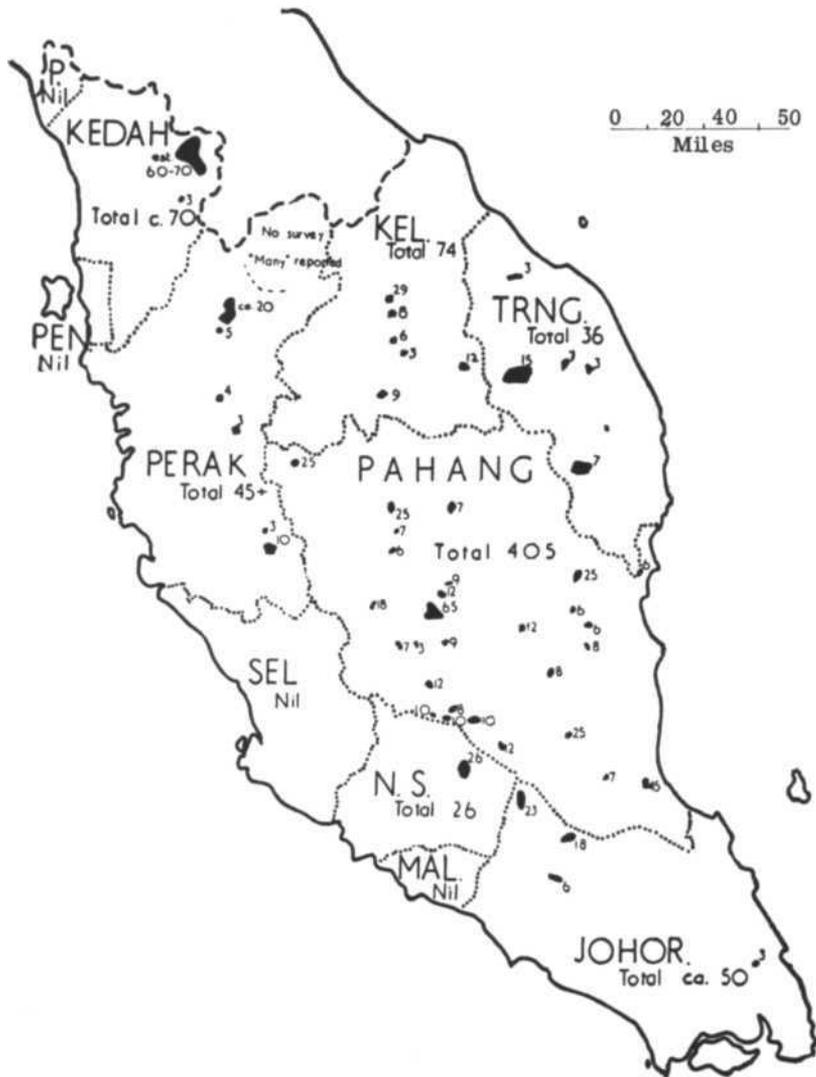


Fig. 18  
 Location and Size of Known Saladang Herds in Malaya



## **Part 3:**

### **Regional Considerations**

#### **Problems of National Parks and Reserves in Indonesia and Emerging Countries**

by

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##### **SUMMARY**

For some regions in Indonesia the only way to ensure the preservation of both wildlife and wilderness is in a strict nature reserve which is absolutely protected. The author gives reasons why nature reserves should be thus protected and lists the many rare and interesting Indonesian animals and plants that are threatened species. Since 1964 the Directorate of Forestry has embarked on a new program in the field of nature conservation with particular emphasis on the integration of tourism within reserves. It seeks close co-operation with other national and international agencies for the better protection and management of nature reserves and wildlife.

##### **INTRODUCTION**

In accordance with the Nature Protection Act of 1941, Government Gazette No. 167, any area can be proclaimed a nature reserve or park in order to conserve wildlife, forests, natural features etc. At this time in Indonesia we have 117 regions in this category (66 in Java, 29 in Sumatra, 14 in Kalimantan and Celebes, and 8 in other islands) totalling 3 million hectares or about 2½ per cent of the total forestland in our country.

Although these reserves are located in different islands throughout Indonesia, this has not insured that our natural resources – animals and plants – are appreciated yet by all the people. According to our experience, the forestlands are shrinking because of the practice of shifting cultivation, and most of the big animals outside the nature reserves are victims of illegal hunters. The reports that many people in Sumatra still catch orang-utans and kill elephants outside the game reserves are deplored. For some regions in Indonesia the only way to ensure the preservation of both wildlife and wilderness is in a strict nature reserve which is absolutely protected.

##### **PRESERVATION OF WILDLIFE IN INDONESIA**

The following points should be stressed in trying to focus public attention on the preservation of wildlife in Indonesia and other emerging countries:

1. Flora, fauna, natural features and geological formations should be protected against disturbance and destruction.
2. Biological sciences need to obtain a real picture of a natural forest, soil structure, wildlife etc. which is essential for forestry, agriculture, animal husbandry, etc.
3. Natural areas are useful for the education of the public and particularly for students in biology, geology, ecology, etc.

4. Animals such as wild oxen, deer, barking deer, wild buffalo, pig, and game birds breeding in a game reserve may migrate to a hunting area and thus provide a major source of food.
5. Nature reserves providing for watershed management will prevent erosion and landslides.
6. These areas will invite tourism and recreation since they are usually in picturesque and attractive regions.

We in Indonesia have the good fortune to harbor many important, rare, and interesting species for example:

1. Animals
  - (a) Both the Sumatra rhinoceros and Java Rhinoceros (Loser Game Reserve and Ujung Kulon).
  - (b) The orang-utan in North Sumatra and Central/West Kalimantan.
  - (c) The elephant and tapir in South Sumatra.
  - (d) The giant monitor (Komodo dragon) in the islands of Komodo, Padar and Rintjah.
  - (e) The bird of paradise and crown pigeon of South Moluccas and West Irian.
  - (f) The wild ox and Java tiger in 'Ujung Kulon' Reserve and 'Baluran' Nature Park.
  - (g) The dwarf buffalo and hogdeer in North and Central Celebes.
  - (h) The white starling of Bali and the black cockatoo (Cacatus) of Coram.
2. Plants
  - (a) The big flowers *Rafflesia* in Sumatra, Kalimantan and Java.
  - (b) *Amorphophallus titasum* and *Rauwolfis* species in Sumatra and Java.
  - (c) All kinds of orchids s.o. the *Vanda*, *Dendrobium*, *Ronanthora* and other species.
  - (d) The flora of the lowland forest of Ujung Kulon.

All of the above, both plants and animals, are threatened species and only strict nature reserves, like Ujung Kulon, can act as a sanctuary for the safeguarding of the few remaining individuals.

## GOVERNMENTAL ORGANIZATION

In Indonesia the two bodies entrusted by the government with nature conservation are

1. the Directorate of Forestry and its Nature Conservation and Wildlife Management Division and
2. the National Institute for biological research (Botanic Garden).

These two working in co-operation deserve great credit for safeguarding the one-horned rhino in Ujung Kulon. Without their efforts the rhino would probably be extinct.

The Directorate of Forestry with the assistance and close co-operation of other agencies concerned (Police Service, Civil Service, Botanic Garden, Information Service, Customs etc.) tries to accomplish its task in the field of nature conservation by:

1. Disseminating information throughout the country by means of manuals, posters, pictures, pamphlets.
2. Enforcing the existing laws and regulations and punishing any violations.
3. Encouraging conservation education in the schools and for the general public.

With the establishment of the Ministry of Forestry in June 1964, and a forestry conference in December a new policy and work program in the field of nature conservation was drawn up to include the following:

1. The importance of reserves.
2. Management of natural resources.
3. The function of reserves for the public.
4. Integration of reserves with tourism.
5. Nature conservation as a means of our people's revolution.

Starting in 1965 the Directorate of Forestry has been working hard to develop some tourist areas for both native and foreign visitors, within some of the reserves (three in Java, including 'Pangandaran' near Bandung and 'Baluran' in East Java; two in Sumatra, and one each in Bali and Komodo) without injury to the plant and animal life.

#### **NON-GOVERNMENTAL CO-OPERATION**

The Directorate keeps in close touch with foreign associations such as the IUCN in Morges and the Pacific Science Association in Hawaii as well as the Naturalist's Society in Bogor.

I take this opportunity to express my gratitude to those agencies and persons, especially the IUCN, Dr. H.J. Coolidge, and Dr. and Mrs. Talbot, who were so kind to arrange my participation in the 8th General Assembly of the IUCN in Nairobi in 1963, during which I had the opportunity to visit many national parks in East Africa.

The many suggestions of the Talbots in late 1964 became a great contribution to the better protection and management of our national parks, nature reserves and wildlife.

Thus, in co-operation with organizations at home and abroad our Directorate seeks to find the best ways of tackling problems, and establishing the basic principles of preservation and the management techniques for our nature parks and equivalent reserves.

## ANNEX 1

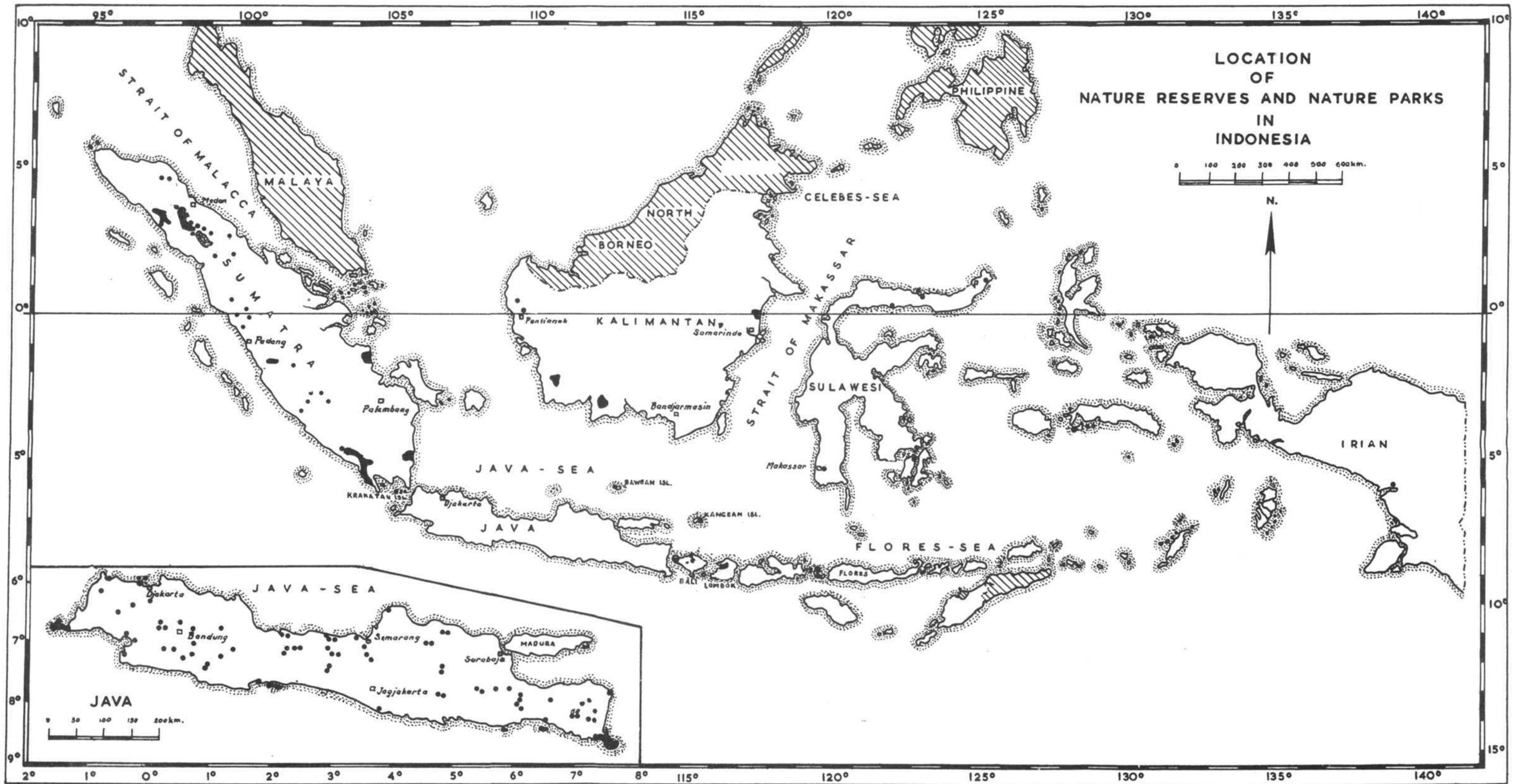
## LIST OF NATURE RESERVES IN INDONESIA

No.	Name of nature reserve	Total area in hectares	Classification <sup>1</sup>	Particulars
1	2	3	4	5
WEST JAVA				
1	Angke	15	1, 2, 4	birds incl. water-fowl.
2	Artjadomas	2	1, 8	
3	Dungus Iwul	9	1, 4, 8	
4	Gebungan	2	1, 4, 7	
5	Getas	-	1, 8	tree.
6	Gunung Djagat	126	1, 4, 8	
7	Gutji	2	1, 6, 7	mineral spring.
8	High plateau Dieng	85	7, 9	
9	Janlappa	32	1, 4	dipterocarpus.
10	Junghuhn	2.5	8	
11	Karang Bolong	0.5	1, 2	bird nests.
12	Keling	60	1, 7	
13	Koorders monument (Pandjalu)	16	7, 8, 9	
14	Malabar	6	1, 4, 7	
15	Moga	1	1, 7	waterfall.
16	Nusa Kambangan	77	1, 4, 5	<i>Rafflesia patma</i> , <i>Pisonia sylvestres</i> .
17	Pagerwunung Darupono	30	1, 4, 9	natural teak forest.
18	Panaitan	17,500	1, 4, 6	wilderness.
19	Panandjung – Pangan-daran	457	2, 4, 5, 7, 9	wild ox, <i>Rafflesia</i> .
20	Papandajan	844	6, 9	crater.
21	Peson Subah	10	1, 4	lowland forest.
22	Pringombo	58	6, 8	
as	Pulau Bokort	18	1, 2, 4	waterfowl.
24	Pulau Dua	8	1, 2	waterfowl, pelicans
25	Pulau Rambut	20	1, 2, 4	white and black ibis
26	Rantja Danau	2,500	1, 2, 4	waterfowl, xeriphyll plants.
27	Sekapung	2	6, 7	
28	Sukawajana	32	4, 7, 9	
29	Takokak	50	1, 4	mountain flora.
to	Tangkubanprahu	22	6, 7, 9	
31	Tangkubanprahu (P. Ratu)	33	6, 7	

No.	Name of nature reserve	Total area in hectares	Classification <sup>1</sup>	Particulars
1	2	3	4	5
32	Telagabodas	285	6	
33	Telagapatengan	150	9	
34	Telaga Randjang	-	1, 6, 7	mountain lakes.
35	Telagawarna	23	7, 9	
36	Tjadasmalang	2	1, 4, 7	
37	Tjibanteng	447	1, 2	birds, wild ox.
38	Tjibodas	1,040	1, 4, 5, 6, 7, 9	birds, black leopard.
39	Tjigenteng-Tjipandji	10	1, 4	mountain flora.
40	Tjikepuh	10, 000	3	birds, wild ox, sea turtles, deer.
41	Tjimungkat	56	1, 4, 5	birds, owls, hawks.
42	Tjurug Bengkawah	-	1, 7	waterfall.
43	Udjung Kulon	37, 500	1, 2, 4, 5, 6, 7	Javan rhino, wild ox, tiger, black leopard, <i>Pavo muticus</i> , lowland forest.
44	Ulolanang Ketjubung	71	1, 4	Dipterocarpaceae.
45	Widjaja Kusuma	0.5	1, 4	<i>Pisonia sylvestres</i> .
EAST JAVA				
46	Ardjuno Lalidjiwo	580	1, 2, 4	
47	Baluran	25, 000	2, 7	wild ox, wild buffalo, deer, black leopard.
48	Bawean	15	2	Bawean deer.
49	Banjuwangi Selatan	62, 000	2, 4, 5	wild ox, deer, sea turtles, wilderness.
50	Besowo Gadungan	7	1, 4, 7	
51	Gua Nglirip	3	6	limestone caves.
52	Gunung Abang	50	1, 4	
53	Gunung Baung	200	1, 4, 7	
54	Gunung Pitjis	22	1, 4, 7	
55	Gunung Slgogar	200	1, 4, 7	Quercus.
56	High plateau Yang	15, 000	2	leopard, deer.
57	Kawah Idjen	2, 560	1, 4, 6, 7	
58	Laut Pasir Tnegger	5,240	6, 7, 9	caldera.
59	Manggis Gadungan	12	1, 4, 7	
60	Nusa Barung	6,100	1, 2, 4, 5	deer and birds.
61	Pantjur Idjen	9	1, 4	
62	Pulau Sempu	877	1, 2, 4	
63	Ranu Darungan	380	1, 4, 5	

No.	Name of nature reserve	Total area in hectares	Classification I	Particulars
1	2	3	4	5
64	Ranu Kumbolo	1,340	1, 7	
65	Ranu Pani Regulo	96	1, 4, 7	
66	Saobi, Kangean	430	2, 5	Megapodius and birds.
67	Sungei Kolbu	9	1, 4	
68	Tjeding	2	1, 6, 7	
SUMATRA				
69	Baringin Sati	0.1	8	<i>Ficus benjamina.</i>
70	Batang Palupuh	3.5	1, 4	<i>Rafflesia arnoldi.</i>
71	Batu Gadjah	1	6	
72	Batu Ginurit	1	8	
73	Bengkulu	71	1, 4	<i>Rafflesia arnoldi.</i>
74	Berbak	190, 000	1, 2, 4	<i>Dicerorhinus sumatraensis.</i>
75	Bungamas Kikim	1	1, 8	archaeology.
76	Despatah	0.3	1, 4	<i>Rafflesia arnoldi.</i>
77	Dolok Saut	39	4	
78	Dolok Tinggiradja	167	1, 6, 7	
79	Dusun Besar	12	1, 4, 5	<i>Vanda hookeri,</i> fowl.
80	Gedung Wani	-	1, 2	elephant, deer.
81	Gua Ulu Tiangko	1	8	prehistory, archaeology.
82	G. Rakata, P. Sertung	2,500	1, 6	
83	Kluet	20, 000	2, 4	orang utans.
84	Lau Debuh-debuh	7	1, 6	sulphuric mud.
85	Lembah Anai	211		
86	Lembah Harau	298	4, 5, 6, 7, 9	butterflies.
87	Mount Indrapura	125, 000	1, 4, 5	mountain goats.
88	Mount Loser	416, 000	2, 5	Sumatran rhino, orang-utan, mountain goat, elephant, birds.
89	Mount Wilhelmina (Longkat)	200, 000	1, 2	orang-utans, tapir, mountain goat, elephant.
90	Rimbo Panti	3,500	1, 4, 5	
91	Serbojadi	300	1, 2, 4	orang-utans, Rafflesia.
92	Sibolangit	115	1, 4, 7	

No.	Name of nature reserve	Total area in hectares	Classification <sup>1</sup>	Particulars
1	2	3	4	5
93	South Sumatra	356,000	2, 5	<i>Dicerorhinus sumatrensis</i> , wild buffalo, elephant, tapir, gibbon.
94	Tjawang	0.2	1, 4	<i>Rafflesia arnoldi</i> .
95	Way Kambas	130,000	1, 2	<i>Dicerorhinus sumatrensis</i> , elephant.
BORNEO				
96	Kotawaringin	100,000	2	orang-utan, <i>Nasalis larvatus</i> , wild ox.
97	Kutai	306,000	2	orang-utan, <i>Nasalis larvatus</i> .
98	Lo Pat Fun Pi	8	1, 4	
99	Mandor	195	1, 4	<i>Vanda</i> sp.
100	Mount Palung	30,000	2, 7	
101	Padang Luwai	1,000	1, 4, 7	orchids.
102	Sampit	205,000	2	orang-utan, <i>Nasalis larvatus</i> , wild ox.
CELEBES				
103	Batlmurung	10	2, 5, 6	rhinoceros.
104	Mas Papaja Radja	160	1, 5	turtles.
105	Mount Lokon	100	1, 6	
106	Mount Tangkoko Batuangus	4,446	1, 2	hogdeer, anoa, <i>Megacephalon maleo</i> .
107	Napobalano	9	1, 4, 7	<i>Cynopitecus niger</i> , <i>Anoa depressicronis</i> .
108	Panua	1,500	1, 5	<i>Megacephalon maleo</i> .
109	Tanggala	123	1, 5, 7	anoa.
BALI				
110	Bukit Batukahu	1,600	4, 6, 7	
111	Sangeh	10	1, 4	holy forest, dipterocarpus.
112	West Bali	20,000	2, 4	Bali tiger, white starling, deer.



Sapinji, bl. 5-1957

Fig. 19

No.	Name of nature reserve	Total area in hectares	Classification <sup>1</sup>	Particulars
1	2	3	4	5
LESSER SUNDA ISLANDS				
113	Komodo Island	30,000	2, 5	<i>Varanus komodoensis</i> , deer.
114	Mt. Rindjani	40,000	4, 5, 6	Photinia, fowl, mineral spring.
115	Padar-Rintjah Island	16,500	2, 5	<i>Varanus komodoensis</i> , deer.
MOLUCCAS				
116	Mount Api	80	2	seabirds.
WEST IRIAN				
117	Mount Lorentz (Trikora)	40,000	1, 2, 4, 5	birds of paradise, crowned pigeon, Nicobar pigeon, black and white cockatoos.
Total = ± 3 million hectares				

<sup>1</sup> The numbers in column 4 indicate the classification of each nature reserve:

- 1 = strict nature reserve
- 2 = animal sanctuary
- 3 = game reserve
- 4 = botanic
- 5 = zoologic
- 6 = geologic
- 7 = aesthetic
- 8 = historic
- 9 = recreation.

# **Brief Notes on Park Development and Public Education in Bako National Park, Sarawak, Malaysia**

by

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## **VOLUNTARY ASSISTANCE IN PROVIDING AMENITIES IN BAKO NATIONAL PARK**

Considerable labor expenses may be involved in the essential tasks in a national park of providing a well cleared network of paths, of clearing a well-demarcated boundary, and of clearing campsites. At Bako costs were considerably reduced by securing the voluntary support of the local Boy Scouts and also of certain secondary schools. The central campsite having already become established, parties of schoolboys and Scouts came down during their holidays and with great enthusiasm cut the new paths with the assistance of a local guide who had previously staked out the best routes. Bridges and ladders up rock falls and other obstacles had to be made professionally, but the jungle experience gained by the schoolboys and Scouts was a useful addition to their training, and was, in fact, extremely popular.

## **THE NEW GUIDE TO BAKO NATIONAL PARK**

When Bako National Park was originally constituted, a small guidebook was published giving details of the facilities available and a short introduction to the natural history of the area. Recently a more comprehensive guide has been completed, giving the same information on facilities, and also popular but informative articles by authorities in the respective fields of geology, ornithology, botany and other aspects. This serves

- (a) to encourage a deeper interest in the unique natural amenities of the park itself by the public in general, and
- (b) to provide a basis of knowledge about the park for educational purposes.

One of the main purposes of Sarawak's proposed national parks is to provide the country's school children with outside laboratories where the natural sciences, and particularly biology which is of critical importance in an agricultural country such as Sarawak, can be taught. This familiarity with the importance of national parks from school age onwards will also, of course, lead to an increasing awareness among the educated public of the importance of conservation in general.

# Protection and Management of Natural Areas in Latin America – Implications for South East Asia

by

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## SUMMARY

The author presents a general review of the problems in the field of protection and management of wildlife and natural areas encountered by developing countries in Latin America which are similar to those being faced in the countries of South East Asia. He shows the many adverse and the few favorable factors affecting nature conservation including, whenever possible, an appreciation of the future trends and the most promising lines of action – as well as a hint on mistakes to be avoided.

## INTRODUCTION

Many of the countries in Latin America show great similarities with South East Asian countries. Many are situated in the tropical regions and may be classified within the group of 'underdeveloped' or 'emerging' countries. There are other qualifications which have been established to express a state where a large amount of the population lives below what is generally considered as a satisfactory standard of health, the latter as defined by the World Health Organization (WHO) as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.

Such qualifications apply to many regions of the world including the South East Asian countries. In Latin America, as elsewhere, successes and failures have been achieved in the field of protection and management of wildlife and natural areas and hence it is felt that the experience accumulated may be of interest to the countries of South East Asia. No attempt is made to render a detailed account of what has been done, such as for example a list of existing national parks. Rather a general review of the problems encountered will be made so as to show the adverse and favorable factors affecting nature conservation, including, whenever possible, an appreciation of the future trends and possibly the most promising lines of action – as well as a hint on mistakes to be avoided. It is hoped that the resulting information may be used by people shaping policies within their countries.

## THE MANY FACTORS WEIGHING AGAINST PROTECTION AND CONSERVATION IN LATIN AMERICA

Taking Latin America as a whole, protection and management of natural areas when compared to countries in Europe or the U.S.A., offer a distressing picture. There are noteworthy exceptions, of course, but they do not appreciably change the overall picture. Generally speaking there is little feeling for conservation programs, and this may perhaps be best appreciated and evaluated through the paucity of the budgets which programs connected with wildlife, national parks and other forms of management of natural areas, receive through national or private sources. There are several underlying factors to this situation.

1. The very fast rate of population increase moves against conservation.

The Latin American population is predominantly agricultural and while the present agricultural area is still small, it is quickly expanding. There is a general feeling in the region that there is plenty of room for an expanding population at least for most countries in Latin America. To foster development it is thought that more manpower is

needed to move into the hinterlands and untap the resources of the country, usually uninhabited forested areas. However, it is also becoming increasingly clear to everyone connected with planning, especially economists, that the present astonishing rate of increase of population, works as a fundamental braking force or deterrent against improvement of the human conditions.

It is a well known fact that for an annual increase of population of 1 per cent a country must save and invest each year at least 3 per cent of national income in order merely to maintain per capita income unchanged – meaning no improvement in the average living levels. If the population increase is 2 per cent the saving and investing must be 6 per cent of the national income and if 3 per cent (quite common in Latin America), saving and investing must reach 9 per cent. If an annual increase in per capita income of only 1 per cent is to be achieved, a country with 2 per cent population growth must use as much as 9 per cent of national income in saving and investment. If the country wants to reach an annual increase of 2 per cent in per capita income – and this is only considered a 'reasonable' figure – and its population is growing 3 per cent, which is presently an average for the region, then the saving and investment as a percentage of the national income must reach 15 per cent (Jones 1962).

In many countries, spectacular advances in medicine have brought about a lowering in death rate which now results in the fact that over 40 per cent of the population in many countries is below 18 years of age. This in turn represents an enormous additional effort for the working population since it becomes increasingly difficult to give all these children the education and the care to which they are entitled.

Of course these proportional increases in production are not achieved in most countries and hence economic difficulties to keep pace with the demands of the rising population are increasing year after year. In fact in some Central American countries education, housing and production of food are actually deteriorating (Meeting on Human Conservation 1965).

In relation to nature protection the result of this fast population increase has brought about an invasion into marginal regions, especially the wet and steep areas, where the same systems of farming practiced for dryer or more level areas are freely transplanted, with of course foreseeable disastrous results. Helped by fire and powerful machinery forests are being cleared at increasingly fast rates and that means obviously the extinction of plant and animals as well as erosion, water contamination and deterioration of protective, spiritual and scientific values.

At present, as in many other areas in the world, a controversy is raging as to the implications of what science and technology can do to improve the welfare of mankind. Impressed by technological advances and the food surplus problems of the United States, many people believe that improvements and an end to human misery are just 'around the corner'. However here again, it is not so much what science and technology can eventually do but how fast they can improve welfare. It is a race against time where destruction advances at such a fast pace that science and technology can hardly keep up. This can best be expressed in the following curves recently discussed by the author at the above cited meeting on Human Conservation held for the Central American countries. (See Fig. 20).

2. Forests, whether natural and untouched or presently utilized by men, are too much in competition with present land use.

Forests are being cleared at an increasing rate in Latin America, because they compete with food production. This applies equally to the large land owner who is accumulating wealth as to the small farmer who needs new land to produce food for his family. A typical example is clearing the forest on latosols in wet areas for one or two crops of corn or upland rice or other crops. The land will be abandoned after one or two years or will be converted to pastures which will hold on a few more years before they become unproductive usually because of compaction and invasion of undesirable woody species. Once abandoned it takes a long time to revert to forest under these circumstances. Moreover, when a short dry season prevails, secondary brush on compacted soils is liable to burn whereas the original forest would have been much more resistant to fire.

Shifting agriculture is still practiced, over many areas. Formerly a rather stable system, it is rapidly disintegrating because population pressure is usually becoming so great that the necessary time lapse to keep the system in balance, is not respected,

and again the land ends up in poor shape. This means new encroachments on forest areas to open lands for agriculture, which until recently, were always considered as clearly marginal.

Forestry on a sustained yield basis is practically unknown in areas where extensive natural forests still prevail. Highgrading is the rule in those areas. At this stage it must be admitted that science and technology still have not solved the technical and economic problems involved in harvesting economically the mixed forest although recently some progress has been made in Mexico. There the system of 'forest units', established under a strong and socially minded Central Government, has tended to favor large and efficient wood using industries by securing sufficient forest land as well as technical know-how so as to allow sound management practices.

On the whole however, forests have been and are still considered enemies of progress and practically every Latin American country has grandiose colonization schemes for presently forested areas, usually in the wet tropics. Many scientists who have studied past colonization attempts have drawn the attention to the dangers of moving into the wet-lands without evaluating all the possible drawbacks – which are plentiful. They rather suggest improvements in agriculture and grazing in areas presently settled. But the political pressure and the general illusion involved in 'untapping' the riches withheld by the forest, seem presently too strong for any serious opposition.

3. Only a very small minority has feelings for wildlife, and recreation, associated with wilderness.

There are probably some cultural roots behind this statement. A feeling for wildlife and recreation is usually strongest among people from urban areas who also happen to be best educated. However, the majority of the population in Latin America is either rural or has spent some time of its life in a not very distant past in some rural area. There are also some economic roots for this attitude since it would be hardly realistic, for example, to demand aesthetic feelings for wildlife from hungry, hard pressed peasants who have to spend most of their existence in fighting for their survival and that of their own family.

#### **THE POSITIVE FACTORS WEIGHING IN FAVOR OF NATURE CONSERVATION**

Against the adverse factors cited above, the first impression is to be pessimistic and there are many reasons for remaining so. But there are also some indications of some change. In a recent Congress on population held in 1965 in Cali, Colombia, and organized mainly through the efforts of one of the most respected past presidents of that country, Dr. Alberto Lleras Camargo, a general plea for responsible parenthood with noticeable overtones of population control was made, something which would have been inconceivable 10 years ago, especially in Colombia. There are also other implications and some of these deserve special mention because of their possible usefulness for South East Asia:

1. There is still land in many inaccessible areas and some of it will probably 'hold out' for the next 20 years. This provides some margin in time to allow planning for management. Unfortunately these are only a few of the many natural habitats presently found in Latin America. At this stage, it must be taken for granted that the majority of existing natural habitats will probably be wiped out by the turn of this century. Moreover, little is presently known about the extension of these habitats although some efforts have been made in this direction. (For example see Budowski, 1965).
2. The larger city population and the formation of an industrial population has increased interest in the management possibilities of natural areas especially in connection with recreational aspects. This trend is of course likely to be strengthened with more urban population growth. In some countries proper efforts to funnel these feelings into organizational channels is showing great promise. The campaign realized in Washington, D. C, through the joint efforts of several regional organizations is beginning to produce some impact.
3. Tourism both internal and from outside sources is beginning to produce favorable results affecting the economy of many countries. Aesthetic and recreational values associated with wilderness have contributed to increase the need for protection and management practices and to justify expenses in this direction.

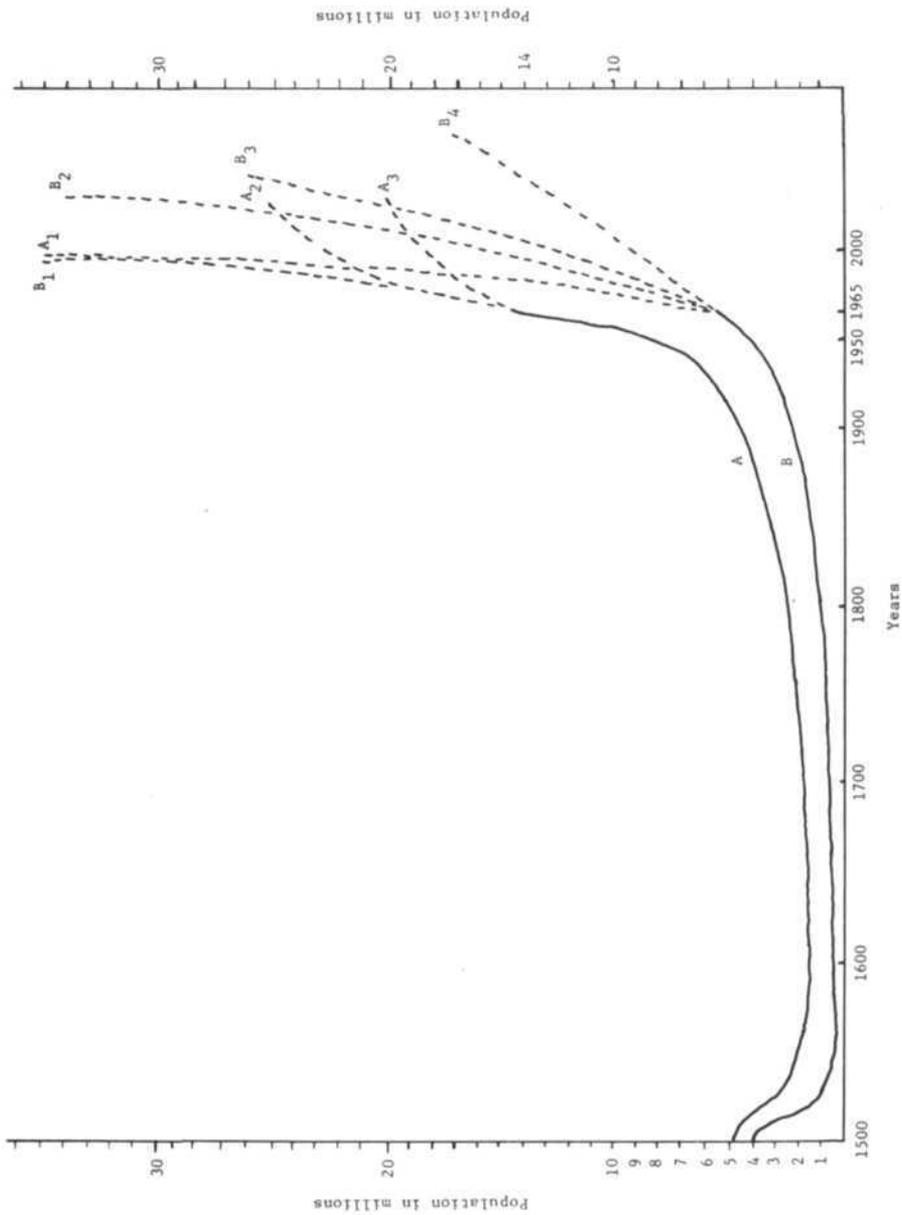


Figure 20  
 The Race Between Population Growth and Technology  
 Applied to Improve Health (Census W. H. O.) in Central America.  
 Possible Projections. (See Page 397)

Fig. 20. The race between population growth and science and technology applied to improve health (Census W. H. O.) in Central America. Possible projects.

Curve A. Population growth with possible projections whether:

- (a) Growth follows past trends (projection  $A_1$ )
- (b) The rate of growth slows down 'naturally' because of improvements in living conditions (projection  $A_2$ )
- (c) The rate of growth slows down considerably due to an active family planning campaign (projection  $A_3$ ).

Curve B. Combined effect of what science and technology can do for health improvement. The position of this curve in relation to A indicates if health conditions are improving (left of A) or deteriorating (getting farther to the right from A). Presently it must be assumed that most of the Central American population is not benefitting from science and technology to enjoy the minimum health requirements. Hence in 1965, B is right of A. Four projections are considered.

- (a) B rises so sharply that it reaches A in spite of its verticality (projection  $B_1$ ). This is most improbable because it would involve not only very far reaching and imminent developments in science and technology but also its ready application and adoption by the population.
- (b) and (c) B eventually reaches A when the population growth rate decreases. The year when this occurs will depend on the rate of decrease of population growth. The more the rate decreases, the sooner B will cross A (projections  $B_2$  and  $B_3$ ).
- (d) B never crosses A in all the projections at least in the foreseeable future. This means more misery, frustrations, instability, encroachment on marginal areas, etc. (projection  $B_4$ ).

4. Although most of the countries are nominally democratic, some drastic measures in favor of protecting natural resources can often be successfully taken with relative ease although these measures may not be understood or may even be scorned by the vast majority of inhabitants of a country.
5. Finally, the impact of education is being slowly felt and is likely to increase. A group of very respected leaders with good scientific background, is beginning to participate in the shaping and execution of sound conservation policies. The same may be said of mass education, although efforts here are apparently less convincing at this stage. In some countries, the opinion and action of some respected philanthropists have greatly contributed in preserving areas of wilderness. At present, efforts are being made to introduce conservation courses in different schools, particularly in connection with forestry and agriculture. The trend is likely to grow. For the first time, in 1966, several graduate courses in national parks and recreation will be offered by the Forestry Program of the Inter-American Institute of Agricultural Sciences, at Turrialba, Costa Rica.

## SUCCESSSES AND FAILURES IN CONSERVATION PROGRAMS

The best results are usually achieved when there is a firm hand controlling management of natural areas. This is, for instance, the case in some areas in Mexico where the Government is willing to make the necessary efforts. Tourism has helped a great deal and an excellent combination of archaeological and folkloric values together with a cheap cost of living have made tourism a business valued in the hundreds of millions of dollars. How much of this can be attributed to the scenic values is debatable but certainly not negligible.

Puerto Rico is an excellent example of a correct appreciation of the values offered by wilderness before it was too late, greatly through the help of U.S. federal institutions, principally the Forest Service. Today a very wide use for recreation, training and scientific research is made in what are now preserved areas.

In Venezuela much was achieved through pressure from very influential and powerful business people – some of them with admirable scientific motivations. The same can be said for many other countries, notably Brazil and Colombia where often achievements are linked with people who 'have a name'.

Argentina has probably the best national parks network. This is only fitting for a country which can claim great leaders in the field of conservation and relatively high standard of living. Chile has done admirably with its water resources, especially in connection with fishing. However, widespread forest destruction in the South is still a common sight.

Failures too have been widespread. Perhaps the most common mistakes include the assumption that it is possible to make conservation plans on paper or to draw national parks on a map and then let time pass. Many of the so-called 'national parks' exist only in theory although they have been legally established. The Government has usually a very poor reputation as an administrator. In some countries, when the Government declares its intentions to protect some areas, these become too often all the more vulnerable to squatters. The reason lies, of course, in the lack of funds assigned to make these areas functional for the purpose for which they were designed. Or if funds are made available they are discontinued after some time, for instance when the Government changes. Often there are no trained men in the country.

## THE FUTURE OF CONSERVATION PROGRAMS

This very brief approach towards a complex situation leads to a series of conclusions.

1. Obviously there is a tremendous need for education at all levels. Particularly successful seems to be the training of future potential leaders since these seem to be in the most effective position to promote the best measures connected with effective conservation practices. Education however is usually a slow process.
2. In the meantime drastic emergency measures are demanded to save wilderness areas from destruction. Here is where regional organizations and international aid with their prestige and economic weapons can be most effective. Technical aid is a mark of our time and since it is made in the name of improving standards of living it is only fair that conservation receives its due share of consideration when programs and budgets are in the making. Only through the concerted efforts of the scientific world can some of the adverse trends be successfully stopped.

## LITERATURE CITED

- Budowski, Gerardo. 1965. The choice and classification of natural habitats in need of preservation in Central America. *Turrialba*. 15(3): 238-246.
- Jones, Joseph Marion. 1962. Does overpopulation mean poverty? Center of International Economic Growth. Washington, 64 p.
- La Conservacion Humana en Centro America en Octubre 1965. Resumen de discusiones 1966. Guatemala, C.A. INCAP 72 p. Copies available through the Conservation Foundation, Washington, D.C.

# Conservation in Hong Kong

by

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## SUMMARY

Several reasons are given why the conservation of Hong Kong is of great potential concern to preservationists and ecologists interested in South East Asia as well as to the inhabitants of the Colony themselves. The people of Hong Kong would greatly benefit from a conservation program especially the conservation of water. National parks would provide badly needed recreation areas. Fauna and flora are being rapidly depleted; police measures to control hunting, poaching and damage to vegetation are totally inadequate and ineffective.

During the past two years a considerable amount of information on the possibilities of nature conservation in Hong Kong has been accrued and recommendations have been submitted to the government, but so far no practical measures have been taken toward the establishment of either national parks or reserves.

## INTRODUCTION

It is perhaps not commonly realized that the Colony of Hong Kong contains within its borders 398.5 square miles of somewhat mountainous land. Even less commonly realized is the fact that 86.4 per cent of this land consists largely of grassland, scrub and woodland. Only 22.5 square miles is 'built-up' area. It is evident, therefore, that Hong Kong qualifies topographically as a rural area deserving of a conservation program. It is as well, however, to examine Hong Kong for more meaningful reasons for conservation:-

1. Hong Kong is representative of the China subcontinent but unlike China is freely accessible to visiting western scientists.
2. It is situated at the boundaries of the Oriental and Palaearctic regions and so has representatives of tropical and temperate fauna and flora. This geographical position also places Hong Kong in the path of major migration routes.
3. It has a 'remnant' fauna and flora and should be considered as being of major interest as an area which has been divested of its tropical rainforest cover within historical times. Deforestation has been brought about by man and the vegetation should now probably be regarded as a mixture of relatively stabilized, natural scrub, planted woodland and unstable grassland. All are probably modified to a greater or lesser degree by fire and grassland is subjected to heavy cropping for fuel.

These points should simply serve to indicate that Hong Kong is of great potential interest to preservationists and ecologists interested in South East Asia. Here is a possible 'laboratory' for investigations on the aftermath of rainforest deforestation.

## THE BENEFITS OF CONSERVATION TO THE PEOPLE OF HONG KONG

### 1. Conservation of Water

Amongst the needs for the conservation of natural resources in Hong Kong, the conservation of water must take pride of place. Lack of water is an ever present danger due to a variable rainfall, poor water holding capacity of soil and rock and insufficient storage reservoirs. For the period 1964-65 capital expenditure by the Government on water was estimated at something more than U.S. \$24 million and a further U.S. \$3

million for water bought from China. The water retaining capacity of the catchment areas will be a function of the soil cover of those areas. However, denudation of the soil, and erosion, are considerable problems in Hong Kong. It may be, however, that loss of plant cover and erosion would be lessened in a game reserve. There is some indication that rodent populations in Hong Kong are high, and while, as yet, there is no definitive evidence that those high populations are destroying plant cover, it is certainly a possibility. It is also evident that predator populations have fallen considerably in the past few years and again it is a possibility that this has resulted in a rodent population increase. It would thus seem to be well worth investigating the possibilities of establishing game reserves in catchment areas, particularly in view of the extensive reservoir construction schemes being carried out at present. The cost would be small compared with the current outlay on water provision.

Although forested catchment areas exist today the plant cover is largely unnatural. Also the faunal balance is being or has been destroyed by excessive poaching and indiscriminate hunting. No effective measures are taken to control poaching and hunting in such areas.

## 2. Recreation Areas

The youth of Hong Kong is sorely in need of accessible recreation areas. These areas must be policed, however, by wardens who are willing and capable of instructing the young people of Hong Kong in the beauties of nature and the evils of litter dropping, fire raising, and the destruction of flora and fauna; all of which are common occurrences in the present catchment areas. The recreational spaces in Hong Kong are totally inadequate, amounting to a total of 343.18 acres, including soccer pitches, tennis courts etc. This figure represents 1 acre per 10,000 people.

## 3. Need for National Park

Social stresses and pressures are continually increasing in any city which is undergoing rapid economic expansion; this is particularly true of Hong Kong. The population has increased by approximately 1.2 millions in the last 10 years and vehicle density now exceeds 155 vehicles per mile of road. The numbers of people seeking the countryside every weekend appears to be steadily increasing. There are however, few places for these people to go where they can take an interesting, but not too arduous, walk away from the crowds. A national park with some areas with 'planned' walks would surely be welcomed by these people as a relief from social tensions.

## **THE URGENCY OF NATIONAL PARK ESTABLISHMENT**

The fauna of Hong Kong is being rapidly depleted by poachers, to be sold as food or for medicinal purposes. The rate of depopulation is probably directly correlated with the rate of increase of the human population and consequent increased demand.

There is also a considerable amount of hunting by people unable, for the most part, to recognize the animals they shoot and in the event of recognition unwilling to abide by the law.

There is a concomitant disregard for the flora, although this is not so permanently damaging. However, fires, grasscutting and the collecting of wood and plants for fuel and medicinal use, must certainly have a damaging effect on the vegetation and ultimately on the fauna.

Police measures to control poaching, hunting and damage to vegetation are totally inadequate and ineffective.

Land sales for building purposes are consuming considerable portions of land covered by stable scrub (the nearest approximation to natural vegetation) particularly on Hong Kong Island which is a declared nature sanctuary. There is little effective attempt made to prevent unnecessary destruction of vegetation during the preparation of building sites. Reclamation projects are also increasing in number with consequent destruction of marine and littoral fauna.

## **MEASURES WHICH HAVE ALREADY BEEN TAKEN TO OBTAIN SANCTION FOR THE ESTABLISHMENT OF A NATIONAL PARK**

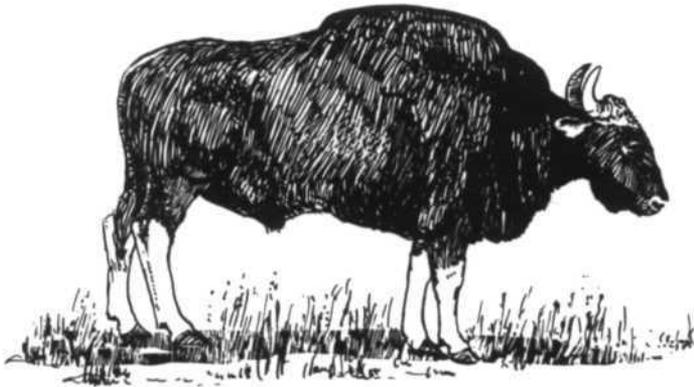
During the past two years a considerable amount of information on the possibilities of nature conservation in Hong Kong has been accrued and recommendations, of an official and unofficial nature, have been submitted to the government.

1. Under the auspices of the Agriculture and Fisheries Department, a working party was convened and prepared a lengthy report on the 'Scientific Aspects of Nature Conservation in Hong Kong'.
2. Peter Scott made a brief visit to the colony and approached government officials in an unofficial capacity in support of a conservation program.
3. Dr. and Mrs. Talbot of the IUCN acted as consultants to the Agriculture and Fisheries Department and produced a report and recommendations on the 'Conservation of the Hong Kong Countryside'.

In addition to this much publicity has been given to the principles of and needs for conservation in Hong Kong. This has been brought about largely through the activities of one of us (P. M. M.) in the popular press, television, radio, public lectures and an exhibition of local fauna.

The response from the leaders of the Hong Kong community has been disappointing although much interest has been manifested by the general public in the fauna of Hong Kong. The government of Hong Kong is nominally interested in conservation but so far no practical measures have been taken towards the establishment of either national parks or nature reserves.

Note: All figures in this paper have been extracted from 'Hong Kong, Report for the year 1964', Hong Kong Government Press, 1965.



GAUR

# A Guide to Khao Yai National Park

by

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## SUMMARY

This paper describes the Khao Yai National Park in Thailand giving its extent, history, present status, and main points of interest. A list of the regulations of the park will be found in the Annex.

## DESCRIPTION AND BACKGROUND

Khao Yai National Park in Thailand covers quite an extensive area of mountainous terrain – about 2,168 square kilometers which includes parts of the four adjoining provinces of Saraburi, Nakorn Rajsima, Nakorn Nayok, and Prachinburi. The average elevation is 800 meters. Khao Lam, the highest peak is 1,328 meters high, and Khao Keow, the long ridge on the side of Nakorn Nayok Province, is 1,270 meters.

Up until very recent times the area was largely inaccessible because of the steepness of the mountain trails. Many parts of it are still unexplored as each village is only familiar with a limited locality. About 40 years ago some families from villages of Nakorn Nayok Province cleared part of the forest, settled down, and established Khao Yai village. Shifting cultivation caused changes in the forest cover and a considerable area of valuable forest land was turned into non-productive grassland dominated by *Imperata* grass. Because of the inaccessibility of the villages and the consequent lack of government supervision the district became a notorious hide-out for outlaws. The Government therefore dissolved the district of Khao Yai, ordered the villagers to vacate the place, and prohibited any further settlement. The sites of the old abandoned farms are now almost over grown with *Imperata* grass.

## ECONOMIC IMPORTANCE

Khao Yai is economically important for the following reasons:

1. Its watershed areas are a source for several streams and rivers including the Nakorn Nayok and Prachantakam Rivers, which supply water to the agricultural lands.
2. It has beautiful and varied scenery including caves and is especially noted for its waterfalls.
3. It has a great variety of forests, and plants, especially orchids.
4. It has a large number of wild animals and birds.

## HISTORY OF THE PARK

The government, recognizing the importance of these natural resources, has taken steps to conserve them and to make necessary improvements and developments for the public benefit. Khao Yai was proclaimed a national park in November 1959 and was officially opened in February of 1962. In 1960 the Council of Ministers set up a committee for its development and management. Forty kilometers of asphalt road 10 meters wide were constructed by the High-Way Department from the Friendship Highway to the center of the park's tourist development at Nong King in addition to a

10 kilometer dirt access road. Trails to scenic points have been laid out, areas around the waterfalls improved, and living quarters for the law enforcement forestry officers have been constructed. The Ministry of Agriculture has been authorized to define the boundaries of the park so that there will be no further destruction of the forest and in 1965 it set aside about 30 square kilometers inside the park to be managed by the Tourist Organization of Thailand. The bungalows and restaurant, which were constructed by the Lottery Bureau in 1961 for tourists, and the 18-hole golf course, built in 1962, are within this area.

## VEGETATION

The great variety of scenery that Khao Yai National Park encompasses ensures a corresponding variety of vegetation.

The evergreen forests are generally found on the banks of creeks and on steep slopes where many species are found including *Dipterocarpus gracilis*, *Dipterocarpus costatus*, *Skorea sericeiflora*, *Hopea odorata*, *Aquilaria crassna*, *Cedrela toona*, *Cinnamomum siamense*, *Gmelina arborea*. The epiphytes are:- *Lycopodium phlegmaria*, *Lycopodium sq.*, *Rhynchostylis Ophioglossum pendulum*, *Platynerium sq.*, *Epipremnum sq.*, *Esia albidotomentosa*.

The deciduous forests are usually found on the lower part of the hills within the area of Nakorn Rajsima Province and is composed of such species as *Lagerstremia spp.*, *Pterocarpus spp.* etc. which shed their leaves in the dry season.

## WILDLIFE

Herds of deer and wild animals such as elephants, tigers, bears, wild hogs, gaurs, porcupines, mouse deer, barking deer, sambar deer, civets and mongooses are native to the area and may be seen along the road, especially at night, and from the Wildlife Watch Tower as they emerge from the thickets early in the morning or late in the evening. There are also many kinds of birds such as the Emerald Dove, Wood-peckers, Minivets, Little Pied Hornbill, Silver Pheasant, Great Hornbill, Lorikeet, Sunbirds, Red-bills, Blue Magpies.

## WATERFALLS

Khao Yai is well known for its numerous waterfalls, the biggest and most beautiful being Nang-Rong, while Hew Suwat has a drop of about 25 meters; near the Orchid waterfall a variety of orchid species can be seen, and Kong Keow is situated near the park office.

## OTHER ATTRACTIONS

The Khao Yai Shrine at the entrance of the Park has been built to enshrine the spirit that guards Khao Yai Forest. Visitors may go in to pay their respect and pray for their own blessing and safety.

The Rattan Suspension Bridges crossing Lamtakong Creek may be regarded as masterpieces of forest engineering. Beautiful panoramic views of the forests and countryside may be enjoyed from The View Point near the park entrance and the Forest Department's Rest House. The Office of Tourist Organization runs ten bungalows, eight motels, and five tourist cottages plus the restaurant and the golf course. In addition there is a camping ground which may be used by requesting permission from a forest officer. For hikers there are 23 kilometers of trails, mainly following the streams, often leading to waterfalls and passing through dense forest, open grass fields and valleys.

Hints for visitors and list of park regulations will be found in Annex I and II.

## ANNEX I

### Hints for visitors to the National Park

1. The road leading up the hill is steep and narrow in parts, so, please check your car, follow the traffic signs and drive carefully.
2. The waterfalls may be slippery at some places so be careful in swimming and walking along the stream.
3. You may encounter wild animals and camping all alone in the jungle would not be advisable.
4. Be careful with your drinking water. Boiled water is always preferable.
5. Staying overnight you need a mosquito net to prevent malaria.
6. Snakes and leeches may be found in the muddy fields and in the dense forest. It is therefore necessary to be cautioned about them while hiking through such areas.

## ANNEX II

### The National Park Regulations

The National Park belongs to the people. It is the duty of everyone to keep it clean. The Royal Forest Department asks for your co-operation in the following matters:

1. Do not carry any kind of shooting rifles within the National Park area.
2. Do not damage trees, plants, or take away orchids or other vegetation of any kind from the National Park.
3. Do not shoot or hunt in the National Park.
4. Take all precautionary measures to prevent forest fire.
5. Help us to keep and maintain all kinds of signs erected in the area for the benefit of visitors.
6. Before camping in the National Park, please contact the National Park officers, who will assist you in the selection of a proper camp site.
7. Please bear in mind that within the National Park nature and sceneries are to be preserved in the best manner possible.
8. In case of emergency please report immediately to the officers in charge.

# Plan for the Conservation of Nature in Vietnam<sup>1</sup>

by

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## SUMMARY

Vietnam with its variety of climate, and topography offers great opportunities for the systematist and the ecologist. A list of proposed national parks and reserves in both low and high altitudes is given. The author makes a plea for regional co-operation in establishing parks in order to obtain maximum efficiency.

## INTRODUCTION

Owing to its location at the crossroads of several regions and to the variety of its climate and topography, Vietnam offers numerous possibilities to scientists in the study of ecology, flora, and fauna. Consequently, the conservation of nature in this country is of great interest both to the systematist and the ecologist.

Since 1958, thanks to the efforts of IUCN, the public authorities have been interested in and concerned with the safeguarding of natural resources. The study of the principal sites to be protected was undertaken at the request of the government, thanks to the assistance of Dr. Ruhle, National Park Service of the U. S. A., in 1961. The National Conservation Committee was founded in 1965, consisting of representatives from the Ministries of Education, Agriculture, and Public Works. The National Park at Trang-bom, created in 1958, will be put on a continuing basis; the national parks of Bach-Mã and Hai-Van are awaiting ratification.

It is with this encouraging prospect that we propose today the following suggestions.

## CONSERVATION OF ANIMALS THREATENED WITH EXTINCTION

The existing laws are ineffective in protecting some rare animals (rhinoceros, tapir, kouprey and gaur, etc.), and we should also draw attention to the necessity of protecting some habitats used by migratory birds. Among the interesting sites some, such as Iles Paracels, Iles des Pecheurs, and Iles des Deux-Freres, could be easily converted into reserves. Among other sites, those which are in mangrove forests deserve special attention. In fact, exploitation and management of mangrove forests will bring as yet little known but certainly harmful changes to bird life. Therefore, an urgent need is a study of migratory birds, in their habitat, their egg-laying site at present, etc. Vietnam lacks ornithologists. Help from the IUCN would be very useful particularly as the latter might co-ordinate research in several countries at once.

## THE CONSERVATION OF FLORA

The ground flora is relatively better known than the fauna although some regions are better explored than others. The preservation of the former, of course, goes together with that of the ecological sites. Protection is absolutely necessary for these areas which serve as type localities for many endemic species, comprising ten to twenty per cent out of a total of about 7,000 species. The regions of Bach-Mã, Vong-Phu, Hòn-Bà, Dalat, and Châu-dốc can be mentioned.

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<sup>1</sup> Original in French.

The conservation of two important ecological factors, namely climate and water, should be a concern of primary importance, not only for the technically advanced countries, but also for developing ones. In effect, for many countries in the latter category, the ratio of forests to the cultivated areas is already close to the optimum, beneath which there is a great risk of harmful and hardly remediable change of climate. In Vietnam as in most countries of South East Asia prevention of over-exploitation of forests, fire fighting and plans for the decrease of shifting cultivation are insufficient. The alteration of the climate is sometimes perceptible in one generation.

In this connection, we wish to point out that the project for the installation of an oil refinery at Nhatrang is not advisable; the residues of this industry would surely change, not only the hygienic conditions of the best seaside resort in Vietnam, but also the ecological conditions for marine fauna and flora, which are amongst the best known of the China Sea.

## **PROTECTED SITES**

In connection with the sites to be protected, we propose the following:

### **Regions of Low Altitudes**

The regions of low altitudes are those that are adjacent to the populated areas. They are the most threatened and moreover, difficult to protect.

The Con-Son Island (Poulo-Condor) located at the mouth of the Mekong River has a rich vegetation, unspoiled and relatively well explored. Its flora is interesting because it represents the most southern flora conserved in Vietnam.

The Châu-dộc mountains, among which is the Nui-Cam (716 meters), are also interesting. Besides a few endemic and rare species found there, its vegetation gives an idea of the original vegetation of the country. We hope that the Nui-Cam, which is at the moment a forest reserve, could be usefully made into a completely protected reserve.

The Col de Blao and the Cap Varella are already on the list of reserves to be created in the 1961 project submitted to the government. The Col de Blao, uninteresting from the economic point of view, contains a fauna and flora ranging from the plain level to the sub-montane level (1, 000 meters). The Cap Varella represents one of the rare localities where the tropical forest descends to the sea level.

### **Regions of High Altitude**

Besides the region of Bach-Mâ-Hai-Van, already studied and protected and the Langbian region, which is mentioned in the aforesaid project of the Ministry of Agriculture, we wish to draw attention to two other regions:

The Region of Hòn-Bà, south of Nhatrang, reaching its highest point at 366 meters, the flora of which has been well studied.

The Chu-Yan-Sin, the highest point in Vietnam (2, 405 meters), economically is not very interesting but biologically important.

In short the system of reserves and national parks, which we are going to present to our national committee, has been selected so as to obtain a variety from the ecological point of view and to protect the interesting fauna and flora.

## **THE NEED FOR REGIONAL CO-OPERATION**

To be realistic, one must accept the fact that the creation of numerous parks and reserves necessary for the conservation of the flora, fauna and ecological heritage will be difficult in South East Asia for quite a long time.

Therefore, it would be desirable to co-ordinate the efforts of the various states in order to obtain maximum efficiency.

For the very close neighbouring countries where the biotypes are very similar (like the geographical Indochina) it would be useless to create reserves which are ecologically similar, but there is urgent need to establish together a system of diversified

reserves. Therefore, it would be desirable that people responsible for the conservation program of a country are knowledgeable about reserves and parks of neighboring countries in order to create in their own country a complementary system. Later on, when circumstances will allow, every country will, of course, be able to have its own complete system of biological reserves.

# Conservation of Limestone Hills in Malaya

by

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## SUMMARY

The importance of limestone hills in South East Asia as features worthy of conservation for their contribution to the landscape, study of geomorphology, geology, ecology of plants in specialized habitats and of animals in the peculiar communities of the caves, their major significance in biogeography and archaeology is reviewed. Religious and tourist interests are noted. The heavy pressure to exploit the limestone hills for valuable and/or easily accessible minerals is discussed in relation to the need to co-ordinate conservation and exploitation in a planned manner. The need for appropriate legislation and the efforts of those to obtain it are reported. A special plea is made for Batu Caves.

## INTRODUCTION

This account refers mainly to Malaya where limestone (like unmetamorphosed sandstone) is among the rarer of the major formations exposed above the surface. Limestone hills are more common in parts of Burma and Thailand, so that conservation problems are perhaps less pressing there (moreover the author has insufficient experience of these more northern parts of South East Asia). Sabah and Sarawak are somewhat better endowed with limestone hills than the States of Malaya and exploitation is only just beginning in East Malaysia, where dolomite is required as a fertilizer (freight constitutes nearly three quarters of the cost of imports from Malaya) and a need for constructional materials is developing. Therefore similar problems are likely to arise as in Malaya although perhaps more slowly.

## LANDSCAPE, GEOMORPHOLOGY AND GEOLOGY

The limestone hills rise precipitously from the valley floors as tower karsts, which either as single pillars or as groups form a very characteristic landscape. These provide valuable scenic relief especially in the Kinta Valley where the landscape has been devastated by hydraulic tin mining. (Molesworth Allen 1961). The geomorphology is imperfectly understood (Paton 1964 and Gobbett 1965) and quarrying may prevent proper assessment. Malayan limestone shows a wide range in chemical composition from calcite (calcium carbonate) to dolomite (the magnesium-calcium salt), the geological age varies and the degree of metamorphosis. Fossils are rare in the metamorphosed rocks adjacent to the granitic intrusions, but occur in the peripheral deposits (Jones 1961). Although paleontologists may welcome some exposures by quarries and mines, they can hardly be reconciled to the total destruction of some of the smaller sites.

## ECOLOGICAL HABITATS

The range of habitats is exceedingly wide, both outside on the hill surface and inside in the numerous caves. Limestone is free draining and liable to many forms of erosion, thus the topography is broken, desiccated cliffs and knolls alternate with damp hollows and 'hanging valleys'. Owing to the lack of silica or other residues after limestone has been dissolved in rain water the soil is usually very thin consisting in sheltered places of an accumulation of peaty plant remains subject to severe leaching. The variety of

habitats and their peculiarities, notably the base rich substrata and the aridity due to drainage in a region of heavy precipitation and generally acid soils, leads to a highly specialized and remarkably rich fauna and flora. However, each niche depends upon a precarious balance, which may not be restored even in decades, should it be destroyed or disturbed by exposure through the opening of quarries or by fire. Sometimes fire is spontaneous in the very dry vegetation, more often fire spreads accidentally from adjacent human activity and may be deliberately started by mineral prospectors or hunters (Molesworth Allen 1961, Anderson 1965). Rare species may be lost for ever during unnecessary fires.

Numerous caves are found within the limestone, most are almost totally dark except at their mouths and under chimneys. Usually moist within, but they range from underground streams to well drained and ventilated parts. The ecology of Malaysian caves has been discussed by Bullock (1965) and in relation to prehistoric man by Harrisson (1965).

## **FLORA, VEGETATION AND PHYTOGEOGRAPHY**

Fragmentary additions have been published since the most extensive account of the flora of Malayan limestone hills by Henderson (1939). Anderson (1965) and Tern Smitinand (1965) have described limestone vegetation in Sarawak and Thailand. The first UNESCO Limestone Flora Expedition to Kelantan in 1962 collected more material and its inception emphasized the urgency and importance of these studies. The need to preserve as many wild plant species as possible is widely recognized. These are the gene banks for crop improvement (for example twice recently collectors visited Malaya to obtain living wild banana material). Orchid breeding and production is a profitable trade in Singapore (and Bangkok) or other cross-roads of international airways. This too requires protection of the basic material. No one knows if phytochemistry may not require species yet undiscovered.

Such a conservation program for plants depends on protection of the habitats, there are too many plant species, not a few undescribed and unknown, for them to be kept in gardens even if their cultivation could be assured. Firstly, examples of common habitats must be preserved, but it is even more urgent to save examples of restricted or specialized habitats, in particular those such as limestone which have proved themselves by an abundance of rare species.

The limestone hills provide a refuge for plants which were probably once much more widespread as were perhaps the conditions they require. Now the limestone hills appear as islands in an ocean of unsuitable soils or other adverse environments. The distribution of the species upon these 'islands' is a study of far reaching consequence in the phytogeographic analysis of the history of the region, which is now dissected by sea barriers.

## **FAUNA AND ARCHAEOLOGY**

The only large mammal closely associated with limestone hills in Malaya is the serow, which seems to need access to their vegetation perhaps for nutritional reasons. Serow are reported to wander onto the granite hills as well but to return eventually to their own individual middens on limestone. The molluscs are found in abundance on the limestone hills and have evolved isolated local races (Van Bethem Jutting 1960; Tweedie 1961) and this provides a living laboratory for the study of speciation in action. We do not know how little limestone cliff is needed to conserve a unique species of mollusc or how great a value there is in doing so, the answers will probably only be known too late. It is likely that other invertebrates show great variety and speciation because of the varied habitats, vegetation and isolation.

Within the caves, in particular in those which are totally dark, there is a complex network of predators, parasites and scavengers dependent ultimately on the food brought in by the huge colonies of bats and/or birds (Bullock 1963, 1965; McClure 1961, 1965; and Dunn 1965). There are few more fascinating communities rewarding to various zoological specialists, in particular parasitologists. Man himself must be included among the prehistoric fauna. His remains and artifacts, stratified in the bat guano of the limestone caves, have been the principal source of archaeological data in the whole region (Harrisson 1961, 1965; Lamb 1965; Peacock 1965).

## **OTHERS INTERESTED IN CONSERVATION**

The tourist presumably appreciates landscape conservation. In the caves the beauty of stalactite and stalagmite may be seen. The Temple Cave of Batu Caves, Kuala Lumpur, is the only natural feature of tourist interest within easy reach of the federal capital. Mention of the Temple Cave recalls the religious interest in caves since pre-historic man chose caves as burial places until the present day when, following strong traditions of their homelands, Hindus use them as temples and the Buddhists establish monasteries in them. Although considered by some to be exploiters of the caves, the collectors of birds' nests for soup have ultimately an interest in the conservation of the swiftlets themselves and the caves, which shelter them, and hence the hills.

Some do not regard these latter activities as compatible with the scientific. However, apart from the need to respect others' interests, it is often essential to combine every reason in favor of conservation to make a case which will receive attention from the authorities, who are hard pressed by economic arguments for exploitation and destruction.

## **EXPLOITATION**

The extraction of guano and consequent prevention of controlled excavation is detrimental to archaeology, but probably not seriously so to other features for conservation. Attention may be drawn to slightly costlier but more efficient forms of phosphate fertilizer (Watson 1964). Other forms of exploitation concern minerals, for example lead tin mining at Kaki Bukit, iron ore extraction near Ipoh (in which prospecting methods are very destructive) and even gold mining underground in Malaya but affecting the hills in Sarawak. Calcite is wanted by the cement works and dolomite for fertilizers. The limestone of various types in between, with too much magnesium for cement or too little for fertilizer, goes for general construction work, for marble slabs, road foundations and railway ballast. All these involve quarrying and eventual total destruction.

In many cases hydraulic tin mining exposes underground limestone, which may be more suitable for specialist uses than limestone from the hills, this is done without further damage to the landscape at Rawang by Malayan Cement in search of calcite. However, it is cheaper to blast down the hills than to pump out the mines and lift out the rock in the case of the larger general consumers, which are mainly official bodies (public works and railways) and consequently continue to work their quarry leases to the detriment of the hills in the interest of the national purse. Often when underground rock might be more suitable this is blocked by problems over leases and land alienation law.

## **CONSERVATION LEGISLATION**

In the Federation of Malaya, Antiquities and Treasure Trove Ordinance No. 14 of 1957, provides for complete control of excavation, including guano. In practice a license to dig guano is only refused if the archaeological importance of the site can be established first. Occasionally public appeal may be successful, but the solution must come from training more Malaysian archaeologists to be able to investigate the sites. Ten acres of temple reserve is protected by law around the established shrines, but this is quite inadequate for scientific purposes, the center of the site usually being disturbed anyway.

Certain limestone outcrops, including caves, occur in the Taman Negara (National Park), Anak Takun lies in Templer Park near Kuala Lumpur, but otherwise the majority of the limestone hills in Malaya are unprotected by any conservation enactments. Furthermore there is as yet no general legislation for the creation and protection of nature reserves. (Other States in Malaysia are better provided for in this respect). The first requisite is some more general legislation on nature reserves in the States of Malaya, this is being studied by the government authorities.

Until areas of importance can be gazetted as permanent nature reserves, local opinion must be harnessed to encourage government departments to co-ordinate their efforts towards conservation policy. 'Conservationists' must play their part in studying the

areas, so that positive proposals may be advanced, which hills or parts thereof should be preserved, which may be turned over for exploitation, also constructive suggestions on alternative materials or sources for the products of the hills. Since there is no government department in the States of Malaya definitely responsible for investigation of conservation needs or to exercise this co-ordination, much of this work falls on amateurs or professionals working on a non-official basis; the time they can afford and the influence they can wield is limited. Their proposals are forwarded to State and Federal authorities by the individuals or more often through bodies such as the Malayan Nature Society or the Batu Caves Protection Association, latterly there has been a move towards trying political, i.e. parliamentary, channels.

Eventually the future of conservation in Malaya will depend upon moulding strong, well-informed public opinion to press for departmental co-ordination and the necessary legislation to declare and maintain inviolate nature reserves in the face of heavy capital investment and strong economic arguments in favor of exploitation. Local success has been achieved near Ipoh and at Batu Caves in the re-allocation and re-alignment of quarry leases. However, it is possible for these decisions to be over-ridden in future, and there is clearly scope for further improvement in the present situation.

In conclusion special mention of Batu Caves should be made. This is the southernmost limestone hill on the actual land mass of Asia. Previous work has shown its biological significance and it is conveniently situated near the University of Malaya. The preservation of this hill is sought by religious and tourist interests also, nevertheless quarrying continues, some of it threatening one or another aspect of its fauna and flora. Those united in the Batu Caves Protection Association will appreciate any support in their efforts to save the important features from destruction.

#### LITERATURE CITED

- Anderson, J.A.R. 1965. Limestone Habitat in Sarawak Proceedings Symposium on Ecological Research in Humid Tropics Vegetation, Kuching, Sarawak, 1963, 49. Government of Sarawak and UNESCO.
- Bullock, J.A. 1963. Notes on the cave faunas of two limestone massifs in the Taman Negara. *Malay. Nat. J.* 17: 46.
- 1965. The Ecology of Malaysian Caves. *Malay. Nat. J.* 19: 57.
- Dunn, F.L. 1965. Gua Anak Takun: Ecological Observations. *Malay. Nat. J.* 19: 75
- Gobbett, D.J. 1965. The Formation of Limestone Caves in Malaya. *Malay. Nat. J.* 19: 4.
- Harrison, T. 1961. Prehistoric Fauna Changes and Losses in Borneo. Nature Conservation in Western Malaysia 1961. *Malay. Nat. J. Spec. Issue:* 89.
- 1965. Further Cave Exploration and Archaeology in East Malaysia. *Malay. Nat. J.* 19: 31.
- Henderson, M.R. 1939. The Flora of the Limestone Hills of the Malay Peninsular. *J. Mal. Br. Roy. As. Soc.* 17: 13.
- Jones, C.R. 1961. Fossils in Malaya. Nature Conservation in Western Malaysia, 1961. *Malay. Nat. J. Spec. Issue:* 83.
- Lamb, A. 1965. Early Mahayana Buddhist Shrines in the Malayan Limestone. *Malay. Nat. J.* 19: 36.
- McClure, H.E. 1961. Batu Caves, Kuala Lumpur. Nature Conservation in Western Malaysia 1961. *Malay. Nat. J. Spec. Issue:* 73.
- 1965. Microcosms of Batu Caves. *Malay. Nat. J.* 19: 65.
- Molesworth Allen, B. 1961. Limestone Hills near Ipoh. Nature Conservation in Western Malaysia 1961. *Malay. Nat. J. Spec. Issue:* 68.
- Paton, J.R. 1964. The origin of the Limestone Hills of Malaya. *Journ. Trop. Geogr.* 18: 134.

- Peacock, B.A.V. 1965. The Prehistoric Archaeology of Malayan Caves. *Malay. Nat. J.* 19: 40.
- Tem Smitinand. 1965. The Vegetation of Doi Chiengdao a Limestone Massive in Chiangmai, North Thailand. Proceedings Symposium on Ecological Research in Humid Tropics Vegetation, Kuching, Sarawak, 1963, 39. Government of Sarawak and UNESCO.
- Tweedie, M.W. F. 1961. On certain Mollusca of the Malayan Limestone Hills. *Bull. Raffles Mus.* Singapore 26: 49.
- Van Bethem Jutting, W.S.S. 1961. Non-marine Mollusca of the Limestone Hills in Malaya. Proceedings of the Centenary and Bicentenary Congress of Biology Singapore 1958: 63.
- Watson, G.A. 1964. The Effects upon the growth of *Hevea* of ten phosphatic fertilizers, passim Annual Report Head, Soils Division, Rubber Research Institute of Malaya, 1963: 22.

(Of various alternative references those in the Malayan Nature Journal have been given, however parallel and more detailed accounts of the archaeological work may be found in journals such as that of the Malayan Branch of the Royal Asiatic Society or of the Sarawak Museum).

# Game Reserves and Other Aspects of Wildlife Conservation in Thailand

by

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*Director General, Royal Forest Department, Bangkok, Thailand*

## SUMMARY

Thailand has a rich variety of wildlife which until World War II led a relatively tranquil existence in secluded forested mountain areas. Since that time, for many reasons, chief of which is unregulated hunting, wildlife has been depleted rapidly. A government act to limit this hunting has been largely unimplemented because of the lack of money and trained man power in the Royal Forest Department. It is hoped to remedy this with the aid of various international organizations.

Thailand abounds in a variety of natural resources among which wildlife is one of the most valuable. The country has a large area of mountainous forest which until World War II provided a tranquil refuge for this wildlife.

Since then however, the increases in population, professional and amateur hunters, roads, modern lethal weapons, and agricultural lands have depleted the wildlife. Unregulated hunting has caused the extinction of the beautiful Schomburgk deer (*Cervus schomburgki*) at one time abundant in the jungle and savanna of Thailand and brought other rare and valuable species such as the Javan rhinoceros (*Rhinoceros sondaicus*) and wild buffalo (*Bubalus bubalis*) to the verge of extinction.

To guard against the further destruction of this invaluable national wildlife resource the government promulgated the 'Wild Animals Reservation and Protection Act B. E. 2503' for which we, as Thais, should feel thankful. However, although this act has been in effect for almost five years, its execution has not advanced far. The Royal Forest Department is limited severely by a small budget and a lack of forest personnel directly responsible for enforcing the act. It requires time to study means of control, grant licenses, and to learn many new techniques about wildlife before successful measures can materialize. Furthermore there is a lack of close co-operation with other government agencies dealing with the same problem.

Certain portions of the public do not yet realize the value of wildlife as a resource for the common good, and, in hunting, put their own selfish interest for food and pleasure foremost. The Royal Forest Department is handicapped in trying to curb violators of the Act in that it has insufficient and ill-equipped personnel. Most hunters today own better quality vehicles and guns than the already overworked forest officers. For these reasons insofar as the present man power and budget will permit the Forest Department has tried to select three or four game reserves in Thailand in secluded locations where wild animals are still plentiful.

The aim of setting up reservation areas is to create wildlife sanctuaries where the animals can live in peace and reproduce abundantly, with the hope that wildlife as a natural resource will be an inheritance for posterity. In addition to establishing sanctuaries the Royal Forest Department will try to train game wardens in various technical aspects of wildlife. Research will deal with the utility of wildlife, collection of specimens throughout the country, study of their habitats, survey of species, and numbers – all of which will enhance the method of wildlife management in the future. Co-operation with and aid from the IUCN, the World Wildlife Fund, and FAO will be sought in order that Thailand as a whole will benefit from wildlife as one of its most important natural resources.

## **Closing Plenary Session**

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During the Closing Session of the Conference the Resolutions Committee presented their resolutions which were discussed, modified and approved by the Conference. Following three talks 'looking ahead' to hoped for conservation activities in the future, came concluded remarks by 6 officials of the Conference sponsoring agencies and organization.

## Resolutions Committee

The Resolutions Committee appointed by the Conference included the following participants:

Chairman:	Dusit Banijbatana	–	Thailand
Secretary:	Hugh F.I. Elliott	–	United Kingdom
Members:	Abdul Aziz Umar	–	Brunei
	A. Rahman-Ali	–	Malaysia
	Sisavang Chanthepha	–	Laos
	Chew Wee Lek	–	Singapore
	Pham Hoang Ho	–	South Vietnam
	Dioscoro S. Rabor	–	Philippines
	Otto Soemarwoto	–	Indonesia

# The Resolutions Approved by the Conference at the Closing Plenary Session

## Resolutions Concerning Organization, Control and Management

1. A Regional Conservation Organization for South East Asia.

*Recognizing* the variety of organizations concerned with conservation in South East Asia –

*believing* that there is a need for a regional body to list, keep in contact with and co-ordinate approaches to these organizations, and to assess the conservation requirements of the region as a whole – and *believing* that this body should include representatives of each country of the region, and aim at securing the closest liaison with conservation organizations and individuals, and with all other local, national and international organizations concerned, if duplication of effort is to be avoided –

The IUCN Conference on Conservation of Nature and Natural Resources in Tropical South East Asia, meeting at Bangkok on 4 December 1965 –  
RECOMMENDS that IUCN should initiate discussions with a view to establishing a regional conservation organization at the earliest practicable time under appropriate international sponsorship.

2. Resource inventories, research and land use programs.

*Considering* that information on natural resources requires to be based on comprehensive resource inventories, drawn up on established principles and including reference to socio-economic factors such as land tenure and agricultural methods –

and *recognizing* that in planning the management and utilization of natural resources, it is essential that these resources be treated as a whole and that the research services supporting them should be interdisciplinary –

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RECOMMENDS the organization in all countries of national resource inventories, the establishment of research services on an interdisciplinary basis, the setting aside of adequate samples of the main types of environment for research purposes, and the framing and application of land use policies on the basis so provided.

3. Co-ordination of Conservation Legislation

*Considering* the variations in the type and scope of legislation affecting conservation of natural resources in general, and National Parks and wildlife in particular, which is to be found in the countries of South East Asia –

and *believing* that it is desirable to establish basic standards and as much uniformity as possible –

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RECOMMENDS that through appropriate channels such as the IUCN Commission on Legislation and the Legislation Research Branch of F. A. O., summaries of existing laws having been collected and listed should be made available to Governments, departments and organizations concerned, supported by suggested 'model legislation', based on a comparative study of the material, to facilitate future revision and co-ordination.

#### 4. Support of the World Wildlife Fund (W. W. F.)

*Having noted* with appreciation the support given to a number of projects in S. E. Asia by the World Wildlife Fund –

*being aware* that many nations in the region are reaching economic levels which may permit some voluntary contribution from industry or from wealthy individuals towards conservation development in their own countries –

*noting* the stimulus to conservation provided by the concept of a world movement –

and *recognizing* that fund-raising requires specialized techniques based on experience –

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URGES conservationists in South East Asia through their organizations to become affiliated with W. W. F., either by the formation of a National Appeal or in some other appropriate manner.

#### 5. Conservation and Ecology in the Mekong River Development

*Recognizing* that the development of the Mekong River, so important to the future welfare of the peoples of South East Asia, will be one of the most comprehensive programs of resource development yet undertaken in the world –

and *believing* that ecological investigations associated with the development plans may not only permit 'biological salvage', by recording biological and environmental phenomena which may have to be disturbed or destroyed, but may also sometimes suggest alternative proposals that can save unique natural values that might otherwise be lost, so contributing directly to the effectiveness of the whole development program –

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URGES the countries involved as well as the many national and international organizations participating in the development project, to give greater attention in this and all similar projects with which they may be concerned in the future, to ecological investigations as an integral part of the vital resource analyses supporting the planning.

#### 6. Control of pests by toxic chemicals

*Recognizing* the importance of more efficient and extensive control of crop pests in South East Asia, but also the fact that the wholesale use of pesticides in temperate countries has resulted in new pest problems and in adverse side-effects on wildlife resources, which could be even

more serious if these temperate control practices are transplanted to a tropical environment –

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RECOMMENDS restriction whenever possible of the use of more toxic unselective pesticides and the intensification of basic and applied research into pest populations and their control, in order to develop efficient control practices for the Region which make maximum use of biological, cultural or natural control methods, supplemented only where necessary by *selective* chemical or artificial methods, which are likely to cause minimum damage to the environment and its flora and fauna.

## RESOLUTION ON RESEARCH AND EDUCATIONAL FACILITIES

### 7. Support of the International Biological Program

*Recognizing* that the International Biological Program (IBP) provides an unprecedented opportunity for biologists to participate in a worldwide study of man and his environment –

and *believing* that the ecological nature of IBP promises to provide a scientific basis for conservation hitherto not generally available –

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URGES the biologists of the Region to participate in IBP to the fullest possible extent and, especially, to design programs and projects which will permit maximum co-operative scientific effort among all the countries of South East Asia.

### 8. The UNESCO Regional Working Group on Conservation of Nature and Natural Resources in Tropical South East Asia

*Commending* the UNESCO South East Asia Science Co-operation Office for its initiative in organizing the Regional Working Group –

and *recognizing* the valuable precedent set for the establishment of such groups in tropical regions of the world –

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strongly SUPPORTS the continuation and strengthening of the work of this Group, especially in the general fields of education and research.

### 9. Ecological Research and Conservation in connection with the International Biological Program, Indonesia.

*Commending* the proposals of the Council for Science of Indonesia in support of IBP for ecological study and conservation of natural areas, especially those with rare species or constituting rare habitats such as the Ujung Kulon Reserve, where it is intended to establish a research station –

and *congratulating* the Indonesian Directorate of Forestry for the part it is playing in protecting and administering these conservation areas –

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RECOMMENDS that the program of study and conservation should be extended to other areas of outstanding biological interest, such as the Loser Reserve in Sumatra, and that this work should receive all possible assistance.

10. Institute of Environmental Sciences, Thailand

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Strongly ENDORSES the concept of establishing in Thailand an Institute of Environmental Sciences as part of the International Biological Program and of the network of similar centers for research and learning being organized with the co-operation of the Smithsonian Institution.

11. Collaboration of conservation experts with local natural resources departments and conservation organizations

*Bearing in mind* the importance of treating the conservation of nature as an integral part of the conservation of all natural resources –

and *recognizing* the ever increasing interest in conservation not only on the part of organizations particularly concerned with wildlife but also of all departments and institutions concerned with natural resources, because of the critical problems facing man's fast expanding population in relation to its dependence on dwindling resources and of the consequent need to establish their management on a basis of 'sustained yield'–

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URGES all engaged in furthering the purposes of nature conservation, and particularly visiting conservation experts, to collaborate with all natural resource departments, institutions and organizations and make full use of their knowledge, experience and facilities, when preparing plans and drawing up recommendations.

12. Development of Conservation Education

*Considering* that the essential long-term basis for the conservation of natural resources as an integral part of economic development lies in education, and that this needs to be approached at the three levels of formal education in schools, formal education in institutions of higher learning, teacher training and other vocational training, and public education involving information and extension services –

and *convinced* of the importance of the exchange of ideas and experience of educational methods, provided there is adequate machinery to adapt such methods to regional and national requirements and traditions –

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RECOMMENDS that efforts should be intensified to promote the investigation of regional and national requirements in South East Asia in the field of conservation education, in consultation with Unesco, FAO and IUCN's Commission on Education; and, in particular, consideration should be given to the possibility of setting up a South East Asia Committee

comparable to the North-West Europe committee of the Commission. The conference further RECOMMENDS that, where this has not already been done, educational authorities should make particular provision for including instruction in the conservation of nature in the curricula of primary and secondary schools.

13. Supply of educational materials

*Aware* of the shortage of materials for the teaching of and arousing interest in conservation of nature and natural resources in many parts of South East Asia, and of the fact that it is undesirable to make use of materials available elsewhere unless they are first properly revised and adapted to suit local conditions –

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RECOMMENDS that the assistance of appropriate international agencies should be sought in facilitating or financing the preparation and supply of such materials.

14. Short-term training programs

*Bearing in mind* the lack of field experience of problems related to environmental management and conservation, which is evident in South East Asia, particularly among teachers and the middle grades responsible for managing and developing National Parks and equivalent reserves –

and *believing* that it is essential to institute short-term training programs for such cadres, pending plans for establishing permanent middle-grade training institutions comparable with those which have been developed elsewhere with the assistance of FAO and other international organizations

The IUCN Conference on Conservation of Nature and Natural Resources in Tropical South East Asia, meeting at Bangkok on 4 December 1965 –

RECOMMENDS that attention should be given to the possibility of recruiting through international or bilateral aid programs a team or teams of experts to visit the countries of the Region and, in close collaboration with local specialists, to plan and initiate suitable courses of instruction.

## **RESOLUTIONS ON SECURING THE SURVIVAL OF THREATENED SPECIES**

15. Action programs for threatened species

*Considering* that the Red Data Book of the Survival Service Commission of IUCN lists 14 species of mammal and 24 species of birds in South East Asia, which there is good reason to believe are approaching extinction –

and *recalling* the economic, scientific, ethical, and aesthetic reasons for safeguarding and rehabilitating such species, while it is still possible to do so, and the urgency involved –

The IUCN Conference on Conservation of Nature and Natural Resources in Tropical South East Asia, meeting at Bangkok on 4 December 1965 –

RECOMMENDS that the Governments of the countries of the Region be invited to set up programs, in consultation with their scientists and with the assistance of international organizations concerned, especially IUCN's

Survival Service Commission and the International Council for Bird Preservation to ensure that essential measures to safeguard and rehabilitate species threatened with extinction are instituted and implemented urgently.

16. Research on biology of the Orang-utan

*Considering* that it is now well-known that the steep decline in wild populations of the Orang-utan may soon lead to its extinction, and that this would be a calamity from the scientific and many other points of view, which can still be avoided by wise planning based on knowledge of the biology of the species –

and *considering* that the existing state of this knowledge is still quite unsatisfactory –

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RECOMMENDS that the Governments directly concerned be asked to appoint research officers to carry out long-term studies of the breeding biology and behaviour of the species, on the lines of those recently carried out in the case of another endangered primate – the Mountain Gorilla.

17. Rehabilitation of the Monkey-eating Eagle, Philippines

*Bearing in mind* the Resolution adopted by the International Council for Bird Preservation (1962), calling for urgent measures to safeguard the remnant of this species, and the fact that it is not only a species of the greatest scientific interest but also the most famous of the whole outstanding avifauna of the Philippines –

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RECOMMENDS that the attention of the Government of the Republic of the Philippines be again called to the international importance attached to the survival of the Monkey-eating Eagle, and that it should be asked to intensify all possible measures accordingly.

18. Rehabilitation of the Tamarau, Philippines

*Learning* with alarm of the serious situation of the Tamarau, an animal unique to the Philippines of which less than 100 may now survive –

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REQUESTS the Government of the Republic of the Philippines to set aside areas in which the species can be assured absolute and effective protection, and to support such measures by a scientific program of propagation of a small captive herd.

19. Study of the Giant Catfish

*Believing* that two species of Giant Catfish *Pangasius sanitwongsei* and *Pangasianodon gigas*, are in some danger of extinction and aware that little is known of their biology on which to base a conservation program –

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RECOMMENDS that UNESCO (SEASCO) and FAO (IFPC) be requested, in consultation with the Survival Service Commission of IUCN, to consider establishing and assisting research in Thailand, Cambodia and Laos, directed towards an understanding of the life-cycles of these species, as a basis for securing their survival.

20. Further Research on the Leathery Turtle.

*Recognizing* that the Leathery Turtle, *Dermochelys coriacea* is one of the world's most seriously threatened reptiles –

*and commending* the research, management and conservation techniques which have been initiated and developed during the recent years in Malaysia –

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RECOMMENDS that the Government of Malaysia be invited to promote, in consultation with IUCN, UNESCO, FAO, WWF and other appropriate agencies, further intensive research into the biology, ecology and population dynamics of the Leathery Turtle.

21. Research on Marine Turtles

*Recognizing* the economic importance of marine turtles in South East Asia as a resource –

*and believing that* over-exploitation constitutes an increasing threat to their continued existence, although it is well known that management of turtle-egg incubation and hatchling distribution can increase the number of young turtles reaching the sea –

*believing* also that proper management and conservation of stocks depends on a much wider knowledge of the biology of the various species than at present exists –

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RECOMMENDS that Governments of the countries of the Region be invited to seek advice from appropriate agencies for the purpose of urgently initiating research, management and propagation programs designed to lead to a recovery and build up of marine turtle stocks.

22. Use of Field Immobilization techniques

*Noting* the widespread interest in immobilization techniques based on drugs for the capture of wild animals, and the fact that suggestions for the use of these techniques in capturing rare and threatened species are now being made in most countries of South East Asia –

*and recognizing* that when properly used such techniques can be successful, but that there is always a grave risk attached to them and, if employed by inexperienced persons, especially on species not previously immobilized or under different environmental conditions from those in which trials have taken place, they may have little chance of leading to successful capture and every chance of resulting in injury or death of the animals–

The IUCN Conference on Conservation of Nature and Natural Resources in Tropical South East Asia, meeting at Bangkok on 4 December 1965 –

RECOMMENDS that these techniques should not be used on rare or threatened species, except when employed by highly qualified and experienced personnel who have carried out all the necessary experimental work on methods, drugs and doses, so that these can be applied with confidence to the species and environmental conditions involved; and then only when equal or better results cannot be obtained by conventional capture techniques.

23. Controlled breeding of threatened species in captivity

*Bearing in mind* that the decline and extinction of species is often due to alteration or destruction of their habitat, and that sometimes it is impossible to halt such processes in time to ensure recovery of the species conserved –

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RECOMMENDS the establishment under controlled conditions by responsible institutions and approved individuals, of breeding stocks of such threatened species, and further recommends that, on the advice of scientists and organizations concerned with this problem, Governments should be asked to enact legislation to permit and encourage, but under strict control, such emergency measures for the rehabilitation of these species.

24. Use of explosives and toxic vegetable substances in fishing

*Convinced* that the wholesale and unselective disturbance and destruction of fish stocks and their habitat by the use of explosives and toxic vegetable substances, can too easily lead to a catastrophic decline and perhaps total elimination of economically valuable fish resources –

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RECOMMENDS that Governments should be asked to examine the use of these methods with the greatest care and to place them under the strictest control or prohibit them entirely.

## **RESOLUTIONS ON NATIONAL PARKS AND THE SAFEGUARDING OF HABITATS**

25. *Recalling* the recommendations of the First World Conference on National Parks (Seattle, July 1962) and of Resolution No. 12 C./2. 213 of the General conference of Unesco (12 December 1962) as endorsed by the U.N. General Assembly (16 December 1962), in favor of conservation of natural resources, fauna and flora –

*being aware* of the importance of National Parks, and equivalent reserves not only for the enjoyment of the people, but also for scientific study, watershed protection, wildlife sanctuary and protection of natural monuments and phenomena –

and *considering* that areas set aside for such purposes are only a small fraction of the total area of most countries, seldom exceeding 2 or 3 per cent –

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RECOMMENDS that pressures on duly constituted Park areas for use for purposes contrary to the principles on which Parks are set up, should be discouraged, diverted or totally barred, and that all Governments of the Region should be asked not only to establish an adequate system of National Parks, but ensure that it is placed on a firm and permanent legal basis.

26. Creation of Orang-Utan reserve, Ulu Segama, Sabah

*Bearing in mind* the present heavy drain on remaining wild populations of Orang-utan, and the difficulties of providing early and adequate training of research workers on the breeding biology of the species, as a basis of measures for ensuring its survival –

The IUCN Conference on Conservation of Nature and Natural Resources in Tropical South East Asia, meeting at Bangkok on 4 December 1965 –

RECOMMENDS, as an essential provision in the immediate future for safeguarding a sufficiently large wild population of Orang-utan, the establishment of an area of 700 square miles at Ulu Segama in eastern Sabah as a Game Sanctuary, which would also have very valuable general conservation interest.

27. Use of Sungei Dusan reserve, Malaya, for protecting Sumatran rhinoceros

*Commending the* Government of Malaya for the establishment of the Sungei Dusan reserve at Ulu Bernam for the very rare Sumatran rhinoceros –

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REQUESTS the Government of Malaya as a matter of urgency to ensure that effective measures are taken to protect the Sumatran rhino in this reserve, so that it may fulfill its most important purpose.

28. National Parks and Reserves Policy, Malaysia

*Recognizing* that the Legislatures of the States of Malaysia have taken wise and far-sighted measures in establishing a system of Forest and Game Reserves, and National Parks –

and *believing* it desirable that this system should be extended and strengthened, and placed on as uniform a legislative and administrative basis as possible –

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RECOMMENDS that the Government of Malaysia be requested to develop the greatest possible co-ordination of policy and legislation, while extending reservation and control to wildlife species and areas of particular scientific interest not yet covered by the existing system, with particular reference to rare formations, such as limestone hills and the Batu Caves; and further RECOMMENDS as a matter of urgency financial support for taxonomic and ecological research in these limestone areas.

29. Creation of a Taal Volcano National Park, Philippines

*In view* of the outstanding biological interest and remarkable natural features of the Taal Volcano island, enhanced by the recent eruption –

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REQUESTS the Government of the Republic of the Philippines to take appropriate legislative and administrative measures to establish a Taal Volcano National Park, thus taking advantage of the present opportunity to safeguard a unique national asset.

30. Ujung Kulon Reserve, Indonesia

*Considering* that this world-famous reserve now constitutes the last certain habitat of the Javan rhinoceros, whose survival therefore depends entirely upon the maintenance of the reserve –

and *commending* the Government of the Republic of Indonesia for its recognition of this fact –

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REQUESTS the Government of Indonesia to continue its efforts to maintain the Ujung Kulon Reserve in good condition and to assure absolute and effective protection for its now unique species, the Javan rhinoceros.

31. Siting of Highways, Railways and Power Lines in relation to National Parks

*Bearing in mind* the possibility of adverse consequences to National Parks and equivalent Reserves, arising from the construction of major lines of communication through them –

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RECOMMENDS that when routes for such communications are being planned, experts on conservation should be consulted at an early stage, with a view to reducing disturbance to a minimum.

32. National Parks in Sarawak

*Having learned* of proposals to constitute nine National Parks in Sarawak –

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Endorses the proposals and RECOMMENDS in particular early establishment of the proposed Gunong Mulu National Park.

33. Nature Reserves in Hong Kong

*Considering* that only 22½ square miles of Hong Kong's 398½ square miles is built over and occupied by nearly 4 million people, for whom access to open spaces and nature is of great recreational value, likely to increase with the increase of population –

*Taking into account* the situation of Hong Kong near the junction of the Oriental and Palaeartic regions, with representatives of tropical and temperate fauna and on a prominent migratory bird route–

*And bearing in mind* the easy accessibility of this scientifically interesting area and the contribution that national parks and nature reserves can make to the tourist industry –

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RECOMMENDS that the Government of Hong Kong be asked to give urgent consideration to setting land aside suitably zoned for its beauty, biological interest or recreational value, especially in such areas as Sai Kung peninsula, Tung Lung Island, Sharp Island, the Mai Po marshes, the western tip of Lantau Island and all water-collecting areas, thereby providing a unique example to the world of the determination and ability of a highly populated country to retain wilderness areas for the material and spiritual welfare of its people.

34. Pollution of Rivers, Singapore

*Recognizing* the rapid pace of industrialization and urbanization in Singapore and the problems involved in the disposal of industrial and domestic wastes, with consequent pollution of fresh waters –

*Aware* that 20 fish species appear to have become totally extinct during the last 30 years in the rivers of Singapore Island –

*And Commending* the recent anti-pollution measures undertaken by the Government of Singapore –

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RECOMMENDS that particular care be taken to avoid pollution of those rivers which still retain populations of indigenous fish-fauna of Singapore Island.

## RESOLUTIONS OF THANKS AND APPRECIATION

35. Posters designed by Thai Schoolchildren

*Considering* the posters painted by Thai Children, competing for prize-winning designs for a poster in support of IUCN, to be outstanding for their decorative qualities, originality and as conservation education material, expressing as they do a lively appreciation of some of the aims of IUCN – and *believing* that they could be of significant value to conservation education programs in other countries –

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RECOMMENDS that representative samples of these posters be deposited in the IUCN Documentation Center at Morges for demonstration and possibly loan purposes, or preferably, reproduction of outstanding examples, which would be made available as appropriate to other organizations and countries.

36. National Research Council

*Having enjoyed* the hospitality and admirable facilities of the National Research Council of Thailand for the five days of its discussions and the many kindnesses extended by all those associated with it in acting as host to the Conference –

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EXPRESSES its grateful thanks to the National Research Council and the Applied Scientific Research Corporation, their officers, staffs, the Organizing Committee, and all others concerned, and its deep appreciation of their unremitting work in ensuring the success of the Conference.

# Looking Ahead

## Where do we go from Here – and How?

### Implementation of Conservation in Tropical South East Asia

by

DR. LEE M. TALBOT

*Program Organizer, IUCN South East Asia Project*

In the course of this conference we have discussed a wide variety of problems of conservation within this region. It was not our purpose to solve all of these problems in the meetings – we could have had a week's meeting on any one of the many subjects discussed and we would still not have solved the problems. Instead, our purpose was, in part, to better prepare us – the participants – to solve the problems. Our objectives were to exchange information, experience and techniques; to get acquainted with one another and with one another's work and problems; and basically to obtain for each of us a better perspective on conservation in general, and on conservation in this region in particular; so that when we have left this conference we will be better able to understand and deal effectively with our own specific conservation situations.

In this first part of this objective we appear to have been outstandingly successful. But now we leave this conference. What happens now? Where do we go from here – and how?

The where do we go, in terms of specific local and regional conservation objectives, have been presented in the conference papers, outlined in the resolutions, and discussed in and out of the Technical Sessions and other meetings. However, it has been said that it is all well and good for conservationists to talk to conservationists, but that the important thing is to see what they do after talking to each other. Therefore, what we should consider now is how do we go from here? What do we do?

First, we should answer the question, 'What kind of an animal is a conservationist?' When we arrived here, most of us had pretty clear ideas of what conservation was, and what a conservationist was. In all probability, few of our ideas would agree with those of the others of us. When we assembled here there was obvious surprise at the variety of kinds of 'conservationists' who had assembled. To illustrate this point, we can consider the list of participants. On any page it is unusual to find more than two individuals with the same profession, and we find more than 40 distinct occupations in the first third of the list alone.

And this graphically illustrates a key point we must bear in mind in implementing conservation; conservation is not any one specialized field – it is not only bird preservation; not only preventing soil erosion; not only protecting certain habitats from destructive human activities. It is a positive, constructive, common sense approach to use and management of all the basic

natural resources on which our survival and development is based. As such it is of central importance to all of us. To quote from the Declaration of the Government of Thailand on the Conservation of Natural Resources, which His Excellency, the Deputy Prime Minister presented to the Conference at our opening session: 'Natural resources are essential to any nation's survival; they are a necessary foundation to economic and social development; and they are a heritage beyond value for the future.'

Conservation is not just the concern of a small band of single minded enthusiasts; it effects all of us; it is the business of all of us; it is a subject that we, and our organizations and our governments must take seriously.

This realization is one of the most important things we take from here; and one of the most important things we can do as a result of this conference is to convey this fact to the others with whom we are working.

Conservationists often complain that they are alone and that nobody understands conservation; to some degree they are right; but to a large degree this may be due to their own approach to conservation, and the failure to either understand, or to convey to others, that conservation involves everybody, that it is not just a vague concept of interest to a few people, but a solid need of direct importance to everybody.

This is a first step.

The second one is associated with it. No one aspect of conservation really can be isolated from any other, any more than one animal can exist in isolation from the various parts of its environment. An animal does not exist alone. It can be considered perhaps, to exist in the center of a spider web of inter-relationships. The radiating strands are the animal's relationships with the many parts of its environment, including other animals, plants, soil, water etc., and each of these radiating strands are, in turn, linked, as by the circular strands of our spider web. Survival of the animal depends on keeping its ecological web intact, and if we affect any one strand of the web, we may in some way affect all of them. If we wish to conserve this animal it is not good enough to work on only one strand of his ecological web; we must consider all of them.

In the same way, there are many strands in the web of conservation and if we are effective we must consider all of them. This sounds good in theory, now let us consider how this works in practice:

Among us here there are persons working in most fields of use and development of natural and human resources in the region. We all have experienced the tendency to concentrate entirely on our single resource, or pursue our single objective in conservation, alone and without reference to the associated resources or conservation objectives. Partly because of training; partly because of the administrative organization of things; and partly because of time pressure we tend to work in isolated compartments, and to approach conservation in the same way.

There is more and more recognition now, that if we are to be effective in conservation we must have a broad approach – not a narrow one. And this applies equally whether we are planning the land use for an entire country or protecting the birds in a small reserve.

Where do we go from here on this? We can carry this approach with us into our work – and this will automatically effect most aspects of conservation in the region – and we can convey this approach to those with whom we work and to our governments.

These two points to which I have just devoted considerable time, primarily concern our own attitude, approach, and our own effectiveness as conservationists. This involves us. Our effectiveness as conservationists depends on us – on our own attitude and approach.

Now, let us consider briefly the conservation tools we can take away from this conference.

This conference itself is a tool we can use. When we return to our offices and home countries we should report on the conference. Tell them about it. The fact that such a conference has been held in this region at this time – with over 150 participants from about 30 countries in South East Asia and elsewhere – clearly shows that conservation is a subject of great importance – and that it is recognized as such locally and internationally. Make sure that this fact is known.

We have just passed a series of good resolutions. Some of these are specific and some general. We should take the ones that apply to our particular conservation interests, and use them to call the attention of the appropriate organizations or governments to the subject; to show the extent of international interest and concern in the subject. The resolutions are a tool for conservation; it is up to us to use them. The resolutions will be published in the proceedings, but in a few days you will all be sent a mimeographed copy of the resolutions as approved by the Conference. Use that copy; you don't have to wait for the proceedings.

Another tool that we can use is the list of participants with their addresses. The conference has given us the opportunity to meet others from the region and from outside the region who have similar interests and concern with conservation. The conference has provided an introduction. We can keep up an effective working relationship by correspondence, and in person when we travel.

We have contributed and received many ideas on specific needs and specific things to do and ways to do them during the meetings. Most of this will appear in the Proceedings when they are published. The Proceedings will provide another most valuable tool. It will be a unique and comprehensive reference on conservation in this region; it should provide, in effect, a guidebook to conservation in this region.

We have seen clearly that South East Asia has its own set of ecological, social, and other conditions that affect conservation; that conservation in this region must be considered in the context of this region and that we cannot directly apply standards and procedures from other parts of the world to conservation in this region.

We have also seen that in spite of these differences, many of the basic problems facing conservationists are pretty similar in any country throughout the world. Conservation is not just a concern of the Africans, the Americans, or somebody else. It is a concern of everybody.

Experience gained elsewhere can be of very great value to those of us working here. And, to quote again the Declaration of the Government of Thailand, 'Conservation requires specialists, training, and facilities that may not be available within Thailand at the present time. Since Conservation is of international concern, we strongly hope that other nations and the international agencies will co-operate with and assist us ...'

And this brings up the final point I wish to make in considering how do we go from here:

International co-operation and assistance in conservation is available. At this meeting we have been told of a number of international organizations that are willing and ready to help with conservation in South East Asia.

There exists today in South East Asia an opportunity for conservation co-operation that is unparalleled in history! International assistance in conservation has been growing slowly. First there were individual projects in a few individual countries; then there was the African Special Project, about which we have heard earlier in these meetings and in which many international organizations focused attention on conservation in Africa. That was a sort of proving ground; now the mechanisms are set up and the attention has been focused here.

There is, as we have heard, a large amount and variety of assistance and co-operation available. The representatives of many of the organizations involved have been here with us. In the meetings we have shown them what the situation is and what the needs are. However, they cannot initiate such assistance. They need requests from you.

Each organization has its own procedures for application. The representatives we have met here, and the other representatives of the organizations within each country will be most happy to assist with applications and to provide information. In some cases we know to whom we should address these requests. In many cases we all may be in doubt.

When in doubt ask someone, write – personally or officially – to the representatives you have met here, whose addresses are on the list, or directly to the IUCN for information.

This conference has given us the opportunity to see in general, and in many cases, in particular, where we want to go. We now have many of the tools to use and the methods to follow to get there.

Now it is up to us.

# Conservation, Biologists, and the IBP

by

DR. EDWARD H. GRAHAM<sup>1</sup>

*Deputy Convener, Conservation Section of the IBP  
Chairman, Ecology Commission of the IUCN*

In being permitted a few closing words on science and the International Biological Program may I first tell you how grateful I am to have had the opportunity to discuss with so many of you from South East Asia the plans for this new program in your part of the world. May I remind you of the theme of this program, namely 'The biological basis of productivity and human welfare.' This theme tells us that man and his affairs are very much a part of IBP, just as man is very much a part of nature. The program is essentially ecological in content, which relates it closely to conservation for ecology is the scientific basis for conservation.

The IBP must undertake research which promises to help solve modern problems. In the modern world the numbers of people are increasing at an alarming rate. Yet there is a limit to the capability of environments to support people, even though in most parts of the world this limit may not yet have been reached. This week the newspapers carried an official report by the Government of India that the country was faced by a critical food shortage. The same papers announced that the United States was drastically revising its policy of exporting excess grain. For the first time, the U.S. no longer exports rice, previously an excess crop. Thailand is fortunate in being a high rice producer, and an exporter also of other agricultural products. Your population density is still relatively low, although it increases at the rate of 3 per cent per year. Your neighbor Laos has a population density of only 30 persons per square mile, against 680 in Japan. The amount of agricultural land per person in Laos is about 2 acres, in Japan less than 1/5 of an acre. While facts such as these do not express a critical land-man ratio in this region, other factors are not so favorable. South East Asia has a literacy rate of 15 per cent, in Japan 95 per cent of the people can read and write. In Thailand there is one physician for 8,000 persons, in Indonesia one for 48,000 persons. In Japan there is a doctor for every 900 persons. Such statistics reveal national and regional distinction. Furthermore, they reveal the kind of broad economic and social context within which biologists must labor and make their scientific contributions.

In the modern world the isolated biological survey, or resource inventory, or other static evaluation is in itself no longer good enough. Society is not likely to support such endeavors because they are not worth much to society. However, if they are related to, and especially if they are undertaken with, the objective of interpreting the capability of environments for use, such endeavors may be very valuable. Ecological studies which contribute to the determination of land-use capabilities are of basic value to the economic development of a region. And may I point out here that the conservationist interested in parks and wild lands has a vested interest in the improved pro-

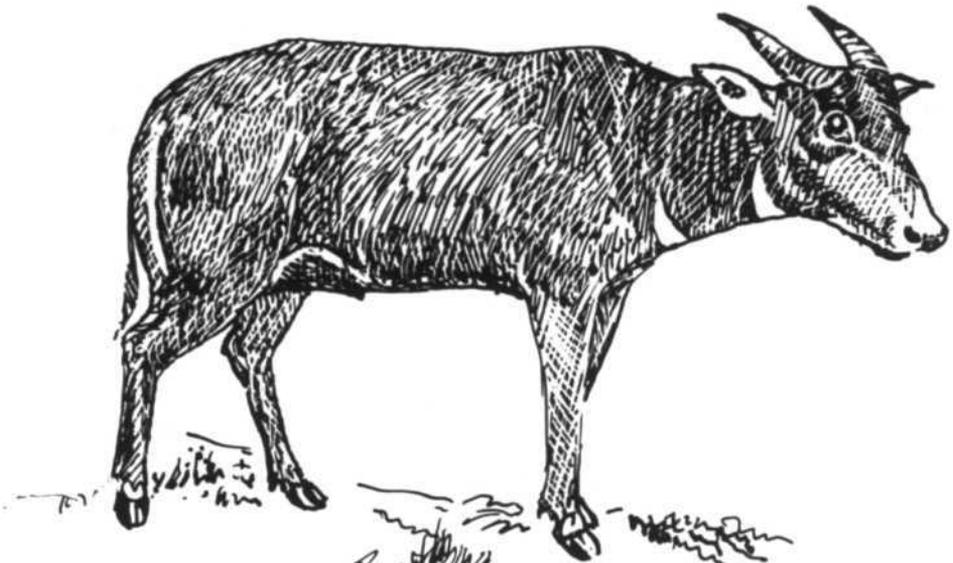
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<sup>1</sup> Deceased in 1966.

duction of agricultural lands. When crop lands are made highly productive by the intensive application of modern technological improvements, pressure is automatically reduced for the use of marginal lands for agricultural purposes.

The values of establishing a world network of research reserves is not just to preserve ecosystems as outdoor museum pieces. Such reserves constitute check areas or yardsticks for managing comparable areas of land or water under intensive use, and they furnish data basic to the development of guides to rational resource management. They are the source of animals employed in experimental medicine, especially the larger primates, and they are reservoirs of genetic materials which may one day prove to be of economic value.

Therefore, in designing your programs and projects for IBP, may I suggest that you think in terms of the broad needs of your people and of the rational, long-term use and management of the natural resources available to them. Do not be ashamed of practical research. Some of the most creative biological work has been accomplished in the solution of pragmatic problems. I have only to mention Louis Pasteur to make my point. Look ahead to the fresh contributions the biologist can make to the world in which we live, and do not necessarily pattern your research after the kinds that have been traditionally undertaken. New techniques, new ideas, and new concepts are demanded. The biologist today carries a heavy social responsibility, and I believe that one of the reasons we now have an International Biological Program of the kind that is being formulated is in itself expressive of the need for biologists to fulfill this responsibility. It is up to you to make the most of it. Thank you.



TAMARAU

# Reflections on Conservation

by

DR. F. FRASER DARLING

*Vice-President, The Conservation Foundation*

It has been said in the course of this Conference that there is evidence of a decline in religious observance in the East, with the consequences which might be imagined for the welfare of wild animals. This is one of those truisms which need some analysis and some comparison with what has been happening in the West. One could say that with the decline of religious conviction in the West there has grown up the ethic of conservation, and that the period of greatest destruction was one of almost exaggerated religious observance. I think we should not link either decline or rise of religious adherence with the present attitudes towards animals and their habitats, though there is every good reason to prepare the way for the new ethic of conservation with its understanding of wholeness and immanence to occupy the ground lost by orthodox religions overfilled by dogma.

The social disciplines of gregarious man go far beyond the purely religious and I think it is in the ground lost by these that we should look for the decline in the status of habitats and their denizens. The emergence of social man in subsistence cultures, part agricultural and part hunting or vegetarian food gathering, demanded certain disciplines of restraint, such as the orderly restriction of the numbers of grazing animals on the community's common pastures, or observance of a date, as Quist-Arcton has reminded us in an earlier session of this Conference, when the community should begin fishing or taking some wild crop. Failure to observe such customs and rules endangered the survival of the whole community and the situation was perfectly understood. Sometimes a sound empirical reason might be lost in adherence to what had become a taboo, but on the whole these rules which conserved habitats and stocks of animals were good.

The trouble comes when, by trade or prosperity, subsistence disciplines no longer apply because certain foods or goods can be afforded to be brought in from outside. The man who begins to exceed his tally of grazing animals and he who hunts out of season is no longer seen as a direct threat to survival of the community; before long everybody is breaking the unwritten rules, the pastures are overgrazed and the stocks of animate natural resources are diminished and eventually lost.

And now let us look for a moment at religion itself: the Judaic religion, from which both Christianity and Islam derive, is strongly monotheistic. Man identifies himself with God and the rest of animate nature is considered to be something below and outside him, something which is there expressly for his benefit or, if there seems no benefit to be gained, such manifestations of animate nature can well be removed. The old Mediterranean religions were strongly polytheistic, as were also the faiths of the East. Certain deities were associated with certain creatures and phenomena in the natural world so that there was in effect a natural system of checks and balances. Man was not over nature and all-powerful because he associated himself with the one god, but lived with nature much more and his acts of destruction were apt to be negative processes rather than acts of positive impact.

All in all, both East and West have produced a degraded world through time. Possibly because the West has gone even farther towards complete destruction of natural resources, there has grown this new feeling of the ethic of conservation, backed up by scientific understanding, leading us to appreciation of the interdependence of the natural world. No act is without consequences and the science of ecology brings us to comprehension of causes and consequences. It should be possible now to be well aware when we diverge dangerously from practices and philosophies built on this newer scientific understanding and the new reverence for nature, of living with nature rather than over or under it. The greatest difference between us and the rest of animate nature is the fact that we have the power of reflection and of choice of action. This places upon us the responsibility for the welfare of the natural world in which we are without doubt the dominant mammalian species.

# Concluding Remarks-IUCN

by

PROFESSOR FRANÇOIS BOURLIÈRE

*Honorary Chairman of the Conference; President of IUCN*

Ladies and Gentlemen:

As this meeting comes to its end, it is a most pleasing duty to extend, on behalf of all the members of the IUCN delegation and all the participants to this conference, our most sincere thanks to those who have made this symposium possible.

First of all I want to thank again the Government of Thailand, the National Research Council and its Chairman Phya Salwidhan Nides who has done so much, not only during the past five days but also during the past six months, to make our stay here both profitable and enjoyable. We have been very impressed by all that has already been done in this country in the field of conservation of nature and natural resources and we are quite confident that striking progress will be made in the near future. The declaration of the Government of Thailand read at the Opening Session of our Conference is a particularly good omen for the future.

Second I want to thank our two other sponsoring agencies, UNESCO and FAO whose active participation in our discussions has been of so great an importance. I want also to mention that UNESCO has financially assisted about 30 participants and has thus permitted a more representative participation of the various countries in the South East Asian region. Prior to this Conference UNESCO has also made possible Dr. Talbot's trips to all countries in the region to facilitate attendance. We are most grateful to our 'Foster Mother' for this help. I do not forget also that the World Wildlife Fund, and especially its American Appeal, has made possible the First Stage of our South East Asia Project; IUCN is deeply grateful to this sister-organization for this crucial contribution to the success of this Project.

I would not like to forget at that stage the three people whose enthusiasm and hard work during the last two years who initiated and prepared this Conference. Hal Coolidge's interest for that part of the world is well known and goes back to his first expeditions here in the early thirties. Lee and Marty Talbot had already given ample proof of their efficiency at the time of our Arusha Conference. Since then they have done even better, and I am glad, on behalf of the IUCN Board, to thank all three for the nice job they have done.

Finally I would like to thank the 160 participants of this Conference for their most active participation to all our sessions. Their contributions have added much to the nearly 100 background papers and have made our discussions very lively.

As we are running short of time, I will not bother you with long personal comments on this meeting. I would like only to mention one point. I have been extremely impressed during the past five days by the emphasis held by all our Asiatic colleagues on the social, economic and even political aspects of conservation. During the audience His Majesty the King granted

to five of us, His Majesty himself brought up this point and did it very strongly. Nowhere else in the world are the intimate relationships between man and his environment indeed as obvious than in South East Asia. Nowhere else is the population pressure and the need for rapid and often drastic improvement of living conditions more acute. It is therefore urgent that conservationists adapt their policy to the particular conditions of that part of the World. We have to realize that it is not against Man, but with him and for him that Nature will be safeguarded. I hope that IUCN and its specialized commissions will in the coming years, together with experts of UNESCO and FAO, be able to assist the South East Asian countries in devising the practical ways and means of improving the living conditions of their people without ruining the unique natural resources of that part of the World.

## Concluding Remarks—General Chairman

by

MR. HAROLD J. COOLIDGE

In closing this memorable Conference, the first of its kind held in South East Asia, it is appropriate to refer back to the opening remarks of our President, Professor F. Bourlière, who stated 'It is our hope that this Conference will bring forward new concepts and new ideas which will in the long run help to improve the living conditions of the peoples of South East Asia.' I am sure I speak for many of you in expressing the feeling that the mandate he gave us has been fulfilled, not only in formal meetings and discussions of a wide range of subjects relating to natural resources and practical aspects of their conservation, but also in the opportunities for informal discussions by people of many countries sharing common interests and by the 36 resolutions adopted by this Conference.

A high tone was set for this meeting by the inspiring address from His Excellency, Field Marshal Thanon Kittikachorn, the Prime Minister, delivered at the opening plenary session by his distinguished representative Prince Wan Waithayakorn. Prince Wan pointed out that the international sponsorship of the Conference by IUCN, UNESCO, and FAO was symbolic of the approach to conservation that has been found most fruitful and successful by nations, governments, and international agencies and specialists. He also expressed the hope that the Conference would mark a turning point in tropical South East Asia, both in the awareness of conservation needs and in the realization of sound conservation action both at national and international level. The Prime Minister can be assured that many aspects of conservation needs have been explored in depth, and guidelines established for action programs to be encouraged and carried out by participants when they return to their own countries.

It was especially gratifying that so many of you participated in the panel discussions of the technical sessions, and that the resolutions of the Conference represent such a good consensus of the views of those attending the meetings. Many of the resolutions deal with animal species or natural areas where action programs can be undertaken by government agencies.

It is my hope that what has been accomplished here during these past few days may not only repay many times over the efforts of our host government and its representatives, but that it will establish a landmark which will inspire similar regional conferences in other parts of the world, and particularly in Latin America.

In closing, on behalf of the International Union for Conservation of Nature, I wish to express our deep gratitude not only to all those who planned and organized this Conference, but to all of you who contributed your time and effort in making it such a success. I also want to make a special mention of the impact on the delegates of the effective and original paintings by the children of Thailand. This was a joint project of the Teachers Association of Thailand and the Association for the Conservation of Wildlife under the leadership of Dr. Boonsong Lekagul.

I feel sure we will return to our respective countries inspired by what we have learned, increasingly aware of the large task that lies ahead, and gratified by the warm Thai hospitality and friendly co-operation that has surrounded us during this meeting. We now look forward to participating in the interesting field trips arranged for us during the remainder of our stay in this beautiful country.

# Concluding Remarks—Program Organizer

by

DR. LEE M. TALBOT

First of all it is my very pleasant duty to acknowledge with the deepest gratitude the work of the National Research Council of Thailand who, on behalf of the Government of Thailand, has served as Host Organization of this Conference and to whom we are indebted for so many of the pleasant events of the past week, including the gracious receptions and dinner.

But when we speak of an organization, we are really speaking of the individuals who make it up and who do its work. As Program Chairman I wish to speak of the part that these individuals have played in making this Conference such a success.

Few of us realize how many people are involved in a conference such as this, and the large amount of work they must invest in its preparation and execution. During this past week we have seen only a few of the very many people who have worked so hard to make our visit possible, profitable, and pleasant.

At first we had hoped to take this opportunity to acknowledge them all by name. But to do so would take far more time than we have available, and there are so many that if we did, we would almost certainly miss someone. Consequently, I must limit my specific acknowledgements to a few individuals, but we all know that these few people are representatives of many.

Frequent mention has been made of the Thai Organizing Committee and its gracious and capable chairman, Dr. Pradisth. We are all greatly indebted to him and his group. The various members of the committee represent Thai organizations, each of which has contributed in an appropriate way to the Conference. For example, Dr. Pradisth represents the National Research Council, mentioned above. Among other things, his personnel have seen to staffing the Reception Desk at the airport; the Information Desk and other centers at the Conference; arrangements for hotel accommodations; transportation; and a host of other organizational matters. Mr. Dusit Banijbatana, Director General of Forestry, and Col. Somchai Hiranyakich, of the Tourist Organization of Thailand, have ably and graciously organized the field trips and tours, provided exhibits, and other hospitality. Professor Thiem Komkris has seen to the all important arrangements for our facilities and lunches here at Kasetsart University; and Dr. Boonsong Lekagul with the Wildlife Conservation Association of Thailand has helped with field trips and organized the memorable conservation ballet and exhibition of school children's conservation posters. Mention should also be made of the committee's secretary, Dr. Torbongs Donavanik.

The Applied Scientific Research Corporation of Thailand, with its chief advisor, Mr. Frank G. Nicholls, has been a silent but invaluable partner in the preparation and execution of this Conference. The corporation has provided its facilities and staff – who have often volunteered their services day and night, I might add – to help us in innumerable ways during the past year. I particularly would like to mention Group Captain Sorn, Manager of Administrative Services; Mrs. Penai, Mrs. Boonchern, and other corporation secre-

taries and typists who have performed miracles in preparing the mass of papers – well over 100 papers and conference documents of one kind or another; and Mr. Pitchit, Head of the Documentation Reproduction Unit, which has reproduced all these documents for our use. Special gratitude is due to Miss Sumitmai who, in addition to her long hours of work this week, has assisted us with correspondence and many other matters over the past months.

We are also indebted to Dean Pakdi Lusanand who has graciously placed the facilities of the Rice Building and its staff at our disposal for these meetings and exhibits.

Special thanks are due to Mr. Mattsson and Mr. Mills of the UNESCO Centre for Science and Technology for South East Asia for many forms of assistance including making possible my travel in connection with the conference and enabling many participants to attend. We also wish to express appreciation to Mr. Kim and the FAO Offices in Bangkok for various facilities and assistance with papers, including help in translation, in which Mrs. Christina Mills also assisted.

For those of us in the IUCN it has been a great pleasure to work again with old friends, such as Mr. Dusit Baniibatana and Dr. Boonsong Lekagul. We also greatly value the new working friendships we have found.

I know that I speak for those of us 'visitors' who have been involved in the organization of this conference, when I say that it has been an honor and privilege to work with Dr. Pradisth, Mr. Nicholls, their staffs, and our other Thai friends; and I know that I speak for all of us here in expressing our deep gratitude to them all.

# Concluding Remarks–Thailand

by

DR. PRADISTH CHEOSAKUL

*Honorary Vice-Chairman of the Conference; Chairman of Thai Organizing Committee; Deputy Secretary-General, National Research Council*

Mr. Chairman, Ladies and Gentlemen:

It is most gratifying to note that this Conference has come to a successful ending. We are deeply indebted to the IUCN, UNESCO and FAO for their full co-operation. To the General Chairman, Mr. Coolidge, and Dr. Graham, Dr. Ripley, Commander Scott, Dr. and Mrs. Talbot we wish to express our special thanks for their able organization. Due credit goes to the valuable contributions of our distinguished participants. Personally I owe sincere gratitude to my associates and assistants for their hard work in order to facilitate this Conference.

This is a moment of mixed feeling. In one thought we are happy that the difficult part of the Conference is over. In another thought we are sad that pretty soon we will miss all of you. Anyway, we hope this Conference will lead to a series of similar meetings in the future and promote closer co-operation between countries of South East Asia in conservation of nature and natural resources.

In closing we wish you all a pleasant trip home.

# Concluding Remarks—UNESCO

by

MR. WAYNE A. MILLS

*Acting Director of the Unesco Regional Centre for Science and Technology for Southeast Asia*

Mr. Chairman, Ladies and Gentlemen:

Thank you very much for this opportunity to make a brief final statement. First, I would like very much to thank once again our hosts for all they have done to make this Conference possible, and to thank IUCN and our fellow cosponsors for their fine co-operative efforts.

I have felt myself very privileged to have been able to attend this Conference, during the course of which I have been deeply personally impressed by the tremendous importance and magnitude of the problems in nature conservation which are facing us, and which must be solved now before it is too late.

On behalf of Mr. Mattsson, the Director of my office, who has written asking me to express his sincere regrets at not being able to attend, I wish to assure the Conference that the Unesco Regional Centre for Science and Technology for Southeast Asia will make every effort to co-operate in the follow-up of the findings and recommendations of the Conference at the regional level.

We are most gratified that the Conference has recommended and supported the continuation and strengthening of the Unesco Regional Working Group. The Working Group itself has been, during its current meetings, successful in finding mechanisms by which it can attempt to implement some of the recommendations of the Conference, and at its final session today, and during subsequent working party meetings on special topics will study the problems further with a view to additional concrete recommendations and action.

We are also most pleased to receive and shall also try our best to take appropriate action on the several other resolutions addressed to or referring by implication in whole or in part to Unesco.

At various times during the period of this Conference, some anxiety has been expressed about possible duplication of efforts by the various organizations and groups concerned with conservation. It is indeed true that the waste of time, resources, and efforts involved in any such duplication and overlap would be tragic, especially considering the overwhelming number and urgency of the problems which we must solve and with which we are at present only beginning to cope. At this timely and vitally important conference, many specialists from the region and from throughout the world, and many representatives of the conservation-concerned organizations have gathered together to collect and exchange information, programs and ideas, and to underline the most important problems for urgent action.

This opportunity for the exchange of information, which must continue, and the invaluable contacts we have made with one another, together with a pledge, in which Unesco most heartily joins, to make a maximum effort to assure the

closest possible collaboration, co-operation, and liaison with all concerned, should enable us now to leave the Conference table and with renewed and united strength and efficiency start now to take immediate action, which several speakers in the Conference sessions have so eloquently urged.

Thank you.

## Concluding Remarks–FAO

by

MR. M.S. KIM

*FAO Representative, Regional Forestry Officer, FAO, Bangkok*

Mr. Chairman, Ladies and Gentlemen:

We are grateful to IUCN for taking the initiative in organizing the present meeting on Conservation of Nature and Natural Resources in the South East Asia region; also our sister co-sponsor, UNESCO, various technical session chairmen and discussion leaders, the Thai Government, its National Research Council, the Kasetsart University, the people who prepared the lunch, the bus drivers and all those who worked so hard to make this meeting a landmark in the history of conservation in the South East Asian region.

It has been an exciting, interesting, informative, and happy meeting. It has been a serious meeting with a serious purpose focusing attention on different aspects of the Asian problems of conservation. Both representatives with pressing needs and those with the means of help have increased their perspectives, met some of the people they need to meet, made new friends and formed new plans of action for the future.

We also commend the IUCN Resolutions Committee for the particularly fine set of resolutions they have formed and I am sure they will provide a most useful guide for any organization interested in the development of specific action in the field.

On behalf of FAO, I thank you.

# **Background Papers on the Status of Conservation by Countries**

The following background papers are divided into two groups:

1. National conservation papers of the UNESCO Regional Working Group on the Conservation of Nature and Natural Resources in Tropical South East Asia.
  - (a) Introduction and key to the papers.
  - (b) The papers.
2. Other national conservation papers.

**Part 1**  
**National Conservation Papers of the Unesco**  
**Regional Working Group on the Conservation**  
**of Nature and Natural Resources in Tropical**  
**South East Asia**

# **Introduction and Key to National Conservation Papers of the Unesco Regional Working Group on the Conservation of Nature and Natural Resources in Tropical South East Asia**

Members of the UNESCO Regional Working Group on the Conservation of Nature and Natural Resources in Tropical South East Asia were requested to prepare papers on conservation activities and problems within their countries. The papers were intended to be a general summary of the status of conservation within each country and to contain, as available, information on the points listed below. They served as working documents for the Working Group Meetings and also as background papers for the Conference.

The papers are presented by countries in alphabetical order. Two papers were received from the Philippines and both are presented. For easy reference, most papers are presented in outline form, with the information presented by letter and number according to the following headings in the outline below. In case of doubt refer back to the appropriate letter and number in this outline for details of the question involved.

- A. General data.
  1. Area of country.
  2. Population (with date of last census).
  3. Economy.
- B. Government departments and official organizations concerned with conservation with their addresses and their function, e.g. forest departments, trustees of national parks, conservation advisory councils, etc.
- C. Organizations concerned with conservation research with their addresses and particular interests, e.g. museums, universities, research divisions of departments.
- D. Private conservation organizations with addresses, general objectives, activities, approximate number of members.
- E. National parks and equivalent reserves (including scenic or historic reserves, monuments, etc., but not including forest reserves and wildlife reserves or sanctuaries).
  1. Organizations responsible for establishing and maintaining national parks and equivalent reserves; their authority and objectives.
  2. List, if available, of national parks and equivalent reserves. Area of park and brief descriptive details including date of establishment, location, and significant features.
  3. Public information and interpretative services provided and degree of effectiveness.
  4. Training given to park personnel.
  5. Visitors' facilities.
  6. Park management and emphasis; e.g. preservation, recreation, tourism, etc.
  7. Percentage of parks kept as true wilderness.
  8. Degree of exploitation or commercial activity (except for visitor accommodation) allowed legally in the park, e.g. logging, resettlement, hunting, grazing, fishing.
  9. Effectiveness of park protection, e.g. poaching, illegal settlement, illegal logging, etc.

10. Introduction of any exotic plants and/or animals into the national parks.
  11. Major problems facing the national parks, e.g. training of personnel, illegal activities, lack of funds, etc.
  12. Other comments.
- F. List of other areas that should be preserved or managed as parks or equivalent reserves – area involved, description and reasons for establishment and recommended designation of the reserve (e.g. national park, scenic reserve, etc.). Also proposals for wildlife reserves and sanctuaries or other types of reserves for wildlife.
- G. Forest conservation.
1. Percentage of total land area of country under forest.
  2. Percentage of forest reserves.
  3. Objective of forest reserves (e.g. protective forest, productive forest, scientific research, etc.).
  4. Types of training provided for forestry personnel.
  5. Degree to which illegal clearing or logging is a problem. Main factors involved (e.g. insufficient funds, lack of personnel, pressure groups, etc.).
  6. By whom logging carried out – forest department, private industry, or both.
  7. Research branch in forestry department, if any. Effectiveness of staff and funds.
  8. Reforestation.
    - (a) Program of regular reforestation, if any, and by whom carried out; degree of government support.
    - (b) Type of reforestation carried out, e.g. replanting, seeding, natural regeneration aided by protection.
    - (c) Degree of selective poisoning of 'non-commercial' trees as part of reforestation program, if any.
    - (d) Amount of area reforested relative to the area cut annually, i.e. is lumbered forest being replaced adequately?
    - (e) Reforestation – use of native or exotic trees.
    - (f) Degree of success of reforestation, e.g. are reforested areas adequately protected from re-clearance, fires, grazing, etc. ?
  9. Forest fires: nature of problem, cause of fires; what measures taken to cope with problem.
- H. Soil and water conservation.
1. Situation with regard to soil and water conservation. Degree to which these problems are being solved.
  2. Public and private bodies concerned with such conservation problems; degree to which activities of such bodies are co-ordinated.
  3. Existing legislation and effectiveness thereof.
  4. Details of any existing soil and water conservation projects; existence of any long term plans.
- I. Conservation of wildlife.
1. Organization(s) responsible for wildlife.
  2. Adequacy of laws to protect and manage wildlife; areas in which additional legislation would be needed. (Appropriate laws attached if available.)
  3. Adequate enforcement of laws; if not, why not.
  4. Types of training provided for wildlife management personnel.

5. Problem(s) of wildlife control; what is being done.
  6. Game reserves.
    - (a) List of existing wildlife reserves and sanctuaries with area, brief description, and objective.
    - (b) Effectiveness of reserves; adequacy of patrolling.
    - (c) Other areas that should be established as wildlife reserves of some sort should be listed under paragraph F.
  7. Wildlife research.
    - (a) Wildlife research projects being carried out, if any.
    - (b) Research division, if any, in the government body responsible for wildlife.
    - (c) Most urgent of additional wildlife research problems.
- J. Threatened species of animals and plants.
1. List of known wild animals and plants threatened with extinction with causes of destruction.
  2. Length of time threatened species are expected to survive if conditions not corrected.
  3. Recommended measures to prevent their extermination.
- K. Pesticides and herbicides.
1. Degree to which pesticides (including herbicides) are used; what kind and for what purpose.
  2. Effective controls, if any, on use of pesticides.
  3. Known direct or indirect dangers from the use of pesticides to wildlife or the ecological balance of areas involved.
  4. Research, if any, being carried out to assess the effectiveness and ecological impact of pesticides.
- L. Public education on conservation.
1. Programs or projects on conservation education for the public.
  2. Methods of executing programs.
  3. Use of newspapers, magazines, radio, or television for these purposes, if any.
  4. Course on conservation, if any, in school curriculum.
  5. Private bodies, if any, interested in conservation; how they are constituted and how they operate.
  6. Degree of success achieved by private bodies in educating the public.
  7. Availability of necessary texts on conservation for teachers and students at different levels.
- M. Training of conservation personnel.
1. Training schools or other facilities, if any, for:
    - (a) Forestry management.
    - (b) Wildlife management.
    - (c) National parks and reserves management.
    - (d) Other aspects of conservation, e.g. soil and water, watershed conservation, range management.
  2. Opportunity, if any, for advanced (university level) training in the above.
  3. Would international experts be beneficial as advisors or instructors to provide training in the above? Are there or have there been such experts, and if so, what was the nature of their work and was it effective?

4. Most urgent conservation training problems and how they should be approached.
- N. Personal view of most urgent conservation problems of the country; how should they be approached; would international action or assistance help, and how?



# The Status of Conservation in the State of Brunei

by  
THE BRUNEI DELEGATION

## A. General data.

Brunei is a sultanate under British protection on the western coast of Borneo, between latitude 4°2' and 5°3' north and longitude 114°4' and 115°2' east. The climate is tropical with an average daily range between 76°F. and 86°F., and annual rainfall from 100 inches at the coast to over 200 inches in certain parts in the interior.

1. Area: 2,226 square miles.
2. Population: 83, 877 in the 1960 census. The latest estimate (1965) is 100, 000.
3. The economy of the state is mainly dependent upon the export of crude oil; secondly in comparatively small amounts are rubber and timber.

## B. Official conservation organizations:

1. Under the law relating to forests and forest produce, the Department of Forestry (Jalan Robert, Brunei Town, Brunei) is responsible for land conservation maintenance and land reserves including reforestation.
2. The water conservation is mainly executed by the Ministry of Agriculture, in co-operation with the Public Works Department, both located at Brunei Town, Brunei.
3. The Brunei Museum (Brunei Town) is responsible for the establishment and maintenance of ancient monuments and historical sites, antiquities, treasure trove, archaeological reserves and excavations.

## C. Conservation research activities:

There is no organization, either public or otherwise, responsible for conducting conservation research in Brunei.

## D. Private conservation organizations:

None.

## E. National parks and other reserves:

There is no national park or similar institution yet in Brunei. However, under the Brunei Five-Year National Development Plan, 1962-66, provisions are made for the creation of a state park, parks, botanical gardens and other recreation centers and facilities.

## F. List of other areas that should be preserved, etc.

No details provided.

## G. Forest conservation:

1. About 96 per cent of the total land area of the state is under forest, of which 75 per cent are high forest and 21 per cent are degraded forest.
2. Forest reserves cover about 42 per cent of the total forest area, and a further 351 square miles of peat swamp forests will be brought under the forest reserves; making a total of 52 per cent.
3. At present objectives of the forest reserves are mainly twofold:
  - (a) Protective.
  - (b) Productive on a selection felling system. This sector is increasing as the means of communications develop more and more.

4. Recruitment to the Forest Department subordinate staff is through daily paid forest laborers. Promotion to monthly paid forest laborers is as a result of examination in tree identification and elementary mathematics. Vacancies in the establishment of forest guards/foresters are filled from monthly paid forest laborers after a similar examination. Every year two forest guards are sent to the Forest Research School, Kepong, Malaya, for a ten-month course. There is no school of forestry of any description in Brunei. Other officers are recruited from abroad either on a two or three year contract which may be continued or on a special arrangement for a specific purpose. The ultimate objective is to replace the contract officers with locally recruited personnel when suitable persons are available.
- 5 and 6. Logging does not present a problem as it is carried out by licensed private bodies. Illegal clearing, however, constitutes some problems due mainly to the inaccessibility of the areas. Apart from a few scattered tiny villages, the areas are not within reasonably easy reach.
7. Research experiments are almost negligible, i. e. under 500 acres.
8. Reforestation is carried out in the permanent forests (Forest Reserves) by natural regeneration aided by silvicultural treatment which includes selective poisoning implemented by the Forest Department, and no public body is engaged. Trial plantings are carried out with a view to eventual reforestation of degraded land unsuitable for other purposes. The species are of natural and fast growing exotics. The trial plantings started in October, 1964, have to date produced satisfactory and encouraging results.
9. Forest fires are not a problem in natural forest at present, but could become one in pine plantations. Expert advice will be obtained before establishing these plantations on a large scale.

#### H. Soil and water conservation:

There is no legislation specifically dealing with soil and water conservation. In practice to a certain extent, the Ministry of Agriculture protects the land against soil erosion mainly by means of tree planting and making terraces. A huge portion of the land, however, is still left unprotected.

Soil survey is being actively considered, and it is hoped that the report will be of great benefit to improve the existing conditions of soil in the state.

Water conservation presents a problem in the state, and the survey of possible water resources has been concluded and the possibility of building reservoirs is being examined. Otherwise, there exists no water conservation in the country.

#### I. Conservation of wildlife:

There is no effective legislation concerning the conservation of wild life, and neither has there ever been any study made in this respect. It is apparent, however, that some of the wild animals, viz. deer, wild fowls, red and proboscis monkeys, mouse deer, antelope, and porcupine will eventually disappear unless appropriate steps are taken to protect them.

#### L. Public education on conservation:

There is no educational program on nature protection for the public, either in the form of propaganda for the general public or as part of school curriculum. In some secondary schools, however, students are encouraged to take part in non-academic club activities which include the study and the training of students to learn something about the beauty of the natural surroundings in which they live. This, of course, is a very limited program, as it only caters to a few selected interested students.

#### N. Personal view of conservation in Brunei:

Although the need for effective and purposeful nature protection within the framework of the conservation and development of natural resources of the state is very much desired, the failure to fulfill this need is due mainly to two factors:

1. Ignorance on the part of the public regarding the needs and purposes of nature protection, and this in turn results in an attitude of public indifference.

2. There is insufficient emphasis on conservation on the part of the authorities; as a result nature protection does not get the priority it deserves in the implementation of the National Development Plan and other government projects.

What is needed is a re-examination of the list of priorities on the part of the authorities, and initiative should be taken to educate the general public in conservation. This should include the need for nature protection in the curriculum of secondary schools as well as in the adult classes. The authorities' channels of communications, particularly broadcasting, should be used to the fullest extent in propaganda work of this nature. Above all, international assistance would help by providing experts for these projects. Financial assistance may not be needed by the country.

# Conservation in Cambodia

by  
THE CAMBODIAN AUTHORITIES

- A. General data:
1. Area: 181, 000 square kilometers
  2. Population: 6 million
  3. Economy: Dependent on agriculture and on export of rice, corn, pepper, rubber, cattle and timber.
- B. Official conservation organizations etc.:
1. Ministry of Agriculture (Phnom Penh) assisted by a Conseil Superieur de la Chasse is concerned with general policy regarding hunting and fauna protection; provincial and regional committees are concerned with the protection of fauna.
  2. Direction des Eaux, Forêts, et Chasses is concerned with enforcing hunting regulations and those protecting the flora and fauna. It includes Inspection des Chasses concerned with game and national parks and Inspections des Eaux et Forêts concerned with the protection of flora outside game reserves and national parks.
- C. Research on fauna and flora conservation is under the Ministry of Agriculture.
1. Institut de Recherches Forestieres: forestry research.
  2. Institut des Recherches Piscicoles: fisheries.
  3. Inspection des Chasses: fauna.
- D. There are no private organizations in Cambodia concerned with nature conservation. Provincial hunting associations are provided for in the new hunting regulations.
- E. National Parks.
- 1 and 2. There is one national park in Cambodia, the Angkor National Park (10, 700 hectares, of which 7, 400 are wooded) plus various historic monuments or touristic sites scattered throughout the country. These are all under the authority of the Conservation des Ruines d'Angkor under the Ministere de l'Education Nationale et des Beaux Arts. The Conservation des Ruines d'Angkor is in charge of protection, conservation, and restoration; its aim is archaeological and touristic study.
  3. The Ministry of Tourism provides information and interpretive services.
  4. Training of park personnel: Omitted.
  5. The Société Khmere des Auberges Royales (SOKHAR), under the Ministry of Tourism, is in charge of visitors' facilities, including cars, guides, rooms and restaurant. The Hotel des Temples is located inside the park and the Grand Hotel is in Siemreap, six kilometers away.
  6. Park management:  
See 1 above. In addition the Forestry Service is in charge of reforestation and Public Works, roads and bridges.
  7. In Angkor National Parks two ruins have been left in their natural state.
  8. Logging, hunting, and fishing are prohibited in the park. New inhabitants are forbidden to settle and ways of removing those already there are under consideration. Except for the tourist facilities mentioned in 5 above (and drinking stands) no commercial enterprises are authorized in the park.

9. Park protection is effective.
10. No exotic plant or animal introduction is permitted.
11. There are practically no problems in Angkor National Park.

F. List of other areas that should be preserved:

In theory all the game reserves, after being developed, are to become totally protected national parks and/or reserves. Koulen-Promtep (North Cambodia), 1, 467, 000 hectares is to be made into a national park for the protection of historical monuments and endangered species such as the kouprey, serow, and giant ibis.

Areas having second priority are the following:

Fauna reserve of Phnom-Prich (Kratie),	195,120	hectares
" " " Lomphat	197, 480	"
" " " Kirirom	81, 720	"
" " " Phnom-Kravanh	280, 640	"

In addition two other areas are under study as reserves for the preservation of endangered species:

Reang Khvao (near Mont des Cardomomes), about 20, 000 hectares, an ideal habitat for the serow;

The Great Lakes, about 300, 000 hectares, during the dry season, the habitat of migrating and water birds. Protecting this latter area will enable resident birds to reproduce and migratory ones to rest in safety.

G. Forest Conservation:

1. The wooded area (13, 300, 000 hectares) represents 73 per cent of the total area of the country.
2. Forest reserves include 3, 900, 000 hectares or 29 per cent of the wooded area.
3. The objectives of the forest reserves are soil conservation, logging, and scientific research.
4. The training of forestry personnel depends on the job. At the top level of direction and planning the various specialists (Ingenieurs) are trained abroad (Nancy, France; Gembloux, Belgium; Quebec, Canada; Athens, Georgia, U.S.A.). A new Royal University for Agronomy will soon make it possible to train them locally. Medium-grade field personnel are trained locally at the Ecole Nationale d'Agriculture et de Sylviculture and have the title of Controleur des Eaux, Forêts, et Chasse. Rangers are taught at the Ecole des Gardes et Brigadiers des Eaux, Forêts, et Chasse.
5. Illegal clearing for cultivation is a major problem in the highlands of the north. The main reasons for it are lack of education and the difficulty of applying forest regulations for it is necessary to take into account the needs of the indigenous population.
6. Logging is carried out by private organizations under control of the forestry service.
7. Institut des Recherches et d'Enseignement Forestier is the forest research institute.
8. Reforestation:
  - (a) Reforestation is always carried out by the Forestry Service. Since 1965 the government has launched a national reforestation campaign in which every inhabitant between the ages of 15 and 55 must plant two trees a year under the direction of the Forestry Service.
  - (b) Reforestation is carried out with seedlings grown by the inhabitants in cleared areas. In wooded areas, thinning operations are carried out around seedlings and saplings.
  - (c) Poisoning of non-commercial species is not practiced.

- (d) Areas reclaimed by plantings or by clearing: 800 hectares per year. Areas annually affected by cutting (180,000 hectares) are located in regions near the navigable waters of the Mekong, Tonle-Sap, and Gulf of Siam. Cutting is carried out in such a way that natural regeneration is assured hence the difference in the above figure.
- (e) Reforestation is done with native species and a few exotic ones.
- (f) Natural and artificial reforestation can be considered as effective provided it is kept up for a certain length of time (cleaning, thinning, etc.). Areas thus treated are well protected against fires by preventive measures (fire breaks) and against new clearings. The population is less likely to interfere with what is planted than with what grows naturally.

#### 9. Forest fires:

Forest fires were a great problem in Cambodia prior to 1964, both accidental (from cigarettes, cookfires, honey collecting) and those set on purpose to renew grass for cattle, to collect antlers, hunt tortoises, clean rice fields. Following a meeting of civilian as well as military and forestry administrative authorities, in April 1964, a national campaign against forest fires was launched by the government. Committees to combat the menace were organized at provincial, regional, and village levels with the help of the clergy and the collaboration of all services concerned.

An active propaganda campaign is carried out through radio, posters, and signs. Individual merit rewards were bestowed and permits to cut wood were given to those committees who have shown devotion to the cause. The campaign has been effective; of the 730,000 hectares burned each year only a half (339,000 hectares) have burned this year.

#### H. Soil and water conservation:

(not answered)

##### I. Conservation of wildlife:

1. The Service des Eaux, Forêts, et Chasse, under the authority of the Ministry of Agriculture is responsible for wildlife.
2. Royal Ordinance No. 24 of 26 January 1940 regulates hunting and the protection of some animal species. This law is outdated. Prakas No. 194 (1960) forbids the hunting of large wild animals until a new law can be passed. A new hunting code has been put before the National Assembly.
3. The new hunting regulations which are about to be put into effect will insure better protection of the fauna. For their effective application, the corps of rangers must be enlarged and must receive special training.
4. Types of training provided: (not answered)
5. Problems of wildlife control:

Damage to crops by wildlife is reported to the Inspection des Chasses du Service des Eaux, Forêts, et Chasses and they decide what measures to take. Usually the people are advised to organize drives to chase elephants away from the fields by using firecrackers, or explosions with acetylene gas in bamboo tubes, or to light fires around the fields. The use of firearms, even to frighten the animals, is authorized only in cases of extreme necessity.

##### 6. Game reserves:

- (a) See F above. Koulen-Promtep and Lomphat are for the special protection of the kouprey.
- (b) Each reserve and the Angkor National Park is patrolled by guards, the number depending upon the size of the area. There are some rare cases of poaching, but it is felt that the reserves are effective. It is felt that the animals are regaining confidence and they are now willing to be photographed from cars before running away. (Banteng are alerted at 60 to 80 meters, Muntjac deer at 30 to 40 meters, Eld's deer at 40 to 50 meters.)

7. Wildlife research:

- (a) There is almost no research on wildlife.
- (b) No government organization specializing in wildlife research.
- (c) The most urgent need is for research on threatened species.

J. Threatened species.

1. The kouprey (*Novibos sauveli*), the serow (*Capricornis sumatrensis*); and the pig-deer (*Cervus porcinus*) are threatened species, the kouprey and the pig-deer because of hunting and destruction of habitat. The serow is hunted because of its horn which is believed to have curative powers.
2. It is impossible to determine the length of time the species may survive. With the present support of the government (since 1960) there is a good chance that they will be saved at least temporarily.
3. In 1960 hunting was forbidden and reserves were created. Since then the threatened species have increased, but very slowly. To prevent their disappearance, reserves must be more numerous and must be completely protected; much-threatened species must be raised in captivity; and neighboring states might create similar reserves so that the animals can move from one pasture to another without danger.

K. Pesticides

1. Pesticides are used against anopheline mosquitoes and insect pests of crops; herbicides are used only on rubber plantations to control *Imperata cylindrica*. Poisoning of non-commercial tree species is not done.
2. There is no system of controls on the use of pesticides as yet.
3. Pesticides are noxious for insectivorous birds and carnivores.
4. No research on pesticides has been carried out to verify the noxious effects. Everyday observation shows these effects.

L. Public education on conservation:

- 1 and 2. Conservation education is carried out by pamphlets, posters, postage stamps, and by release of game by the Chief of State.
3. A column in a weekly paper *Realtiés Cambodgiennes*, is set aside for the 'Friends of Nature'. There is a weekly national radio program devoted to the protection of fauna and flora.
4. A plan for a course in wildlife conservation to be included in the school curricula was sent sometime ago to the Ministry of National Education.
- 5 and 6. There are no private bodies concerned with conservation education.
7. There are no texts because of the cost of printing.

M. Training of conservation personnel:

1. Courses in wildlife conservation are given only in the Ecole Nationale d'Agriculture, de Sylviculture et d'Elevage and the École des Gardes et Brigadiers des Eaux et Forêts.
2. Advanced training is given at the above. A zoological garden is planned for the future Royal University of Agronomy, now being built.
3. If an international expert were brought in funds would also have to be furnished by an international organization to enable him to implement his program.
4. The most urgent problem is the training of conservation personnel which cannot now be undertaken because of the austerity program.

N. Most urgent conservation problems.

Personnel and supplies are needed to adequately protect the existing reserves. An educational program to awaken public interest is also needed. International assistance in the form of work, propaganda, and materials would be welcome.

# Conservation in Laos<sup>1</sup>

by

FATHER P. J. BRIX

*Société Royale des Sciences Naturelles du Laos, Vientiane, Laos*

## A. General

1. Area: 230, 000 square kilometers
2. Population: about 2 million.
3. Economy: production and export of timber (teak), benzoin, opium, tin.

## B. Government departments concerned with conservation:

Services des Eaux et Forêts under the Ministère de l'Économie, (Vientiane).

## C. Organizations concerned with conservation research:

Société Royale des Sciences Naturelles du Laos. (Secretariat de l'Agriculture, Vientiane, Laos).

## D. No private conservation organizations.

## E. National Parks and equivalent reserves:

Vat Phu (Champassak)

That Luang (Vientiane)

Phu Si (Luang Prabang)

Plaine des Jarres (Thra Ninh, Xieng Khuang)

## F. List of other areas that should be preserved etc.:

Because of its geographic location, varied topography, and special climate, Laos has a rich flora and fauna. It appears necessary if Laos wants to create protected areas, to select at least three or four in varying latitudes and altitudes.

## G. Forest Conservation:

1. 50 per cent of total land area is under forest.
2. 3. and 4. Nil.
5. In theory timber cutting is under the control of the Service des Eaux et Forêts of Laos. The ray system (shifting agriculture) is a great problem particularly in the mountains where the inhabitants completely destroy all plant life with a three year cycle of cultivation. If the inhabitants do abandon a site for any reason (such as war, epidemics, a sorcery) the area is taken over by tall grass, numerous landslides occur, and accelerated erosion takes place each rainy season. The provinces of Xieng Khuang, Sam Neua, Phon Saly and Luang Prabang show the seriousness of the problem. The Département des Eaux et Forêts seems helpless in the face of this practice which is political as well as economic as the mountain people consider their rays traditional.
6. Logging is carried out by private enterprise.
7. Research branch in forestry: ?
8. No program of reforestation carried out.
9. Forest fires:

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<sup>1</sup> Original in French.

Forest fires are a serious problem especially in the areas abandoned by shifting cultivators and invaded by tall grass. These are often deliberately set for hunting purposes and aid in destruction of the species. Nothing is done to cope with the problem.

H. There is no program of soil and water conservation.

I. 1. The Departement des Eaux et Forêts is responsible for wildlife.

2. Adequacy of laws etc.:

In theory a hunter must have a hunting permit, but in practice the inhabitants of both lowlands and mountains live mainly by hunting and gathering.

3. During the Buddhist Lent, which coincides with the season for the dropping of young for many mammals, hunting is officially prohibited. Unfortunately, this regulation is frequently ignored.

4. No training provided for wildlife personnel.

5. Nothing is being done about any problem of wildlife control.

6. There are no game reserves.

7. No research at government level; the only research carried on is by members of the Royal Society of Natural Sciences of Laos.

J. Threatened species:

Nil.

K. Pesticides:

Nil.

L. Public education in conservation:

Nil.

M. Training of conservation personnel:

Nil.

1. and 2. There are no training schools or opportunities for advanced training for conservation personnel (but are there even any conservation personnel? lch).

3. International experts from the UN or ECAFE could be sent to the Direction de l'Agriculture or the Departement des Eaux et Forets to point out the problems.

N. Urgent Conservation problems:

The problem of shifting agriculture by mountain inhabitants is certainly a worrisome question. Several solutions could be recommended, or perhaps a compromise between them:

1. Some leguminous species, strong enough to resist invasion of the tall grass, might be planted on abandoned sites to enrich the soil.

2. Reforestation might be attempted with natural species for timber and firewood; orchard species (oranges, tangerines, lemons, tea, coffee, cinnamon); species with essential oils where feasible; and tree plantations (teak, benzoin) when the villages appear to be stable and no longer nomadic.

3. Everything should be done to educate and persuade the village chiefs to induce the villages to settle down, giving them enough room, and taking care not to upset the tribal and clan customs.

# Status of Conservation in Malaya

by

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## A. General Data:

1. Area: c. 50, 000 square miles.
2. Population: 7½ million.
3. Economy: Rubber and tin exports.

## B. Government Departments and Official Organizations concerned with Conservation:

1. Department of Forestry, Kuala Lumpur; with State Forest Officers in each State.
2. Game Department; Chief Game Warden, Seremban, Negri Sembilan.
3. Department of Fisheries; Director, Kuala Lumpur.
4. Department of Agriculture; Director, Kuala Lumpur.

## C. Organizations concerned with research into conservation:

All Departments listed above B have research branches.

## D. Private conservation organizations:

Malayan Nature Society (P.O. Box 750, Kuala Lumpur, Malaya, Malaysia) 600 members, general conservation.

## E. National Parks and equivalent reserves.

1. The organization responsible for the establishing and maintaining Malaya's National Park (Taman Negara) is the Game Department. The objective of establishing and maintaining of our Taman Negara is principally for the conservation of our country's fauna and flora.
2. Malaya has only one national park (Taman Negara). It was established in 1938, and named the King George V National Park. It is located in the three States of Pahang, Kelantan and Trengganu. The most significant feature of the park is that it contains a good representation of most of the fauna and flora found in our country.
3. Public information is offered in the form of a park brochure. However, not many of these brochures are available to the public due to lack of funds.
4. At present no training is given to park staff due to lack of manpower and funds.
5. At the present moment the Park has a modern 4 roomed rest house, two two-roomed chalets and five two-roomed halting bungalows.
6. The Taman Negara is under the charge of a superintendent who is a game warden. He is responsible for the administration and control of the park. The Superintendent is responsible to the Chief Game Warden who is the Officer in Charge of the Park. At present the emphasis is on recreation, tourism; conservation is sadly lacking due to shortage of manpower.
7. Ninety nine per cent of the Park is kept in its true wilderness.
8. No exploitation, except for fishing which is under license at \$5/- (Malayan dollars) per person for a period of 30 days.
9. The protection of the park is, sad to say, ineffective; there is poaching, both for fish and game, and the illegal collection of bamboo and rattan.

10. No exotic introduction.
11. The major problems facing our park are:
  - (a) The lack of training for the staff;
  - (b) Poaching and illegal collection of bamboo and rattan;
  - (c) Over-emphasis on the catering for tourists;
  - (d) Lack of personnel, and
  - (e) Lack of funds.
12. The Malaysian Government has approved a plan for the spending of (Malayan dollars) \$750, 000/- for the development of the park over the next 5 years – 1966 to 1970 - to build more facilities to cater for more tourists. With this development it is hoped that we could get funds to recruit more game rangers for conservation work.

F. Other areas:

The Game Department has two areas in mind which could be created Game Reserves. The area which is situated in Upper Perak along the Perak River has an area of 17, 808 acres. In this comparatively small area are situated 11 salt licks. Wildlife, especially the larger species like elephants, seladang and rusa, is abundant. The second area is in central Pahang in the Tasek (lake) Bera area which covers about 10 square miles. In this area, apart from land animals, there are also wild duck, coots, rails and crakes.

G. Forest conservation:

1. Forest Area: 67 per cent.
2. Forest Reserves: 26 per cent.
3. Types of Forest Reserves:
  - (a) Protective.
  - (b) Productive.

Within them are located virgin jungle reserves and other research areas.

4. Training provided for forestry personnel:
  - (a) Senior officers: 3-6 months training under the guidance of the officers of the F.R.I., Kepong, to orientate graduates from Forestry Institutions abroad in local forestry.
  - (b) Subordinate staff: 11 months elementary forestry training at the Forest School, F.R.I., Kepong. A refresher course catering for the senior grades of staff is being started covering selected subjects only.
5. Illegal clearing for shifting cultivation by the aborigines constitutes a significant forestry problem, although such a practice has also been common among the other races of the country. The main factors involved are difficulty of control and inadequate legislation. A weak policy might also be a factor.
6. Logging carried out by private industry.
7. There is a Forest Research Institute at Kepong. Although not too badly funded, it is inadequately staffed.
8. Reforestation:
  - (a) Program carried out by government.
  - (b) Generally reforestation is by natural regeneration aided by protection. Where natural regeneration failed or is inadequate, the forest is enriched by planting. Regular plantation is established where the area is decidedly poor but suitable for exotic tropical conifers.
  - (c) Selective poisoning is used.
  - (d) Averaging over the last four years (1961-64) the area cut annually is of the order of 66, 600 acres and the area reforested is 50, 800 acres. Thus the

area reforested amounted to approximately 76 per cent of the area cut. It should be realized that there is still a considerable amount of back-log brought about by the Japanese occupation of the country and the emergency that followed.

- (e) Both native and exotic species are used in reforestation.
  - (f) Reforestation is quite successful generally. Where reforestation is in high forest by natural means or by enrichment planting it is adequately protected but where regular plantations of conifers especially are concerned, fires are still a serious threat.
9. Forest fires are not generally a problem but they are with regular plantations of conifers. Man is generally the cause and measures are being taken to prevent occurrences, such as constant clearing of fire breaks and the provision of adequate fencing.

#### H. Soil and Water Conservation:

A number of irrigation projects are in hand, intended to more than double the area of rice cultivation under controlled water supply within a few years. Major hydro-electric schemes are also in operation, under construction and planned. The Federal Land & Development Authority (Jalan Gurney, Kuala Lumpur) are probably concerned in some of this.

#### I. Conservation of wildlife:

1. The Game Department is responsible for conservation of wildlife.
2. The laws protecting wild life are found in the Wild Animals and Birds Protection Ordinance No. 2 of 1955. The present ordinance is considered to have many 'loop-holes' and requires revision.
3. Enforcement of this Ordinance is inadequate, as the Game Department is facing a serious shortage of staff and trained officers. Public support is also lacking.
4. No training at the present moment.
5. At present staff of the Game Department take action to drive animals away from the cultivation they are destroying as soon as such a case is reported. As a final resort 'leaders' of the herd may be shot and killed to drive the animals away.
6. (a) The CHIOR Game Reserve has an area of 14 square miles. It is situated north of Sungei Siput, north of Perak.
- (b) The Taman Negara has an area of 1677 square miles. In addition to being a game reserve, it is also Malaya's only National Park. The object of this Park is for the conservation of the fauna and flora indigenous to this country.
- (c) The Sungkai Game Reserve has an area of 15 square miles. It is situated southeast of Bidor, Perak.
- (d) The Krau Game Reserve is situated east of Raub, Pahang. It has an area of 252 square miles. In this Game Reserve are many Elephants and Seladang.
- (e) Sungei Dusun Game Reserve has an area of 10,700 acres. It is situated southwest of Tanjong Malim, Perak.
- (f) Bukit Batu Game Reserve has an area of 7½ square miles. East of Kuala Kubu Bahru, Selangor.
- (g) Gold Course Kuala Lumpur Reserve.
- (h) Port Dickson Island Bird Sanctuary is situated on Pulau Burong (2 roods), Pulau Babi (1 rood) and Pulau Perjudi (1½ rood). They are situated to the southwest of Port Dickson.
- (i) Segamat Wild Life Sanctuary (146 square miles) and Endau-Kluang Wild Life Reserve (401 square miles). Both these reserves are situated on the northern border of Johore and Pahang.

- (j) Endau-Kota Tinggi Wild Life Reserve (878 square miles) is situated north of Kota Tinggi, Johore.
- (k) Kuala Pahang Bird Sanctuary has an area of 5 square miles situated to the east of Pekan, Pahang.

Note: The objectives of a c d f i j are for the conservation of wildlife. As for b above in addition it also serves as a place of recreation for tourists, g h and k are chiefly for the conservation of Birds. Finally, e the Sungei Dusun Game Reserves were created for the conservation of the Rhinoceros found there.

7. Wildlife Research:

- (a) Research projects are being carried out.
- (b) No research division in government body responsible for wildlife.
- (c) In addition to the rhinoceros, research on the elephants (*Elephas maximus*), gaur or seladang (*Bos gaurus*) and sambar deer (*Cervus unicolor*) are deemed most urgent.

J. Threatened species of animals and plants;

- 1. Javan and Sumatran Rhinoceros (*Rhinoceros sondaicus*) and (*Didermocerus sumatrensis*). Both species are believed by both the Malays and Chinese to be a 'miracle animal' and that all parts of the animals have some medicinal value to cure all kinds of illness. It is believed that scrapings of the rhinoceros horns made into a brew and taken will cure cancer and other diseases! An ounce of rhinoceros horn would fetch anything up to \$350.00 (Malaysian dollars), dried rhino blood could be sold at \$45.00 an ounce and even its dung is readily bought by Chinese practitioners.

The gaur or seladang (*Bos gaurus*) is poached for its meat.

- 2. In the opinion of responsible officers of the Game Department, if no action is taken now the rhinoceros will disappear altogether from our country in 5 years time. The gaur or seladang can last a little longer – perhaps ten years time.

3. Measures to prevent extermination:

The creation of more game reserves in areas where these animals are found. A stricter law, for the maximum penalty under the present Ordinance is 6 months imprisonment and/or a fine of \$1,000/- for killing a totally protected animal which includes the rhinoceros, is insufficient to act as a deterrent. And finally the recruitment of more officers and Game Rangers to enforce the law.

K. Pesticides:

- 1. Liberally used. Sodium arsenite widely used as herbicide, in plant control in both forestry and plantation. We have no knowledge of the extent of the use of other poisons.
- 2. Not answered.
- 3. Such poisons can hardly be other than dangerous.
- 4. We believe research is being carried out on pesticides. Refer to Rubber Research Institute, P.O. Box 150, Kuala Lumpur, in addition to organizations listed under (B).

L. Public education on Conservation:

- 1-4. Generally there are no programs in conservation education; refer to Education Department.
- 5. Private bodies: See (D) above.
- 6. Little by little, success is being made in educating the public.
- 7. No texts as such are available.

M. Training of conservation personnel:

1. Training schools:
  - (a) There are training schools for forestry personnel. (see G, 4 above).
  - (b) None for wildlife management.
  - (c) None in national park management.
  - (d) None in other aspects of conservation.
2. No opportunity for advanced training in above subjects (as such).
3. Dr. Lee Talbot was here recently; his report has not yet been published.
4. For training we believe that it would be preferable to send local staff abroad to established institutes, rather than to bring in 'international experts' unacquainted with local conditions, without special sponsoring from the Government, but see N 1, and N 2 below.

N. Urgent conservation problems:

We give below comments of:

1. An officer of the Game Department

'In my opinion the most urgent conservation problems facing my country today are listed as follows:

- (a) the lack of staff of the Game Department;
- (b) no facilities and trained staff to do research work;
- (c) no facilities to train the staff of the Game Department;
- (d) lack of public support.

To approach the above problems particularly on a b c above, high officials of the Government should be made to see and understand the importance of the conservation of wild life to this country and the world at large by local individuals /organizations and international organizations like the IUCN and others. Once the high officials of the Government see the point and give us their support I feel sure the problem will solve itself. As for d above, once problems a b and c are solved then we could start on the 'education' of the public by running civic courses and lectures at schools, etc.

Presently international organizations could help immensely by sending us experts to help us in doing research work and the training of our officers overseas'.

2. An authorized spokesman of the Department of Forestry –

'Beside what has been indicated under G4 above, at present there is no other forestry training available in the country. Professional training has always been obtained from abroad. What are needed are training facilities for the intermediate and higher level in the form of a college and the establishment of a School of Forestry or a Faculty of Forestry within the existing University of Malaya. International assistance could help in the establishment of the faculty in the form of personnel for the teaching staff whilst in the case of the college, since it is going to be a completely new institution, both funds and personnel would be required. The possibility of a joint training at the existing College of Agriculture with the assistance of the Forest Research Institute might be investigated'.

In our opinion, public education is of crucial importance. Since this task has not been taken over by the Education Department, it falls on private bodies (D, above). Funds to support current conservation programs of the Malayan Nature Society would be extremely useful.

Acknowledgments:

In preparing our reply we have drawn fully on letters from the State Forest Officer, Negri Sembilan and Malacca, on behalf of the Chief Conservator of Forests, and from Mr. Bernard Thong, for the Chief Game Warden, States of Malaya. We gratefully acknowledge the help of these gentlemen.

## **Conservation in Malaysia**

For the status of conservation in the nation of Malaysia please see papers under the appropriate state: Malaya, Sabah, Sarawak.

# Status of Conservation in the Philippines

by

PARKS AND WILDLIFE OFFICE, MANILA, PHILIPPINES

## A. General data:

1. Area: 115, 758 square miles. The Philippine Archipelago extends 1,152 statute miles north to south and consists of 7,107 islands of volcanic origin.
2. Population: 32, 345, 000 (3-4 per cent increase annually).
3. Economy: Predominantly agrarian with some industry.

## B. Government departments and national organizations concerned with conservation:

### 1. Government departments:

- (a) Department of Agriculture and Natural Resources (Diliman, Quezon City). Virtually all the agencies of this department are concerned with utilization and, at least nominally, with conservation of natural resources.
  - 1) Parks and Wildlife Office is charged with conservation of wildlife and management of national parks and recreation areas.
  - 2) Bureau of Lands is concerned with disposition of lands.
  - 3) Departmental Employees Organization (DANREA) is a very active organization potentially of great importance to conservation.
- (b) Board of Travel and Tourist Industries (Manila) has direct concern with national parks because of their role in tourism and recreation. Philippine Tourist and Travel Association is a non-governmental organization created and subsidized by the Board.
- (c) Department of Education (Manila):
  - 1) Concerned with school curricula.
  - 2) National Museum is concerned with a variety of natural and cultural resources.
- (d) Department of Public Works and Communications (Manila).
- (e) Office of the President (Manila). The following, which affect natural resources, are directly responsible to the Office of the President:
  - 1) FAO National Commission
  - 2) National Parks Development Committee
  - 3) General Forestry Committee of the Philippines
  - 4) National Cultural Commission
  - 5) UNESCO National Commission
- (f) National Shrines Commission (Ft. Aguinaldo, Quezon City).
- (g) Other governmental owned or controlled bodies nominally concerned with conservation include:
  - 1) National Power Corporation and National Waterworks and Sewerage Authority are concerned with control and conservation of watershed areas.
  - 2) Development Bank and National Development Company are concerned with land use.

2. National organizations:

- (a) Philippine Association for the Conservation of Nature and Natural Resources (UNESCO Office, Manila) is a non-stock, non-political organization created by the UNESCO National Commission of the Philippines to carry out the recommendations adopted by the General Conference of UNESCO in December 1962 on 'Economic Development and Conservation of Natural Resources, Flora and Fauna' and the Recommendations concerning the safeguarding of the beauty and character of landscape sites.
- (b) Philippine National Committee on Natural Resources (Manila) assists in determining present and potential uses of natural resources and in programs of public education.
- (c) Not answered.

D. Private conservation organizations:

1. Boy Scouts of the Philippines is very strong throughout the islands and their objectives include 'conservation'.
2. Conservation Committee of the Philippine Constitutional Society.
3. Forestry organizations:
  - (a) Society of Filipino Foresters
  - (b) Philippine Lumber Producers' Association. N. b. Some private lumber companies have developed and followed effective conservation policies within their own lease and concession areas.
4. Philippine Chamber of Agriculture and Resources.
5. Philippine Hunters' Club.
6. Other sporting clubs include the Philippine Anglers' Club and Rod and Gun Clubs on American Naval and Air Force Bases.

E. National parks and equivalent reserves:

1. The Parks and Wildlife Office, under the Department of Agriculture and Natural Resources, is the agency responsible for establishment and maintenance of national parks and equivalent reserves. Its objectives are the conservation and development of national parks and the conservation of wildlife.
2. There are at present 49 national parks in the Philippines. (See Annex I for list).
3. There are no public information or interpretive services provided as yet.
4. There is no educational institution in the country to give training in park management.
5. No answer.
6. The main emphasis is on preservation in national parks.
7. The major problems facing the national parks in this country are as follows: lack of financial support from the government; lack of sufficiently trained personnel; lack of equipment; political interference; public apathy toward parks and their objectives; insecurity of career officers in the service. These deficiencies have led to illegal encroachments, settlement, and poaching. There is above all a lack of national policy regarding parks, and lack of adequate classification of types of 'national parks'.

F. Other areas that should be reserved as national parks:

See Annex 3, List of Proposed National Parks.

G. Forest conservation.

1. Approximately 42 per cent (about 13, 000, 000 hectares) of the total land area of the Philippines is in forest, as of June 30, 1964. The break down of land-use in the Philippines is as follows:

<i>Use</i>	<i>Area in Hectares</i>	<i>Per cent</i>
Commercial forest	9,257,556	27.76
Non-commercial forest	4,102, 021	13.80
Cogon or open land	5,509,216	18.51
Swamps	662, 447	2.23
Cultivated and other lands	11. 210, 050	37.70

2. In 1964 about 3.8 per cent (1,154, 405 hectares) of the country was under forest reserves.
3. Forest reserve areas under Republic Act No. 3092 are subject to scientific management, and are set aside as production and protection forests.
4. Personnel of the Bureau of Forestry are trained in the College of Forestry, University of the Philippines, which offers a four year course in forestry and a two year ranger course. A basic ranger course is also offered at the Araneta University, a private institution.
5. Kaingin-making (shifting type of cultivation, normally done in forest lands), squatting and timber smuggling are major problems which greatly hamper the work on forest conservation. The laws are adequate enough to effect a workable forest conservation program, but politics has made these laws unenforceable. These illegal practices annually destroy 12, 000 hectares of forest land in Western Mindanao which is 1/5 of the total land area of the Philippines alone and the National Economic Council estimates that the annual forest destruction for the country is 172, 000 hectares. The basic problems confronting the Bureau of Forestry are:
  - (a) Lack of financial support from the government;
  - (b) Lack of personnel;
  - (c) Lack of equipment and adequate funds for travelling expenses;
  - (d) Political interference;
  - (e) Public apathy towards forest conservation.
6. Logging is carried out by private industry either under a license or a lease agreement. There has been a move to issue licenses only to big lumber companies under long term lease agreements with a three year probationary period since big companies protect their investments and would therefore control forest utilization and implement scientific management programs.
7. Bureau of Forestry has a research division which undertakes studies in silviculture of forest trees and plants of economic importance, acclimatization of exotic plants, effects of grazing, and timber growth. It is believed that it is not adequately staffed or funded for effective operations.
8. Reforestation
  - (a) The Reforestation Administration was established in June, 1960, to counter the gross destruction of forest lands and reforestation is a sole responsibility of the government. Licenses are required, as part of the conditions on the license to undertake reforestation within their licensed area; however, this is not effective.
  - (b) Reforestation is carried out by replanting, seeding, and natural regeneration.
  - (c) The area reforested amounts to only about 1 per cent annually of all the areas destroyed by the various forest users, legal or otherwise.
  - (d) In spite of the extensive program on reforestation, the area covered amounts to only about one per cent annually of all the areas destroyed by the various forest users – legal or otherwise.
  - (e) Not answered.
  - (f) It is quite difficult to say that reforestation in the country is successful.

9. Forest fires are not a major problem. They are common only in Northern Luzon where small cattle raisers in search of fresh grass burn portions of coniferous type forest. Extensive forest patrol and information campaigns have been undertaken to educate the people on the dangers of forest fires.

H. Not answered.

I. Conservation of wildlife.

1. The conservation of wildlife is the responsibility of the Parks and Wildlife Office. Its legal basis is found in Act No. 2590 as amended.
2. This law is inadequate, it is not properly enforced and it should be up-dated.
3. Except in some isolated areas, there is no active enforcement of the law because of lack of personnel, lack of appropriate training and funds, brought about by the absence of public support.
4. There is at present no formal training for wildlife management personnel in the country.
5. There is no problem of wildlife control except in cases where there is a great concentration of rice birds. Extensive hunting and trapping of wild pigs and monkeys has eliminated the crop depredations of these pest species.

6. Game reserves.

Except in one area the game reserves are unmanned. See Annex 2 for List of Game Refuges and Bird Sanctuaries.

7. Wildlife research.

- (a) No wildlife research carried out except for minor observations undertaken when funds become available.
- (b) There is no research division but there are research personnel available.
- (c) The most urgent wildlife research projects are studies on population:
  - 1) particularly of game species,
  - 2) biology of threatened species,
  - 3) habitat requirements,
  - 4) ecology of plants and animals in national parks,
  - 5) species relationships.

J. Threatened species:

1. The tamarau species – (*Bubalus mindorensis* Huede)
2. The monkey-eating eagle – (*Pithecophaga jeffreyii*)
3. The monkeys – (*Pithecus spp.*)

K. No answer.

L. Public education on conservation:

1. There is a forest education and information committee composed of forest resource use agencies and the Parks and Wildlife Office which operates from the College of Forestry, University of the Philippines.
2. The committee provides conservation bulletins, posters, brochures, radio broadcasts, and other informational media.
3. Newspapers, radio, etc. have been employed in a very limited manner usually only for sensational articles on national catastrophes as floods and drought.
4. Through the initiative of the National Resources Branch of the National Research Council of the Philippines, conservation subjects are now included in the basic curricula of elementary and high schools.
5. and 6. Private conservation organizations have not been very effective in conservation education because they do not attempt it and the membership in some organizations is limited to the wealthy.

7. There is now one biology text following an ecological approach on the secondary level which was published with the aid of the Asia Foundation. It is available but not in national circulation.

M. Training of conservation personnel:

1. There is at present a College of Forestry and a College of Agriculture (University of the Philippines) which provide training on a university level for forest and soil management only.
2. Advanced training leading to a master's or doctor's degree have been undertaken abroad under technical assistance programs of the United States, United Nations specialized agencies, and the Colombo Plan. There has been, however, a move initiated by Dr. and Mrs. Lee M. Talbot during their recent survey in the Philippines under the IUCN to establish a conservation institute in the state university for co-ordinated training in natural resources management.
3. We were privileged to have the services of international experts on forest management provided through the FAO and the U. S. technical assistance program. The major bulk of their activities, particularly in forest management was to provide a) improvement of forest management curriculum, and b) to act as advisors particularly in forest inventory and c) to arrange training of local personnel abroad. In most cases, their work and guidance have been effective, except when the same comes in conflict with the political aspirations of some people.
4. The most urgent conservation training need is in resource management. International experts as advisors or instructors could provide on-the-job training and formal college education for professional natural resource management personnel.

N. Most urgent conservation problems of the country:

1. Problems:
  - (a) Shifting cultivation and the making of illegal clearings in national parks, forest reserves, wildlife reserves and the protection forests;
  - (b) Illegal logging;
  - (c) Conservation education on all the aspects of natural resource conservation; and above all
  - (d) The lack of a national integrated natural resource conservation program.
2. Approach to solutions:
  - (a) Socio-economic reorientation;
  - (b) Provision of a definite and co-ordinated natural resource program;
  - (c) Provision of an intensive public education and information conservation program;
  - (d) Sufficient public support through dissemination of available factual information on the status of natural resources of the country;
  - (e) Provide for a definite land use pattern through zoning and the establishment of reserves with full or absolute legal protection; and
  - (f) Sufficient government support.
3. The most urgent conservation need is to awaken the government and the people to the importance of natural resource conservation. This can only be done through international action, particularly through a United Nations, co-ordinated project which the government itself will be bound and obligated to support. The establishment of a national policy regarding natural resources should be a condition preceding any action to be taken.

## ANNEX 1

## LIST OF NATIONAL PARKS IN THE PHILIPPINES

Names of National Parks	Location	Proc. No.	Establishment Date	Areas in Hectares	Special Features
1. Roosevelt N.P.	Hermosa, Bataan	567	3-30-33	1,485.00	Rock formations, natural hot springs & game refuge.
2. Mt. Arayat N.P.	Arayat, Pampanga	594 Amd. by 203	6-27-33 9-16-34	3,714.2074	Panoramic, aesthetic & recreational.
3. Libmanan Caves N.P.	Libmanan, Camarines Sur	654	2-6-34	19.4	Series of crystal caverns and beautiful cataracts.
4. Bicol N.P.	Basud & Daet, Camarines Norte; & Lupi, Sipocot, Camarines Sur	657 Amd. by 656	2-13-34 12-23-40	4,225.00 5,201.00	Panoramic, & aesthetic virgin forest & game refuge.
5. Mt. Canlaon N.P.	Bago, La Carlota, La Castellana, Murcia, Canlaon & San Carlos, Negros Occidental & Villahermoso, Negros Oriental	721	8-8-34	24,577.60	Famous crater, waterfalls, hot springs, gorges & peculiar rock formation.
6. Quezon N.P.	Atimonan, Padre Burgos & Pagbilao, Quezon	740 Amd. by 594	10-25-34 8-5-40	535.0765 983.0765	Recreational, aesthetic & panoramic.
7. Bulusan Volcano N.P.	Casiguran, Barcelona, Bulusan, Irosin, & Juban, Sorsogon	811	6-7-35	3,673.2928	Famous crater, mineral hot spring, peculiar rock formation & panoramic.
8. Callao Cave N.P.	Penablanca, Cagayan	827	7-16-35	192.00	Inspiring caves, deep canyon & beautiful streams.
9. Sohoton Natural Bridge N.P.	Basey, Samar	831	7-19-35	840.00	Natural stone bridge, waterfalls, historical & recreational.
10. Sudlon N.P.	City of Cebu	56	4-11-36	696.00	Historical, aesthetic & scientific values; waterfalls & natural swimming pools.
11. Mt. Apo N.P.	Kidapawan, Cotabato; and Sta. Cruz & Guianga Davao	59 Amd. by 413	5-9-36	76,900.00	Medicinal hot spring, waterfalls & highest mountain in the Philippines.

Names of National Parks	Location	Proc. No.	Establishment Date	Areas in Hectares	Special Features
12. Mt. Data N.P.	Atok, Bokod, Tudlay, Kabayan, Kibungan, Man- kayan, Impasugan, Benguet, Kiangyan & Hunduan, Ifugao & Bauko, Ennaso, Kayan & Sabangan, Bontoc, Mt. Province	65 Amd. by 634	6-3-36 10-8-40	5,512.00	Waterfalls, numerous springs, towering rocks, bottomless ravines, zigzag road, temperate climate & pine forest.
13. Kuapnit Balinsasayao N.P.	Baybay & Abuyog, Leyte	142	4-16-37	364.00	Panoramic, aesthetic & scientific.
14. Tongonan Hot Spring N.P.	Ormoc, Leyte	161	6-14-37	272.00	Medicinal hot spring, recreational, geyser & scientific.
15. Managao Volcano N.P.	Burauen La Paz, Leyte	184	8-27-37	635.00	Medicinal hot spring, recreational, panoramic & aesthetic.
16. Central Cebu N.P.	Balamban, Toledo & City of Cebu	202	9-15-37	15,393.5833	Aesthetic, scientific & only remaining forest of Cebu.
17. Aurora Memorial Park	Bongabon, Nueva Ecija; and Baler, Quezon	220	11-11-37	2,356.00	Swimming pools, spring, invigorating climate scientific & game refuge.
18. Biak-na-Bato N.P.	San Miguel, Bulacan	223	11-16-37	2,117.00	Historical, geologic, panoramic & recreational.
19. Mt. Dajo N.P.	Patikul, Talipau, Jolo, Sulu	261	2-28-38	213.3510	Historical & game refuge.
20. Caramoan N.P.	Caramoan, Camarines Sur	291	7-20-38	347.00	Caves, subterranean river & panoramic hills.
21. Mayon Volcano N.P.	Albay, Camalig, Guinobatan, Libog, Ligao, Manlipot, Tabaco, Albay	292	7-20-38	5,458.6500	Panoramic, aesthetic, scientific & recreational.
22. Mt. Isarog N.P.	Naga, Calabanga, Tinambac, Goa Tigaon & Pili, Camarines Sur	293	7-20-38	10,112.3478	Health Resort wonderful canyons, gorges, ravines, waterfalls & game refuge.
23. Thirad Pass N.P.	Angaki, Concepcion, Bigay, Cervantes & Cuyo, Ilocos Sur	294	7-20-38	6,320.00	Historical.

Names of National Parks	Location	Proc. No.	Establishment Date	Areas in Hectares	Special Features
24. Fuyot Spring N.P.	Hagan, Isabela	327	10-8-38	819.00	Spring, caves, educational, aesthetic & recreational.
25. Pagsanjan Gorge N.P.	Cavinti & Lumban, Laguna	392	3-28-39	152.6448	Waterfalls, gorges natural swimming pools, aesthetic, panoramic & recreational.
26. Basilan N.P.	Lamitan, Basilan City	457	9-25-39	6,451.00	Waterfalls, natural swimming pools, virgin forest & game refuge.
27. Mado Hot Spring N.P.	Awang, Cotabato	456	9-25-39	48.00	Medicinal hot spring, recreational & health resort.
28. Manleluag Spring N.P.	Mangatarem, Pangasinan	612	9-3-40	91.7	Medicinal hot spring, recreational & health resort.
29. Rizal N.P.	Dapitan, Zamboanga	616	9-3-40	10.00	Historical, aesthetic & panoramic.
30. Hundred Island N.P.	Alaminos, Pangasinan	667	1-18-40	1,844.00	Unique physical composition of islands, recreational & scientific.
31. Mts. Bana-haw-San Cristobal N.P.	San Pablo, Lilio, Nagcarlan, Rizal, Majayjay, Laguna & Lucena, Lucban, Sariaya, Candalaria & Dolores, Quezon	716 Amd. by 812	5-21-41 12-27-61	11,133.3015 9,056.2373	Panoramic, aesthetic & recreational.
32. Bataan N.P.	Hermosa, Orani, Samal, Abucay, Balanga, Pilar, Bagac and Moron, Bataan	24	12-1-45	31,400.00	Historical.
33. Quezon Memorial Park	Diliman, Quezon City	42 Amd. by 373 Amd. by 650 Amd. by 811 Amd. by 54	7-5-54 12-26-56 2-17-60 12-27-61 10-27-62	197.2796 94.0490 197.2796 197.2796	Recreational,

Names of National Parks	Location	Proc. No.	Establishment Date	Areas in Hectares	Special Features
34. Manila Bay Beach Resort	Manila & Paranaque, Rizal	41	7-5-54	464.6612	Recreational & health resort.
35. Tiwi Hot Spring N.P.	Tiwi, Albay	47	7-10-54	47.12	Recreational & scientific & health resort.
36. Bossang Pass N.P.	Cervantes, Ilocos Sur	55	8-10-54	304.00	Historical.
37. Luneta N.P.	Manila	234 Amd. by 470	12-19-55 12-30-57	16.2383	The largest open space in the heart of Manila ideal for recreation.
38. Naujan Lake N.P,	Naujan, Pola and Victoria, Oriental Min-	282 Amd. by 793	3-27-56 9-29-61	21,655 1,966.4	Scientific, aesthetic value, widest breeding place for marsh birds.
39. Mainit Hot Spring N.P.	Compostella, Davao	466	1-15-58	1,381.00	Aesthetic & Medicinal hot springs.
40. Bulabog-Putian N.P.	Dinglo & San Enrique, Iloilo	760	6-14-61	854.3300	Scientific, panoramic, historical, game refuges, watershed.
41. Initao N.P.	Initao, Misamis Oriental	R.A. 3568	6-21-63	57.00	Virgin forest, beautiful sandy beaches, recreational.
42. Northern Luzon Reroes Hill N.P.	Bo. Gulvec, Ganta & Narvaca, Ilocos Sur	132	7-9-63	1,316.00	Lagoon, waterfalls, rock formations, Spanish Tower, historical.

## ANNEX 2

## LIST OF GAME REFUGES AND BIRD SANCTUARIES IN THE PHILIPPINES

Name of Game Refuges & Bird Sanctuaries	Location	Areas in Hectares	Date Established	Proc. No.
1. Liguasan Marsh Game Refuge & Bird Sanctuary	Dulawan, Liguasan & Pikit Pagalungan	43,930	1-1-41	For Adm. Order No. 19
2. Magapit Game Refuge & Bird Sanctuary	Lallo and Gattaran, Cagayan	7,577.5	8-15-47	For Adm. Order No. 10
3. Ursula Island Game Refuge & Bird Sanctuary	Brooke's Point Palawan	0.675	4-30-60	P. & W. Adm. Order No. 14
4. Mt. Iglit Game Refuge and Bird Sanctuary	Sablayan, Occidental Mindoro	8,956	4-1-61	P. & W. Adm.
5. Minasawa Island Game Refuge & Bird Sanctuary	Burdeos, Polilio Island, Quezon, Province	4,375	9-15-64	P. & W. Adm. Order No. 7
6. Lake Danao Game Refuge & Bird Sanctuary	San Francisco Pacijan Island Camotes Group Cebu Province	480.00	Proposed	
Total Area ...		65,319.17		

Revised:  
EGV/amj/bbc  
8/11/64

## ANNEX 3

## LIST OF PROPOSED NATIONAL PARKS

Name of Proposed Parks	Place	Status
1. Bathala Cave National Park	Sta. Cruz, Marinduque	For Survey
2. Provincial Beach Resort	Lian, Batangas	" "
3. Blanca Aurora Water Falls	Gandara, Samar	" "
4. Cawayan Fall National Park	Virac, Catanduanes	" "
5. Camp Verde National Park	Ibajay, Capiz	" "
6. Diffun National Park	Diffun Nueva Vizcaya	" "
7. Jawili Water Falls	Aklan, Palawan	" "
8. Mt. Hibokhibok National Park	Camiguin Islands	" "
9. Kasagawa Ruins National Park	Legaspi, City	" "
10. Kennon Road National Park	Benguet, Mt. Province	" "
11. Malbog Hot Spring	Marinduque	" "
12. Palo Beach National Park	Palo, Leyte	" "
13. Rexas-Quirino National Park	Vigan, Ilocos Sur	" "
14. Mt. Lamot National Park	Bulacan	" "
15. Mainit Spring	Caribbean, Leyte	" "
16. Quezon Park	Guinoog, Misamis Or.	" "
17. San Burst Park	Iloilo City	" "
18. San Miguel Park	Tago, Davao	" "
19. Bulabog Putian National Park	Dingle, Iloilo City	" "
20. Hinulugan Taktak	Antipolo, Rizal	" "
21. Paoay Lake Park	Paoay, Ilocos Norte	" "
22. Lamog Spring Park		" "
23. Holjogon Park	Masbate	" "
24. Lawton Drive Municipal Park	Tanjay, Or. Negros	" "
25. Manuel Fortich National Park	Malaybalay, Bukidnon	" "
26. Mapaso Hot Spring Park	Gattaran, Cagayan	" "
27. Malulod Park	Polilio, Quezon	" "
28. Gapan Park	Gapan, Nueva Ecija	" "
29. Albay Park	Albay, Albay	" "
30. Libog Park	Basud, Albay	" "
31. Blue Beach & Playground Park	Dagupan City	" "
32. Buhi Lake Park	Buhi, Camarines Sur	" "
33. Apolinario Velez Park	Cagayan de Oro City	" "
34. Dagohoy Park	Nabanga, Bohol	" "
35. Minalungao Park	Nueva Ecija	" "
36. Communal Forest	Tantay, Palawan	" "
37. Macahambus Cave & Agustin Hill	Cagayan de Oro City	" "
38. Manila Railroad Park	Calawag, Quezon	" "

Name of Proposed Parks	Place	Status
39. Mt. Matumtum Park	Buayan, Cotabato	For Survey
40. Maria Cristina Falls	Iligan-Baloi, Lanao	" "
41. Patag-Dacu, Tabogan	Negros Occidental	" "
42. Opol Park	Misamis Oriental	" "
43. Roxas Park	Tubod, Lanao	" "
44. Veterans Park	Compostela, Davao	" "
45. Roxas Memorial Park	Puerto Princesa	" "
46. Quirino Park	Dumalag, Capiz	" "
47. San Teodoro Park	Mindoro	" "
48. Sagod Islands Park	Jabonga, Agusan	" "
49. Sibulan Park	Negros Oriental	" "
50. Lake Cebu Park	Koronadal, Cotabato	" "
51. U-ugon Park	Morong, Rizal	" "
52. Taal Lake Park	Batangas	" "
53. Talomo Beach Recreation Center		" "
54. Mt. Balagbag Park	Tagkawayan, Quezon	" "
55. Mt. Piddig Park	Piddig, Ilocos Norte	" "
56. Pinamaloy Lake Park	Maramag, Bukidnon	" "
57. Mt. Magdiwata Park	San Francisco, Quezon	" "
58. Sinundungan Cave & Annaguan Cave	Tuguegarao, Cagayan	" "
59. Lopez-Lakandula Blood Compact	Bool, Tagbilaran, Bohol	" "
60. Community Fishpond Park	Cebu	" "
61. Lake Gogo & Glory's Hole	Subic Bay	" "
62. Jose P. Laurel Park	Batangas	" "
63. Gen. Wood & Baga Falls	Zamboanga del Sur	" "
64. Zambales Park	Zambales	" "
65. Fort Pilar Park	Pittit Barracks, Zamboanga City	" "
66. Lon-cy Spring	San Gabriel, La Union	" "
67. Prosperida Park	Bahbah & Aspetia, Agusan	" "
68. San Miguel Tarlac Park	Tarlac	" "
69. Parker Volcano Park	Cotabato	" "
70. Bohol Park	Garcia-hernandez, Bohol	" "
71. Karahian Valley	Pilar, Bohol	" "
72. Tagaytay Park	Tagaytay City	" "
73. Apaliha & Ayucan Spring	Candelaria, Quezon	" "
74. Ramon Magsaysay Shrine	Mt. Manungal, Cebu	" "
75. Quririno Resettlement Reservation	Dinaig, Cotabato	" "
76. Calvario Hill National Park	Piddig, Ilocos Norte	Pending approval by the President of the Philippines.

Name of Proposed Parks	Place	Status
77. Talomo Beach Resort	Davao City	Inspected and surveyed, and draft of Proclamation under process.
78. Pili Point National Park	Curry, Camarines Sur	Inspected and surveyed.
79. Alsong Cave National Park	Rizal, Cagayan and Cooner Apayao, Mt. Province	Inspected and preliminary survey finished.
80. Zinnundungan Cave National Park	Faire and Lasam, Cagayan	Inspected and preliminary survey finished.
81. Red Arrow Monument National Park	San Nicolas, Pangasinan	Pending inspection and survey.
82. Atimonan Beach Resort	Atimonan, Quezon	Pending inspection and survey.
83. Tigayon Mt. National Park	Kalibo, Aklan	Pending inspection and survey.

# Conservation Activities and Problems in the Republic of the Philippines

by

MR. SEVERINO U. NABLO

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## A. General Data:

1. Area: 29, 741,290 hectares.
2. Population: 32, 345, 000 (July, 1965)
3. Economy: Mainly dependent upon exports of copra (\$156, 019, 000), sugar (\$148, 264, 000), and logs and lumber (\$143,114, 000).

## B. Government departments concerned with conservation.

### 1. Bureau of Forestry

(Isabel Bldg., Corner Isabel-Espana Streets, Manila, Philippines) has jurisdiction and authority over the demarcation, protection, management, reproduction, occupancy, and use of all public forests and forest reserves and over the granting of licenses for the taking of forest products therefrom (Section 1816 of the Revised Administrative Code).

### 2. Parks and Wildlife Office

(El Oriente Bldg., Plaza Binondo, Manila, Philippines). Supervises, administers and manages national parks and all forms of game and wildlife and their conservation.

### 3. Reforestation Administration

(Diliman, Quezon City, Philippines) – Reforestation and afforestation of bare and denuded areas within the public domain and their conservation.

### 4. Philippine Fisheries Commission

(Corner Real and Magallanes Streets, Intramuros, Manila, Philippines) – Management, development, production, conservation, occupancy, demarcation, protection and utilization of national and municipal fisheries, public fishery resources and fishery reservations.

### 5. Bureau of Mines

(Manila, Philippines). Supervision, administration and disposition of mines, minerals, and mineral lands and their conservation, and promotion of the development of the mining industry.

## C. Organizations concerned with research into conservation:

All those listed under 'B' above plus:

### 1. College of Forestry

(University of the Philippines, College, Laguna, Philippines) particularly forests and forest resources and their management for sustained yield; pests and diseases.

### 2. Forest Products Research Institute

(College, Laguna, Philippines) research and investigation on forest products, their properties and uses; forest pests and diseases.

D. Private conservation organizations:

1. Philippine Association for Permanent Forests, Inc. (5th Floor, Maritima Building, 117 Dasmarinas Street, Manila) is composed mostly of forest concessionaires and is concerned with the conservation of forests for their continuous harvest. It helps its members to determine the best harvesting methods to give them the highest returns and still save residuals for future cuts. Its objectives include:
  - (a) to arouse interest in and assist with forest conservation;
  - (b) to ask government to designate specific areas as permanent forests;
  - (c) to undertake reforestation in open forest lands through contract with the government.

It has 11 sustaining lumber company members and 22 regular individual members.

E. National parks and equivalent reserves.

1. The Parks and Wildlife Office is responsible for establishing and maintaining national parks and equivalent reserves.
  - (a) Its authority is provided by law particularly Republic Act No. 826 creating the Commission on Parks and Wildlife and Executive Order No. 216, series of 1956, creating this office into the Parks and Wildlife Office; Act No. 2590, of February 4, 1916; and Act No. 3915, of February 1, 1932, known as the National Park Law.
  - (b) Its objectives are:

General: 'To conserve the scenery and the natural and historic objects and wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations; and to promote the effectual planning, development, conservation, and maintenance of national parks as well as the conservation of wildlife.'

Specific:

- 1) To establish and administer National Parks to provide the people with recreational centers and resorts for their use, observation, health, pleasure, and inspiration;
- 2) To establish and manage game refuge, bird sanctuaries, and game farms for the conservation of wildlife;
- 3) To establish and maintain geological gardens for the enjoyment and education of the people;
- 4) To regulate the harvesting and exportation of wildlife;
- 5) To conserve National Parks in their primeval state and protect and preserve wildlife therein;
- 6) To devise effective methods for improving the accessibility and usefulness of National Parks;
- 7) To conserve geologic features of considerable extent and natural curiosity and other objects of interest, such as waterfalls, gorges, caverns, geysers, samples of erosion, mountain and rock formations;
- 8) To preserve areas of historic and prehistoric value, paleontological remains, and other natural formations of scientific or ethnological interest;
- 9) To regulate the cutting of trees, removing of earth, minerals and other resources from the National Parks;
- 10) To supervise the reforestation, development, and improvement of denuded areas undertaken by concessionaires; and
- 11) To assist in the promotion of the tourist industry of the Philippines.'

2. (Editor's note: Since the List of National Parks provided by this author is the same as that provided by the Parks and Wildlife Office which administers them, the list has not been duplicated in this paper. Please see Annex 1 of the preceding paper.)
3. Press releases in newspapers and radio interviews are handled by the Parks and Wildlife Office and are effective in arousing public interest but not fully successful in arousing civic mindedness amongst rural populations for the protection of parks and wildlife.
4. On-the-job, in-service training is provided.
5. No visitors' facilities are provided so far.
6. Parks are administered by the Parks and Wildlife Office for recreation, scenic and wildlife purposes. Management improvements have not yet been introduced into the existing parks, because of lack of personnel and funds.
7. Almost all the national parks are still in their original state of true wilderness.
8. Commercial logging was allowed in very few parks, but this has been stopped. Grazing on open grass lands is allowed, but hunting and settlement are not.
9. Present protection of park areas is not so effective for lack of protection personnel and funds. Illegal settlement and logging are common, but not insurmountable.
10. Exotic plants and animals have not been introduced into the national parks so far.
11. Major problems facing the national parks:
  - (a) Lack of funds and personnel;
  - (b) Illegal logging and settlement;
  - (c) The need for trained personnel and of training those already employed.

F. Other areas that should be reserved as national parks or equivalent reserve:

No other area.

G. Forest conservation:

1. Total land area of Philippines under forest: 43.79 per cent (13, 022, 024 hectares)
  - (a) Highland forests:
 

Commercial forest:	27.76 per cent (8, 257, 556 hectares)
Non-commercial forest:	<u>13.80 per cent (4, 102, 021 hectares)</u>
	41.56 per cent (12, 356, 577 hectares)
  - (b) Mangrove Swamps: 2.23 per cent ( 662, 447 hectares)
2. Per cent under forest reserves as of June 30, 1965:

	<i>Per cent of upland forested area</i>	<i>Per cent of Philippines</i>	<i>Area in Hectares</i>
Established Forest Reserves:	13.475	5.6	1, 665, 485.48
Proposed forest reserves:	<u>10031</u>	<u>4.17</u>	<u>1, 239, 82900</u>
	23.506	9.77	2,905,314.48
Communal Forests <sup>1</sup> (2, 030)	1.968	0.818	243, 307.72
	<u>25.474</u>	<u>10.588</u>	<u>3,148,622.20</u>

<sup>1</sup> Communal Forests are special forests reserved exclusively for the personal needs of all residents of a municipality (township). Personal needs refer to timber and minor forest products for home construction and other uses for personal purposes – not for business or commerce. Communal Forests locally serve as game refuges or sanctuaries.

3. Philippine forest reserves are established principally for protection and production purposes and secondarily for scientific purposes.
4. Training of forestry personnel  
Foresters first study and train at College of Forestry, University of the Philippines. On-the-job training during first six months of appointment in the Bureau of Forestry; training seminars on specialized jobs are held from time to time; advanced study at College of Forestry, University of the Philippines or abroad.
5. Illegal clearing for temporary cultivation (shifting cultivation) continues and is a socio-economic problem created generally by mountainers and landless families in rural areas.  
Illegal logging, particularly for export, is flourishing.  
Laws and regulations against these illegalities are strict, but lack of funds for travel inspection purposes and lack of personnel handicap control.
6. Logging is carried out by private industry under either an ordinary timber license or timber license agreement with operations closely supervised by government foresters. No trees less than fifty centimeters (19.68 inches) in diameter, breast height, are allowed for cutting, particularly in the case of our Philippine mahogany.
7. There is a Forest Research Division in the Bureau of Forestry which is handicapped by lack of funds and lack of dedicated researchers. The latter is a result of low pay that discourages good material personnel to join research. (Minimum annual salaries: Research Forester - P4, 404; senior Research Forester - P5, 928; Forestry Supervisor II - P6, 552).
8. Reforestation:
  - (a) The government, through the Reforestation Administration, undertakes regular reforestation of denuded and barren public lands not disposable under the Public Land Law for private ownership.  
The work of the Reforestation Administration is supported by
    - 1) funds collected on timber cut in public forests (0.40 to 0.50 pesos per cubic meter of timber) averaging 3 to 5 million pesos annually, and
    - 2) from annual appropriations from the national government which amounted to 7, 705, 850 pesos in 1964.
  - (b) Reforestation is both by replanting and seeding. Natural regeneration aided by protection is handled by the Bureau of Forestry.
  - (c) Poisoning of 'non-commercial' trees is not yet a part of the reforestation program. It is because areas to be reforested by this office are treeless, being barren and denuded.
  - (d) During the last five years (1961 -1965), an average of 23, 353 hectares was reforested annually by planting and seeding.
  - (e) Reforestation is carried out using native trees.

(f) Where there is protection all the year round, reforestation is successful. But where protection against grass fires, trampling by man and animals, etc. is not continuous and sustained, reforestation is far from being successful e.g. during the last three years (1963-1965), for example, 36, 683 hectares were *replanted* as against 53, 346 hectares of new areas planted.

9. As a whole forest fires are not a problem in the country.

- (a) Our tropical forests are generally moist and fires usually do not grow to destructive proportion.
- (b) Brush fires in our pine forests (about 6-45 per cent of the forest area) are an annual occurrence destroying mostly the seedlings and saplings and are caused by carelessly discarded cigar and cigarettes and intentional burning to invite wild game, particularly the deer, for hunting purposes.
- (c) We have a total of 761 forest guards, plus 250 fire wardens in the pine forest in the Mountain Province. Our goal is to have about 4, 000 guards to provide one guard for every forest sector of 2 to 3 thousand hectares,

#### H. Soil and Water Conservation:

1. The various soil and water conservation problems of the Philippines revolve around forest and watershed destruction generally brought about by shifting cultivation, destructive logging, and overgrazing.

Water draining from bare watersheds is becoming a national problem. Estimate of the current over-all annual flood damage in the Philippines is over 40 million pesos, greater than that resulting from any other single natural cause.

Soil erosion is one of the most serious problems that threatens farms, pastures and deforested watersheds. Reports of the Bureau of Soils in 1952 showed that 500 million tons of Philippine soils are lost annually due to erosion. This loss is equivalent to 3 million tons of ammonium sulphate, 6 million tons of superphosphate and 2 million tons of potassium sulphate fertilizer.

Solutions to these problems are difficult because of lack of funds although there is increasing public consciousness of the need for action.

2. (a) The government agencies concerned with the use, development and conservation of soil and water resources are:
- 1) Bureau of Forestry
  - 2) Bureau of Soils
  - 3) Bureau of Plant Industry
  - 4) Bureau of Public Works
  - 5) National Power Corporation
  - 6) National Irrigation Administration
  - 7) Irrigation Service Unit, DPWC
  - 8) Reforestation Administration
  - 9) National Waterworks and Sewerage Authority
- (b) Some of the private groups are:
- 1) Society of Filipino Foresters
  - 2) Soil Conservation Society
  - 3) Rural Improvement Clubs under the auspices of agriculture extension workers.

The past activities of these different conservation groups were confined mostly to the agencies' particular function and line of work and were not as closely co-ordinated as they are at present.

3. Among the most important laws to insure the conservation of soil and water resources are:

- (a) Commonwealth Act No. 2711 (Revised Administrative Code) –which embodies the forest law. It includes forest conservation through wise utilization as well as the conservation of soil and water not only in forest lands but also on the lowlands.
- (b) Commonwealth Act No. 120 – creating the National Power Corporation and nationalizing the hydro-electric industry. This law reserves, among others, all streams, lakes and springs for the production of hydro-electric power in the Philippines.
- (c) Commonwealth Act No. 447, as amended, otherwise known as the 'Kaingin law', protects the public forest from illegal occupation and wanton destruction.
- (d) Republic Act 3092, known as the 'Permanent forest law' – Provides the permanency of public forests.
- (e) Other important legislations created the Bureau of Soils, the National Irrigation Administration and the Bureau of Public Water.

These legislations were all good and strict enough to effectively safeguard wise utilization, development and conservation of water, and soil resources. However, economic considerations have greatly slowed down full implementation of the provisions of these laws.

4. Details of existing soil and water conservation projects:

- (a) The Bureau of Forestry's projects of watershed management has four major objectives:
  - 1) conservation of natural resources such as forest range, wildlife, as well as soil and water.
  - 2) improvement and maintenance of land productivity for forest products, agricultural crops and livestock through proper land-use and the introduction of conservation farming practices.
  - 3) increase maintenance of water yield for domestic, irrigation, industrial and hydro-power uses, and
  - 4) watershed protection and flood control.

This project attempts to integrate timber production with water production. Implementation of the project was strengthened with the creation of the Forest Protection and Watershed Management Division in the Bureau of Forestry, and the provision of funds to execute and carry out its objectives

- (b) a pilot watershed project with the assistance of the U.N. Special Fund; duration of project is four years.
- (c) The National Power Corporation has a ten-year development plan which includes among other things the construction of multi-purpose dams for hydro-power irrigation, flood control and municipal industrial water uses.
- (d) a project on Water Resources Survey and Investigation to formulate comprehensive programs for river basins multi-purpose development has been started with the financial assistance of the United States Government. It is planned to continue for a period of 5 years through 1967. The project aims to cover the 7 major river basins of the country comprising an aggregate drainage area of 10,113, 700 hectares;
  - 1) the Agno River Basin
  - 2) Agusan River Basin
  - 3) Bicol River Basin
  - 4) Cagayan River Basin
  - 5) Cotabato River Basin

- 6) Ilog-Hilabangan River Basin and
- 7) the Pampanga River Basin and includes plans for hydro-power, water reservoir development, flood control, irrigation and drainage, domestic and industrial water supply including land-use and resource planning, improvement and protection of water quality, soil and sediment control.

I. Conservation of Wildlife:

1. The Parks and Wildlife Office is responsible for wildlife.
2. Basic laws and regulations are adequate enough to protect wildlife but are considered inadequate for proper and effective management.
3. Enforcement is inadequate because of lack of trained personnel, lack of funds, and lack of support from the government and the public.
4. No training provided so far for wildlife management personnel.
5. At present no problem on wildlife control.
6. Game reserves:
  - (a) (Editor's note: Since the List of Game Refuges and Bird Sanctuaries provided by this author is the same as that provided by the Parks and Wildlife Office which administers them, the list has not been duplicated in this paper. Please see Annex 2 of the preceding paper.)
  - (b) These reserves are, for the present, neither effective nor patrolled.
7. Wildlife Research:
  - (a) There are no wildlife research projects being carried out at present.
  - (b) The Parks and Wildlife Office has no research division.
  - (c) Wildlife research projects that should be given first priority are
    - 1) Population studies, distribution, size, and habitat requirements of game species;
    - 2) Biology of the threatened species of wildlife, such as the tamarau, monkey-eating eagle, and monkeys;
    - 3) Ecological studies on plants and animals in national parks; and
    - 4) Species relationships.

J. Threatened species of animals and plants

1. (a) Wild animals threatened with extinction:
  - 1) Tamarau – (*Bubalus mindorensis* Huede)
  - 2) Monkey-eating eagle – (*Pithecophaga jefferyi*)
  - 3) Dugong-dugong
  - 4) Giant scops owl – (*Otus gurnayi*)
  - 5) Green imperial pigeon (or Mindoro imperial pigeon) – (*Tucula mindorensis*)
  - 6) Eastern sarus crane – (*Grus antigone sharpei*)
  - 7) Green sea turtle – (*Chelonia mydas*)
- (b) Plants threatened with extinction:
  - 1) Molave – (*Vitex parviflora* Juss. – Verbenaceae)
  - 2) Ipil – (*Intsia Bijuga* (Colebr.) O. ktze. – Leguminosae)
  - 3) Mangkono – (*Xanthostemon verdugonianus* Naves – Myrtaceae)
  - 4) Tindalo – (*Azelia rhomboidea* (Blanco) Vid. – Geguminosae)

2. Since there are no data on population of threatened animals, nor on how many are hunted down per year, no estimate could be given on when these animals may disappear.

The threatened plant species are now scarce but what are left are already well protected. By law, only those above 60 centimeters d.b.h. and over are allowed for cutting.

3. More game wardens, realistic enforcement of game laws and intensification of public conservation education will help much in saving threatened species from total extinction.

K. Pesticides. (Answers are a courtesy of the Bureau of Plant Industry.)

1. (a) Pesticides are used liberally but only on certain agricultural crops. Most vegetables are treated with insecticides and fungicides to produce quality vegetables for the market. Only about 15 per cent of the total acreage of 3.7 million hectares in rice is sprayed against rice pests as stem-borers, leafhoppers and certain fungus diseases. Pesticides are used on fruit trees like citrus and pineapple only seasonally but quite heavily.
  - (b) Herbicides principally the hormone type are used to control weeds in lowland rice paddies, but there is no large scale application since mechanical weeding costs very little and family labor is available.
  - (c) There is very little application of herbicides to destroy non-commercial trees.
  - (d) During the past eight years, the Philippine government undertook large scale application of rodenticides by ground crews and aerial dispersal using such acute poison as Sodium Fluoroacetate (1080) and Fluoroacetamide (1081). Both aerial and ground applications of various types of insecticides are being used against locusts.
  - (e) Vector eradication campaign like malaria control are waged in limited problem areas. The City Health Departments of urban government undertake a control of mosquitoes, flies, rats and other noxious pests. Insecticides are liberally used for larviciding breeding areas as well as in fogging market places. In the homes, the control of roaches, mosquitoes, ants, bedbugs, rats and fleas is done by licensed commercial operators. Again, in certain cases, pesticides are used liberally.
2. The Insecticide and Fungicide Act No. 139 of 1923 is entitled 'An Act to prevent the importation, manufacture, sale or transport within the Philippine Island of adulterated or misbranded Paris green, lead arsenates, lime sulphur compounds and other insecticides and fungicides and regulating traffic therein and for other purposes'. Although this law regulates the use of certain pesticides, however, in the light of recent pesticide technology, some of its provisions are now obsolete and a new pesticide law should be promulgated. For the present government agencies in close co-operation with local pesticide dealers instituted guidelines in the application of pesticides which the farmers are advised to follow strictly. It is felt that for the present, this is the most effective control on the use of pesticides, both for agriculture and public health programs.
  3. Pesticides are definitely known to be dangerous to wildlife or to the ecological balance in the areas where pesticides are liberally applied, but it is felt that their use contributes to the welfare of the people which is the paramount consideration, while concern over the wildlife structure is of a much lesser importance.
  4. No big projects or research are being undertaken in the country to determine the effects of large-scale pesticide application on the ecological structure of a treated area. However, limited studies show that there exists a certain degree of ecological impact of pesticides especially in areas that have been continuously treated with highly poisonous pesticides. For instance, reports show that there is an apparent change of animal species in the Liguasan marsh resulting from large-scale dispersal of rat poisons. Owls, hawks, rat-eating eagles, wild

cats and reptiles which were abundant before the institution of large-scale application of rodenticides campaign are now decreasing in number perhaps due to the sustained poisoning campaign against rats in these areas.

L. Public Education on Conservation:

1. There is no concrete sustained program for public education in conservation. There are occasional press releases and a weekly radio program 'Forests Build the Nation', and the public relations activities of foresters in rural areas.
2. See above. Also once a year there is an 'Arbor and Birds' Week' celebrated by public and private schools and civic organizations.
3. Newspapers and magazines are used for articles and press releases; radio and television are used to broadcast conservation speeches direct to listeners.
4. No conservation course in curriculum of schools.
5. There is no vocal private body in the country interested in purely conservation. The 'Philippine Association for Permanent Forests, Inc.' is interested in the conservation of the forest for their continuous harvest.
6. The association above mentioned being barely a year old, its activities have barely reached the public; but its influence is beginning to be felt as a potent deterrent to illegal logging.
7. No textbooks on conservation at present exist, although there was a plan for the Bureau of Forestry to start a primer on forest conservation for use in the primary and elementary grades.

M. Training of conservation personnel:

1. Training schools:
  - (a) The College of Forestry of the University of the Philippines, and the Bureau of Forestry of the Department of Agriculture and Natural Resources, have the facilities for training in forest management.
  - (b) There are no training schools for wildlife management.
  - (c) No training schools for national parks and reserves management. Same as 'b' above.
  - (d) The Bureau of Forestry has just organized its Forest Protection and Watershed Division concerned with conservation of soil and water.
2. There is no opportunity for advanced (university level) training in natural resources management.
3. International experts in the above specialized fields would certainly be helpful. The Bureau of Forestry has had some American forestry advisors under the US/AID program and one U. N. expert on watersheds. All were successful in focussing attention of high policy making bodies on the importance of forest conservation through proper forest management. Forest management has been improved from a hit and miss method to selective logging for sustained yield. Watershed management is now getting attention where before it was entirely neglected. Pilot forests will soon be put up where investigations will be conducted aimed at the proper conservation of forests, soil, water and other natural resources.
4. The most urgent conservation training problems are:
  - (a) Lack of funds;
  - (b) Lack of properly trained personnel, including experts on the different levels of conservation; and
  - (c) Lack of equipment for research/investigations, including laboratory equipment and supplies and materials.

N. Our most urgent conservation problems are:

1. Conservation of the forest resource. —A massive educational campaign aimed at fully educating the people of all levels, including the politicians, on the importance of the forest and the dangers that will result from their destruction. Pilot or demonstration forests should be developed at strategic locations so that people may see the beneficial influences the community derives from the presence of the forest in contrast to communities with barren and treeless surroundings.

An international expert on public information and educational dissemination would certainly be much welcome in the Bureau of Forestry. Forest conservation films and all the means and equipment for showing them in cities, towns, and rural areas would be a great help in addition to posters, leaflets, etc.

2. Conservation of soil and water through proper watershed management. Pilot projects are needed where research on different kinds of forest conservation can be carried out, as planned by the Bureau of Forestry.

International assistance would be beneficial and there is a plan to send Philippine staff abroad to study as well.

3. Conservation of game and wildlife. Because little or no knowledge exists, intensive field surveys and studies should be taken of game and wildlife for the promulgation of regulations aimed at their conservation and for the information of the public which considers it lightly at this time.

## ANNEX 1

### Basic Laws Protecting Wildlife in the Philippines

- 1) Act No. 2590  
(Approved February 4, 1916) - An act for the Protection of Game and Fish;
- 2) Act No. 3915  
(Approved February 1, 1932) - An act providing the establishment of National Parks declaring such parks as game refuges, and other purposes;
- 3) Republic Act No. 826  
(Approved August 14, 1952) - An act creating the Commission on Parks and Wildlife, defining its powers, functions, and duties;
- 4) Forestry Administrative Order No. 7  
(Took effect on January 1, 1934) - National Parks Regulations (Particularly Chapters VIII and XI).
- 5) Forestry Administrative Order No. 17  
(Took effect on October 20, 1939) - Regulations for the taking, possessing, selling, exchange, or exporting of certain protected game and wildlife.
- 6) Forestry Administrative Order No. 18  
(Took effect on January 1, 1940) - Closed seasons and regulations for certain game and other wildlife.

## ANNEX 2

### Common Pesticides Used in Philippine Agriculture and Public Health Programs

#### I. Insecticides:

##### A. Chlorinated Hydrocarbons:

1. DDT
2. BHC (Lindane or gamma isomer)
3. Dieldrin
4. Aldrin
5. Endrin
6. Chlordane
7. Heptachlor
8. Methoxychlor

##### B. Organo-phosphates:

1. Methyl parathion
2. EPW
3. Malathion
4. Diazinon
5. Dimethioate
6. Dipterex
7. Lebaycid
8. Phosphamidon

##### C. Carbamate:

1. Sevin

#### II. Fungicides:

1. Zineb
2. Maneb
3. Captan
4. Copper (various forms)
5. Burdo mixture
6. Ferbam
7. Anti-biotics (Blasticidin, Agrimycin)
8. Mercurials

#### III. Herbicides

1. 2, 4-D
2. MCPA
3. Karmex
4. 2, 4, 5-T

#### IV. Rodenticides:

1. Sodium Fluoroacetate or '1080'
2. Fluoroacetamide or '1081'
3. White arsenic
4. Warfarin
5. HCN dust fumigant

#### V. Molluscide:

1. Metaldehyde

# Conservation in Sabah, Malaysia

by

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*Conservator of Forests, Forest Department, Sandakan, Sabah, Malaysia*

## A. General Data:

1. Area: 29,388 square miles
2. Population: 454,421 (1960 Census)
3. Economy: mainly dependent on export of timber and agricultural products.

## B. Government departments and official organizations concerned with conservation:

1. Forest Department (P.O. Box 311, Sandakan, Sabah) – Management and control of forest exploitation, and conservation of wild life.
2. Sabah National Park Board of Trustees: (c/o Conservator of Forests, P.O. Box 311, Sandakan, Sabah) – control and management of National Parks.

## C. Organizations concerned with research into conservation:

1. Research Branch of the Forest Department, Sabah.
2. Sabah Museum.
3. Research Branch of the Agriculture Department.
4. Sabah Society, P.O. Box 547, Jesselton.

## D. Private conservation organizations:

None.

## E. National Parks:

1. Sabah National Park Board of Trustees established by National Park Ordinance, No. 5 of 1962, for the purposes of controlling and managing the national parks. The Board of Trustees shall –
  - (a) be a body corporate to be known by the name of 'The Sabah National Parks Trustees', with perpetual succession and a common seal;
  - (b) in its corporate name, be capable of suing and being sued;
  - (c) be capable of holding, purchasing or otherwise acquiring for the purposes of a national park any movable property, and of alienating such property;
  - (d) be capable, with the approval of the State Secretary, of holding, purchasing or otherwise acquiring for the purposes of a national park any immovable property and, with such approval, of alienating any such property; and
  - (e) exercise the powers and perform the duties conferred upon it by this Ordinance.
  - (f) The duty and function of the Board is to control, manage and maintain national parks and, where they consider it desirable so to do, to purchase any property for such purposes. The main objective is to preserve vegetation and wild life of places of interest.
2. List of National Parks:

The one park, so far, is Kinabalu National Park comprised of 275 square miles, constituted on May 16, 1963, lies about 35 miles east of Jesselton the capital of Sabah, Malaysia, and surrounds Mount Kinabalu (13,455 ft.) which is the highest mountain in South East Asia. It forms part of the Crocker Range, a belt of mountainous country bordering the South China Sea.

3. Information leaflets about the Kinabalu National Park are available; effectiveness is not yet assessed.
4. No training of park persons at present. Enquiries have been made of the possibility of training park personnel in the African College of Wild Life Management. Enquiries were also made from the University of London Conservation Course. The latter requires high academic qualifications which the present personnel do not possess. The former proved to be mainly for game management with nothing or little of the management of national parks. Australia, New Zealand and U.S.A. are other possibilities.
5. Facilities are provided for visitors by prior arrangement with the Park Warden. At Park Headquarters there is at present accommodation for 20 persons; en route to the summit of the mountain there are four climbers' huts spaced at approximately 2½-3 hours walking distance apart. See Annex 1.
6. The park is managed with multiple emphasis –preservation of scenic value, vegetation and wild life, and tourism. It is managed by a Board of Trustees and Park personnel.
7. Consistent with the objects of management, the park is generally kept as true wilderness.
8. Exploitation or commercial activity is prohibited.
9. The protection of park areas is effective. There are a very few old settlements established within the park area prior to reservation; it is proposed to excise these areas where possible or to resettle the inhabitants elsewhere. There are no illegal settlements within the Park; some poaching is believed to take place around the perimeter while visitors do sometimes remove vegetation, especially orchids.
10. Exotic plants and animals are not being introduced. But, with the specific permission of the Park Warden ornamental plants, shrubs and trees may be introduced around staff quarters and buildings situated on the perimeter of the park.
11. The major problems facing the national park are training of personnel (see 4 above) and lack of funds. National park funds come from annual Government grants, voluntary contributions and gifts or bequests of money. Funding of this nature is uncertain.
12. Other Comments: None.

F. Other areas immediately proposed as National Parks:

1. Pulau Gaya –presently a forest reserve (Domestic reserve). An island comprising 3,150 acres, and located opposite Jesselton is proposed as a national park because of its scenic value, beautiful beaches, wealth of marine life and coral reefs lying in crystal clear water.
2. Bukit Padang (old reservoir area), Jesselton. About 150 acres – protection of *Nepenthes*; recreational area.
3. Leila Forest Reserve, Sandakan. About 730 acres. Protection of flora and recreational area.

G. Forest Conservation: (as of end of 1964).

1. 23, 350 sq. miles out of 29, 388 square miles = 80 per cent is under forest.
2. Forest Reserves constitute 9, 885 square miles – 33.6 per cent notified and proposed 11, 560 = 39.3 per cent.
3. Objectives of Forest Reserves

Class I	-	Protection Reserves, maintenance of forests essential on climatic or physical grounds =	976.85 square miles
" II	-	Commercial forests for supply of timber and other produce to meet the general demands of trade =	8,402.94 square miles
			carried forward 9, 379.79 square miles

		brought forward 9, 379.79 square miles
Class III	- Domestic forests, for the supply of timber and other produce for local consumption =	74.65 square miles
IV	- Amenity forests for local amenity or arboretum work =	119.81 square miles
V	- Mangrove forests	<u>320.16</u> square miles
		9, 884.56 square miles

4. Forestry training:

- (a) A 3 months introductory course on general and elementary forestry practice at Sandakan Forest School. New recruits after serving 3-6 months, are trained in this school.
- (b) A 9 months course at the Kepong Forest School, Malaya, to train and qualify foresters for promotion to forest ranger.
- (c) Overseas training at Rangers' School Coimbatore, South India, for staff in the intermediate cadres whose educational qualifications are inadequate to admit them for entry to an Australian or English University.
- (d) Overseas training under the Colombo Plan leading to a B.Sc. degree in Australia for officers in the intermediate cadres who have higher qualifications such as Overseas School Certificate or a Philippine B.Sc. (Forestry) degree.

5. Excepting 'shifting cultivation' practiced by natives on the West Coast, Interior and along the Kinabatangan, and illegal logging on a small scale on areas near rivers; illegal clearing and illegal logging are not problems. Shifting cultivation occurs mainly in secondary forest but a small amount of virgin forest is destroyed each year. Government settlement schemes are now helping to solve this problem. Illegal logging is encouraged by the high price paid for export logs. It increases when prices are high and diminishes when prices are low. Illegal logging is confined to State land and when rampant it is difficult to control because of lack of staff. Most of the field staff are engaged in looking after logging and silvicultural operations in the Permanent Forest Estate (Forest Reserves).

6. Logging is carried out entirely by private firms.

7. Research is carried out with a Forest Botanist, Ecologist, Plantations Officer and a Wood Technology Section. They are reasonably well funded but inadequately staffed.

8. Reforestation:

- (a) Where the indigenous forest is logged within forest reserves the forest is regenerated using natural seedlings. The treatment is undertaken by the Forest Department using the tropical uniform system, that is by poisoning the relics left after logging and all the non-commercial and defective commercial trees over 6 inch diameter so as to allow the uninhibited growth of existing commercial seedlings and saplings.
- (b) Reforestation proper is mainly limited to trials and small scale plantations of exotics on degraded grasslands on the East Coast of Sabah.
- (c) Selective poisoning: see (a) above.
- (d) We aim to regenerate all the logged over areas within the Permanent Estate as and when they are logged, but in some years we have not quite kept up with logging due to lack of labor. In 1963, 33, 000 acres were treated and in 1964 the area treated amounted to 21, 500 acres. Reforestation (plantations) at present amounts to twenty or thirty acres per annum but will increase in the next five years to about 300 acres per annum.
- (e) Indigenous species in the indigenous forests; mainly exotics (pines and Araucaria) in the reforestation areas.
- (f) The indigenous forests are free from damage; the trial plantations are subject to occasional small fires.

9. Forest fires are no problem at present.

H. Soil and water Conservation:

1. Soil and water conservation is not a serious problem at present. There is close liaison between the Agriculture, Lands & Surveys and Forest Departments. Areas too steep for agriculture and cultivation are constituted Forest Reserves and wholly protected. Water Catchment Areas are also put under Forest Reserve.
2. Forest, Agriculture and Lands & Surveys Departments are concerned with such problems. Proposals for Forest Reservation are agreed on by these Government Departments.
3. Forest Reservation is legally covered by the Forests Ordinance, 1954. Forest Reservation provisions are adequate and strict enough.
4. Existing Projects:  
Paragraph G. 3 refers. Class I Reserves are mainly reserves to conserve soil and water.

I. Conservation of Wild Life:

1. Game Branch of the Forest Department is the responsible authority.
2. The Fauna Conservation Ordinance (No. 11 of 1963) is adequate.
3. There is at present inadequate enforcement of the law due to lack of staff. Recruitment is slow due to lack of suitable candidates.
4. Practical training only for wildlife personnel; there is no academic training as yet.
5. Crop raiding elephants are a serious problem especially with the recent expansion in agricultural development near Sandakan, Lahad Datu and Mostyn. Attempts to scare them away with firecrackers are not very successful and often the leader has to be shot. The Staff is at present inadequate to deal with this problem.
6. Game Reserves:
  - (a) Kota Belud Sanctuary: Approximately 50 square miles in extent. Covers marshland, paddy fields, coconut plantations, village and hills between the Tempasok and Pandasan rivers near Kota Belud. To protect migratory birds during the season.
  - (b) Mantanani Sanctuary: Comprising Mantanani Besar and Lungisan Islands. Two small islands in Kota Belud District. To protect Frigate birds, Megapodes and Pied Imperial Pigeons.
  - (c) Labuan Sanctuary: Comprises area round the Labuan War Cemetery, Hospital and old Government House. To attract and protect birds round this area. Records scanty.
  - (d) Sipidan Sanctuary: Sipidan Island, Semporna District. Covers an area of 7.68 acres. Turtle eggs are collected on this island by natives. It was constituted a Sanctuary in 1932. (original records lost during World War II).  
It is the haunt and breeding place of four species of pigeon.
  - (e) Bohaydulang Sanctuary: In Semporna District, and covers an area of 76.80 acres. Constituted a Sanctuary in 1937. There is now a cultured pearl industry and a police post on the island.  
To protect the Megapode.

7. (a) (b) and (c) No wildlife research projects as such as yet; it is hoped to carry out research on the ecology, breeding and feeding habits of rhinoceros, dugong, orang-utan, hawksbill and green turtle, but the Game Branch of the Forest Department is an executive body and, is not equipped to undertake research at present.

J. Threatened Species.

1. (a) Wild Animals:

Rhinoceros –Killing the animals for their alleged therapeutic properties.

Orang-utan – Hunting and capture of young animals for export to collectors for Zoos.

Dugong – Killed for food.

(b) Plants:

Palms: *Orania* near Kudat, shifting cultivation and land alienation.

*Corypha* near Kudat and Bandau being killed by Agricultural Department because it is considered as a host for insect pests in coconut. Some lowland Dipterocarps, such as *Shorea gratissima* which only occurs at sea level. Land alienation taking up their habitats. On Kinabalu some rare endemics suffer from souvenir hunting tourists e.g. *Potentilla leuconota*.

2. Rhinoceros probably extinct very soon. Expert investigation of the status of this species is urgently required. Orang-utan – Local opinion is that there are many more orang-utan than outside authorities believe. More stricter patrols, propaganda and rehabilitation of confiscated animals may save this species.

3. Measures to prevent extermination:

More lowland research and virgin jungle reserves are needed as well as sanctuaries for the threatened species. It is feared that the rhinoceros population has been reduced to such a level that the species can no longer maintain itself.

K. Pesticides:

1. Pesticides against insects are not used in forestry and are only used on a very small scale in agriculture in Sabah. Arboricides are extensively used for eliminating weeds in agricultural estates and also in poisoning the unwanted commercial trees in forest operations. The effect of using sodium arsenite on the flora in lowland dipterocarp forest has not been evaluated; but since undergrowth below 6 inches diameter is in the main not poisoned this threat is not considered to be very serious. No wildlife has been reported killed by sodium arsenite in the forest.
2. The Subsidiary Legislation to Poison (Agricultural and Industrial) Ordinance, Cap 99 – The Poisons (Sodium Arsenite Regulations) 1953 provides regulation for the importation, sale, storage and use of sodium arsenite.
3. Effects on wildlife:  
See (1) above.
4. No research regarding pesticides is being carried out as yet.

L. Public education on conservation:

No problem at present, apart from some pamphlets on the flora and fauna of Kinabalu National Park. Some useful work in publicizing conservation problems is done by the Sabah Society which produces a quarterly journal.

M. Training of Conservation Personnel:

1. There are facilities for training in forest management but none in any other aspects of wild life conservation.
2. No opportunity for advanced training.
3. and 4. See N below.

## N. Urgent Problems:

The most urgent problem is to obtain and train sufficient staff to deal with the present day to day conservation duties of the Game and Forest Department. Thereafter to undertake research into the status of threatened species and to disseminate among the public a real appreciation of the principal needs and vital importance of the proper conservation of Sabah's wild life and natural resources.

International assistance is needed to supply the necessary training facilities and to loan an experienced zoologist to initiate research projects.

I gratefully acknowledge the assistance given by Messrs. A.J. T. Bayles, V.M. Corpuz, W. Meijer and G.S. de Silva of the Forest Department and Mr. P. Thomas of the Department of Agriculture in the preparation of this paper which answers briefly a questionnaire from the UNESCO Regional Working Group.

## ANNEX I

### Details of Accommodations at Mt. Kinabalu

1. Park Headquarters, Simpang Kinabalu, Semi-permanent structure situated near the Kambarangan Road junction at the 35th M.S. Ranau Road. Communal dining room/lounge, kitchen, bathrooms and pit latrines. Two dormitory type rooms each with 5 double tiered beds (10 persons); water supply, tables, stools, oil lamps, oil cooking stoves; a limited number of sleeping bags, blankets and sheets for hire. Caretaker i/c.
2. Climber's Huts (En route to summit; all prefab. Aluminium with plank floors and glass louvre windows)
  - (a) Layang<sup>2</sup> (elevation approx. 8, 700 feet)

Double Hut; each half comprising sleeping accommodation 12½ by 10 feet with subsidiary kitchen room 7½ by 5 feet and supplied with mirror, oil lamps, tier-bunk beds (8), table and stools, oil cooking stove (2 burners), cooking pots, fry pan, basins, buckets, some cutlery, crockery, mugs, dustbin etc.
  - (b) Panar Labah – Huts Nos. 1 and 2 – (Elevation approx. 11, 000 feet).

Each comprising sleeping accommodation 15 by 10 feet with subsidiary kitchen room 10 by 5 feet. Similar to the Layang<sup>2</sup> Hut.
  - (c) Sayat<sup>2</sup> (Elevation approx. 12, 500 feet).

Comprising sleeping accommodation 10 by 10 feet with subsidiary kitchen room 5 by 5 feet furnished in a similar manner to the Layang<sup>2</sup> Hut but with only 4 tier-bunk beds.
3. An unfurnished prefab 'Altent' structure with plank floor together with other temporary buildings at ex-Royal Society Base Camp, at Mesilau. (Opposite to Kundasang about 2 miles walk in).

Sleeping bags with detachable inner cotton sheet linings and blankets may be hired from Park H. Q. Flysheets and camp beds are also usually available for hire. There is a small charge for the use of the huts. All applications for accommodation should be addressed to the Park Warden, c/o Forest Office, Jesselton (Phone 2234).

# Conservation in the State of Sarawak, Malaysia

by

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## A. General Data:

1. Area of Sarawak: 48, 342 square miles
2. Population: 744, 529 (1960) 2.5 per cent increase per year 1947-60.

Principal racial groups	Population	Percentage of total population
Iban	237, 741	31.9
Chinese	229,154	30.8
Malay	129, 300	17.4
Land Dayak	57, 619	7.7
Melanau	44, 661	6.0
Other indigenous	37, 931	5.1
Other Non-indigenous (Asian)	6,492	0.9
European	1,631	0.2
	<hr/> 744, 529	<hr/> 100.0

3. Economy: largely dependent on primary products of which the most important are rubber, timber, pepper and sago.

## B. Government departments and official organizations concerned with conservation:

1. Ministry of Agriculture and Forestry, (Kuching, Sarawak, Malaysia) has the overall responsibility for agricultural, forestry and conservation policy within the state.
2. Forest Department, (Kuching, Sarawak, Malaysia) is largely responsible for the implementation of the Wild Life Protection Ordinance and the National Parks Ordinance. Senior forest officers are appointed as game wardens and wardens of national parks. The Conservator of Forests is the appointed Chief Game Warden and until recently was the ex-officio Chairman, Board of Trustees, National Parks.
3. Board of Trustees, National Parks, (c/o Ministry of Agriculture and Forestry, Kuching, Sarawak, Malaysia) is responsible for control, management and maintenance of the national parks. The Board is at present being reconstituted.
4. Sarawak Museum (Kuching, Sarawak, Malaysia). The Curator, Sarawak Museum, takes an active interest in all conservation matters. He is a Game Warden and a member of the Board of Trustees, National Parks, and is also executive officer of the Turtles Board.
5. Turtles Board, (c/o Ministry of Agriculture and Forestry, Kuching, Sarawak, Malaysia) has the responsibility to control and operate the turtle industry in accordance with the Turtle Trust Ordinance.

C. Organizations concerned with research into conservation:

See B above,

D. Private conservation organizations:

Nil.

E. National Parks:

1. Board of Trustees, National Parks. The authority of the Board is laid down in the National Parks Ordinance. The Board makes recommendations to the Minister, Agriculture and Forestry, regarding the constitution of new parks. The constitution of new parks requires the approval of the Governor in Council. An objective of the recent Board of Trustees was to constitute a series of national parks which will include areas of all the principal primary vegetation communities that occur in Sarawak.
2. One national park (Bako National Park) has been constituted. Proposals to constitute a further nine parks have received the approval in principle of the Minister, Agriculture and Forestry, and constitution on some of these parks is proceeding. A list of all parks, constituted and proposed is attached as Annex 1.
3. No public information or interpretive services.
4. Training of park rangers is undertaken in Sarawak.
5. In the Bako National Park a bungalow and hostel are provided for visitors, and a second small bungalow reserved for visiting scientists. Similar facilities are proposed for some of the new parks.
6. Each park will be managed by a Park Warden (a forest officer appointed by the Minister, Agriculture and Forestry), and by a Board of Management, appointed by the Board of Trustees, National Parks. The principal emphasis is to pre-serve areas of primary vegetation and associated wild life and to provide recreational facilities in natural surroundings for the peoples of Sarawak.
7. The Bako National Park is, and the proposed parks will be, composed of areas of almost entirely primary vegetation, except in small localities where facilities are provided for visitors.
8. No commercial activity is permitted in parks, though rights for the removal of small amounts of forest produce from limited localities may be allowed.
9. Protection of the Bako National Park is entirely effective.
10. No exotic plants or animals are introduced.
11. Sarawak is in an early state of development as regards the constitution of national parks and the major problem is to persuade the people of the State of the need for conservation and for national parks.

No other comments.

F. Other Areas:

All areas for proposed parks are included in Annex I.

G. Forest Conservation:

1. Approximately 70 per cent of total land is under forest.
2. 24 per cent is forest reserve.
3. The objective of the forest reserves is primarily for productive forest.
4. Senior staff university training abroad leading to a degree in Forestry; junior staff training courses held in Sarawak.
5. Little problem of illegal clearing or logging at present though owing to pressure on the land it is likely to increase in the future.
6. Logging is carried out by private industry under license.

7. Forest Research Branch comprises three senior officers. Estimates for next five years have recently been approved under the Malaysian Development Program 1966-1970 and these should prove adequate. No additional staff required at present.
8. Reforestation:
  - (a) Carried out by Forest Department staff.
  - (b) By natural regeneration assisted by silvicultural treatment.
  - (c) Not answered.
  - (d) Silvicultural treatment at present is only undertaken in peat swamp forest approximately 80 per cent of the exploited permanent forest estate in this forest type is treated annually. There is little working at present in the permanent forest estate in the hills.
  - (e) Native trees are used in reforestation. Exotics (principally pines) are being tried on a purely experimental scale.
  - (f) A complete covering of trees will follow on any land that is logged whether silvicultural treatment is undertaken or not. The land is adequately protected.
9. Forest fires no problem.

#### H. Soil and Water Conservation:

With a relatively small population in Sarawak soil and water conservation has not been a major problem in the past. Some work is at present being done by the Agriculture Department and the Irrigation Branch of the Public Works Department. Erosion in areas under shifting cultivation can be severe.

#### I. Conservation of Wild Life:

1. Organizations responsible:
  - (a) Forest Department
  - (b) Sarawak Museum

There is no Game Department in Sarawak.
2. Protection of wild life is covered by the Wild Life Protection Ordinance (1958).
3. The law is not adequately enforced, mainly because most of the native races are living in relatively inaccessible areas where it is difficult or virtually impossible to control illicit killing of protected animals.
4. No specialized training in wild life protection is given.
5. No problem of wildlife control.
6. Provision is included in the Wild Life Protection Ordinance for the constitution of Wild Life Sanctuaries, but in fact no such sanctuaries have been constituted.
7. (a) Sarawak Museum is undertaking research projects on wild life, particularly on the orang-utan and other arboreal mammals. The ecology of bird life in primary forest is also being studied.
- (b) No research division in the government is responsible for wildlife.
- (c) Preliminary surveys should be undertaken in all proposed national parks, particularly the Gunong Mulu National Park, to determine the wild life population and its density.

#### J. Threatened Species of Animals and Plants:

1. (a) All the following animals and birds are protected by law:
 

Long-nosed monkey ( <i>Nasalis larvatus</i> )	No immediate danger
Orang-utan ( <i>Simia satyrus</i> )	Position desperate, work being undertaken.
Rhinoceros ( <i>Rhinoceros sumatrensis</i> )	Virtually extinct

Reef egret ( <i>Egretta sacra</i> )	No immediate danger
Cattle egret ( <i>Bubulcus coromandus</i> )	" " "
Storm's stork ( <i>Ciconia stormi</i> )	Rare, but little information.
Lesser adjutant stork ( <i>Leptoptilos javanicus</i> )	" " " "
White-bellied sea eagle ( <i>Haliaeetus Leucogaster</i> )	No immediate danger
Gray-headed fishing eagle ( <i>Ichthyophaga ichhyaetus</i> )	" " "
Black-naped tern ( <i>Sterna sumatrana</i> )	" " "
Brown-winged tern ( <i>Sterna anaetheta</i> )	" " "
Pied imperial pigeon ( <i>Ducula bicolor</i> )	" " "
Green turtle ( <i>Chelonia mydas</i> )	An international problem
Hawksbill turtle ( <i>Eretmochalys imbricata</i> )	" " "
Leatherback turtle ( <i>Dermochelys coriacea</i> )	" " "

(b) The following animals are not yet protected but nevertheless are threatened:

Dugong ( <i>Sirenia</i> )	Very rare on Sarawak coast, little information.
Wild ox ( <i>Bos sondaicus</i> )	Very few herds are now in existence, pressure of population is destroying their natural habitat.
Niah cave gecko ( <i>Cyrodactylus</i> )	Localized distribution confined to Niah limestone caves.
Cave earwigs ( <i>Arixania esah</i> )	" " "

(c) The principal plants that are threatened with extinction occur on limestone hills. Many of these plants are endemic to particular hills. In addition certain orchids have a very localized distribution and are much sought after by collectors. Further information is required on both groups of plants.

2. See notes after each species listed above – length of time threatened species is expected to survive.

3. Measures to prevent extermination:

- (a) The problem is complex and varies with the different species. Legal protection by itself is quite inadequate if this protection cannot be enforced. It is considered that the constitution of a series of national parks, adequately patrolled, is likely to give protection to some of the threatened animals and birds on the above list and also to many species (such as the leaf monkeys, gibbons, lemurs, pheasants, and hornbills) which though not immediately threatened are likely to be so in the future. The establishment of these parks, and in particular the Gunong Mulu National Park should have priority in the overall scheme of conservation.
- (b) In certain cases, for instance that of the terns and storks, further measures should be taken to adequately protect the breeding grounds of birds.
- (c) The conservation of turtles and dugong (and dolphins) is a problem that can only be solved by international co-operation, and measures should be taken by international bodies interested in conservation.
- (d) The plight of the orang-utan is desperate and immediate measures in Borneo and Sumatra should be taken to ensure the survival of this species. Work is being undertaken now and Mrs. Barbara Harrisson will report on proposals for conservation.

#### K. Pesticides

Pesticides are at present little problem in Sarawak. Sodium arsenate is used in silvi-cultural treatment by the Forest Department but its use is not considered to be dangerous to wildlife as it is only applied in peat swamp forest.

#### L. Public education or conservation:

1. Preliminary programs have been started.
2. Programs carried out by co-operation between the Sarawak Museum and Radio Malaysia, Sarawak.
3. A course on natural history, including conservation, is being prepared by the Schools' Broadcasting Section of Radio Malaysia, Sarawak, in co-operation with the Sarawak Museum.
4. See 3 above.
5. No private bodies interested in conservation.
6. Not applicable.
7. No texts available.

#### M. Training of conservation personnel

1. No training schools or other facilities.
2. No opportunity for advanced training.
3. In future some training of national park and possibly Game Department (if established) staff may be required.
4. See paragraph N below.

#### N. Urgent Conservation Problems:

The most urgent conservation problems are:

1. Conservation of orang-utan. Mr. and Mrs. T.H. Harrison are the experts on this subject and Mrs. Barbara Harrison will submit a report to the Working Group.
2. The constitution of the proposed national parks. This is largely an internal problem concerning the Ministry of Agriculture and Forestry, the Board of Trustees National Parks and the Forest Department. International assistance would be of value in providing strong support for the program. When the Gunong Mulu National Park is constituted it would be of the greatest value to have the assistance of a qualified wild life expert to survey the wild life in the park to determine the species representation and its approximate density within the park.
3. Full implementation of the provisions of the Wild Life Protection Ordinance. The establishment of a Game Department in Sarawak is a first necessity.
4. International co-operation on the protection of turtles.

## ANNEX I

### National Parks in Sarawak, Malaysia

#### A. Constituted:

##### 1. Bako National Park

Established 1st May, 1957, with extension 1st January, 1960.

Location: Situated on a peninsula at the mouth of the Sarawak River in the southwest of Sarawak.

Area: 10.5 square miles.

Description: An interesting area of unique primary vegetation, which is largely tropical heath forest but is very varied. Twenty-five vegetation communities, including mangrove and mixed dipterocarp forest, occur. The Long-nosed Monkey (*Nasalis larvatus*) is well established within the park. Recreational facilities, including two bungalows and a hostel, are provided for visitors, and an extensive series of paths through the park is maintained.

#### B. Proposed:

##### 1. Gunong Mulu National Park:

Status 1965: Proposals to constitute this park have been approved by the Sarawak Government and preliminary proclamations issued.

Location: On the watershed between Tutoh (tributary of the Baram River) and the Mendalam (tributary of the Limbang River) rivers; the international boundary between Sarawak and Brunei forms part of the northern boundary of the park.

Area: 239 square miles.

Description: A superb area of primary vegetation. Almost the whole of Gunong Mulu itself, Sarawak's second highest mountain (7,798 feet) falls within the park and primary forest occurs from the base, at approximately 400 feet, to the summit. The unique limestone mountains Gunongs Api and Benarat rising to over 5,000 feet (probably the highest limestone between north Thailand and New Guinea), are within the park. Wild life abounds.

A small group of nomadic Punans live in the park and their rights will be protected.

##### 2. Matang National Park:

Status 1965: Proposals to constitute approved in principle by Minister of Agriculture and Forestry. Proposed boundaries at present being examined.

Location: Twelve miles west of Kuching, the capital of Sarawak, in southwest Sarawak.

Area: 8.5 square miles.

Description: An area of rugged terrain on the sandstone mountains Gunong Serapi (2,988 feet) and Gunong Matang. Lower slopes covered with mixed dipterocarp forest and the upper with submontane tropical heath forest. An interesting flora and fauna occurs within the park.

Easily accessible from Kuching the park will provide excellent recreational amenities for the population of the capital.

##### 3. Gunong Gading National Park:

Status 1965: Proposals to constitute approved in principle by the Minister of Agriculture and Forestry. As the whole area falls within reserved forest constitution should not be difficult.

Location: On the coast thirty miles west of Kuching, near the town of Lundu.

Description: A compact group of small mountains (highest 2, 900 feet) consisting of granodiorite and entirely covered with dipterocarp forest. Of great scenic beauty and of botanical interest.

Will become easily accessible from Kuching when the Kuching Lundu road is completed.

4. Sabal National Park:

Status 1965: Proposals to constitute approved in principle by Minister of Agriculture and Forestry. Constitution likely to be delayed as area lies close to border with Indonesia.

Location: In southwest Sarawak adjoining Kuching Simanggang road, seventy-five miles from Kuching.

Area: 5 square miles approximately.

Description: A broad transect of primary vegetation of ecological interest that is mainly not represented in other proposed parks.

5. Pelagus Rapids National Park:

Status 1965: Proposals to constitute approved in principle by Minister, Agriculture and Forestry, and by the Divisional Development Committee. Boundaries at present being examined. Constitution not likely to prove difficult as the proposed park largely falls within reserved forest.

Location: Ten miles upriver from Kapit on the Rejang River in Central Sarawak.

Area: 20 square miles approximately.

Description: An area of primary forest bordering on the most famous rapids in Sarawak. Of great scenic beauty and likely to have a great recreational potential for the residents of Sibu and the Lower Rejang. The vegetation along the rapids includes some endemic species.

6. Simalajau National Park:

Status 1965: Proposals to constitute approved in principle by Minister, Agriculture and Forestry. Little difficulty is envisaged in constituting park as whole area falls within the Simalajau Forest Reserve.

Location: On coast ten miles northeast of Bintulu in Central Sarawak.

Area: 15 square miles approximately.

Description: An area of rocky coastland with diverse vegetation types containing one of few remaining undisturbed coastal terraces dominated by *Agathis alba*.

Will provide some of the best bathing and recreation facilities in Sarawak.

7. Sungei Dalam National Park:

Status 1965: Proposals to constitute approved by Sarawak Government and preliminary proclamations issued. Whole area formerly reserved forest and no difficulties are expected.

Location: On the outskirts of the town of Miri in northern Sarawak.

Area: 2 square miles.

Description: An exceedingly interesting small area of undisturbed tropical heath forest on very infertile soils. Easily accessible from Miri.

8. Lambir National Park:

Status 1965: Proposals approved by Sarawak Government and preliminary proclamations about to be issued.

Location: Fifteen miles from Miri and bisected by the main road that runs south from the town.

Area: 16 square miles approximately.

Description: A steep ridge of ecological interest that will preserve a range of vegetation communities that are localized in Sarawak and contains many interesting plants.

Access is easy from Miri and the proposed park will provide excellent recreational facilities for the people of that town.

9. Loagan Bunut National Park:

Status 1965: Proposals approved in principle by Minister, Agriculture and Forestry. Precise area of park not yet decided.

Location: Near the confluence of the Baram and Tinjar rivers twenty miles south of the town of Marudi in northern Sarawak.

Area: 20 square miles.

Description: The object of this park is to conserve an area of peat swamp forest. This forest type is being heavily exploited at present and there is a danger that no undisturbed forest will be preserved.

A shallow lake within the area will provide recreational facilities. It is known to have a rich migrant bird life and will be of particular interest to ornithologists.

10. Niah National Park:

Status 1965: Approved in principle by Minister, Agriculture and Forestry, and by the Divisional Development Committee. Constitution not likely to prove difficult as area is within reserved forest.

Location: Thirty-five miles southwest of Miri in northern Sarawak.

Area: 15 square miles approximately.

Description: The limestone massif of Gunong Subis is situated in the center of the proposed park. The Great Cave has one of the first archaeological sites in South East Asia and the millions of cave swifts and bats are of great zoological interest. The limestone flora is undisturbed and is of botanical interest, and includes many endemic plants.

# Nature Conservation in Singapore

by

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*Deputy Director, Botanic Gardens, Singapore*

## A. General Data:

1. Area: about 230 square miles.
2. Population: 1, 445, 929 (1957 census). Today, it is estimated to be 1, 800, 000.
3. Singapore's economy is based on commerce and light industries.

## B. Official conservation organizations:

Three Government Departments and one statutory board are concerned with conservation. They are the Botanic Gardens, the National Museum, the Water Department of the Public Utilities Board and the Nature Reserves Board.

## C. Organizations concerned with research into conservation:

There is no central body conducting research into conservation alone. Research activities in the Botanic Gardens, the National Museum and the University of Singapore have strong bearing on conservation.

## D. Private conservation organization:

The Malayan Nature Society, Singapore Branch, (c/o Department of Botany, University of Singapore) is intimately concerned with conservation problems. It has a membership of about 150 adults and 100 schools and junior members. Together with the parent body in Kuala Lumpur, it is responsible for the numerous conservation projects (like protection of the leathery turtle etc.) now in progress in Malaya.

## E. National Parks and other reserves:

All the Nature Reserves in Singapore come directly under the control of the Nature Reserves Board (c/o Botanic Gardens, Singapore). The Water Catchment is the responsibility of the Water Department in Singapore. These Nature Reserves are protected by the Nature Reserves Ordinance No. 8 of 1955 which became law on 6th March 1951. This Ordinance prescribes for the full protection of animals, plants, soils and minerals within the reserves, the employment of Reserve Rangers etc.

The reserves are as follows:

1. Bukit Timah Nature Reserve. Lowland Dipterocarp Forest, approximately 184 acres, situated on Bukit Timah Hill (alt. 580 feet) in the center of the island. This is an important reserve as it is the only portion of uncut lowland dipterocarp forest left on the island.
2. Pandan Nature Reserve. Mangrove Swamp Forest, approximately 300 acres, situated on the eastern bank of the Jurong River Estuary southwest of Singapore. Though disturbed, the forest still contains interesting species of animals and plants.
3. Kranji Nature Reserve. Mangrove Swamp Forest, approximately 50 acres, situated in the north-north-west corner of the island.
4. Water Catchment. Old secondary forest mainly. Acreage approximately 4, 000. It is situated right in the center of the island and adjoining the Bukit Timah Reserve.

These reserves are set aside and reserved for the preservation of the flora and fauna contained therein for purposes of biological research, biological education and recreation. About 90 per cent of the reserve area is true wilderness. Introduction of exotic

plants and animals and commercial exploitation of the reserves are strictly prohibited. The reserves are, however, open to visitors for recreation. Paths and shelters are made for this purpose. The protection of the reserves is fairly effective. Rangers, though untrained, are constantly on patrol in the reserves. The greatest threat to the reserves as a whole comes from population pressure on land as well as the disturbance to the habitat.

#### G. Forest conservation:

Outside of the reserves noted above (E) there is almost no forest land in Singapore. There are no forest reserves, and no forestry as such.

#### H. Soil and water conservation:

Singapore gets about 80 per cent of her water from Malaya. The reservoirs in the catchment area supply the rest. The Water Department is primarily responsible for this aspect of conservation. As for soil conservation, those within the nature reserves are well protected by the Nature Reserves Ordinance.

#### I. Conservation of Wildlife:

Wildlife within the confines of the Nature Reserves are adequately protected by the Nature Reserves Ordinance. As mentioned before, their protection is fairly effective. Within the catchment area, the Nature Reserve Ordinance together with Municipal Legislation provide also adequate protection to the wildlife. In the Botanic Gardens, wildlife is protected by the Wild Animals and Birds Ordinance which unfortunately is not very effective in enforcement.

Wildlife research as a separate discipline is not undertaken in Singapore. However, the research projects of the University of Singapore, the National Museum and the Botanic Gardens have bearing on wildlife conservation.

#### J. Threatened species of animals and plants:

Most native species of animals and plants in the reserves are threatened. The threat comes not so much from poaching as from the disturbance of the habitat. The reserves are too small in acreage; and this results in the exposure of the forest interior to the disadvantage of both animals and plants.

#### K. Pesticides:

Pesticides are used quite liberally in Singapore. These are used mainly to control insects injurious to man as well as those injurious to cultivation. There is no effective control on the use of these pesticides. Pesticides have not, as far as we know, caused any damage to wildlife in the reserves.

#### L. Public education on conservation:

There are no programs or projects on conservation education for the public as a whole. However, wildlife conservation gets occasional publicity in the local press, radio and television. Unfortunately nature conservation is not in the curriculum of Singapore schools. Consequently, there are no textbooks devoted entirely to conservation for schools. However, undergraduates in the departments of Botany and Zoology in the University of Singapore do receive some instruction on nature conservation.

#### M. Training of Conservation Personnel:

Singapore has no schools devoted to nature conservation for conservation personnel. Neither is there any advanced training for forestry, wildlife, national park and nature reserve management.

#### N. Most urgent problems:

The greatest problem in Singapore is firstly the pressure of population on the available land, and secondly lack of public interest in nature conservation. The result is that the public looks on the reserves as 'ripe for development'. The Botanic Gardens, the National Museum and the University of Singapore are doing their utmost to impress upon the authorities the need for nature conservation in an island which is forging ahead in industrialization. Moral support from international bodies like the IUCN would be most useful.

# General Information on Conservation Activities and Problems in Thailand

by

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## A. General data:

1. Area: 514, 000 square kilometers.
2. Population: 26, 257, 916 (1960 census); now estimated as over 30 millions.
3. Economy: Mainly agricultural products; Rice, maize, rubber, kenaf, cassava, sugar cane, tobacco, fruits, etc. timber and tin. Main exports listed according to priority in the first half of 1956 are rice, rubber, tin, maize, cassava, kenaf and others.

## B. Government departments and official organizations concerned with conservation:

1. Royal Forest Department, (Phaholyothin Highway, Bangkok) – conservation and management of forests, national parks, wildlife, wildlife reserves and sanctuaries.
2. Department of Land Development, (Rajdamnern Avenue, Ministry of National Development Building, Bangkok) – soil and water conservation.
3. Royal Irrigation Department, (Samsen Road, Bangkok) – water conservation.
4. Department of Fishery, (Rajdamnern Avenue, Ministry of Agriculture Building, Bangkok) – conservation of fishery resources, both marine and freshwater.
5. Department of Mineral Resources, (Rama VI Road, Bangkok) – conservation of mineral resources.
6. Ministry of Interior, (Asdarng Road, Bangkok) – conservation of wild elephants.

## C. Organizations concerned with research into conservation:

1. National Research Council, (Phaholyothin Highway, Bangkok) formulating and co-ordinating national research programs; collection and dissemination of information; subsidizing of research projects; documentation and research library.
2. Royal Forest Department, (Phaholyothin Highway, Bangkok) Division of Silviculture – watershed management research, national parks and wildlife research, forest management research.
3. Faculty of Forestry, Kasetsart University, (Phaholyothin Highway, Bangkok). Department of Conservation – watershed management research, soil and water conservation, wildlife conservation, forest management research.
4. Royal Irrigation Department, (Samsen Road, Bangkok).
  - (a) Section of Hydrology: hydrological research, watershed management research.
  - (b) Division of State Irrigation: Research on the conservation of water in agricultural use.
5. Department of Land Development, (Rajdamnern Avenue, Bangkok). Division of Soil and Water Conservation and Management: Soil and water conservation research, soil moisture conservation research.
6. Department of Fishery, (Rajdamnern Avenue, Bangkok). Division of Marine Fishery Investigation – research in the conservation of fishery resources.

7. Department of Mineral Resources, (Rama VI Road, Bangkok). Technical Division: research in the conservation of mineral and terrestrial resources.
8. Working Committee on Watershed Management, Ministry of National Development (Rajdamnern Avenue, Bangkok). Research on management and rehabilitation of denuded watershed.

D. Private Conservation Organizations:

1. Association for the Conservation of Wildlife, (4 Custom House Land, Bangrak, Bangkok) – Promotion of conservation concepts in all phases of conservation and particularly in wildlife, national parks and forestry.

Main activities are the dissemination and promotion of conservation knowledge through all forms of mass media and through schools and educational institutions; encourages the formation of bird watching groups and organizes nature tours to various places for adults and children.

Number of members at present about 600.

E. National parks and equivalent reserves:

1. The Royal Forest Department is responsible for establishing and maintaining national parks. The objectives for the establishing of national parks are:
  - (a) the preservation and development of natural areas of highly scenic and scientific values for the perpetual enjoyment of the public;
  - (b) scientific studies;
  - (c) the conservation of the natural resources therein.

The Fine Arts Department is responsible for establishing and maintaining historic monuments.

Their authorities are vested in the National Parks Act and the Archaeological Sites and Articles and Articles of Arts and National Museum Act. The objectives for the establishing of historic monuments are to preserve and restore (to a certain extent) sites of great historical and archaeological value, such as old capitals, temples, national monuments etc.

2. List of National Parks and Historic Monuments:

(a) National Parks

- 1) Tung Slang Luang National Park in Phitsanuloke and Phetchaboon Provinces, Central Thailand, established in 1963. Area: about 125, 300 hectares. Prominent park features are rolling plateau about 1200 meters high, streams, waterfalls and mountain scenery. Interesting species of fauna include gaurs, deers, elephants, tigers and birds of many varieties. Interesting species of flora are *Pinus spp.*, *Dipterocarpus spp.* and *Quercus spp.*
- 2) Khao Yai National Park in the provinces of Nakorn Nayok, Saraburi, Nakorn Rajasima and Prachinburi, established in 1963. Area: 216, 800 hectares. Prominent park features are rolling plateau about 700-1200 meters in elevation, streams, waterfalls and mountain scenery. Many species of wild animals and birds are found in abundance in this national park, including wild elephants, bantengs, deers, barking deers, bears, wild pigs and a few tigers and leopards.

This national park is the nearest (165 kilometers) to Bangkok and other large centers of population in Central Thailand.

- 3) Pu Kadung National Park. Established in 1962, this park is situated in Loey Province, North Eastern Thailand and has an area of about 34, 813 hectares. This park is considered one of the most beautiful in Thailand. Its scenery of rolling grass-lands interspersed with pine forests and rock garden formation, fascinates all people who visit the area. The park has an elevation of about 1350 meters. The flora includes *Pinus merkusii*, *Pinus khasya*, *Dacrydium elatum*, *Helicia spp.*, *Anneslea fragrans*, *Gordonia dalglieshiana*, *Podocarpus*

*imbricatus*, *P. neriifolius*, *Phyllotaxus griffithii*, *Betula alnoides*, *Carpinus viminalis*, *Acer tonkinensis*, many species of *Quercus Castanopsis*, *Lithocarpus* and rhododendrons. Wild flowers and orchids are found in great number. The fauna includes deers, tigers, wild pigs and many kinds of birds.

(b) Historic Monuments

- 1) For historic monuments, over 1000 have been established throughout the country. Detailed list can be obtained from the Department of Fine Arts, Bangkok.
3. Public information and limited interpretive services are provided at every national park and historic monument and are effective to a certain extent.
4. National Park personnel have training based mostly on forestry education with a few courses in conservation. This is supplemented by observation and study tours abroad for some of the personnel.
5. Visitors' facilities are provided for most of the national parks.
6. The National Parks are managed by Park Superintendents with a few assistants in each park.

The emphasis is on preservation, recreation tourism, scenic areas, vegetation wildlife and scientific study.

7. At present as all the national parks are in the initial stage of development, there is no area set aside as true wilderness, but plans are being developed for the survey of areas to be set aside as true wilderness in the future.
8. Exploitation or commercial activity are not allowed legally in the National Parks.
9. Protection of most of the national parks, at present, is not very effective. Poaching is prevalent, but illicit clearing and logging are not very serious.
10. Exotic plants and animals are in principle, not introduced into the national parks.
11. The major problems facing the national parks at present are;
  - 1) Lack of training of personnel in park management and development.
  - 2) Poaching.
  - 3) Inadequate funds and personnel for the management and development of the parks.
12. Though the Royal Forest Department is empowered by law to be solely responsible for the management and development of national parks, it is sometimes hard pressed by some pressure groups for the starting of certain activities that are against the principles of national parks.

F. Other areas that are being studied and proposed as national parks and wildlife reserves:

1. Proposed National Parks:

- (a) Khao Salorp or Erawan National Park. This park has an area of about 202,400 hectares and is situated in the Province of Kanburi, Central Thailand. Prominent park features are many beautiful waterfalls, scenic mountain ranges, evergreen forests and abundance of wildlife.
- (b) Doi Inthanon National Park. This park is situated in Chiangmai Province, Northern Thailand and has an area of about 13,200 hectares. In this park is the highest mountain peak of Thailand, Doi Inthanon, with an elevation of 2595 meters. Prominent park features are sub-temperate forests of pines, oaks, chestnuts and rhododendrons, mountain streams and many famous waterfalls.
- (c) Doi Suthep National Park. This park about 14,500 hectares in area, is situated close to Chiangmai, the Northern metropolis of Thailand, being

only 6 kilometers from that city. A good road about 12 kilometers long, winds up the mountain side to the famous shrine of Wat Phra That Doi Suthep and the Forest Experimental Station at an elevation of about 1054 meters. Prominent features of the park are many beautiful waterfalls, mountain streams, and a wide range of forests from the lowland dry deciduous dipterocarp forests to pine forests and sub-temperate montane forests.

- (d) Nam Nao National Park. This park is situated in Phetchaboon Province, Central Thailand. It has an area of about 18, 000 hectares. Prominent features are open pine, oak and dipterocarp forests. Many species of wild animals and birds abound in this park.
  - (e) Khun Tarn National Park. This park is situated at an elevation of about 1000 meters in the mountain resort of Khun Tarn in Lampang and Chiangmai Provinces, Northern Thailand. Its area has not yet been exactly determined, but should be not less than 10, 000 hectares. Prominent park features are scenic mountain ranges, waterfalls, pine forests and a great variety of wild orchids. The longest railway tunnel in Thailand, 1 kilometer long, passes through this mountain range.
  - (f) Larn-Sarng Waterfall National Park is about 16, 000 hectares in area and is situated in the province of Tak, Northern Thailand. Prominent park features are beautiful waterfalls, teak and mixed deciduous forests and many varieties of wild animals and birds.
  - (g) Prieu Waterfall National Park. Situated in Chantaburi Province, Eastern Thailand; it has an area of about 22, 050 hectares. Scenic features are rough mountains, rushing streams and a famous waterfall.
  - (h) Mount Kitchagoot National Park. This park is situated also in Chantaburi Province, but its area has not yet been exactly determined. Prominent features of the park are a famous shrine, covering Buddha's foot print, beautiful mountain scenery, and streams.
  - (i) Mount Phu Pharn National Park. This unique and very primitive area is in Sakol Nakorn Province, North Eastern Thailand. Its area has not yet been exactly determined. A highway from Sakol Nakorn to Kalasin climbs up to the top of the pass in this park. Prominent features of the park are beautiful mountain scenery, many interesting flora and fauna.
  - (j) Mount Sam Roi Yord National Park. This park involves both mountains and seashore, covering an area of about 6, 300 hectares. It is situated in Prachuab Kirikhan Province on the western coast of the Gulf of Thailand. Prominent park features are a famous cave, jagged limestone cliffs and beautiful sandy beaches.
  - (k) Khao Laung National Park. This is the only area in Southern Thailand proposed as national park at present. It covers roughly an area of about 8, 800 hectares and is situated in Nakorn Srithamraj Province. Within its boundary is Mount Khao Laung, the highest mountain peak in Southern Thailand, being 1986 meters in height. Prominent features of the park are beautiful mountain scenery, dense stand of tropical rain forests, and an abundance of wildlife.
2. Proposed wildlife refuges
- (a) Wildlife refuges in the process of being established
    - 1) Salak Phra Wildlife Refuge in the province of Kanburi, Central Thailand with an area of 96, 000 hectares.
    - 2) Phavor Wildlife Refuge in the province of Nhonkai, North Eastern Thailand, with an area of 30, 000 hectares.
    - 3) Huey Kha Khang Wildlife Refuge in the province of Uthai-Thani, Central Thailand, with an area of 140, 000 hectares.

In these wildlife refuges all kinds of game and birds abound and they will be strictly protected.

- (b) Wildlife refuges proposed during the next three years
  - 1) Oom Koy Wildlife Refuge in Chiangmai Province, Northern Thailand with an approximate area of about 15, 000 hectares.
  - 2) Klong Na Dam Wildlife Refuge in Ranong Province, Southern Thailand, with an approximate area of 20, 000 hectares.
  - 3) Nam Nhao Wildlife Refuge in Phetchaboon Province, Central Thailand with an approximate area of 20, 000 hectares.

B. Forest Conservation:

1. Total area of the country under forest is 51-50 per cent.
2. Total forest area under forest reserve is 28 per cent.
3. The objectives of the forest reserves are both for productive and protective purposes and also in some areas for the purpose of scientific study.
4. Types of training that are being provided for the forestry personnel.
  - (a) Professional training at the Faculty of Forestry, Kasetsart University; a 5 years course leading to the degree of the Bachelor of Science in Forestry.
  - (b) Sub-professional training at the Phre Forestry School; a 2 years course, leading to the granting of a Certificate in Forestry, after the completion of the course.
  - (c) Advanced training abroad for the master and doctor degrees for qualified personnel.
  - (d) In-service training in various subjects, usually of short duration.
  - (e) Study and observation tours abroad for selected individuals.
5. Illegal clearing and illegal logging are quite serious problems in Thailand. Main factors involved are:
  - (a) Inadequate protection of the forests owing to insufficient personnel and funds.
  - (b) Present system of administration of the national forests.
  - (c) Some loopholes in the present forest law.
  - (d) Pressure groups of land-hungry people and landlords who want to take up agriculture in the rich forest lands, despite other available areas outside the forests.
  - (e) Not enough timber for the large existing number of local saw-mills.
  - (f) Large number of hill tribes people who practice shifting cultivation on mountain lands.
  - (g) Inadequate public education.
6. The Royal Forest Department does not carry out any logging, but the Forest Industry Organization, a governmental concern, is solely responsible for the logging of teak and certain dipterocarpus species. Logging of other species, than those aforementioned, is carried out by industry and by individual permit and lease holders.
7. There is a research branch in the Royal Forest Department, but it is presently inadequately staffed and funded to be sufficiently effective. A forestry research institute is in the process of being established with the help of the Federal Republic of Germany and it is hoped that when the institute is in operation, forestry research will be greatly accelerated.
8. Reforestation:
  - (a) Regular reforestation is carried out mostly by the government. There are some private planting of mangroves and industrial woods, but they are very small in acreage. No government support is given to private planting except in the granting of land used for this purpose and in supplying

information when requested. A policy is now being formulated to give out long term forest leases and to have the lessors do afforestation work under the auspices of the Royal Forest Department; thus it is hoped afforestation will be speeded up to meet the needs of industry and the local population.

- (b) Reforestation is carried out mostly by replanting.
  - (c) No selective poisoning of the 'non commercial' trees is carried out as part of the reforestation program, except for research purposes.
  - (d) Area reforested by planting is approximately 1600 hectares annually. No comparison can be made to cut-over areas as cutting is mostly selective and not clear-felling. It is felt that the present rate of replanting is inadequate to keep the forest on a sustained-yield basis, but an inventory survey of all the existing forests has not been completed, it is not possible at present (except for teak), to accurately determine how much area should be replanted with the commercial species now in demand.
  - (e) Reforestation is carried out mostly by using native species, with a few exotics.
  - (f) Reforestation on the whole is successful, but some areas are still inadequately protected from fire and theft.
9. Forest fire is quite a problem in Thailand, though it does not cause as much damage as in temperate countries. The annual burning of most of the deciduous forests kills seedlings of valuable species and contributes to erosion and damage of fallen and some of the standing timber. In the pre-climax type of forest, such as the teak forest, however, forest fire may be beneficial in encouraging natural regeneration and keeping out invading evergreen species. In the evergreen type of forest, forest fire may be actually harmful by killing most of the seedlings and some of the standing timber and opening up the area to the invasion of grass and fast-growing non-commercial species.

The causes of forest-fires are mostly man-made started by hunters and people who live near or travel through the forest. Forest fires clear the undergrowth and grassy areas and induce the sprouting of new grass favored by game animals. Many forest fires are caused by shifting cultivations, road crews or just for the sake of seeing something burning.

No forest fire protection is carried out at present, except in reforestation and research areas, though according to the forest law now in force, setting fire to a forest area is illegal and liable to heavy punishment.

#### H. Soils and Water Conservation:

1. The problem of soil and water conservation in Thailand is not very acute at present, but with the expansion of agriculture into marginal lands, the devastation of forest areas and the repeated burning of forests as well as the widespread practice of shifting cultivation on mountain lands, siltation of streams and rivers, coupled with the drying up of perennial water supply, are now prevalent. The Government is tackling the problem through various agencies such as the Royal Forest Department, the Royal Irrigation Department, the Agriculture and Rice Department, the Mineral Resources Department, Kasetsart University and lately through the Land Development Department, which was only established in 1963.
2. At present only government organizations as mentioned in paragraph 1 are concerned with soil and water conservation problems and there is no central body to co-ordinate the activities of the different ministries and departments, except in the case of watershed management, where a Working Committee on Watershed Management acts as a co-ordinating body.
3. Legislation dealing directly with soil and water conservation is in the initial stage of drafting by the Land Development Department, but mismanagement of water and forest resources are dealt with under the existing irrigation and forest and mining laws.

4. Soil conservation outside of forest lands is in the initial stage of development. The Land Development Department now operates seven soil and water conservation centers and three mobile units which provide direct assistance to farmers in establishing conservation practices on their land. Two soil and water conservation centers are planned to be put up each year until every province has at least one such center.

For water conservation, many storage dams are being put up or contemplated by the Royal Irrigation Department and the National Power Authority. Some big storage dams have already been completed and put in operation such as the Phumiphol Dam, the Dang Kracharn Dam, the Ubolratna Dam and the Nam Pong Dam.

Long term plans for the building of water storage dams in the principal rivers and tributaries of the Kingdom already exist and will be executed according to the economic development of the country.

#### I. Conservation of Wildlife:

1. The Royal Forest Department is responsible for the conservation of wildlife throughout the country and the Ministry of Interior for the conservation of wild elephants outside the national forests.
2. Existing laws for the protection and management of wildlife are considered adequate for the present.
3. Enforcement of the laws is inadequate due mostly to insufficient staff and funds and lack of public support.
4. No formal training is now being provided for wildlife management personnel, except a few courses offered at the Faculty of Forestry, Kasetsart University. Some promising people are also being sent for advanced training abroad.
5. Damage to cultivation by wildlife does occur, but not to any serious extent; no government action is being contemplated to combat the damages at present.
6. Game Reserves
  - (a) At present, only 3 wildlife refuges are in the process of being established.
  - (b) and (c) Not answered.
7. Wildlife Research:
  - (a) No wildlife research project is being carried out at present, except for the collection and identification of birds and small mammals by the Royal Forest Department, the Faculty of Forestry and the Association for the Preservation of Wildlife. Some private individuals are also working in this field. SEATO is engaged in the banding of birds and the study of their migration and the transmission of diseases through these migrations. Chulalongkorn University is helping in this project.
  - (b) At present there is no research division in the government body responsible for wildlife, but the Royal Forest Department is in the process of setting up a Division of Wildlife and National Park Management and research in wildlife will be carried out by this division.
  - (c) Additional wildlife research that is most urgent:
    - 1) Study of the population of wildlife and their distribution.
    - 2) Ecology of wildlife.
    - 3) Effective protection methods for wildlife.

#### J. Threatened Species of Animals and Plants

1. There are many wild animals and plants which are being threatened with extinction, through over exploitation, destruction of their habitats and host plants by various causes. These include:



#### K. Pesticides:

1. Pesticides are used freely in the country. They may be divided into 4 main types.
  - (a) For the control of insects causing damages to agricultural crops, parathion is the most widely used in the organic phosphate insecticide group. Others also of wide application are the chlorinated hydrocarbons group such as the cyclodiene insecticides. Compounds of the carbonate insecticides and botanical insecticides groups are not very much used at present.
  - (b) For the control of insects injurious to man and animal, insecticides of the chlorinated hydrocarbons such as DDT are used everywhere. Second in priority are the BHC or cyclodiene insecticides group such as dieldrin and others.
  - (c) For the control of plant diseases, copper and mercuric fungicides are most in favor, followed by the sulfur fungicides.
  - (d) For the control of weeds, 2-4D and other related compounds are very much favored.
2. At present there is no law or regulation controlling the use of pesticides, but the Ministry of Agriculture is now drafting a law on this subject, which it is hoped will be promulgated soon.
3. It is well known among the scientists in Thailand that pesticides are dangerous directly and indirectly to wildlife and to the ecological balance of the areas involved. The widespread use of insecticides for vegetables in some places and in the aerial spraying of rice fields, has caused the death of fish and other aquatic fauna as well as the birds. The use of insecticides also destroys predators and other beneficial insects, thus upsetting the balance of nature, resulting in frequent and repeated swarming of the leaf hoppers and Bombay locusts which cause widespread damage to the rice and maize crops.
4. Very little research has been carried out in the use and control of pesticides and in the keeping in balance of the biological factors involved. At present only Kasetsart University and the Department of Agriculture of the Ministry of Agriculture are conducting research in these lines.

Research so far carried out on:

- (a) The toxicity of the different kinds of insecticides to animals, especially fish in the rice fields.
- (b) The use of biological agents in the control of insects.
- (c) Cultural control of insect pests.

#### L. Public Education on Conservation:

1. Though no regular program or project has been set up for conservation education for the public, the Royal Forest Department, other governmental agencies and the Association for the Conservation of Wildlife have, however, widely spread the concept of conservation to the public at irregular intervals and on appropriate occasions.
2. These education programs are carried out through the press, radio, television, exhibits, tree planting on arbor day, public lectures and distribution of pamphlets and posters.
3. Newspapers and magazines are willing to publish articles and pictures on conservation, and often there are editorials on conservation topics or on controversial issues. The local newspapers have been largely instrumental in spreading the concept of proper conservation of the natural resources of the country among the public. For radio and television, there are many programs during the year touching on conservation. The general feeling at present is that, through the efforts of all these mass media, most of the educated class are now more or less conservation-minded.

4. There is no separate course on conservation in the curriculum of the schools, but the teaching of conservation is incorporated in various text books at all level of schooling.
5. Private bodies that are interested in conservation are not many. Prominent ones are the Siam Society and the Association for the Conservation of Wildlife. Members of the Society and Association are drawn from all walks of life and both groups operate through membership dues, endowment and sale of publications. Conservation education is carried out by lectures, excursions, and publication in the Society and Association's journals.
6. These private organizations have been partially successful in educating the public particularly urban dwellers of the educated class, but the rural population is still apathetic and generally untouched.
7. Textbooks for the teaching of conservation for teachers have been prepared by the Ministry of Education, but no separate text book on conservation for the different school levels exists. The Royal Forest Department has prepared a forestry primer for students of the 4th grade in primary school, but the use of this primer is optional.

#### M. Training of conservation personnel:

1. At present the Phre Forestry School of the Royal Forest Department has facilities for the training of personnel in forest management, but not in wildlife and national parks management. A general course in conservation is also offered. For soil and water conservation, the Land Development Department, the Royal Irrigation Department, the Agriculture and the Rice Departments, have training courses for their personnel. With regards to watershed conservation, some training is given to the Border Police and personnel of the Public Welfare Department, who are working with the Hill Tribes people.
2. Advanced or university level training in forest management, wildlife management, national parks and reserve management, soil and water conservation, watershed management and range management are available at the Faculty of Forestry and other faculties of Kasetsart University in Bangkok.
3. International experts as advisors or instructors would be beneficial in the fields of wildlife, watershed, and national parks management. In 1959-1960 Dr. George C. Ruhle, an expert on national parks from the National Park Service of the U.S.A. was asked to come and give advice on the selection and setting up of national parks in Thailand. His suggestion for proposed national parks has been generally followed.
4. The most urgent conservation training problems in the country are: first, to get well-qualified instructors who have the necessary experience and acquaintance with local or similar conditions, to train personnel at the professional and sub-professional levels, and secondly, to secure advisors on public education and conservation teaching in primary and secondary schools. This would also include giving advice on the preparation of suitable text-books and training of teachers for the teaching of conservation.

The problems can be approached by assigning international experts to act as advisors and instructors for a period of not more than 5 years and to select suitable local personnel for advanced training abroad to take over the duty of these experts after the 5 year period.

#### N. Urgent Conservation Problems:

The most urgent conservation problems in Thailand, according to the writer's opinion, according to priority are:

1. Effective protection and management of the national forests, including the watershed areas.

For effective protection and management of the national forests, the establishment of forest reservation should be speeded up and the administration of each of the national forests should be entrusted to the national forest supervisor and his staff of district forest rangers, more of which will have to be

trained to adequately staff all the national forests. More forest roads should also be built for efficient patrolling of the forests and for the carrying out of forest operations. Inducement to the local populace in the form of employing them in forest operations, giving them land for temporary cultivation in selected sites for plantations, and encouraging them to engage in small-scale industry using products from the forests, which they should be able to obtain readily and legally, would contribute largely to their support of the government's forest policy and make them feel that their welfare was more or less dependent on good management and conservation of the forests in their neighborhood. Emphasis should be put more on the prevention of damage to the forest rather than the suppression of timber thefts and illegal clearing by going to the why of such stealing and clearing and trying to remedy the causes, rather than just catching and punishing people. The National Forest Policy should also be modified to grant long term forest concession to industry and local timber companies with provisions that they should also contribute in the protection and replanting up of forest areas.

For watershed management, the problems are quite complex and a team of international experts should be sought to survey the situation and recommend suitable policy and implementation. The practice of shifting cultivation on mountain lands should be thoroughly studied and recommendations made on the stabilization of the hill tribes people and inducing them to practice soil and water conservation in their methods of cultivation. At the same time measures should be introduced to raise their standard of living and to give them some formal education to become good and responsible citizens of the country.

2. The training of game wardens and the setting up of an efficient organization within the Royal Forest Department for the management and conservation of wildlife as soon as is possible. This organization should be well financed and well-staffed with qualified personnel.

For effective wildlife management and conservation, a nucleus of dedicated game wardens and staff, well-versed in wildlife management, should be trained at Kasetsart University by utilizing the already existing university staff with an addition of a few international experts. Sufficient funds and personnel should be assigned afterwards to the Royal Forest Department for the establishing of wildlife reserves and for the efficient protection of wildlife within and outside the reserves. Interested scholars and researchers should be encouraged to come and conduct research in all phases of wildlife management in the country, including the taking of census of big game in the proposed wildlife reserves.

3. The creation of conservation conscientiousness in the general public.

For public education in conservation, a team of international experts to advise the Ministry of Education and other government agencies on policy, programing and co-ordination of efforts, as well as for the training of teachers in conservation, would be most helpful and of great benefit to the country in the long run.

# The Status of Conservation in South Vietnam

by

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## A. General Data:

1. Area: 65, 700 square miles (1961)
2. Population: 14, 314, 829 (1965) according to the National Institute of Statistics.
3. Economy: production and export of agricultural crops such as rice, rubber, peanuts, tea, beans; also export of substantial quantities of buffalo, salted fish, sand, and sodium chloride.

## B. Government departments and official organizations concerned with conservation:

1. Ministry of Rural Affairs (54 Nguyen Binh Khiem St. Saigon):
  - (a) Directorate of Forest Affairs (30 Mac dinh Chi St. Saigon) – responsible for general land conservation, establishment and maintenance of national parks and wildlife protection. The Directorate has a Conservation and Reforestation Service actively concerned with various aspects of conservation.
  - (b) National Committee on Nature Conservation advises the government on conservation matters.
2. Ministry of Culture and Education – establishment and maintenance of historic monuments.

## C. Organizations concerned with conservation research:

1. Botany Department, Faculty of Science (227 Cong Hoa stg. Saigon) – carries out botanical surveys of critical areas and threatened plant species.
2. National Center of Scientific Research (30 Le Thanh Ton St., Saigon) –working on a vegetation map including an inventory of natural resources of the country.
3. Directorate of Agricultural Research (121 Nguyen Binh Khiem St., Saigon)
  - (a) Soil Division – land use and soil restoration.
  - (b) Forest Research Division – studies of artificial and natural regeneration, reforestation and introduction of exotic tree species.
4. Oceanographic Institute (Nhatrang) – investigating marine resources along the coast of Vietnam.

D. Private conservation organizations: The only private organization which is interested in nature protection is the Biological Society of Vietnam, but it has no specific program for this purpose.

## E. National parks and equivalent reserves:

In Vietnam at present there is no true national park except for a small area of 400 hectares at Trangbom, about 35 miles northeast of Saigon. It is located within a forest experiment station and is administered by the Directorate of Forest Affairs. However, it is not effectively protected due to the lack of personnel and the closeness of many refugee villages.

It has been suggested that other suitable areas within numerous forest reserves could be managed as national parks. The Bach-Ma-Hai vãn area of approximately 78, 000 hectares has been approved as a national park by the National Committee on Nature

Conservation. An area at Hao Son-Dai Lanh (Cape Varella), the best known scenic area on the coast, about 50 kilometers north of Nhatrang, has also been proposed as a national park.

F. Other areas which should be reserved:

A list of other areas proposed for reserves includes:

1. Bao Lôc Nature Reserve which covers the forested area southwest of Blao.
2. Nui Ba Nature Reserve which includes the 2163 meters Lanbian summit, about 15 miles east of Dalat, a highland summer resort.
3. Due Xuyên Wildlife Reserve in the Banmethuot region.
4. Canh Duong Scenic Reserve and O Loan Scenic Reserve on the coast.

G. Forest Conservation:

1. 36 per cent of the total land area of Vietnam is under forest.
2. Of the above 10 per cent is forest reserve.
3. Forest reserves are divided into protective forests and productive forests.
4. They are administered by Forest Service personnel trained for conservation, forest management, and reforestation.
5. Illegal clearing and illegal logging are rampant today in Vietnam, a war-torn country where conservation laws and forest regulations are unenforceable in many areas.
6. Logging is carried out by private industry.
7. Forest research is assumed by the Directorate of Agricultural Research through its four forest experiment stations at Trang Bom, Dran, Lang Hanh, and Manline. These stations are not adequately staffed.
8. Reforestation:
  - (a) The Service of Conservation and Reforestation is responsible for regular reforestation throughout the country. In some areas, reforestation is also assumed by private parties with government support.
  - (b) and (c) Reforestation involves replanting exotic trees (eucalyptus, casuarina, ..) along the coast and by natural regeneration aided by protection in other areas.
  - (d) Reforestation along the coast is fairly successful owing to the education of the indigenous inhabitants, but inland forest reserves are not adequately protected from shifting cultivation and forest fires.
9. Most forest fires in Vietnam are man-caused. Dipterocarp savanna and pine forests are the most threatened by fires. Effective fire protection measures consist of:
  - (a) establishing fire break lines around fire hazardous areas,
  - (b) setting up adequate organizations for direct control of forest fires as in the timbered triangle Dran-Dalat-Finnom.

H. Soil and water conservation:

There is no specific legislation dealing with soil and water conservation although forest clearing regulations could prevent gullying and soil erosion on mountain sides and protect the headwaters of springs, creeks, and rivers. Land under cultivation is also protected by means of tree planting, control of water drainage, and contour cultivation; along the coast artificial reforestation with eucalyptus and casuarina has been begun as a sand dune fixation and shelter belt. The Soil Service at the Directorate of Agricultural Research is responsible for land use and the restoration of fertility.

I. Conservation of wildlife:

1. The Directorate of Forest Affairs, the Advisory Committee on Hunting, and the Ministry of Rural Affairs are responsible for wildlife conservation.

2. A decree fixing game and hunting rules and wildlife protection was signed by the Secretary of Rural Affairs in 1959.
3. Due to the present situation in Vietnam, (insecurity, insufficient staff, etc.) there is no systematic enforcement of conservation laws and wildlife regulations. Many protected animals are being hunted illegally and both sexes of deer species continue to be hunted and trapped at any time of the year. Game guards are drafted.
4. There is no specific training for wildlife management personnel.
5. Not answered.
6. The decree of 1959 created four game reserves:
 

Krong Polo game refuge of about	533, 760 hectares
Bantum game refuge	27, 840 hectares
Kinda game refuge	53, 760 hectares
Langbian game refuge	4, 800 hectares

 and listed rare wild animals and birds which should be strictly protected.
7. No wildlife research project is being carried out at the present time.

J. Threatened species:

Many kinds of wild animals and plants are becoming scarcer and are being threatened with extinction because of deforestation and careless hunting.

Javan and Sumatran rhinoceros have not been reported for many years. The following animals and birds are expected to become extinct in the near future:

Kouprey	<i>Novibos sauveli</i>
Malay Tapir	<i>Tapirus indicus</i>
Bear	<i>Ursus tibetanus</i>
Gibbon	<i>Hylobates pileatus</i>
Imperial Pheasant	<i>Lopura imperialis</i>

A preliminary survey pointed out that the following trees should be protected to prevent their extermination:

- Pinus kremfii*, the endemic species of pine with flattened leaves
- Pinus dalatensis*
- Libocedrus macrolepis*
- Dacrydium Pierrei*
- Podocarpus imbricatus*
- Podocarpus neriifolius*

K. Pesticides and herbicides:

Pesticides are liberally used in Vietnam to control insects injurious to cultivation; chemical herbicides have been experimented with to prevent forest fires along railroads and highways; and finally, phytohormones for defoliation have been used for military purposes. In areas where the latter have been used it has not been possible to evaluate the effect of phytohormones on the ecological balance, nor to my knowledge has there been any study of the impact of pesticides and phytohormones on wildlife. According to my own observations, most plant species have recovered their growth during the rainy season in defoliated areas.

L. Public education in conservation:

1. Although the government is fully aware of the need for nature protection, there is no specific program of conservation education for the public.
2. and 3. Not applicable.

4. Some aspects of nature conservation such as bird protection, soil conservation, effects of deforestation, etc., are dealt with in geography and science courses on the elementary and secondary school level. The idea of nature protection is initiated in biology and ecology courses on the university level. A proposed course in conservation for secondary schools has been submitted to the ministry responsible.
7. The lack of necessary texts for both teachers and students could be overcome in the near future.

M. Training of conservation personnel:

In Vietnam there is no training of conservation personnel except for the College of Agriculture and Forestry which gives courses in forestry. There is a serious need for experts in both national park and soil protection services.

N. Personal view of conservation problems:

Although the authorities are aware of the importance of nature protection within the framework of conservation and the development of natural resources of the country, much has to be done to put these ideas into laws and regulations. The failure in the enforcement of the existing laws is due to the ignorance and unco-operative attitude of the public. The most urgent need in Vietnam is that of public education in nature conservation. Furthermore, in order to reduce deforestation which destroys wildlife habitat, our conservation policy must concentrate on an intensive development of the use of substitute products in place of firewood and charcoal and on an intensive survey of land use particularly in refugee villages. International assistance would help by providing experts and funds for these projects.

## Part 2

### Other National Conservation Papers

#### Note on the Situation of Nature and Natural Resources in Laos<sup>1</sup>

by

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#### SUMMARY

The author points out the dilemma that Laos faces as a result of continuous war since the end of World War II. On the one hand there is the great need for the people for the best possible utilization of their rich natural resources and on the other, the conditions of hostility that make any development or conservation of these resources difficult if not impossible. Specifically the two greatest problems are shifting cultivation and forest fires.

There is, furthermore, a great need for research – in particular on fish and fish culture, as species, number, and size are decreasing.

#### INTRODUCTION

Laos, stretching over more than 1000 kilometers from north to south, is located between 14° and 22° 5' N. latitude. The country is estimated at 237,000 square kilometers and has common frontiers with Vietnam, China, Burma, Thailand and Cambodia.

Laos is a rich and fertile country with natural forests covering much of the area. With high mountains in the north and more gentle slopes in the south, there are very fertile plains as the Mekong is approached. This river system even with its irregular flow and natural damming is invaluable.

However, Laos has had neither the time nor the means to develop its wealth of natural resources, for since the end of the Second World War and independence the country has been in a continuing state of war. It becomes every day more difficult, if not impossible, to build up the country economically and scientifically and to raise the standard of living of the people.

#### MAN AND NATURE

The majority of the Laotians live in close contact with nature from whom they obtain much of what is needed in their daily existence. The most acute problems that the country faces are those of shifting cultivation and forest fires.

The most striking example is the Meos who migrated to the northern mountains in 1842 and they have felled forests even on the steepest slopes where they alternately cultivate rice and opium. Whole mountains are thus denuded as the Meos move on to other sites in their nomadic existence. The exposed soil becomes very vulnerable to erosion. As the best forests are the first to be felled in the pattern of temporary cultivation there

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<sup>1</sup> Original in French.

is a loss of timber as well as soil fertility. However, the mountain people know of no other type of cultivation and there can be no question of summarily abandoning this system.

Fire is the second problem which we try vainly to stop. Fires occur regularly each year at the beginning of the dry season and as the trees disappear the soil becomes sterile. Dry grass, dead leaves and twigs are burned preventing the formation of humus and the yearly occurrence of burning prevents any natural regeneration of the forest.

The most destructive force of all is the war. The immense amount of damage it inflicts on the country, its inhabitants, and natural resources cannot be underestimated. In order to discover, frighten, and starve out the enemy it is nature that is set upon, yet it must be recognized that nature directly and daily feeds the population of Laos and therefore the natural resources must be protected against any threat of destruction and disappearance.

Wildlife needs quiet and security in order to reproduce and insure the preservation of race or species. The conditions of war, besides the actual destruction, create in the minds of the people a desire to destroy, it is thus difficult if not impossible to teach them to love nature. War conditions make it impossible to administer natural resources and yet proper management is the very basis of scientific work and of civilization the world over.

The Laotian Forest Service is aware of the problems it faces in trying to preserve natural resources yet in spite of these it works ceaselessly to introduce order and method into forestry operations.

## **NATIONAL PLANS AND PROGRAMS**

Much of the plan for national development is devoted to forestry problems, soil conservation, and the protection of forest wildlife and fish.

### **1. Forest Conservation.**

Since 1963 all efforts have gone toward maintaining and improving the existing forests. The conservation of the forest centers around

- (a) protection of the 200,000 hectares of forest reserves and the creation of reforestation areas for rehabilitation of land in the mountains;
- (b) the fight against over-exploitation (shifting agriculture);  
and
- (c) the control of damage by plant and animal pests, i. e. the destruction of noxious animals and insects.

### **2. Fire control.**

Fires are always man-caused, usually for some purpose and usually along paths and trails. Prohibitions regarding the lighting of fires have been put into effect and a program of educating the public has been started. For active fire fighting a defense commission has been formed; personnel may be requisitioned in an emergency, and fire-fighting equipment is kept on hand.

### **3. Hunting.**

With conditions as they are game is hunted as it never was before because of the uncontrolled number of firearms available due to the war. In many regions the game is disappearing or has disappeared. Wildlife protection could be effected by the creation of game refuges and hunting preserves and regulations against hunting during the periods of gestation, dropping of young, and nursing.

## **FISHING AND FISH CULTURE**

The great decrease in the numbers and species of fish in our streams worries the population. To the southeast of Vientiane there is a pond (Bongkhatkhaou) five to eight kilometers long, around which nineteen villages with a population of seven or eight

thousand have arisen. The local population used to be able to satisfy their needs easily, but now the fish are fewer in number and species and also smaller than they used to be.

A Department of Fisheries and Fish Culture under the Department of Forest and Water has been recently organized to study the changes in the aquatic fauna. Its aim is the rational utilization of aquatic resources. Fish and forest resources can be managed similarly – in Forestry the seed trees are protected in cut over areas and in fisheries what must be conserved and protected are the reproducing fish. In order to do this some basic research must be undertaken; we must know the main species of fish in our streams; the areas where certain especially palatable fish occur; the time of fertilization and egg laying; and how to protect the reproducing individuals and the young fish. To do this we propose to undertake some preliminary studies listed below to serve as a basis for later projects in improving and increasing fish production.

1. Survey of fish producing water resources:

Surveying and mapping those rivers, streams, lakes, artificial ponds, etc. available for fish culture should be undertaken as well as measuring the duration of the floods to find out if these areas could be used for fish culture.

2. Study of species:

Cataloguing and studying principal species of fish, their migrations and causes for their disappearance.

3. Study of eggs and young fish:

These can be separated into two groups (1) those that are wild and (2) those that are hatched in fish hatcheries. The latter group can also be subdivided into two: (a) those species spawning in open waters where the young fry can be gathered and (b) those species spawning in enclosed waters under supervision.

4. Growth:

Place each species in waters best suited to it and choose those species that have the fastest growth rate.

# The Current Situation of Conservation in Vietnam in 1965

by

MR. NGUYEN VAN HIEP and MR. NGUYEN DINH MO  
*Conservation and Reforestation Service, Directorate of Forest Affairs,  
Saigon, South Vietnam*

## SUMMARY

This paper describes the status of conservation in Vietnam and indicates the kind of conservation work that is being done in spite of the difficulties presented by the war. The authors discuss the causes of damage to resources, present the conservation legislation and other works that have been accomplished, describe the Bach-Ma Hai-Vân National Park, describe the conservation policy of the country, and make recommendations on the role that UNESCO and the IUCN can play in Vietnam.

## INTRODUCTION

Some people believe that the conservation work in Vietnam has been overlooked. These observations are usually based on the present situation of this country. Due to the continuing war, people within the country and abroad think of Vietnam as a place in which wildlife flora, soil, scenic sites, etc. are being damaged severely and in which the problems of conservation give way in priority to other desperately needed activities.

The main object of this paper is to describe the current situation of conservation in Vietnam and to indicate what type of conservation work can be done in a country where scientists and foresters cannot always go to work in the forests.

## CAUSES OF DAMAGE

The fauna and flora of Vietnam are subject to many kinds of damage. The following are the most serious causes:

In the past decades, shifting cultivation has caused a great deal of damage to the forest. An estimated area of 60,000 hectares is destroyed annually by tribesmen in the hinterland. They move from place to place as their crops use up the fertility of the soil. Fortunately, plants (though of inferior species) will grow on the abandoned sites. The problem of shifting cultivation becomes more serious when the tribesmen move out of their usual habitat. They now have to live in safer areas around the administrative districts or provinces where they can grow crops without being threatened by communist guerillas. Most of these areas are protective reserves and should be kept free from any clearing.

A group of farmers and forest workers claimed some sites in the Dalat summer resort area, and in the proposed Bach-Ma Hai-Vân national park. They argued if they were not granted permission to clear land for farming and to cut timber for wood, they would be destitute. Is clearing the forest really a good economic solution? Among other things, the forests in Vietnam suffer greatly from overcutting. The selective cutting that is followed does not bring back enough seedings to replenish the initial stock.

Wild animals, too, suffer from illegal hunting. Guns are now readily available anywhere. Militia men hunt wildlife for supplemental food. In addition, Viet Cong have also hunted for food, and in the hinterland they have also cleared land for plantations.

## CONSERVATION WORKS THAT HAVE BEEN ACCOMPLISHED

### Laws:

In order to protect fauna and national parks we have the following laws:

Decrees No. 7/59 of March 1959 and No. 175/BCN/ND/HC. 2 of May 25, 1959 provide primarily the following items.

1. Hunting licenses and number of game permitted.  
Hunting License A: Big game hunting.  
Hunting License B: Small game hunting.
2. Two hunting zones in the whole country, one zone for the even years and the other for the odd years. This creates temporary game refuge each year.
3. Five zoologic reserves totalling 676, 640 hectares. One of the five, Krong-Poko with its 533, 760 hectares is situated at the frontiers of Vietnam, Cambodia, and Laos.
4. List of protected game, and animals causing damage to people and crops. Among the protected game and birds we find rhinoceros and tapir, and crane (*Megalornisantigone*).
5. Regulation for game and birds caught for scientific purposes.
6. Penalty by money and/or imprisonment.

### Trang-Bom National Park:

In 1958, the Trang-Bom National Park was established. The Park, 410 hectares in area, is situated at 30 miles northeast of Saigon. Though it does not follow strictly the definition given by the London Conservation Convention (8.11.1933), the park is an indication of goodwill from the government in the field of conservation.

### Bach-Ma Hai-Vân National Park:

Due to the increase in demand for wood, more and more virgin forests are being disturbed or converted to productive forests. Protecting natural areas has been encouraged by the IUCN. The Vietnamese Government has also recognized this, and accordingly the Bach-Ma Hai-Vân will be managed as a true national park. Following are some general characteristics of the park:

1. Location and transportation: The park, approximately, 78, 000 hectares, lies in the Thua-Thien and Quang-Nam provinces. The 1, 500 hectares Bach-ma summer resort and the 1, 000 hectares experimental forest of the Applied Agriculture School found in the vicinity are not included in the park total area. Besides trails, the area has national highways numbers 1 and 14 forming its North and South boundaries. A provincial highway joins Cau-Hai, a town near-by, and Bach-Ma.
2. Topography, geology, soil, and climate: The park consists of a group of high mountains with the highest peak at Mount Bach-Ma (1, 450 meters). The region is largely composed of anthracolithic granite. In the northern part, due to damage caused by human activity, the soil has become lateritic. This region has a tropical monsoon climate with two distinct seasons, the rainy season from September to January, and the dry season, March to August, when the temperature at Bach-Ma varies from 18-23° C. North of the mountains, the precipitation is about three meters; it is lower on the south side.
3. Vegetation and Wildlife: Fortunately, this region has not been damaged by shifting cultivation and still has virgin forest conditions. Vegetation is made up of coniferous species (*Dacrydium*, *Podocarpus*, *Keteleeria*), and hardwoods of the Dipterocarpaceae, Fagaceae, Leguminoseae, Spindaceae, and Myrtaceae. The area is famous with its species of *Camellia* and orchids. Wildlife in the park includes most of the tropical forest fauna. We have elephant, bear, tiger, panther, deer, hog, porcupine, monkey, fox, etc. Birds such as peacock, pheasant, quail are also present here. Besides, the area is extremely beautiful with its seashores and impressive mountains.

The park combined with the old capital (Hue) and Quang-Nam province with the monuments, museums, and sight seeing, makes this an important area for tourism.

### **National Committee on Nature Conservation:**

We scientists, foresters and nature lovers, have fought a great deal to save the area from exploitation. There is always, anywhere in this part of the world, a group of people with the wrong concept of economic development. They demand that part of the area, rich in timber, be given to local people to increase job opportunity. We, on the other hand, have persuaded the Government to create the National Committee on Nature Conservation (Decree No. 65/BCTNT/HC. 2 of July 5, 1961). Chairman of the Committee is the Secretary of Agriculture, and the membership includes representatives from: the Department of Public Works and Transportation, General Directorate of Construction and Planning, the National Museum, Directorate of Technical Research (Education), Directorate of Tourism, Faculty of Science, and Directorate of Agricultural Research. Reporter of the Committee is the Chief of the Service of Conservation and Reforestation. The Committee gives opinion on the establishment of natural reserves and national parks. It organizes sub-committees for planning and scientific studies in biology, geology, conservation of natural sites, and public education on conservation. The committee also includes representatives from related localities with the conservation problems.

### **STRUGGLE FOR CONSERVATION**

The laws and regulations concerning conservation are adequate, but their application is sometimes hard to realize. Of course, in such a place as Vietnam, conservation cannot always have top priority. A great deal of other desperately needed activities should be carried out first. Once in a while, we have to sacrifice some land for the resettlement of refugees. However, when it is possible, we strongly give our opinion on problems related to conservation. Last year, a group of people illegally cleared land for planting in the Tuyên-Duc province (Dalat). The District Forester in the area sent a complaint to the chief of province and to the Ministry of Agriculture. After investigation, the group of farmers had to plant back the cleared area with pines produced by the Forest District. Another group of people asked the government to release part of the area belonging to the Bach-Ma National Park for timber cutting. They claimed that since the area was chosen for the establishment of a national park, they were jobless. The Directorate of Forest Affairs did not agree on the matter. We believe there are ways to increase job opportunity. This group of local people can go somewhere else to practice timber cutting or to find a job. As for economic development, increasing farm yield by better agricultural techniques, for example, would set a higher standard of living in this area.

In several secondary and high schools lessons in conservation have been introduced. The conservation courses are given at a higher degree at the Vocational School of Agriculture in Biao and the College of Agriculture in Saigon. We also have our foresters in the different local committees for wild land distribution. This gives us more opportunity in the decision making of land classification.

### **CONSERVATION POLICY**

Fortunately conservation is under the Directorate of Forestry. This government office has men all over the country who are reliable and care for conservation. We are actually in a waiting state. Active conservation may stay dormant for some time, but we are ready. While waiting for better security, we train our men. When the time comes, we will make an inventory to see exactly what is left to be saved after the long war period.

In the meantime, we are setting up a conservation map for the country. This includes the co-operation of the Faculty of Science, the Directorate of Agricultural Research, and the Directorate of Forest Affairs. We hope this will awaken the public to a need for a conservation law which will make conservation work easier.

## **THE ROLE OF UNESCO AND IUCN**

The conclusion of this paper will be more meaningful if we can include the role of UNESCO and IUCN in the conservation in Vietnam. Yes, these organizations can help us to train specialists in the fields of national park and wildlife management. They can also provide us with documents for the teaching of conservation. We also would like to request UNESCO and IUCN for some symbolic aid. The government of Vietnam would be more aware of the important role played by the conservation in the economic development of the country thanks to some symbolic funds from UNESCO and IUCN, the two international authorities in the matter.

## **CONCLUSION**

Not too optimistic a conclusion, we still believe that the situation of the conservation in Vietnam is by no means desperate. With some more understanding and co-operation, from people and from the government as well, fauna, flora, scenic sites and the likes can be saved from meaningless destruction.

## The Program of the Conference

**MONDAY, NOVEMBER 29, 1965**

OPENING PLENARY SESSION

Main Auditorium, Kasetsart University, Bangkok, Bangkok

0900 Meeting called to order by Mr. Harold J. Coolidge, General Chairman of the Conference.

0905 -1005 ADDRESSES OF WELCOME ON BEHALF OF THE HOST GOVERNMENT AND SPONSORS

Formal Opening of the Conference, and Welcome on behalf of the Host Government, by His Royal Highness, Prince Wan Waithyakon, Deputy Prime Minister of Thailand.

Professor F. Bourliere, President of the IUCN.

Mr. G. Betancur-Mejia, UNESCO Assistant Director-General for Education.

Dr. H.N. Mukerjee, Acting Regional Representative for FAO for Asia and the Far East.

Dr. Pradisth Cheosakul, Deputy Secretary-General, National Research Council of Thailand, and Chairman, Thai Organizing Committee.

Sir Hugh Elliott, Secretary-General of the IUCN.

1005 -1015 Intermission

1015-1100 KEYNOTE ADDRESSES ON THE CONFERENCE THEME, 'CONSERVATION SPOTLIGHT ON SOUTH EAST ASIA'. BY REPRESENTATIVES OF INTERNATIONAL ORGANIZATIONS PARTICIPATING IN THE CONFERENCE.

Opening Remarks, Mr. Harold J. Coolidge

Mr. Thane Riney, Wildlife and National Parks Officer, Forestry and Forest Products Division, FAO

Mr. Wayne A. Mills, Acting Director, UNESCO Regional Centre for Science and Technology for Southeast Asia.

Professor S. Dillon Ripley, President, International Council for Bird Preservation and Secretary, Smithsonian Institution

Mr. Peter Scott, Vice President, International World Wildlife Fund, and Chairman, Survival Service Commission of the IUCN.

Dr. Edward H. Graham, Deputy Convener, Conservation Section of the International Biological Program, and Chairman, Ecology Commission of the IUCN.

Dr. Lee M. Talbot, Director, South East Asia Project of the IUCN, and Program Organizer of the Conference.

1050-1100 Conclusion of Plenary Session and Announcements, Mr. Coolidge

1100-1115 Intermission, participants proceed to the Rice Diseases Research Building

## TECHNICAL SESSIONS

Main Auditorium, Rice Diseases Research Building, Kasetsart University, Bangkok, Bangkok

### 1115-1300 TECHNICAL SESSION I: INTERNATIONAL BIOLOGICAL PROGRAM (IBP)

This Session presents some of the plans and proposals for the conservation work of the International Biological Program. This Technical Session is co-sponsored by the Terrestrial Conservation Section (CT) of the International Biological Program.

Chairman: Dr. E. Balasingam, Malaya

Discussion Leader: Dr. Edward H. Graham, U.S.A.

Recorders: Hon. Aziz Umar, Brunei; Dr. Chew Wee Lek, Singapore

Summarizer: Dr. Sampurno Kadarsan, Indonesia

Speakers: Professor S. M. Cendana, Philippines  
Dr. Pham Hoang Ho, South Vietnam  
Dr. Kasin Suvatabandhu, Thailand  
Professor Otto Soemarwoto, Indonesia  
Dr. Paul Wycherley, Malaya  
Mr. Thane Riney, FAO

1115-1125 Introductions

1125-1215 Speakers' summaries of their papers

1215-1250 Discussion

1250-1300 Summary

1300-1400 Luncheon at Kasetsart University Cafeteria

1400-1600 Meetings of Conference Officers and participants in Technical Sessions in the Auditorium of the Rice Diseases Research Building

1830-2030 Thai Government Reception for Conference Participants at Erawan Hotel

## TUESDAY, NOVEMBER 30, 1965

0845-1300 TECHNICAL SESSION II: ECOLOGY. This Session considers the ecological aspects of conservation in Tropical South East Asia, with emphasis on comprehensive, integrated planning for the use of land and water resources.

Chairman: Professor Otto Soemarwoto, Indonesia

Vice Chairmen: Dr. Pham Hoang Ho, South Vietnam  
Mr. A. Rahman Ali, Malaya, Malaysia  
Dr. Kasin Suvatabhandhu, Thailand

Discussion Leader: Dr. Edward H. Graham, U.S.A.

Summarizer: Dr. F. Fraser Darling, U.K.

Recorders: Mr. E.Z. Cajucom, Philippines  
Mr. Wong Yew Kwan, Malaya, Malaysia

Speakers: Dr. J.D. Bromhall, Hong Kong  
Mr. Udhai Chanphaka, Thailand  
Mr. G.R. Conway, Sabah, Malaysia  
Mr. Philip A. Daley, Hong Kong  
Mr. Macid Y. Gülcur, FAO, Turkey  
Professor J.L. Harrison, Singapore  
Mr. W.B. Hitchcock, Australia  
Mr. Frank G. Nicholls, Thailand

Mr. William P. Panton, Malaya, Malaysia  
Dr. J.A. Tubb, FAO, Australia  
Dr. Thai Cong Tung, South Vietnam

- 0845-0855 Introduction
- 0855-1100 Speakers' summaries and discussion
- 1100-1120 Intermission
- 1120-1250 Speakers' summaries and discussion
- 1250-1300 Summary
- 1300-1400 Luncheon at Kasetsart University Cafeteria
- 1400-1700 Tour of Bangkok provided by courtesy of the Government of Thailand, including visits to the Grand Palace, Temple of the Emerald Buddha, and the Snake Farm.
- 1830- Reception and Dinner given for the Conference participants by the Teachers' Association of Thailand, at the Teachers' Association Hall. Dinner followed by a Conservation Ballet, organized by Dr. Boonsong Lekagul.

### **WEDNESDAY, DECEMBER 1, 1965**

#### 0845-1300 TECHNICAL SESSION HI: CONSERVATION EDUCATION AND TRAINING

Chairman: Dr. Boonsong Lekagul, Thailand

Vice Chairmen: Mr. Eric R. Alfred, Singapore  
Professor Thiem Komkris, Thailand  
Mr. Severino U. Nablo, Philippines  
Mr. J.A. Rondon, Laos

Discussion Leaders: Mr. J. Goudswaard, Netherlands  
Dr. Tom Pritchard, U.K.

Summarizer: Professor S.M. Cendaña, Philippines

Recorders: Mr. K.B. Chung, Hong Kong  
Mr. William P. Panton, Malaya, Malaysia

#### 0845-1100 Part I: Education in Schools

Speakers: Professor J.L. Harrison, Singapore  
Dr. Dolores F. Hernandez, Philippines  
Dr. Phung Trung Ngan, South Vietnam  
Mr. Chamnian Sa-Nguanpuag, Thailand  
Professor Otto Soemarwoto, Indonesia

#### 1100-1120 Intermission

#### 1120-1220 Part II: Training in Conservation

Speakers: Mr. Narit Bhanburana, Thailand  
Mr. Edilberto Z. Cajucom, Philippines  
Dr. C.W. Chang, FAO, Bangkok  
Mr. G.S. de Silva, Sabah, Malaysia  
Mr. E.A. Quist-Arcton, FAO, Ghana  
Dr. Vallobh Naraballoh, Thailand

#### 1220-1250 Part III: Public Education

Speakers: Mr. R.S.R. Fitter, U.K.  
Mr. W.B. Hitchcock, Australia  
Mr. Wong Yew Kwan, Malaya, Malaysia

- 1250 Summary
- 1300-1400 Luncheon at Kasetsart University Cafeteria
- 1400-1800 CONSERVATION EDUCATION WORKSHOP. This workshop is concerned with adaptation and development of conservation education materials for tropical South East Asia.
- 1400-1515 Exhibit Rooms, 2nd floor, Rice Diseases Research Building: Exhibition of education materials collected from other parts of the world and assessment of these by the workshop groups.
- 1515-1600 Demonstration of teaching techniques; color slides.
- 1600-1620 Tea Break
- 1620-1800 Main Auditorium, Rice Diseases Research Building: General discussion and recommendations. Summary.

**THURSDAY, DECEMBER 2, 1965**

- 0845-1300 TECHNICAL SESSION IV: THREATENED SPECIES. This Session considers many of the species of South East Asian flora and fauna that are rare or threatened with extinction.

Chairman: Professor Dioscoro S. Rabor, Philippines

Vice Chairmen: Mr. J.B. Alvarez, Jr., Philippines  
 Mr. E.P. Gee, India  
 Mr. Krit Samapuddhi, Thailand  
 Mr. P.M. Shariffuddin, Brunei

Discussion Leader: Mr. Peter Scott, U.K.

Summarizers: Mr. Noel Simon, IUCN, Switzerland  
 Col. J. Vincent, IUCN, Switzerland

Recorders: Dr. J.A.R. Anderson, Sarawak, Malaysia  
 Miss Luz Castro, Philippines

Speakers: Mr. Eric R. Alfred, Singapore  
 Dr. E. Balasingam, Malaya, Malaysia  
 Dr. Boonsong Lekagul, Thailand  
 Dr. Chew Wee Lek, Singapore  
 Dr. Dheb Manasveta, Thailand  
 Mr. G.S. de Silva, Sabah, Malaysia  
 Mr. E.P. Gee, India  
 Mrs. Barbara Harrison, Sarawak, Malaysia  
 Dr. Anne Johnson, Singapore  
 Dr. H. Elliott McClure, Japan  
 Mr. Frank G. Nicholls, Thailand  
 Professors. Dillon Ripley, U.S.A.  
 Dr. Sampurno Kadarsan, Indonesia  
 Dr. Werner T. Schaurte, Germany  
 Mr. Tem Smitinand, Thailand  
 Dr. S. Somadikarta, Indonesia

- 0845-0855 Introductions
- 0855-1100 Speakers' summaries and discussion
- 1100-1120 Intermission
- 1120-1250 Speakers' summaries and discussion
- 1250-1300 Summary

1300-1400 Luncheon at Kasetsart University Cafeteria

1400-1800 Tour to environs of Bangkok, including the Wat Phai Lorm Sanctuary, by courtesy of the Government of Thailand.

**FRIDAY, DECEMBER 3, 1965**

0845-1300 TECHNICAL SESSION V: NATIONAL PARKS AND RESERVES. The importance and development of national parks and reserves in tropical South East Asia.

Chairman: Mr. Dusit Banijbatana, Thailand

Vice Chairmen: Mr. Marcelo A. Buncio, Philippines  
Mr. G.L. Carson, Sabah, Malaysia  
Mr. Sisavang Chanthepha, Laos  
Dr. Phung Trung Ngan, South Vietnam  
Dr. Sukarja Somadikarta, Indonesia

Discussion Leader: Mr. Harold J. Coolidge, U.S.A.

Summarizer: Mr. Paul Brooks, U.S.A.

Recorders: Mr. G.S. de Silva, Sabah, Malaysia

Mr. Bernard Thong, Malaya, Malaysia

0845-0855 Introductions

0855-1000 Definitions and Classification

Speakers: Professor Jean-Paul Harroy, Belgium  
Mr. J.B. Alvarez, Jr., Philippines

1000-1100 Organization and Utilization

Speakers: Dr. J.A.R. Anderson, Sarawak, Malaysia  
Mr. Myron Sutton, U.S.A.  
Dr. Lee M. Talbot, SEAP

1100-1120 Intermission

1120-1250 Regional Considerations

Speakers: Mr. Sisavang Chanthepha, Laos  
Mr. Wong Yew Kwan, Malaya, Malaysia  
Dr. P.M. Marshall, Hong Kong  
Mr. Phairot Suvanakorn, Thailand

1250-1300 Summary

1300-1400 Luncheon at Kasetsart University Cafeteria

1400-1800 Free, meetings of commissions and committees

1900-2230 Buffet Dinner provided by the Government of Thailand in honor of all participants, in the Royal Hotel.

**SATURDAY, DECEMBER 4, 1965**

CLOSING PLENARY SESSION

Main Auditorium, Rice Disease Research Building, Kasetsart University, Bangkok, Bangkok

1000-1010 Introduction and Announcements, Mr. Harold J. Coolidge, Presiding.

- 1010-1120 Report of the Resolutions Committee, including presentation, and voting on the Resolutions, Mr. Dusit Banijbatana, Chairman of the Committee.
- 1120-1150 Highlights of the Technical Sessions  
 Dr. E. Balasingam, Malaya, Chairman, Technical Session I  
 Prof. Otto Soemarwoto, Indonesia, Chairman, Technical Session II  
 Dr. Boonsong Lekagul, Thailand, Chairman, Technical Session III  
 Prof. Dioscoro S. Rabor, Philippines, Chairman, Technical Session IV  
 Mr. Dusit Banijbatana, Thailand, Chairman, Technical Session V
- 1150-1210 Looking Ahead  
 Dr. Lee M. Talbot, SEAP, Perspective – Implementation of Conservation  
 Dr. Edward H. Graham, IBP, Science – Biological Research  
 Dr. F. Fraser Darling, IUCN, Philosophy – Reflections on Conservation
- 1210-1245 Concluding Remarks  
 Prof. François Bourlière, President, IUCN and Honorary Chairman of the Conference  
 Mr. Harold J. Coolidge, General Chairman of the Conference  
 Dr. Lee M. Talbot, Program Organizer  
 Dr. Pradisth Cheosakul, Chairman, Thai Organizing Committee and Honorary Vice Chairman of the Conference  
 Mr. Wayne A. Mills, UNESCO Regional Centre for Science and Technology in Southeast Asia.  
 Mr. M.S. Kim, FAO Regional Office for Asia and the Far East.
- 1245 Formal Closing
- 1300-1400 Luncheon at Kasetsart University Cafeteria
- 1500 Start of Post Conference Tour – departure for Khao Yai National Park starting from Kasetsart University

## The Officers and Organization of the Conference

CONFERENCE ON CONSERVATION

of

NATURE AND NATURAL RESOURCES

in

TROPICAL SOUTH EAST ASIA

### **Sponsored and Organized by**

The International Union for Conservation of Nature and Natural Resources

### **Host and National Sponsor:**

The National Research Council of Thailand

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Professor François Bourlière, President, IUCN

### **Honorary Vice Chairman**

Dr. Pradisth Cheosakul, Deputy Secretary-General, National Research Council of Thailand

### **General Chairman**

Mr. Harold J. Coolidge, Chairman, International Commission on National Parks, IUCN

### **Program Organizer**

Dr. Lee M. Talbot, Director, IUCN South East Asia Project

### **The Thai Organizing Committee**

**Chairman:** Dr. Pradisth Cheosakul, National Research Council

**Members:** Mr. Dusit Banijbatana, Royal Forestry Department  
Mr. Anunt Komes, Department of Land Development  
Mr. Siri Kewalinsaridhi, Ministry of Interior  
Mr. Nob Balagawongse, Ministry of Education  
Prof. Thiem Komkris, Kasetsart University  
Prof. Kloom Vajrapala, Chulalongkorn University  
Col. Poonpol Asanachinda, Ministry of Defense  
Lt. Col. Somchai Hiranyakich, Tourist Organization of Thailand  
Mr. Luang Tavil Sredhbhanichkarn, Siam Society  
Dr. Boonsong Lekagul, Wildlife Conservation Association

**Secretaries:** Dr. Torbongs Donovanik, Kasetsart University  
Mrs. Praphaiphitt Donovanik, National Research Council

### **Assistant:**

**Secretary:** Miss Sumitmai, Applied Scientific Research Corporation of Thailand

## Alphabetical List of Participants

As pointed out in the Editors' Introduction we have tried to adhere to the common usage in South East Asia using the first name as the 'family name' for the alphabetical listing with names of Chinese, Indonesian, Laotian, and Thai derivation. In most of the other cases the 'family name' used in the alphabetical listing is the last name. If one is in doubt, cross reference can be made to the list of participants by country.

Care has been taken with spelling, but for the errors that invariably occur in transliteration and for those other errors that occur because of omission or commission in lists of this sort, we apologize.

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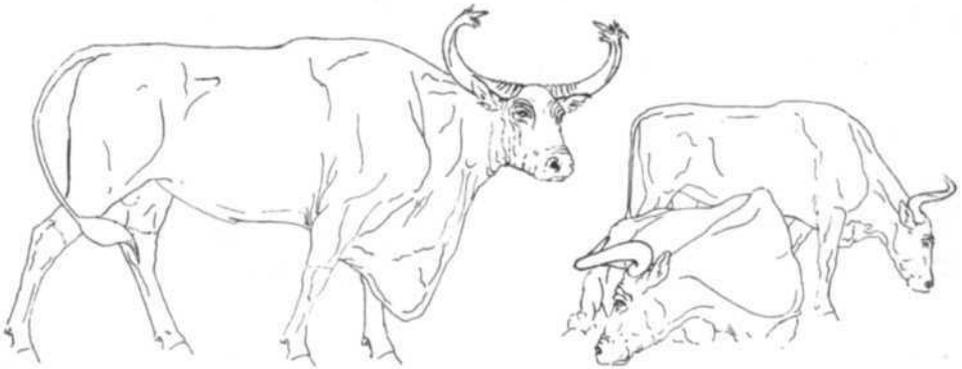
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