

# Conservation of Nature and Natural Resources in modern African States

Report of  
a Symposium organized by CCTA and IUCN  
and held under the auspices of FAO and UNESCO  
at Arusha, Tanganyika, September 1961



*Published with the financial aid of UNESCO*

International Union  
for the Conservation of Nature and Natural Resources,  
Morges, Switzerland 1963

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 economical 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 or cultural or scientific significance. IUCN believes that its aims can be achieved most effectively by international effort in cooperation with other international agencies such as UNESCO and FAO.

The World Wildlife Fund (WWF) is IUCN's chief source of financial support. 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. Its aim is the conservation of nature in all its forms —landscape, soil, water, flora and fauna— by fund raising, publicity, and the education of the general public and young people in particular. It does not normally conduct field operations but works through competent specialist or local organisations. Its projects cover a very wide range, from financial support for the vital scientific and technical programmes of recognised bodies such as IUCN and ICBP (International Council for Bird Preservation) to emergency programmes for the safeguarding of animal and plant species threatened with extinction. It also makes contribution towards the establishment and management of areas as national parks and reserves, and to ecological studies and surveys. WWF's fundraising 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.

Fondée en 1948, l'Union internationale pour la Conservation de la Nature et de ses Ressources (UICN), dont le siège est situé à Morges, Suisse, est une institution internationale indépendante. Elle est composée d'États membres, sans discrimination de systèmes politiques et sociaux, de services administratifs et techniques gouvernementaux, d'institutions privées ainsi que d'organisations internationales. Elle groupe tous ceux que préoccupe le bouleversement du milieu naturel par l'homme, résultant de l'expansion urbaine et industrielle rapide et de l'exploitation excessive des ressources naturelles, qui sont les fondements de la survie même de l'homme. Le but principal de l'UICN est de promouvoir ou de soutenir toute action devant assurer, sur le plan mondial, la pérennité de la nature à l'état sauvage et des ressources naturelles renouvelables, non seulement pour leurs valeurs culturelles ou scientifiques intrinsèques mais aussi pour le bien-être économique et social qui en découle à long terme pour l'humanité.

Ce but peut être atteint grâce à des programmes de conservation visant à une utilisation rationnelle des ressources naturelles renouvelables, spécialement dans les régions où la flore et la faune revêtent un caractère d'un intérêt particulier, où le paysage est d'une beauté exceptionnelle ou saisissante ou représente une valeur soit historique, culturelle ou scientifique. L'UICN est convaincue que ses objectifs peuvent être atteints avec succès par un effort international déployé en coopération avec d'autres agences internationales comme l'UNESCO et la FAO.

La contribution la plus importante aux activités de l'UICN est apportée par le World Wildlife Fund (WWF). Le WWF est une fondation de bienfaisance vouée à la sauvegarde de la faune sauvage et de son habitat dans le monde entier. Il fut créé en 1961 comme fondation de droit suisse et partage à Morges le même siège que celui de l'UICN. Son but est de conserver la nature sous toutes ses formes — paysages, sol, eaux, flore et faune. Pour y parvenir, il organise des collectes de fonds, des campagnes de propagande et d'éducation du grand public et de la jeunesse tout particulièrement. En général, le WWF n'entreprend pas lui-même d'opérations sur le terrain mais il agit par l'intermédiaire d'organisations spécialisées ou locales compétentes. Ses projets couvrent un vaste champ d'action allant de l'appui financier apporté aux programmes scientifiques et techniques vitaux d'organisations spécialisées telles que l'UICN et le CIPO (Conseil international pour la Protection des Oiseaux) jusqu'au financement de programmes d'urgence destinés à sauvegarder des espèces animales et végétales menacées de disparition. Il contribue aussi à l'établissement et à l'aménagement de régions en tant que parcs nationaux et réserves et à des études et enquêtes écologiques. Les collectes de fonds et les activités de propagande du WWF sont exécutées principalement par ses sociétés auxiliaires nationales, existant déjà dans plusieurs pays. L'autorité supérieure du WWF est le Conseil d'Administration international, qui est composé de personnalités éminentes dans de nombreux domaines.

Conservation of Nature  
and Natural Resources  
in modern African States

Compiled by  
Gerald G. Watterson  
with the help of other members of the  
IUCN Secretariat

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## PREFACE

The contents of this publication are designed both as a summary report of the CCTA/IUCN Symposium on the Conservation of Nature and Natural Resources in Modern African States (the Arusha Conference),—and as a handbook of the essential information available to-date, to which interested Governments may refer when they wish to examine the question of including their wildlife resources as an integral part of the overall effort toward economic development of their country.

Each item on the agenda of the Arusha Conference is dealt with as a separate chapter, the contents of which are based on the papers submitted and discussions that took place on the subject.

The aim is to present as shortly as possible the main points of interest and important issues reflected in these papers and discussions, leaving it to the reader who wishes to go on to examine the facts and figures supporting the argument on a particular topic to refer to the relevant papers. These are in alphabetical order of authors.

Other chapters give some account of the study tours undertaken by the participants, set out the recommendations made by the Conference and introduce the "follow-up," IUCN's plan, known as African Special Project Stage Three (ASP III), for initiating the implementation of these recommendations.

The following passages, which originally formed a preamble to the Conference's recommendations, are brought forward here to give them prominence :

The participants at the Meeting express their sincere gratitude to the government of Tanganyika for the hospitality extended to them and the magnificent facilities made available during their visit to Tanganyika.

They wish to thank H. E. the Governor of Tanganyika for the keen interest he showed in the meeting and for his brilliant introductory address. They congratulate the Prime Minister of Tanganyika on

his manifesto which they feel will mark a turning point in the appreciation of the problems of the conservation of natural resources in Africa.

They further wish to thank the Tanganyika and Kenya authorities for their generosity in organizing, for the benefit of all participants, the highly successful Conference Study-Tours.

## CHAPTER I

# ORIGIN AND AIMS

The Arusha Conference was not a "once for all" episode in the history of African conservation. It was one stage in a sequence of activities which had been thought out in advance and had commenced more than a year before Arusha, and is now proceeding steadily with increasing momentum.

The plan for an African Special Project was conceived by IUCN at its General Assembly and Technical Meetings held in June 1960 at Warsaw and Cracow, in Poland. At that time, an impartial assessment of world-wide wildlife conservation problems had led IUCN to the conclusion that the accelerated rate of destruction of wild fauna, flora and habitat in Africa—without adequate regard to its value as a continuing economic and cultural resource—was the most urgent conservation problem of the present time. The destruction of this asset, which includes the finest and most varied large animal populations remaining on earth, would be a biological and cultural catastrophe. To a large extent, these great and unique faunal and floral resources could become exhausted merely because the indigenous people had not had adequately demonstrated to them methods to maintain maximum economic and cultural benefits from them. Wildlife is Africa's most neglected but potentially one of its most valuable renewable natural resources, and one that could be wisely utilized for the benefit of countries so fortunate to possess it. The problem is a two-fold one : first, conservation of the national parks and faunal reserves; and second, the management of wildlife stocks on lands outside the existing parks and reserves, especially on those lands not suited to agriculture.

A plan was worked out by a small group which, converted into the ASP Committee of IUCN and with an increased membership, still continues to guide the activities of the project as a whole. The Chairman of this Committee is Dr. E. B. Worthington, Vice-Chairman Dr. F. Bourliere, and Secretary Sir Hugh Elliott, IUCN Liaison Officer (formerly

George Treichel, Staff Ecologist of IUCN). Its members include Africans as well as Europeans, with FAO, UNESCO and CCTA/CSA represented by observers. Quoting from the original report of this group :

" The special purpose of the project is to inform and influence public opinion through its leaders and responsible persons in the Governments, that the application of conservation practices based on ecological knowledge, is in the best interests of all African countries . . .

Conservation in this sense applies to water, soils, vegetation, and wildlife, although special attention will be given initially to the large mammals which provide an important natural resource, but which are seriously endangered in many areas. This project will be focused primarily on the wild habitats, including National Parks, Fauna Reserves, Nature Reserves, and also other areas of wild land which, under management, are capable of producing crops of animal protein and other wild products on a sustained yield basis. "

The project was conceived originally in three stages, the first stage which was undertaken in late 1960 and early 1961, consisted of a series of visits to discuss the principles and practices of conservation with Governments in Africa and the leaders of local opinion. The person mainly concerned in this, whose services were provided by FAO, was Mr. G. G. Watterson, who was subsequently released by his Organization for a period of eighteen months to become Secretary General of IUCN. In several of the countries visited he was accompanied by Africans whose expenses were provided by grants made by the Fauna Preservation Society in London and the New York Zoological Society. Nearly every country of tropical Africa was visited in this way and a summary of the series of reports on them were published in *Oryx*. About the same time but through different initiative was published the report by Sir Julian Huxley following his study of conservation in East and Central Africa on behalf of UNESCO, and this also helped greatly in preparing the ground for the Arusha Conference.

The second stage of ASP was the Conference itself, the details of which were planned in advance by IUCN in close consultation with the other international agencies concerned, especially CCTA/CSA. This volume is a witness to the fact that it was a success and a landmark in the progress towards proper conservation of nature and natural resources in Africa.

The third stage of ASP, the conception of which is described more fully in Chapter VI, followed soon after the Conference. The ASP III team of consultants, consisting of two specialists with wide experience of

conservation and land use problems in Africa, Mr. Peter Hill and Mr. Thane Riney, began their series of visits to African countries in January, 1962. Each of these visits is designed to allow several weeks investigation, and is made at the specific request of Governments requiring consultation and guidance in framing their plans and programmes for the conservation and development of natural resources.

In 1961 the Executive Chairman of the United Nations' Technical Assistance Board had expressed interest in obtaining first-hand expert advice on projects the support of which would lead to the integration of Africa's wildlife resources into overall land-use planning and would contribute to the Region's economic and social expansion. At a meeting at FAO Headquarters in Rome with the Assistant-Director (Programme and Budget) and with the President and Secretary General of IUCN, he promised financial support for ASP Stage III, and designated FAO as the UN Agency immediately responsible for the handling of such funds.

Stage III is expected to last at least two years in order to comply with the requests from African Governments which are already to hand. If more assistance is requested it is hoped that arrangements can be made for it to continue longer.

Meanwhile a further stage in the follow-up activities, which is conveniently referred to as ASP IV, is now under active discussion. This consists of measures to carry out the projects in conservation which are prepared by the Governments after the consultations and surveys of ASP III. Thus unfolds the plan, and with it the recognition in Africa that the conservation and proper development of natural resources, the wild as well as the tame, is fundamental to the prosperity of mankind.

We cannot anticipate that the project as a whole can stop at Stage IV. There is still a huge field, largely unexplored, in conservation education and in the aesthetic appreciation of wild lands and wildlife. Fortunately in Africa this whole movement is backed by a steadily expanding income derived from the tourist industry, National Parks, and natural products.

## CHAPTER II

# HIGHLIGHTS AND ACHIEVEMENTS

" The survival of our wildlife is a matter of grave concern to all of us in Africa. These wild creatures amid the wild places they inhabit are not only important as a source of wonder and inspiration but are an integral part of our natural resources and of our future livelihood and well-being.

In accepting the trusteeship of our wildlife we solemnly declare that we will do everything in our power to make sure that our children's grandchildren will be able to enjoy this rich and precious inheritance.

The conservation of wildlife and wild places calls for specialist knowledge, trained manpower and money and we look to other nations to cooperate in this important task—the success or failure of which not only affects the Continent of Africa but the rest of the world as well. "

Tanganyika, September 1961.

J. K. NYERERE, Prime Minister

A. S. FUNDIKIRA, Minister Legal Affairs

T. S. TEWA, Minister Lands & Surveys

This Arusha Manifesto expresses in clear terms the attitude of the Host Government of Tanganyika toward the conservation and development of its wildlife and wildland resources. It epitomizes also the tone of the discussions throughout the Pan-African Symposium on the Conservation of Nature and Natural Resources in Modern African States, which constituted the second stage of IUCN's African Special Project (ASP).

The meeting, held in early September 1961 at Arusha in northern Tanganyika, was attended by 140 participants from 21 African and 6 non-African countries and 5 international organizations, not counting CCTA and IUCN who were jointly responsible for the preparation of the Conference. Among the participants were 15 " Fellows " from East Africa and the Rhodesias, Centrafrique, Dahomey, Tchad and Togo. Funds offered by the Governments of Sweden and Switzerland, UNESCO,

the Fauna Preservation Society, the Deutsche Afrika-Gesellschaft, and the American Conservation Association enabled the " Fellows " to attend.

Among the many messages of interest and good wishes for success that were sent to Arusha were those from H. R. H. Prince of the Netherlands and H. R. H. Prince Philip, Duke of Edinburgh.

In his opening Address to the Conference, Sir Richard Turnbull, then Governor of Tanganyika, who combines first-hand knowledge of the deterioration of the environment which has recurred in many parts of Africa with deep understanding of the human and social problems of modern African states, spoke in terms of the disaster which will inevitably descend on the people of a country if its natural renewable resources are not wisely managed. He stressed the fact that the conservation of wild animals, an undoubtedly great national asset, was dependent upon one overriding consideration—the conservation of the habitat. He acknowledged that in many areas man and his domestic animals were multiplying unchecked to bring about their own ultimate destruction by ruining forever the land on which they live. And after outlining the wildlife policy of the Government of Tanganyika and the various problems which this raised, he summarized the situation under three main considerations : (1) wildlife and wild nature were an undoubted source of revenue needed for the government's social services, and must therefore be rationally " exploited " where this was the best form of land use; (2) public opinion, whose support was essential, must be convinced of the value of this special African heritage; and (3) international aid would be needed if the world in general wished to see Africa's unique fauna preserved for the benefit of the people of Africa.

The joint organization of the meeting, under the co-sponsorship of FAO and UNESCO, boded well for the kind of international support that Sir Richard Turnbull deemed essential. Mr. J. S. Annan, of FAO, drew attention during the inaugural session to the senseless destruction of wildlife, coupled with inadequately planned land-use practices, which constituted a real threat to the natural resources of Africa. He pledged FAO's full cooperation and support in assisting Governments develop a rational approach to integrating the conservation and development of wildlife resources into their programs of economic expansion. Mr. A. Gille, of UNESCO, spoke in similar terms, giving special emphasis to the need for more scientific research and general education in the principles of conservation as a basis for intensified rational use of Africa's natural resources if the Continent was to take its proper place in international affairs.

The United Nation's Economic Commission for Africa (ECA) was also represented, and Mr. G. Bridger pointed out that his organization was already planning to conduct some research into the economics of tourism, based essentially on wildlife, in East Africa.

It was clear also that many non-governmental organizations such as IUOTO (International Union of Official Tourist Organizations), CIC (International Hunting Council), ICBP-CIPO (International Council for Bird Preservation) and the Fauna Preservation Society, were anxious to assist. And there were indications also of bilateral and private aid such as the funds given by the Frankfurt Zoological Society (via Dr. B. Grzimek) to erect a hostel for Tanganyika school children visiting the Serengeti National Park.

In the light of such numerous and diverse offers of technical and financial help, the Conference stressed the overriding need for ensuring that such necessary assistance be channelled in such a way as to avoid wasteful application, and thus encourage outside aid. It therefore warmly commended the implications of Stage III of IUCN's African Special Project (ASP) as an essential follow-up to the Conference and the change of attitude which the Conference has so clearly brought forth.

The establishment of the team of two specialist consultants, comprising this Stage III of IUCN's ASP, was considered as the only effective means whereby situations and needs in Africa could be analysed and properly assessed, priorities determined, and help from outside adequately and impartially channelled.

The two members of IUCN's African Special Project (ASP) team have now been appointed. They are Mr. Thane Riney, a land use and wildlife ecologist with considerable experience in Africa, Australasia and North America; and Mr. Peter Hill, a land use specialist who was previously Manager of the Experimental Station attached to the Department of Agriculture at the University of Ghana. This team started work in Africa at the beginning of 1962, and its programme is being planned in the light of requests for assistance which are regularly coming in to IUCN's Headquarters at Morges, Switzerland.

Other recommendations and wishes formulated by the Conference related (1) to the subject of international aid for education and training in conservation at all levels; (2) to land use policies which should aim at avoiding the intensive occupation of land unsuited for such use in the long term; and (3) to the need for greater attention to the economics of resource development programs. The Conference also expressed its congratulations to the Republic of the Congo (Leopoldville) for its

exemplary attitude towards its National Parks. Finally, the wish was expressed that countries assist in defining and preserving a systematic network of type habitats throughout the African continent.

As Professor Baer, President of IUCN, said during the inaugural session, " Man in the past, out of sheer ignorance or greed, has wastefully destroyed plant and animal life, forgetting that neither he nor his children's children can ever become completely independent of their environment, and overlooking the possible contribution that these now extinct forms might have made to his own welfare. "

The Conference was a milestone in the history of the development of an awareness of the need for the scientific conservation of nature and natural resources in Africa. In the words of Professor Theodore Monod, President of CSA and distinguished advisor to IUCN, " Tanganyika has every reason to be proud of the part she played in this big common effort, in hastening the day when Africa will be the shining example to the world of a continent which, fully aware of the incomparable, irreplaceable value of its natural wealth, has devised ways of wise husbandry, avoiding unneeded destruction and achieving a sense of interrelationship between man and his environment in the interests of its own peoples and of mankind in general. "

## CHAPTER III

# THE DISCUSSIONS

## A. THE PRESENT ROLE OF NATURAL RESOURCES

### 1. CONSERVATION OF THE HABITAT

It is a phenomenon of natural habitats that they represent the maximum conversion rate or energy flow within the given climatic and physiographic situations.

F. Fraser Darling

Africa is characterized by great biogeographical diversity, a corresponding diversity in modes of life, and by the particular modifications brought about by local cultural evolution. These three factors clearly underline the complexity of the problem of conservation and rational use of Africa's natural resources.

Habitat is the totality of the environment in which plants or animals live in optimum conditions or as near optimum as can be reached for each species. If we accept the statement that a natural habitat represents the maximum conversion rate or energy flow within a given climatic and physiographic situation, its conservation and the study of the interactions of its components parts—physiography, geology, climate, and the unconscious cooperation between all the animals and plants within that habitat—is a fundamental first principle in maintaining populations of animals and plants, upon which in turn human populations depend.

We are only beginning to apprehend rather than comprehend the intricacy and delicacy of the poise of the world of nature. Each distinctive natural biological community represents an optimum system of conversion of matter, of circulation of energy, in which through evolution by natural selection and consequent differentiation, there is avoidance of competition. No two species fill exactly the same niche or perform exactly the same function, and each species is helping to conserve the habitat. Man is the most adaptable of all animals. There are few natural

habitats he cannot occupy either temporarily or permanently, adapting clothes and shelters to buffer the habitat in some measure. But if, in his lack of wisdom, man cuts down the number of species of animals in a habitat, he renders it harder to maintain, and it will support him less adequately. In a practical, economic example, this is why many so-called pastoral areas of Africa are breaking down. The twenty or thirty natural species of grazers and browsers have been replaced by two or three exotic species. The niche structure is so incomplete that degeneration of habitat takes place. And in many of the poorer lands of Africa, this spells rapid irrevocable and even total reduction of the capacity for supporting human life.

Habitat maintenance is consequently the very basis for conservation—and this includes conservation of wild animals. In the light of demographic expansion, it is usually impossible to avoid some interference in any given locality, whether or not such area is natural, nearly natural or transformed, since any biological community is a dynamic and changing association. The aim in conservation of natural resources is therefore to achieve the maximum wise use of land with the least possible damage to, or reduction of, the elements that maintain the habitat.

The countries of Africa have inherited frontiers that correspond neither to criteria of biological divisions nor to those of ethnic unity. Conservation is therefore an international problem. At the national level, again, there is a fundamental need for close cooperation and for integration of a wide diversity of interests and modes of living into an overall land use plan to promote the best long-term chances of economic and social development. Finally, within each community, there is a need for education to speed the process whereby certain dogmas and traditions which had their practical uses in earlier days, lose their force and harmfulness in the changing social conditions of modern times.

*Discussion Leader:*

Th. Monod, Director. IFAN, Dakar, Senegal.

*Rapporteurs:*

M. Cowie. Royal National Parks of Kenya, Nairobi.

J. Dorst. Mus. Nat. Hist. Nat., Paris, France.

*Background Papers:*

*The Habitat*, F. Fraser Darling. The Conservation Foundation, New York, U.S.A.

*The Physical Environment and the Human Environment in West Africa*,

P. L. Dekeyser. IF AN, Dakar, Senegal.

*The Fauna and Flora of East Africa*, I. M. Grimwood. Game Department, Kenya.

## 2. WILDLIFE UTILIZATION

### a) *Wildlife as a Source of Food*

Nowhere else in the world is so high a value of " wild " proteins in kg. per hectare found as in the African savannah.

F. Bourlière

Only by the planned utilization of wildlife as a renewable natural resource, either for protein or as a recreational attraction, can its conservation and development be economically justified in competition with agriculture, stock ranching and other forms of land use.

Tropical Africa is inhabited by the greatest populations of mammals, and especially of herbivores, in the world. Systematic research in recent years has brought to light the extent of this phenomenon and has enabled its characteristics to be defined. Some of the fundamental ecological features of the game populations, revealed by such studies, underline their potential economic implications and their rightful place as a resource in the increasingly competitive use of land.

The chief reason for the high values of standing-crop biomass per sq. km., as compared with those of more temperate climates, lies in the great variety of ungulate fauna cohabiting in the different " open " regions of tropical Africa. It is not unusual to find up to twenty species living together. These large numbers of far-ranging wild animals, unless denied their full ecological range, do not destroy their habitat. The total " load " of herbivores is distributed over the whole of the plant standing-crop biomass, and is not concentrated on a single constituent (the graminaceous carpet) as in the case of domestic livestock.

Another contributing factor lies in the greater nutritional efficiency of Africa's wild ungulates. This is indicated by the lesser development of their digestive tract, compared with those of domestic ungulates of comparable weight, implying a better utilization of plant food.

There are indications that a further point of interest is to be found in the rate of turnover of savannah populations of wild ungulates. Whereas the highest standing-crop biomass values observed in Africa correspond to populations where a high proportion by weight is made up of two slow-growing, late maturing species of large dimensions (the elephant and the hippopotamus), medium " loads " consist of a dominance of fast-growing and early-maturing small ungulates (antelopes) presenting a rapid rate of turnover, whereby the daily weight increase permitted by

the higher " nutritional efficiency " referred to above is generally greater than that of domestic species.

These considerations, to which must be added the remarkable resistance of many wild species to lack of free water, postulate that in many marginal areas the best use of land can be achieved by the maintenance of balanced populations of wild game. A higher yield of protein could be provided, whilst observing the basic principles of conservation, in many areas suffering from a lack of these nutritional elements.

The African is a realist. The use of game as a source of food is not only more easily understood than the idea of conserving wild animals for aesthetic, scientific or sentimental reasons;—it also fulfills in many instances a strong instinct and a way of life and, if properly controlled, provides the most effective instrument of management. The immediate problem lies in areas outside and adjacent to National Parks, where the survival of African wildlife depends ultimately on the cooperation of the peasant farmer, on the basis of multiple land use. The problem cannot be viewed in isolation; it must be considered in the context of a rapidly advancing tide of human population.

Management of wildlife involves a great deal of basic preliminary research, a study of the needs and way of life of the local communities involved, and their maximum possible participation in management projects. Many practical difficulties are inherent in cropping, processing and marketing the products of such schemes. Moreover, there are sociological problems also in overcoming atavistic and traditional preferences in human diet.

Whereas West Africa is still employing traditional methods of game control and cropping, experiments in East, Central and Southern Africa show that the harvesting of wild animals is feasible and can produce high yields of inexpensive meat. Much work is however required on techniques of cropping and processing, and detailed studies are needed on the economics of game utilization, on the disease aspect and on marketing facilities, before such projects can be more generally applied. The price of game meat must for instance be high enough to produce revenue of sufficient worth to interest local communities; yet the vital need for destocking of scrub cattle implies the application of artificially sustained prices for domestic meat. Under such circumstances, game cropping as a commercial enterprise is difficult unless left to private enterprise. Local meat surpluses present another problem which might be solved by their use as feed for an intermediate, non-grazing animal, producing additional protein-food whilst at the same time relieving pressure on pastoral

areas. Kenya's experience in the use of mobile processing plants for combined use in scrub cattle culling and game cropping, for the production of meat powder, is of particular value and interest in assisting to solve a whole range of difficulties, from preferences in human diet to the export of an easily transportable commodity to areas where it is most needed.

b) *Tourism and Recreation*

If the mass of my countrymen are to be enlisted in the ranks of conservationists, they will expect to see that what they are told is "their heritage," however valuable it may be as a cultural asset, can still be made to earn its keep. I believe it can—through tourism.

T. S. Tewa  
Tanganyika's Minister of  
Land and Surveys

One of the consequences of the increasing dissociation of man from his natural surroundings is an almost pathological attachment to animals. Never before in the five hundred thousand year history of mankind has there been a time when the majority of people were completely cut off from nature and animals. Zoos are therefore springing up all over the world, in the densest human conglomerations. The number has risen to five hundred, and more and more visitors are being attracted to them. An average of 330,000 annually visited the Frankfurt Zoo between 1930 and 1940. This average has now risen to 1.6 million.

At the same time, better standards of living, improved communications, greater leisure time and higher spending power are resulting in a steady increase in the world's tourist traffic. In recent years, tourism in Europe has risen 10 % annually. Revenue from tourism between 1950 and 1959 has increased tenfold in Greece and fourfold in Austria, Germany, Turkey and Portugal. In 1950, 302,000 Americans visited Europe and spent 358 million dollars, in 1959 three quarters of a million spent 931 million dollars. Italy had 365,000 beds for travellers in 1949 and 737,000 in 1959, representing an increase of 102 % which takes no account of the enormous increase in popularity of the tent and the caravan. In Austria during the same period the number of beds increased by 103 %, in Germany by 94 % and in Portugal by 134 %. Revenue from tourist trade in Greece amounted to 19 % of the total exports, in Italy 19 % and in Switzerland 16 %; and even in countries with a large trade

in other exports the proportion was still substantial: 12 % for France, 6 % for Denmark and 4 % for Germany.

With accelerated world wide urbanization, it is an established fact that an increasing majority of holiday-makers are now in search of beautiful natural scenery. Towns and famous buildings, cathedrals and art galleries are usually visited only en route. More and more people are looking for places where they can see animals in their true, wild environment. Africa, with its unique wealth of wildlife, therefore can and must share in this boom.

In 1959, the tourist traffic in East Africa brought in 22 million dollars, placing it at the top of the exports of these countries. The revenue value was exceeded only in Kenya by its coffee exports. But it is clear that tourism is only in its infancy in East Africa;—for the 6,853 Americans who came to East Africa in 1959 do not represent even 1 % of the 705,000 who left the United States for holidays abroad. The modern tourist, en masse, wants to see as much as possible, as rapidly and as comfortably as possible. The National Parks and reserves of Africa have a wonderful opportunity of filling a world need,—modern man's craving for contact with nature.

The development of tourist facilities does however require study and skill if the environment that the visitor comes to enjoy is not to be destroyed by the ill-considered, ill-designed spread of modern facilities.

According to South African experience, "to house a visitor to a National Park in such a way that he will return to that Park and recommend his friends to such sanctuary requires only about one third of the capital outlay required for tourists to other parts of the country." From this point of view alone, money spent on accommodations in a National Park is an excellent investment. As Tanganyika's Minister, responsible for wildlife, wrote : "One of our most urgent needs is an industry which can bring in large sums of money from outside while making the minimum demands on our slender resources for capital expenditure and for foreign exchange."

Tourism never supplants another industry; it supplements all other industries. Its great advantage over many other industries is that, properly managed, it can be expanded indefinitely without destroying or using up its natural assets. Furthermore, "domestic tourism" keeps money earned within a country circulating inside it, and simultaneously educates the citizens on the attractions of their own land. But there is no doubt that tourism is a great and keenly competitive international business. If its development is not to destroy its natural assets, it requires capital and full Government support. There must be adequate airport and

harbour facilities, good roads and transportation, good water supplies and well-designed, appropriate accommodation, electricity, cable and telephone facilities and sanitation. The incentive of a favourable "investment climate" is essential; formalities for outside visitors must be kept to a minimum; assistance is needed to advertise, publicize and promote tourist facilities to the fullest extent; and finally, remembering that the primary function of National Parks is to conserve the country's natural assets, adequate provision is needed for basic resource research; for skilled, appropriate development design and planning; for consumer research, for conditioning the tourist to the circumstances in the countries he is visiting, and for the development of measures to assist him in understanding what there is to see and appreciate.

The importance of not losing forever a heritage that still exists in the world cannot be overstressed. This can be achieved through planned and properly developed tourism, wherever game-meat production is a secondary or impossible alternative form of utilization.

There is one other important aspect of tourism, outside that of the purely economic advantage, which Minister Tewa of Tanganyika admirably summarized when he wrote: "As a newcomer among the independent nations, we need informed and sympathetic friends among the other countries of the world. We hope that those who have visited Tanganyika as tourists will go home with some insight into our problems, some sympathy with our aims and some liking for our people. This will be not the least of the benefits the wild animals can bring to our country." The full value of a visitor must not be measured merely by what he actually spends in a country. It is enhanced because he leaves as an informed ambassador. He has a wider knowledge not only of scenery, folklore and game but of standards, achievements and the problems which have to be faced.

As D. O. Mathews, representing IUOTO, wrote: "Nothing can contribute more than tourism to help the nations and peoples of the world appreciate and understand one another. Nothing can do more to smash economic provincialism which for so many centuries has fragmented the world.

"Tourism is therefore not only a great money-spinning industry, but also a benevolent force which can preserve international relations through better understanding."

*Discussion Leader:*

B. G. Kinloch. Game Department, Tanganyika.

*Rapporteurs:*

- M. Cowie. Royal National Parks of Kenya, Nairobi.  
 J. Dorst. Mus. Nat. Hist. Nat., Paris, France.

*Backgrounds Papers:*

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*Development and Utilization of Wildlife Resources in Uganda*, J. H. Blower and A. C. Brooks. Game Department, Uganda.  
*Observation on number, mortality and reproduction of Elephants in Uganda*, I. O. Buss, Washington State University, U.S.A.; and A. C. Brooks, Game Department, Uganda.  
*Wildlife Ranching in Southern Rhodesia*, A. Mossman. National Museums of S. Rhodesia.  
*Wildlife Management in the Ivory Coast*, G. Roure. Forest Service, Ivory Coast.  
*The Galana River Game Management Scheme*, N. M. Simon. East African Wildlife Society.  
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*Value of the Tourist Industry*, B. Grzimek. Frankfurt Zoo, Germany.  
*The Economics of Tourism in National Parks and Nature Reserves*, R. Knobel. National Parks, S. Africa.  
*The Value of the Tourist Industry*, D. O. Mathews. EATTA, Nairobi, Kenya.  
*The Value of the Tourist Industry in the Conservation of Natural Resources in Tanganyika*, T. S. Tewa. Min. of Lands and Surveys, Tanganyika.

## B. RESEARCH, CONSERVATION AND DEVELOPMENT

### 3. RESEARCH

If conservationists have a case that is worth making—and I believe we have—it must be made in terms of the renewable natural resources of the country we deal with and in terms of the greatest long term benefit to the people of the country, and our investigations should be planned with this in mind.

Thane Riney

If it is true to say that on many categories of marginal land, the utilization of existing plant resources by a spectrum of wild ungulates is more efficient than that by domestic animals, it is essential that such a statement be qualified by precise information obtained through research. Criteria must be established for determining the "degree of marginality" of land and its optimum use. Comparisons must be made of the efficiency of range utilization of domestic livestock and wild ungulates by obtaining evidence from comparisons of diet, digestive efficiency based on killing out percentages and visceral weight, water requirements, growth rates and liveweight gains, age of reproduction, disease relationships and standing crops. Much of Africa's rangeland is characterized by a rigorous climate and high vulnerability to overgrazing-induced erosion or desiccation. The maximum cash return per unit area is so small that it is often not economical to attempt range improvement for the relatively recently introduced domestic stock.

The major issues of Governments lie not directly with animals, vegetation or soil, but with people; and with developing some sort of stability for their economy under which all their human populations can thrive.

Two types of priority needs constitute the initial contribution to be made by wildlife conservationists in helping Government establish a rational land-use policy: the need to integrate closely the information gathered on animal surveys with the way in which the soil and vegetation is maintaining itself in the presence of the study populations;—and the need to make maximum use of the few workers available in Africa by developing rapid survey techniques.

No Government can afford to ignore the principle that whatever is done with land, the soil-vegetation complex will decline in productivity unless conservation values are maintained. If we want to keep steady, healthy populations of animals we must consistently maintain a suitable

habitat to support them. It is hard, then, to over-estimate the importance of surveys which show how habitats are maintaining themselves in the presence of a variety of animals, and how the animals are maintaining themselves within their habitats.

A rapid survey technique has recently been developed in Rhodesia for comparing conservation status under different kinds of land use and under different densities and combinations of animals. It records easily recognized and easily measured types of observations that reflect varying degrees of trouble from the standpoint of maintaining conservation values.

The importance of the conservation aspect for Africa's wild lands is that, no matter how valuable the wild land survey is today, it will be of no lasting help if lands alongside are going out of production; for sooner or later many wild lands containing large mammals will be desired for development as the only good pieces of country left. This potential danger should help fasten interest on lands adjacent to wild lands as well as on the wild lands themselves and emphasize the value of full cooperation and active collaboration with technicians interested in surveying and assessing renewable natural resources other than wildlife.

It is urgently important to develop and standardise ecological techniques, suited to the needs of field workers able and willing to collect the essential data, but with little time for or experience of its analysis. IUCN therefore contemplates the preparation of a handbook of survey and assessment techniques especially designed for use in Africa by biologists and the field staff of National Parks and Game Departments. The form of publication will be such as to allow for revision in the light of experience, but the degree of standardization aimed at should greatly facilitate comparison of data drawn from all parts of Africa.

Techniques developed by the Tanganyika Game Department in assessing and evaluating "carrying capacities" have shown the practicability of employing teams of Game scouts to obtain accurate routine information and thereby enormously reduce the time taken by the lone qualified worker who depends on his own resources to complete a field study programme. In the light of the present shortage of trained biologists, it is encouraging to note that the invaluable ability of relatively numerous but uneducated men to observe well can be channelled into research. Their particular qualifications are keen powers of sight and observation, a liking for the work, the ability to read and write and a proven reliability. Working in some 650 square miles of relatively undisturbed acacia savannah bush country of the type which extends over

much of northern Tanganyika and southern Kenya, systematic observations have been made daily by a team of fourteen such Scouts for a period of nearly four years. The method involves the use of fixed transect lines through the bush along which the men walk daily making accurate observations. These are compiled as statistical data on animal density, the species composition of the population and the sex and age grouping within each species, numerical fluctuations from year to year and through the seasons, habitat and food preferences. The Scouts are trained to recognize and give scientific names to the great majority of the plant species in the area and are skilled at making visual observations of the feeding habits of the animals.

Apart from the need for survey and assessment of resources as basic data for land-use planning—and eventually for resettlement of nomadic tribes in the interests of permanently improved levels of living, and of resource conservation, ecological research is required for habitat management.

It is the characteristics of the habitat which control the abundance of an organism living in that habitat. Soils, the composition and density of the vegetation, and the availability of water, determine its ability to support a certain number of each kind of animal without damage. The condition of the vegetative range indicates the relative abundance of herbivores foraging on it.

The carrying capacity of pasture can be altered with carefully sited, improved water supplies, with grazing control, and by the skilful use of burning patterns. Animal and plant populations normally produce surpluses which can be harvested with no damage to the basic breeding stock. The control of predators and disease organisms, which normally harvest such surpluses and contribute to the establishment of a habitat's carrying capacity, may considerably affect productivity. Healthy animal populations preclude or reduce the risk of epidemics.

The understanding and correct use of such tools, through ecological research, are essential to the management of wild areas and the enhanced quantitative or qualitative contribution that each can make to man's welfare.

The important factor is the land and its optimum treatment for the specific use to which it is put. Without land, nothing can live; and in degraded areas of which there are such extensive tracts in Africa, wild animals can keep the land in production whilst giving it time to rest and recover, provided there has been opportunity for research into the tools of management.

*Discussion Leader:*

F. Bourlière. Faculty of Medicine, Paris, France.

*Rapporteurs:*

P. Hill. IUCN ASP III Consultant J. Verschuren. Biologist, Institut des Parcs Nationaux du Congo.

*Background Papers:*

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H. Lamprey. Game Division, Tanganyika.

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Nordiska Museet et Skansen, Sweden.

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Dept. of Agric, Tanganyika.

*Precis of the papers presented at the Conference of Land Management Problems in Areas Containing Game—Lake Manyara—Tanganyika,* H. C. Pereira.

ARCRN, S. Rhodesia.

#### 4. CONSERVATION AND DEVELOPMENT

The future of human existence depends on the natural environment, of which man is only a part.

K. Curry-Lindahl

##### *Planning the Management of Wild Areas*

Habitat, although self-perpetuating, is subject to change—whether this be natural or artificially induced. The previous chapter has discussed means of causing and assessing such modifications with definite objectives in view.

From this concept of perpetual change it follows that "preservation" of an area by excluding outside interference will not result in its retaining its *status quo*; and the application of active management is necessary in order to stop changes or guide them in a way which is considered beneficial, once some clear objectives are set. This does not mean that integral protection by exclusion of all outside interference is unimportant, however. The absence of human intervention is a measurable standard, whereas its presence may lead to a range of intensities and consequences

which would merely contribute to the upsetting of scientific research in the study of the evolution of standard-habitats and their comparison with various forms of managed habitats.

Whatever the objectives, determined by Government in the interest of human welfare and based upon information concerning land capability, carrying capacities and considerations of conservation in general, it is of great value to establish carefully worked out management plans. Among other advantages, these ensure continuity in the face of changes of staff, and subsequently provide valuable records of case-histories<sup>1</sup>.

A practical example of the initiation of a management plan to promote game ranching is provided by the work of Dasmann and Mossman in the interests of commercial utilization of game animals in Southern Rhodesia as part of the overall land-use planning of the country.

*Some Special Problems of Areas Containing Wildlife. The need for flexibility in the initial determination of culling quotas :* The Central African Republic is a good example of a majority of African territories where the assessment of wild game resources had not been carried out either in sufficient detail or over a period of time adequate to allow for any rational determination of a permissible annual culling quota in areas where hunting is controlled. The problem of avoiding the somewhat inflexible, slow mechanism of administrative regulation, often too remote from any practical understanding of a fluid situation requiring constant revision, has been satisfactorily solved by the creation of " Domaines de Chasse " in which control is directly in the hands of the immediately responsible government service, and culling quotas are revised annually and published by the responsible Ministry. Management of such areas, which often act as buffer zones to National Parks and Reserves, can therefore closely conform to the evolution of the resource and ensure maximum sustained yield. The government department (in this case the Forest Service) responsible for these " Domaines de Chasse " can decide upon their closure to hunting (except for the exercise of strictly local rights of usage), or determine the quantitative and qualitative quota for the ensuing year. It may even propose the granting of proprietary rights to an individual or a society through a fixed-term but renewable lease, to encourage the investment of private development capital and promote rational long-term utilization. In such a case, local rights of usage would

<sup>1</sup> The basic requirements of such a management plan and notes on its preparation are set out by E. B. Worthington in the paper reproduced as an appendix.

be annulled for the period of the lease and compensation provided in the form of cash payment or a regular supply of domestic or game meat to the community concerned.

Northern Rhodesia reports on the fact that in controlled hunting areas, devised with a view to allowing for cropping protein by residents on a long term basis, the recording of kill is frequently omitted due to illiteracy, negligence or dishonesty when overshooting. The resulting crude management of such areas, though based on sound principle, might be reviewed in the light of the method of control employed in the Central African Republic.

In the equivalent of Rhodesia's "second class areas," where there is no limit to the total crop taken, the increasing scarcity of game in the Central African Republic is causing local concern. Although this is in part explained by the greater shyness and elusiveness of game, G. Guignonis reports that there is growing local interest in the creation, under the name of "Forêts rurales," "Réserves forestières" and "Réserves de Chasse attribuables aux Collectivités rurales," of areas in which vegetation and game would be managed by the Forest Service for the exclusive benefit of the local community, members of which would utilize the forest and animal resources to the extent annually determined by the responsible Government Service.

*Aquatic Migratory Bird Concentration Areas:* The study of the migration cycle of Palaearctic birds has revealed that, during the Northern winter, Africa shelters large populations and witnesses a marked cyclical fluctuation in their biological activity. This fact is of great significance in land-use planning of the well-defined areas which provide their strict ecological requirements. Their protection and management is impossible if the environment they favour is destroyed or restricted at the southern end of their migration.

The development of certain crops such as rice, and hydrological improvements which may have far-reaching consequences, are liable to cause serious modifications to the ecological characteristics of the winter colonies the extent of which is relatively restricted. Steps taken in Europe and Asia to protect breeding grounds, and the setting up of reserves at stages along the migratory routes, are meaningless and worthless if the character of the wintering grounds were to be altered indiscriminately.

This is a problem which is truly international in scope. It must be resolved by coordinated action on a vast scale,—as vast as that of the birds' prodigious flight itself.

*The use of translocation as a solution to certain problems* : The translocation, or transference, of animals is of recent origin, especially in conjunction with prior drug immobilization. It is of value in the negative sense of removing animals from areas of human conflict in other ways than through destruction. It may be used in a positive context of bringing animals into an area for reasons such as enhancement of a game reserve by re-introduction of species that have been exterminated, or for the re-establishment of disturbed biological balances.

Translocation may consist of driving wild animals to adjacent areas and keeping them there by the use of fencing, as a means of preventing damage to forestry or agricultural areas. Such measures are likely to become increasingly important as a means of establishing and maintaining boundaries in areas of contiguity between game reserves and agrarian or urban pursuits.

Apart from the problems of release and adaptation to a new habitat, the transference of animals over long distance entails catching, handling and transportation; and the use of drug immobilizing techniques is opening up easier, safer and less costly possibilities. Apart from transfer as an alternative to destruction, such methods can be envisaged for decentralization of small herds of rare animals as a precaution against disease of natural calamity. Control of the various enzootic and epizootic diseases occurring in wild animals may be attempted in this way, and is certainly applicable for small numbers of valuable breeding stock. Direct therapeutic interference is also thus rendered possible.

*The Conflicting Application of Fire Patterns*: In all faunal areas only two possible burning policies are open; either the original habitats can be perpetuated by following the traditional pattern of firing under which the local biota have evolved, or the carrying capacity of the range can be improved by skilful manipulation of burning patterns based on research.

In Northern Rhodesia as in other parts of Africa, Forest Department policy is to encourage an annual burn early in the dry season to conserve the tree cover against late, hot fires. Unfortunately this policy is becoming widespread throughout the country. There is little attempt to concentrate it to areas where tree cover is desirable, nor is it generally realized that what is good forest policy does not apply to wildlife. Amongst ungulates, a period of stress follows extensive early burning, the grazers suffering most. The cumulative effect of this policy is bush encroachment and pasture degradation. The temporary palatability to grazers of the post-burn flush of grass creates a false impression that the policy is

desirable; but by the removal of the original dry season forage, many species of ungulates suffer severely as the dry season progresses. A likely result is a local reduction of grazers, both by their move to new areas and through greater exposure to hunting,—and an increased destruction of tree growth by elephant.

The primary objective of land-use must determine the pattern of management, which should be applied in such a way that it can be restricted to the area concerned. Although early burning is generally detrimental to wildlife conservation, it is clear that in national parks and reserves, tourist requirements call for some early burns for better visibility and display of game.

*Discussion Leader:*

Prof. W. H. Pearsall. U.K.

*Rapporteurs:*

P. Hill, IUCN ASP III Consultant. J. Verschuren, Biologist, Institut des Parcs Nationaux du Congo.

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*Northern Rhodesia*, R. I. G. Attwell and B. L. Mitchell. Game & Fisheries Department, N. Rhodesia.

*The importance of wetland Habitats for European and Asiatic Migrant Waterfowl Wintering in Africa*, J. Dorst. National Museum of Natural History, Paris; and L. Hoffmann. Biological Station of La Tour-du-Valat, France.

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*The use of translocation as a means of preserving wild animals as an integral factor in the solution to certain problems of National Parks and Nature Reserves*, A. M. Harthoorn. Makerere College, Uganda.

## 5. STAFF AND STAFF TRAINING

It will be another generation before children in this country will get inspiration from their parents or elders in wildlife management.

L. C. Beadle, Uganda

Development, the principal theme of the previous chapter, is dependent not only upon research and upon land-use plans which clearly define the areas and objectives where wildlife management is a primary

consideration. The availability and adequate training of suitable staff is of equal importance.

The survey and assessment of wildlife resources, the need for which has already been discussed, demands specialized knowledge. As the potentialities of wildlife become increasingly understood in African countries, so will the need increase for professional conservationists with ecological training. Without the help, in the past, of the sportsman-hunter-naturalist, there would be little or no big game left now upon which to build a change of attitude toward Africa's wildlife resources. But this handful of men were facing straightforward problems. Game was regarded as a purely sporting asset and a convenient fresh meat supply where there could be no other possible use for the land it occupied. Elsewhere it was uncompromisingly condemned as a direct obstacle to development. The Game Warden's task was total preservation of game in certain areas from which humans were completely excluded; the supervision of licensed hunting regulated by laws based on a traditional code of sporting ethics; and the destruction of all species of wild animals in areas where these came into conflict with man's recognized use of land. And there was no cry for the rapid Africanization of the civil services.

Times have changed. Africa's wildlife is restricted in its ecological range and is threatened with extinction. At the same time it is at last being recognized as a natural resource in its own right, and as one of potentially great economic value if properly managed. This in turn involves responsible staff in issues and problems of extreme complexity, and renders close collaboration on an equal footing with the staff of other technical services essential. And at the same time the personnel for carrying out this work is to be found immediately among the nationals of the countries concerned.

The difficulties in the selection and training of local African staff are clearly summarized by Professor L. C. Beadle of Makerere College, Uganda, when he writes :

" It seems to me obvious and supported by experience in more highly developed countries that popular support for wildlife conservation reflects a relatively sophisticated attitude which cannot be firmly established nor defended against shortsighted exploitation in the name of ' progress ' without enthusiastic support from a sufficient number of educated and influential people. It is also true that the production and training of personnel for work in this field is inseparable from the general educational problem. You cannot expect more than rare and exceptional

recruits to these services in the absence of understanding and support from at least a section of the educated public, and conversely the more these posts are filled effectively by Africans the more rapidly will educated and popular support become firmly established. This is the vicious circle which we are working to break. "

The basic educational problem is to foster attitudes which get support and inspiration from parents and elders in the home. No amount of formal courses and examinations will help in this. The first step, and one that has already been taken by co-examiners in the University of London for the Makerere B. Sc. in Zoology and Botany, is insistence on the importance of firsthand local knowledge and the use of local examples to illustrate general principles. For high salaries are not the only incentive that bring people into certain fields of work. Public recognition of the relative importance of such work is of equal significance.

Professor Beadle suggests that the best use to be made of a grossly inadequate number of good teachers is to improve the quality of students in the biological sciences by affording them more opportunity at school for getting inspiration from naturalists in the field. " We believe that the most rapid and effective way of providing opportunities would be through establishing Field Study Centres of the type now so successful in Britain, each with a resident naturalist warden of high calibre and with simple accommodation for school and undergraduate parties, together with some financial provision for the schools concerned. That these would be highly popular is certain from experience with the student camp in the Queen Elizabeth Park. I believe that the post of naturalist warden should be of the highest possible status and be regarded as one of the most important careers open to African graduates in biology after suitable training. In this way a very small number of good people could exert a very great influence. This is one of the two points at which, I suggest, money could very profitably be spent. "

In the matter of training in wildlife management as a distinct subject, Professor Beadle goes on to say : " We are convinced that both school and undergraduate training should be done in their own country. Students must surely grow up in the country in which they are going to live and their own institutions of higher education must be developed properly. It should be remembered too that appreciation of what is involved in such a job or even that it exists is seldom got until our students have been with us for at least a year, and some of our best people have developed very late in their undergraduate careers in interests, ability and character. We could not therefore confidently choose suitable

candidates at an earlier stage. We would also support most strongly an extension of vacation employment successfully practised by some departments. This is really the only way of discovering in advance whether a man is suitable for the job and of giving him a chance to learn what it involves. It inevitably entails some wastage of energy and money but much less than would result from appointing the wrong man.

There comes then the question of specialised postgraduate training and the time at which this should be done. In general it is preferable after a spell of work in the job itself. This gives the additional insurance that the right man has been chosen, but the most important advantage is that he is more mature and experienced and is able to understand better the relevance of the post-graduate course and to benefit from it.

It is certainly true that a really good man with some experience of the job will be much stimulated and broadened in outlook by a spell of work or study in another country, and at some stage in his career he should have this. On technical grounds, however, it is surely desirable that high level postgraduate training in Tropical African Ecology and Wildlife Management should be conducted in Tropical Africa. I suggest that to develop this properly would be another most effective way of spending money which may become available for training in this field. It would, I am sure, be of great value also to the Agricultural, Veterinary and Fisheries services and might well attract students from abroad. Its presence in this country could do much to enhance the local prestige of Wildlife Management and to stimulate greater awareness of the problems of conservation among the people. "

These ideas are largely supported in the Federation of Rhodesia and Nyasaland. The Zoology Department of the University College at Salisbury, with the ultimate aim of creating a full department concerned with training in wildlife management, is making a start by offering a post-graduate diploma course.

In opposition to the general feeling that initial training at least should be provided in the environment in which the student will later be required to work;—and that, apart from the fact that he is unselective in the training he obtains abroad since he has had no prior experience at home, a reversal of the process will ill-adapt him to adjustment on return to his country;—Tanganyika has elected to send students to the United States and to Canada. The arguments in favour of this course of action are threefold : there is no obvious or ready source of recruitment of suitably-educated Africans with a leaning towards working with wildlife; the number of graduates in natural science that can be expected from

African Universities during the next few years is very limited; and lastly, a career in wildlife management in Africa does not at present offer the same attraction and material advantages as a career in the other technical services with which Game Departments must compete not merely for the best but, for some time to come, the only available candidates.

The policy of sending students abroad for training after initial selection by a brief "hardening" course of practical field work with the Game Department, will it is thought help to secure a greater number of suitable candidates. These men will not only see for themselves the importance given to wildlife management as a career in other countries, but will return to Africa with greatly enhanced status in the eyes of their fellows; their views and teachings would be respected; and their personal contacts with visitors of all races made easier.

Staff and staff training objectives do not end with the solution of the problem of securing senior professional officers. The middle ranks, considered to be the vital backbone of all disciplined armed forces and civil services, are largely missing in Africa's wildlife departments. Men of better basic education are needed, to whom can be offered terms of service comparable to those of other uniformed, disciplined and sometimes armed forces primarily concerned with law enforcement. Such elements are required not only to raise the prestige of the profession in the public eye, but to encourage the better elements among the subordinate field staff to seek advancement.

To meet these requirements "Wildlife Management Training Schools" need to be created, initially to serve on a "regional" basis for the training of Game Assistants. Such schools could also cater for improving the standard of the more promising Game Scouts. This would not only help raise the general efficiency of the service, but might check a tendency toward reluctance to enforce regulations in certain areas where recruitment has been made from the local tribes among whom the staff work. A plan for such a school, to be based in the Arusha region of Tanganyika to serve East Africa, has already been prepared in outline, but present lack of finance is the main stumbling block. Similar facilities could easily be incorporated in many of the already existing Forest Ranger Schools on the west coast of Africa.

*Discussion Leader:*

Prof. W. H. Pearsall. U.K.

*Rapporteurs:*

P. Hill, IUCN ASP III Consultant. J. Verschuren, Biologist, Institut des Parcs Nationaux du Congo.

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*Education and Training of Staff*, E. B. Edney. University College of Rhodesia and Nyasaland, Salisbury.

*The urgent need for formalized training facilities for wildlife management personnel in the Africa of today*, B. G. Kinloch. Game Department, Tanganyika.

## C. THE PLACE OF NATURE CONSERVATION IN LAND USE PLANNING

### 6. RELATIONSHIP OF WILD ANIMALS TO FORESTRY, AGRICULTURE, ANIMAL INDUSTRY AND DISEASE

A major problem in the development of any modern state is that of conserving and extending the energy resources available.

W. H. Pearsall

A study of the factors of habitat emphasizes the basic principle that, no matter to what use land is put, its maintenance in good heart is dependant on as close an approach as possible to continuous plant cover, since that cover is the obvious and simplest mechanism for taking in Africa's chief energy resource,—sunlight. The effect of man's activities in making conditions less favourable by ruining the vegetation cover of the earth which feeds and shelters himself and other animals is unpredictable.

As P. E. Glover says : " The unreality of modern education is to be seen at its worst in the mental equipment of its final products where politicians, not scientists, hold the reins. Add to that idea the fallacious belief that in Africa land is inexhaustible and put there for man to exploit at will, and you have disaster. "

The maintenance of a continuous plant-cover in order to absorb as much light as possible must form the basis for developments in land-use. Examples of departure from this principle in any sort of habitat, resulting from bad forestry, agriculture and pastoral practices, or from operations such as extensive clearing or regular burning of vegetation, all show subsequent downgrading of the land and a reduction of potential. The restoration of potential is a much slower process than its depletion, and this is particularly the case in the more arid types of marginal land.

The potential of production by a vegetation cover in Africa is extremely high, but it is only realized where soils and climate in conjunction are favourable. The maintenance of the less fertile, unstable soils in productive use at a low cost is therefore a second major problem, aggravated where high evaporation rates are not compensated by an adequate distribution of rainfall. Land can be managed for a variety of purposes, but in all cases production must be limited to potential. Pearsall recognizes three main groups of sites for land-use. In the difficult habitats so widespread in Africa, he emphasizes the opportunity for the development of

productive systems based on the native plants and animals, the purely biological argument being that plants and animals living there have become adapted over millions of years to life in rather difficult conditions. In these sites the choice is generally between a low level of production and a rapid site deterioration if a higher rate of production is attempted. The scale of production possible rarely justifies a large capital expenditure to overcome difficulties. Even small amounts of capital should not be injected indiscriminately into such marginal areas until Government has obtained some undertaking from those occupying the land that their utilization of it will be controlled and rational. In general, land degradation in Africa does not arise from population pressure so much as from ignorance of the principles of proper management.

The value of wildlife as a resource, particularly in difficult habitats, can be shown to be in no way incompatible with the requirements of agriculturalists, foresters and veterinarians, or with the overall economic and social development of a country.

In the field of agriculture there are far greater possibilities for absorbing extra populations by the more intensive development of areas already partially developed than there are in attempts to develop new areas as yet unpopulated. L. H. Brown, Acting Director of Agriculture in Kenya, considers the 30" isohyet as indicating in most areas of East Africa the threshold below which cropping becomes increasingly unreliable, and where intensive agriculture will not pay, or provide a decent living for those who try to practice it. This threshold is even more clearly defined in the equatorial belt where the annual rainfall comes in two seasons with a sharp drought in between, so that the effective rain for each cropping season is less than twenty inches and usually less than fifteen. He goes on to say : " Much land with less than 30" of rainfall per year is being used at present for subsistence agriculture by Africans, and some has even, in recent years, been opened up in costly settlement schemes. Arable agriculture, in such country, cannot at present or in the foreseeable future, provide much more than a subsistence for its inhabitants, and certainly no opportunity for a high standard of living. The inhabitants are thus condemned to a choice between a continued low standard of living or migration to other areas where they may be able to do better. For in such areas increasing population inevitably means impoverishment of the soil to a point at which it will not support the present population on its present standard of living. As things stand there is competition in them between subsistence cultivation and wild animals, with the result that there are constant demands for the control of the latter on scattered plots

of cultivation often many miles from any house and unprotected by any fence. The point which I desire to stress here is that the present subsistence cultivation systems represent unsound land use and cannot provide a good living for the people anyhow. In the long term, in such areas, it would be more rational to look for other outlets than to slaughter the wild animals so that a few more people can subsist miserably. "

Where such land is used for its proper purpose of stock raising, and where it can be economically developed to a high level of stock production, wild animals will need to be controlled, though not necessarily eliminated. Examples available from Central and Southern Africa clearly demonstrate the enhanced value of such mixed herds, especially where the disease protection problem is greatly reduced by the presence of isolated, resident game populations. The Lake Manyara Conference clearly brought out that, while there is undoubtedly direct competition between plains game and cattle for the best grasses, such as *Cynodon dactylon*, there is also good scientific evidence that many game species make preferred use of types of fodder which are not eaten by cattle except in emergencies (H. C. Pereira).

The contrast between economic ranching and primitive destructive pastoralism is illustrated, in Kenya, by a gross return of about Shs. 13/50 per acre in the former, and some 30 cents in the latter case. The highest economic return per acre on African land, as good as and often better than the European ranches, would not, it is stated, exceed 3/- per annum gross. Production at such a level is no excuse for the destruction of large numbers of wild animals, or the destruction of their habitat. To open up an area of Tsetse bush for use by pastoralists may involve a minimum of 60/- per acre for a possible gross return of 1/- per acre per annum. Although the relative value of land usage in Kenya, in terms of wildlife as opposed to stock has not been accurately computed, it would still seem better for land to be left undisturbed, and for game to bring in some revenue without any appreciable capital expenditure, than for the countryside to become an eyesore and an economic liability. If it is assumed that Kenya's tourist industry based on wildlife, and the African stock industry, make use of roughly the same areas of land, the £ 5½ million revenue from tourism is worth three times that of the African stock industry, and is capable of tremendous expansion.

Means should therefore be sought for increasing and restoring the wildlife resources of such areas, whilst simultaneously protecting and developing local communal rights and enhancing the sources of revenue and economic production potential, and thus afford every prospect of

improvement in local standards of living, instead of condemning local populations to exile or to a deterioration of their local means of livelihood.

In densely populated Nyasaland, the Veterinary Service considers that the isolation of the game reserves and their virtual confinement to unutilizable country precludes any serious challenge by game to domestic animals. Any small inconvenience that the maintenance of game reserves might entail is more than compensated by the very great social and aesthetic advantages to the country of preserving the fauna they contain intact.

The importance of maintaining a continuous vegetative cover has been stressed at the outset, and the same objective is sought by foresters where they establish protective, as distinct from productive, forest zones. Although a certain amount of forest produce may be extracted from such areas, it will largely be available for local use only since commercial exploitation cannot normally be associated with the primarily protective role of such cover. To the indirect benefits and limited revenue thus derived from protective forest zones could well be added the profits in cash and kind which wildlife management could bring to such areas without detriment to their basic objective. Such is also the case for the vast stretches of " miombo " woodland that cover enormous areas of Africa, for which little or no economic use has yet been found other than in the neighbourhood of the mining industry.

This section would be incomplete without some mention of the " bush-game-Tsetse " ecosystem which covers about 3 % million square miles of tropical Africa,—an area larger than the whole of the U.S.A.

The reservoir of trypanosomiasis is the wild game. But as J. Ford says, transmission of the trypanosomes from one wild animal to another is also affected by the tsetse-fly and it is likely (though perhaps not certain) that eradication of these insects would result in the disappearance of trypanosomes from the game population which would then, in this respect, become harmless to man and his farm animals.

Three methods of control or eradication of *Glossina* have been tried during the last sixty years, at costs which now are low when compared with the costs of dealing with some commoner agricultural pests. These are : the clearing of vegetation forming the habitat; the reduction of certain species of wild animal populations to achieve a level of starvation affecting the insect's rate of reproduction; and the use of insecticides. Whereas the first is the most expensive and the most difficult to apply, and reentry of game into a cleared area is difficult to control without the

use of game fences, the long-term success of these methods is also ultimately dependant upon whether the cleared area can be used in such a way that stable and economically sound settlements are formed which keep the land clear of bush and game, and employ land-use techniques which will not impoverish the soil. As Lovemore, of S. Rhodesia's Tsetse and Trypanosomiasis Control Branch, says : " It is pleasing to record that this distasteful method (game destruction) has now been almost completely abandoned in favour of discriminative spraying with residual insecticides applied from the ground combined with some bush clearing. "

In conclusion, therefore, a trend toward a change of attitude is emerging. Whereas in the past, bad allocations of land, combined with bad distribution and bad practices, resulted in wildlife conservationists being allotted areas " on sufferance," and as a last resort of land-use, he need no longer feel he must content himself with " the crumbs from the rich man's table ", but can claim equal partnership in his contribution to rational and productive land-use patterns.

*Discussion Leader:*

M. K. Shawki. Forests Department, Sudan.

*Rapporteurs:*

I. M. Grimwood. Game Department, Kenya.

M. Buffe. Forests and Game Service, Dahomey.

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*Wild Animals, Agriculture and Animal Industry*, L. H. Brown. Agriculture Department, Kenya.

*Notes on the relationship of wild animals to animal husbandry and disease—Nyasaland*, Director, Veterinary Services, Nyasaland.

*The effect of anti-tsetse shooting operations on the game populations as observed in the Sebungwe District, S. Rhodesia*, D. F. Lovemore. Tsetse and Trypanosomiasis Control Branch, S. Rhodesia.

*African wild life and the tsetse fly-borne diseases*, J. Ford.

Department of Veterinary Services, Salisbury, Southern Rhodesia.

## 7. HUMAN ECOLOGICAL FACTORS

Perhaps the revaluation of African wild life could be summed up in the phrase "Profit, Protein, Pride and Prestige," with "Interest" and "Enjoyment" thrown in for good measure.

Sir Julian Huxley

### *Relation to Human Nutrition*

The very large scale on which poaching is now conducted throughout much of Africa demonstrates the presence of a continuing market for game meat.

Industrialization, urbanization, exports and the growing of cash crops are all a direct cause of malnutrition, inhibiting both physical and intellectual development. It is an interesting thought that there is no malnutrition among the nomadic pastoral tribes; the main deficiency in human diet being animal protein. The study of human ecology must therefore be added to the other factors determining land-use patterns.

As has been stressed throughout the report, many game species utilize a wider range of vegetation than cattle, and can make use of range at greater distances from watering points. They are tolerant of trypanosomiasis and can therefore make use of tsetse-infested country; and because of widely different food preferences many species can thrive in the same habitat.

Most game species have a higher yield of edible meat, as a proportion of live weight, than is found in cattle; the killing-out percentages of both Grant's and Thomson's Gazelles, Impala and Eland all being about 60 %, while cattle of the African pastoral tribes rarely exceeds 50 %. There is some evidence that Eland, which are readily domesticated, have a higher rate of live-weight gain and an earlier maturity than have cattle in similar circumstances. Fat is the most uneconomical of animal products, and is more efficiently extracted as vegetable fats and oils than after conversion in the animal. Carcass analysis studies have shown that game species produce more lean meat and less fat and bone than do domestic cattle (Ledger et al.—Lake Manyara Conference, 1961).

These and other results indicate that some game animals are more efficient converters of natural fodder into animal protein than domesticated stock. This is of significance where the low level of economy of many of Africa's emergent countries, and the vastness and ruggedness of

much of their lands best suited to meat production, precludes the possibility of raising the plane of animal nutrition to any appreciable extent. Any improvement in the production of animal products is therefore largely dependent upon the selection of those species best able to convert the existing fodder into meat.

The real problem lies in raising the standard of living and the purchasing power of inadequately-fed populations, and to devise efficient and inexpensive methods of processing, transportation and marketing of animal produce so as to put within their reach the larger quantities of the proteins required for a balanced diet. This is quite compatible with true conservation.

#### *Human and Sociological Factors*

In the previous chapter, it is said that in general, land degradation in Africa does not arise from population pressure so much as from ignorance of the principles of proper management. Sociological factors are nevertheless as much a matter of concern to conservation as are the scientific aspects.

The phenomenal growth of human population in Africa today certainly poses considerable problems for nature conservation. For even if the average for the whole of the continent is not particularly alarming, the picture is altered when we take into account the proportions of desert, swamp or other areas of low productivity in terms of human needs. Human settlements have been established in relation to the potentialities of the environment and vicissitudes of history. And yet intensive land-use is still the general rule, and areas that are inaccessible on account of topography, unhealthiness or remoteness from communications are largely left in their natural state. The existence of regions of very dense population (even on soils of only relative initial fertility where, for instance, certain peoples are anchored to defensive sites, such as the Kabré of N. Togo, the Dogon of the Bandiagara sandstone massif of Mali, or the Somba of Dahomey) moreover illustrates that agriculture can be sustained by the wise action of the land-users in adapting their practices to the dictates of even the most rugged medium. The African is capable of realizing the need for preserving natural equilibria; and it is generally the influence of western materialistic civilization that has caused their disruption.

A special case would seem to be that of densely-populated Nyasaland, the examination of which would indicate the need for study of human population patterns and dynamics, and of population control policies,

especially in areas where the greater part of the land is of low carrying capacity.

The problem lies in associating, in the mind of the African land-user, his inherent adaptability to environmental needs with the effects of outside influences. For as Brasseur rightly points out, peoples originally very much alive to soil conservation resort to practices outside their own area whose sole aim is the extraction of maximum yields with no thought of the consequences on the production potential.

The swift reduction in the satisfaction of local needs through complex and careful land-use practices, brought on by artificially induced increase in demographic expansion and by contact with outside economics, has built up tremendous local pressure on land which has developed out of all proportion to the evolution of viable land-use techniques, acceptable to peasant and pastoral peoples.

With this first obstacle to the notion of nature conservation is therefore correlated the need to demonstrate beyond doubt the soundness of any projected conservation schemes. The lack of appreciation of the underlying principles, and importance to land-use planning, of introduced ideas of conservation is a second major obstacle. Modification of traditional practice in the light of new demands can only be induced by unusually convincing local demonstration of the tangible benefits to be derived from such changes. The disastrous effect of shortsighted and unscientific planning such as the East African Groundnut Scheme, the indiscriminate slaughter of game in the name of tsetse-fly eradication, and the absence of any regard to wildlife conservation in the Kariba Dam development, has damaged the case for conservation more than most people seem to realize.

The problems to which special attention must be given in removing these and other barriers include the need for overall land-use planning in connection with resettlement to relieve areas in which pressure now exceeds carrying capacity; and the provision of local alternative means of livelihood (such as game-cropping activities) which are compatible with local conservation requirements. The activities referred to can also give an outlet for man's natural hunting propensities. But education requires perhaps the most urgent attention. It must include the land-hungry agricultural peoples living on or adjacent to problem areas, it must foster an informed national public opinion and it must spread beyond national boundaries, as it did in abolishing the slave trade, to check the indiscriminate overseas trade in trophies which, by fickle fashion or unfounded credulity, jeopardize Africa's wildlife.

*Discussion Leader:*

Sir Julian Huxley. U.K.

*Rapporteurs:*

I. M. Grimwood. Game Department, Kenya.

M. Buffé. Forests and Game Service, Dahomey.

*Background Papers:*

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*The importance of Game meat in the diet of sedentary and nomad peoples of the Senegal River valley,* P. Cremoux. Forest and Game Service, Senegal.

*Sociological and human factors,* G. Brasseur. IFAN, Dakar, Senegal.

*Human and sociological factors and the place of nature conservation in land use planning,* H. A. Fosbrooke. Ngorongoro Conservation Area Authority, Tanganyika.

*Human and sociological factors,* T. R. Odhiambo. Uganda.

*Note on the Problems surrounding the implementation of a wildlife utilisation policy in a densely populated country—Nyasaland.* Govt of Nyasaland.

## D. WILD FAUNA AND FLORA AS A CULTURAL AND ECONOMIC ASSET

### 8. CULTURAL VALUES

Our game is something we can be proud of and glad to show off to our visitors.

Chief Fundikira

Dr. Wasawo, of Uganda, has summed up the cultural assets of Africa's wild fauna and flora in the following passage : " There is, perhaps, a tendency in the world today to overstress the economic aspects of any natural resource. While this is understandable, it must never be forgotten that ' man does not live by bread alone,' that there are other aspects of his nature that require not only satisfaction but also development. Man appreciates beauty for its own sake—and the appreciation of beauty can be developed and improved. He is a curious being, whose thirst for knowledge can be insatiable—and this curiosity can be improved upon by education and by a better presentation of the challenges of his environment. He has an ear for music, an eye for colour, an appreciation of the vastness of his environment, an urge to meet and exchange views with people of other lands and climes. The cultural development of a people is not only judged by what they produce but also by the way their spirit and minds are developed to appreciate what is around them and in them. In Africa we have a unique flora and fauna which can play a great part in this development. "

It is a heritage which, over the ages, has already made its mark upon diverse cultures of Africa. It finds expression in folklore and its dances, its masks and ceremonies, its art, its music and in the wonderful stories illustrating human characteristics as related to particular birds and mammals. Extermination of such values would be a loss to culture and to communication between peoples.

The scenery and geology, the lakes, rivers and falls, the volcances and calderas, the largest rift valley system in the world, and upthrust fault blocks like that of the Ruwenzori, are all part of this heritage. The unrivalled ecological record of climatic and evolutionary change, including a series of important steps in human origins, is to be found at Olduvai; and in the freshwater fauna of several of the great lakes an outburst of evolutionary differentiation is of special scientific interest.

Science is a part of culture, and the wildlife of Eastern Africa's great game plains and savannahs includes the only easily accessible and readily studied remaining portion of the world's prehuman climax community at its tropical richest. The equatorial rainforest provides another portion, but this is difficult of access and hard to study scientifically. The preservation of such values for detailed ecological study is therefore an urgent scientific task (Huxley). It is a responsibility which Africa holds in trust for the whole world. For man in his ignorance, arrogance or greed, has already irrevocably destroyed too much of the unique plant and animal life on earth, forgetting that neither he nor his children's children can ever become completely independent of their environment, and overlooking the possible contribution that these now extinct forms might have made to his own welfare.

The sight of an abundance of large wild animals in freedom, in a natural and inspiring setting of unspoilt nature, is an unforgettable experience which must be preserved for the benefit of future generations of all peoples. The elevation of the human spirit, the cultural development of man, is largely catered for by the contemplation of the greatness and sublimity of nature. To provide opportunity for Africa's youth, and even its older men and women, to have such experiences should be one of the aims of the New Africa. It is an opportunity for which the continent will be justifiably envied by the people of other lands.

Finally, the contribution of tourism to cultural exchange, already mentioned in one of the earlier chapters, is becoming increasingly important as more and more of the African countries attain independence.

*DiscussionLeader:*

F. Fraser Darling. The Conservation Foundation, New York.

*Rapporteurs:*

R. E. A. Smithers. National Museum of S. Rhodesia, Salisbury.  
Boubacat Sidibé. Forest Service, Senegal.

*BackgroundPapers:*

*Wildfauna and flora of Africa as a cultural and economic asset, and the world interest therein*, Sir J. Huxley. U. K.

*Wildfauna and flora of Africa as a cultural and economic asset and the world interest therein*, D. P. S. Wasawo. Makerere College, Uganda.

## 9. INTEGRATION WITH ECONOMIC DEVELOPMENT

Natural resources are comparatively more fundamental to the economic development of underdeveloped countries than they are to more highly developed states.

S. K. Shawki

Natural renewable resources provide the means of growth for young countries before they reach the stage of using technical methods, technicians and capital essential for the most productive use of the land. Successful development may be long in coming. The resources must therefore be carefully managed so that they are conserved until adequate techniques and power are available. Such management is all the more necessary since natural resources are limited whereas populations continue to grow. In the marginal areas especially, primitive land-use practices may reduce subsistence standards faster than capital input can provide alternative means of livelihood.

An important general principle that emerges is the need, therefore, for integrating the development of wild resources with all other resources in the country, while giving due consideration to the present stage of economic and social development and the state of natural environment.

Great regional differences exist in social structure, in political and economic development, in biological potential and in the extent to which wild resources have been depleted. Policies must therefore be developed within the special terms appropriate to each country, and on a long-term basis.

The mechanism of integration involves policy formation, research and education.

It can be safely assumed that communities will settle mainly in regions where the combined play of natural forces and the intervention of man can lead to a cumulative process of autonomous development, likely to open the way to economic and social expansion. Outside these intensively exploited areas will remain regions of varying size which should be kept as intact and stable as possible, as reserves for the future and as areas for soil and water conservation, recreation, hunting and leisure; their management should be as inexpensive as possible.

Accordingly, there should be demarcated parks or natural reserves where the main aim is the conservation of wildlife for aesthetic, scientific or touristic reasons. Outside these special areas there are others on which wildlife should be managed as the principal form of land use or as an

accessory land use, being combined initially with shifting cultivation, forest exploitation and extensive stockraising, then eventually with more intensive forms of utilization. During this period of transition, animal health measures must be developed. Thirdly, there are areas intensively developed in which wildlife would have no place.

It is with the second category of land that this chapter is most concerned. As has been discussed earlier in this report, the development of appropriate research, the formation of a clear national wildlife conservation policy, and the development of extension and training programmes, effective at all levels of society, are necessary to rational conservation in land-use. Priority for research in areas where policy is directed toward integrating the wildlife resources with others should be considered under the following headings :

1. the collection and organization of local information to facilitate immediate planning;
2. the encouragement of operational research leading to practical demonstrations with emphasis on schemes financed with private capital;
3. the understanding of population dynamics of all common species of mammal and the relationship of animal populations to bush encroachment, fire patterns, and land-tenure systems;
4. the investigation of wildlife economics, particularly in regard to the development of markets for getting protein to the consumer,—and of tourism, including the requirements, the economic and other effects of various categories of visitor, and the applicability of the law of diminishing returns to the number of areas established;
5. the development of an understanding and of methods of control of domestic animal-wildlife disease relation. In promising ranching areas the random movement of game cannot be permitted. Where it is a biological necessity, the study of closed circuits will require attention;
6. the integration of economic research with ecological research, such studies being most profitably carried out at universities in Africa.

In countries short of protein, and where the indigenous fauna could make better use of the land, economic priorities should not necessarily be accepted as overruling conservation priorities. The deficiency may be worth meeting on a subsidized basis, an example of this being school milk distribution in the United Kingdom. Closer attention to the economics of natural resources in the recent past might well have avoided

unnecessarily wasteful or misplaced expenditure of vast amounts of capital on various agricultural schemes, due to the economists' calculations for African conditions being based on highly arbitrary assumptions. The conservation viewpoint requires strong representation in the modern African states, where industrialization and rapid results are looked upon with greater favour than the total benefits accruing from long term rational development.

The establishment of a supra-Ministerial Committee or of an independent, non-political Board (like S. Rhodesia's Natural Resources Board), empowered to carry out its work free of any party political influence or interference, carrying out its duties in a spirit of advice and persuasion rather than direction and control, and relying upon the cooperation and good will of the people, may do more than any other form of organization to ensure proper use being made of a country's natural renewable resources.

*Discussion Leader:*

H. C. Pereira. ARCRN, Salisbury, S. Rhodesia.

*Rapporteurs:*

T. Riney. National Museum of S. Rhodesia.

R. Péperty. Office du Tourisme, Dahomey.

*Background Papers:*

*Integration of the conservation and development of wild resources with programmes of economic development in Modern States*, P. G. Deedes. N. R. B., Southern Rhodesia.

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*Integration of the conservation and development of wild resources with programmes of economic developments in modern states*, S. K. Shawki. Forest Department, Sudan.

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## E. LOCAL HUMAN ATTITUDES AND INTERNATIONAL INTEREST

### 10. LOCAL ATTITUDES TO NATURAL RESOURCES AND THEIR USE

Although economic impact has caused the African outwardly to divorce himself from his environment, there are clear indications that deep down, his traditional bonds with nature are strong, and that lore and custom will again emerge in African culture and contribute to survival and well-being which are forever linked with the husbandry of Africa's living resources.

G. G. Watterson

A survey of the underlying trends in man's changing attitude toward his environment (in terms of locally available natural renewable resources) is not out of place here in evaluating whether those, whose apparent realism prevents them from envisaging man's relationship with nature other than as a utilitarian and efficacious or profitable asset, are justified in this approach.

The evolutionary change takes one through four stages :

- i) fear of, or obedience to nature, and the need for security, in which man feels himself a part of nature and at the mercy of its unpredictable forces (Bantu kraals, Somba " forts," etc.);
- ii) growing self-confidence and increasing observation, leading to rational adaptation of the environment to differential needs (The rice-terraces of Asia, the irrigation systems of old Mesopotamia);
- iii) aggressive, unilateral exploitation, with consequent unbalance and eventual disintegration (the making of artificial environments such as industrial slums, suburban ribbon-development, dustbowls, flood plains and deserts);
- iv) responsible (and often costly) readjustment to and unification with environmental conditions.

Relating this evolutionary process to African conditions, it is perhaps true to say that, after the initial submissive phase of biocenosis, which at best is expressed as the simple exploitative economy of the youth of human colonization, the sudden appearance of outside influence over the past hundred years or so has led straight to the third stage of divorce from environmental limitation, and aggression in the form of a heedless,

prolonged and intensive, characteristically exploitative economy, destroying environment, and leading to stagnation, misery and eventually the extinction of the community. This happens at the moment when elsewhere modern States have recognized, or are beginning to discover, the multiplicity of reasons which render necessary an enlightened policy designed to protect nature and to regulate wisely the exploitation of her resources. It is to be hoped that the stage of recovery due to timely awareness of the need for conservation—the phase of reconciliation and responsibility, when *Homo sapiens* is at last worthy of this appellation—has reached the shores of Africa already. As Monod goes on to say : " I am certain that African tradition is both close enough and rich enough to supply those now responsible for taking decisions with all the information which, *mutatis mutandis*, will enable them to pass from the stage of factual equilibrium imposed from without, towards one of deliberately chosen and organized equilibrium, without tarrying too long in that of ill-planned and unwise exploitation. "

From the beginning of time the inspiration and material needs obtained from the environment led to close constant communion between man and his environment, and to an attitude translated into rules and rites which have been handed down from one generation to another. Africa,—and West Africa in particular,—is still rich in tribal tradition governing the gathering and hunting of food and game. Such customs are basically sound since they evolved over the passage of years and observe the principle of sustained yield. Centralization of government, initiated by the era of colonial rule and in many areas accentuated as a result of accession to independence, has resulted in a decline in the observance of such traditional controls. The introduction of modern techniques and outlooks has been too rapid to allow for their corresponding adaptation and has contributed to their redundancy.

Other special factors affecting African public opinion are that since the white man came, the African has seen him exterminate game over large areas, partly for food or sport, partly to protect his farms from depredation or from competitive grazing,—and also in tsetse control projects. He does not see why he should be stopped from doing the same. Game reserves and National Parks, used and run almost entirely by Europeans, and therefore regarded as being administered exclusively in the interests of the white man, have further contributed to the racial issue which so often colours African thinking on game.

Yet many examples of religious and social practice still exist to illustrate the sympathy felt by African peoples for natural things. They should

provide a basis for future attitudes, modified and adapted to meet the changed circumstances today, and stem the tide of sheer utilitarianism. To do so effectively will require a halt to the plundering of natural resources, much of which is at present still legal. It will require direct instructions and the enforcement of orders. Above all, it will require improved standards of living. For even if it still lies within him to appreciate Sayed Kamil Shawki's interpretation of Omar el Khayyam's paradise of "wilderness"<sup>1</sup>, the African rural dweller must first satisfy his hunger. Those struggling to scrape a bare living from the soil seldom take a long-term view. It is only very recently that the more advanced nations have themselves woken up to the need for faunal conservation—and then only after they had destroyed all but a fragment of what they had to conserve.

*Discussion Leader:*

D. P. S. Wasawo. Makerere College, Uganda.

*Rapporteurs:*

H. A. Fosbrooke. Ngorongoro Conservation Authority, Tanganyika.  
Agbekodo. Forests and Game Service, Dahomey.

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Game and Fisheries Division, Sudan.

## 11. DEVELOPING AN APPRECIATION FOR THE NEED TO CONSERVE NATURE AND NATURAL RESOURCES

The youth of Africa have a superb heritage in their fauna and flora which they can use for intelligent observation, for trained listening and for informed utilization. This is a challenge for education in its broadest sense.

D. P. S. Wasawo

The preceding chapter has indirectly emphasized the importance of conservation education. It is a necessary measure in bridging the gap between the old, small world of local values and loyalties, the old patterns

<sup>1</sup> Omar Khayyam—Quatrain XL  
Here with a Loaf of Bread beneath the Bough,  
A Flask of Wine, a Book of Verse—and Thou  
Beside me singing in the Wilderness—  
And Wilderness is Paradise enow.

of behaviour which stand in close dependence on the natural environment—and universal values which break these concepts and may deprive communities of knowledge of how to make a living out of their locally available natural resources, thus endangering their existence.

Time is short and the means are limited. A campaign on a broad front is neither feasible nor likely to be effective. Those in daily contact with animals, whether they are persons whose crops are raided by elephant or hunters hungry for meat, are stony soil for general propaganda. It is to the leaders at all levels of society and to the coming generation of leaders, that the main approach must be made. National Parks are certainly not the only areas in which wildlife should be conserved. But as the shop-windows of all related conservation measures, they are the most important in the present context. In its simplest terms, therefore, the problem is how to assure that degree of public support for the parks which is essential to the continued existence of wildlife.

Taking his cue from Sir Julian Huxley, John Owen, Director of Tanganyika's National Parks, stresses five themes in this approach: *Possession*: The Parks belong to the people, and are run primarily for their benefit.

*Pride* in the national heritage of their Parks which are world-famous.

*Profit* from the tourist trade, still with its potential barely assessed.

*Pleasure* in seeing the animals, which figure so largely in African folk-lore, in their natural state;

*Posterity* the desirability of preserving representatives of the many animals which are Africa's heritage for their children and their children's grand-children to see and enjoy.

The conservation of wildlife needs to be presented for what it really is : a civilized and cultured interest which is part of the background and personality of Africa—something to be proud of for its own sake, so that Africans themselves may realize that what Africa has to offer to the world in this regard is unique, as well as a highly educated interest. As J. Verschuren of the Congo National Parks Institute says : " Europe has its cathedrals, preserved through ages; Africa is proud to show the prodigious natural spectacles which she has helped to save. "

The people of Africa who will control policy are not those whose livelihood is directly affected by the wild animals. The " indirect " economic benefits of overall land-use patterns are of little concern to them. Any " direct " benefits in supplementing diets, or by providing alternative sources of livelihood, are going to affect a very small number of rural people; and given the choice between ranching low-grade

domestic stock and game animals, it is probable that most Africans would still choose the former for a variety of reasons—milk, limitation of damage to growing crops, ease of herding, and tradition (R. Bere). If an objective is considered important enough in itself there is inevitably an insistent demand for it, regardless of cost. Although as has been shown in earlier chapters, wildlife management can be an important basis for economic development, the economic incentive will largely be correlated to that of pride and prestige, in that nature protection is a sign of a highly advanced civilization, and that countries in the forefront of economic progress also lead the way from the standpoint of conservation.

In reminding those who direct policy and have the power to influence public opinion, of the value and importance of what they are being asked to conserve, it has to be taken into account that most of them now originate from or live in towns and heavily populated areas. They therefore tend to know little of their wildlife heritage and their lives are divorced from contact with wild creatures. Nor is there usually much opportunity for the visual image of wildlife to be recreated and sustained in their minds through the medium of illustrated papers, television and similar amenities. Even the cinema cannot indicate scale to unsophisticated eyes.

The most important step is therefore to encourage as many of these leaders as possible (including those of the future who are still at school and college) to visit the national parks to see for themselves not only the wildlife of their country but also the obvious enjoyment of all who come to see it, many of them at great expense from distant parts of the world. Accommodation, transportation and all other facilities and amenities (launch trips, wildlife films, a visit to the park museum, pamphlets and lectures stressing the position of a national park as the people's recreation area, as a means of protecting the nation's heritage and enhancing its prestige in the eyes of the world, and as the keynote of the valuable tourist industry) should be so arranged as to produce the "cells of enlightenment" in important sections of the community, which are so vital for the future.

Facilities of the type outlined in the previous paragraph, subsequently need to be converted into permanent Field Centres, where students and visitors are catered for by trained African staff of the highest calibre. The appointment of such staff to these and other highly responsible posts in the Parks is a cardinal point in developing the realisation that national parks and wildlife are very much the responsibility and concern of every Nation.

For such field study centres to be successful and appreciation of wildlife to spread and flourish, the ground needs to be prepared through teacher training and emphasis on local natural history in the schools. The value of such teaching in the educational system is at present all too often ignored. No use is being made of a child's basic knowledge of environment. He is being merely "urbanized" and indoctrinated in the three "R's". Yet there is no good reason why the elements of natural resource conservation should not be incorporated in almost every subject in the curriculum. Only if in this way a sympathetic approach is developed from the earliest stage toward the country's natural resources, is the younger generation likely to accept its eventual responsibility for ensuring that these are not improperly exploited and lost for ever.

In the process of building up popular interest in and understanding of National Parks, every opportunity should be taken to present their Parks to the people by film, posters, the printed word, radio, locally staffed mobile "extension" units, and the establishment of media such as annual *Conservation Weeks* in which Government departments, educational and welfare organisations, commerce and industry, all combine to promote the particular natural resource adopted as the main theme of the year. H. S. Mahinda of Tanganyika writes :

" It is not difficult to convert Africans to recognize the value of a thing, provided it is introduced to them in the right way. Almost every African is interested in listening to good stories. Therefore, if you want to get his interest, you must be careful how you explain to him how he is concerned with game. If one is so rash as to blame him, he will not accept what you say, even though it is true. Therefore, whenever I give talks or write pamphlets, I try to compose them with two objects—first, I give the story of Game, how it has maintained us in the past; and what the present situation is; and secondly the reasons why Government is preserving game, and the way in which it is doing so, and trying to make my listeners or readers aware that game is of definite economic value to them and their country. "

" Not very long ago there were no schools in Africa, but special instruction was given to children by parents and others of the tribe. The girls were given lessons by their mothers and old ladies about all that concerned women, and the boys were taught by their fathers and other elder men about what concerned the men. The old people believed that if you teach young children, when they are still young, they will grow up with full knowledge of everything. But unfortunately this good old system does not take into account new ideas and is beginning to lose its

value. Something must now be done to replace it *adequately*, since the old type of instruction contained a great deal of natural lore which school instruction does not replace. Although some girls and boys at present may grow to be clever men and women, they will not compare with the boys and girls of the olden days as regards their knowledge of nature. It is very disappointing to see that some of them cannot even tell the names of different trees and wild animals in their own language. If one wants to know the vernacular names of different things, one has to ask the old men who did not go to school; not the young ones because they do not know them. I regard this as a bad thing for the future generation, for if one does not know about a thing, one can hardly take interest in it. Therefore we must take immediate steps to encourage the teaching of the importance of the conservation of nature to the younger generation. "

Mr. Mahinda's closing remark at the meeting was :

" Obeying the Will of God, Noah, in his Ark, once saved all of His creatures. We have immeasurably more room. Is it not right, therefore, that now that we have the chance, we should do at least the same ? " One might well, in this context, remark on the great deal of attention and effort being concentrated, under the auspices of UNESCO, on saving the man-made Abu Simbel temples from the waters that will rise when the new Aswan Dam is built across the Nile. It would appear to be only right that similar much-needed international aid and support should be given to the preservation of the irreplaceable God-made cultural asset of Africa's wildlife, threatened by the tide of demographic pressure and industrial expansion.

*Discussion Leader:*

K. Curry-Lindahl. Sweden.

*Rapporteurs:*

J. Blower. Game Department, Uganda.

A. Agbekodo. Forests & Game Department, Togo.

*Background Papers:*

*Developing an appreciation of the need to conserve wild life in Uganda*, R. M. Bere, formerly Director and Chief Game Warden, Uganda National Parks.

*Education of the people in Nature and Natural Resources*, A. Gille. Department of Natural Science, UNESCO.

*An experiment in spreading propaganda among indigenous people as to the value of wild life and the need for its conservation*, H. S. Mahinda. Game Division, Tanganyika.

*Developing an appreciation for the need of conservation of nature and natural resources*. J. A. Pile. Natural Resources Board, Southern Rhodesia.

*Awakening public opinion to the value of the Tanganyika National Parks,*  
J. S. Owen. Tanganyika National Parks, Arusha.

*Developing an appreciation of the need of conservation of nature and natural resources.*  
J. Verschuren. National Parks Institute, Congo (Leopoldville).

## 12. INTERNATIONAL AID FOR CONSERVATION

In view of the emphasis placed by so many speakers at the Arusha Conference, on the need for international finance and technical assistance in the field of wildlife conservation, it seems appropriate to end this review by examining some points of special interest to African nations when planning for the future. But it is also relevant to recall the warning given by Dr. Wasawo, that "the rest of the world should always remember that new nations are very jealous of their newly-acquired independence—and that they have to be very careful as to how their advice or help is given".

The keynote and aims of the 1933 International Convention (London), subsequently complemented by the 1953 Bukavu Conference, was protection through legislation. The establishment and periodic revision of lists of species of animals and plants to be protected, and the creation of protected areas (national parks, game reserves) were stressed. The concept of integration of wildlife into the economy of the region was not given special attention.

In 1958, as a result of its sixth General Assembly at Athens, IUCN addressed a request to the Economic and Social Council of the United Nations (ECOSOC) for recognition by the United Nations of National Parks and equivalent reserves as wise land use, and for support in keeping an up-to-date list of them. The objectives of these measures were to safeguard such areas from being wiped out by a stroke of the pen or without the most careful prior assessment of their actual or potential value; and to promote and enhance the pride of ownership of such areas as a heritage worth saving. A first list, containing the replies of fifty-two countries to a comprehensive questionnaire sent out by United Nations in 1959, was published in 1960, and a second edition is in course of preparation. These lists provide IUCN and its Commissions on Ecology and National Parks, with the basic material for evaluating and classifying all existing and potential conservation areas. The effectiveness of the legislation establishing such area will be assessed in terms of the safeguard

afforded. An important category proposed is that of " significant ecological or biological units ", which will be carefully examined and analysed in order to discover and locate particular environments and habitats that have not so far been safeguarded; and others for which measures of special protection are, for a variety of reasons, no longer considered justified.

Whilst on the subject of National Parks, mention should be made of the First World Conference on National Parks, held in Seattle, U.S.A., 30th June - 7th July, 1962, in conjunction with the " Century 21 " Exhibition. It was in Athens, at IUCN's Sixth General Assembly, that Dr. Tsuyoshi Tamura, venerable father of the National Parks system of Japan, urged consideration of such a conference. The programme provided for five days of discussions, followed by organized field trips to Olympic and Mount Rainier national parks. The Conference, support for which was without doubt much stimulated by the Arusha Wildlife Conference, has afforded a further opportunity for greater understanding and an exchange of information among the authorities, both administrative and scientific, in whose hands rests the care of parks and reserves in many countries of the world.

Two of the special agencies of the United Nations, UNESCO and FAO, have for many years been concerned from their respective viewpoints with the conservation of natural resources. The first Session of the African Forestry Commission (FAO-sponsored) at Ibadan, Nigeria, in 1960, made a particularly significant contribution to the definition of aims. After recognizing wildlife as a resource with a rightful place in economic development in Africa, and analysing the causes of threats to its conservation, the Commission established a list of priorities to which attention should be given by FAO, where appropriate through its Regional Technical Assistance Programme. The Commission also set up an " ad hoc " Working Party to examine and analyse existing wildlife policies with a view to drafting a modern Convention for the conservation of wildlife, based upon controlled use; the project to be drawn up in close consultation with IUCN and other relevant international organizations.

IUCN enjoys consultative status on all matters relating to nature conservation, with ECOSOC, FAO, and UNESCO. Ties with CCTA/CSA, strengthened by the joint effort represented by the Arusha Conference, will it is hoped continue to develop and the interdependence of interest between wildlife conservation and tourism makes close liaison with the International Union of Official Travel Organizations (IUOTO) of some

importance. Finally it is worth remembering that the U.N. Technical Assistance Board can and does look to IUCN for guidance in the allocation of priorities to applications for funds for wildlife development and management.

It was because an impartial assessment of worldwide wildlife conservation problems led IUCN to the conclusion that the accelerated rate of destruction of wild fauna, flora and habitat in Africa was the most urgent international conservation problems of the present time—and because foreign aid programmes are particularly prone to overlook conservation and the value of wildlife and habitat as a continuing economic, scientific and cultural asset, that IUCN decided to launch its African Special Project at the close of 1960. An account of the origin and objectives of the project has already been given in chapters I and II of this Report and the encouraging results of the second stage of the project, the Arusha Conference, reflected in public and private offers of aid and an enlivening of interest in many countries throughout the African continent, led to the establishment of the third stage of IUCN's African Special Project, details of which are to be found in chapter VI of this Report. ASP III, as this stage of the project is called, involves the establishment of a team of two highly-qualified consultants with long practical African experience of the aspects and problems of land-use directly related to wildlife conservation. This team is at the service of interested Governments who desire to undertake an assessment of the extent and value of their wildlife resources, and integrate them in their proper place in land-use and economic development plans. It also provides a channel for outside assistance, ensuring that such necessary aid is applied where it is most urgently needed and where it can do the greatest amount of good.

It is hoped that in this way IUCN's ASP III will not only open the door to the tremendous amount of good will and financial and technical aid that is available for the African Region, but also help to ensure that the flow of aid is used to the best effect in saving and developing Africa's wildlife resources.

Whereas FAO is concerned with land-use and productivity, the inter-relationship of one form of utilization on another, the benefits and the dangers that each may present to the overall picture, and the training of the technical staff necessary at all levels to ensure the smooth and effective implementation of land-use measures, UNESCO's main field of responsibility lies in the basic research and the education of a properly aroused public opinion—essential preliminary conditions for the development of land-use techniques on the one hand, and of their acceptance by the

communities directly concerned with their implementation on the other. ECA conducts research into economic and social problems in Africa; a vital function in establishing priorities for action in a Region which is striving for a place, in its own right, in world economy. CCTA combines all these actions, and concentrates its efforts in Africa South of the Sahara alone, drawing Government attention to desirable trends in development, and offering assistance where this is required.

At the non-governmental level, IUOTO has been quick to recognize that wilderness areas and natural beauty constitute an important element in the tourist industry; that man's need for communion with nature would increase with population pressure and the spread of urban and industrial development; and that the tourist industry must be so expanded as to take full account of this craving without destroying the quality of the natural environment which people are seeking. Mention should also be made of the International Council for Bird Preservation and the Fauna Preservation Society, which in close collaboration with IUCN's Survival Service Commission, aim to secure for the species, some of them a sad remnant, that have survived man's thoughtless or deliberately destructive activities, a recognised place in planned development.

Finally, there are many Governmental and private organizations and foundations which are anxious to assist economically underdeveloped countries and regions. Within the African continent itself there are institutions, particularly well located or specially equipped, that can assist, especially in the vital field of applied research.

The Conference clearly brought out that many countries already had, in more or less adequate measure, the qualified services and personnel to put into effect the projects that would contribute to sound long-term development. For other countries, where staff is still in short supply, plans and the willingness to develop training facilities were well advanced. What was in short supply everywhere, however, were the funds essential to the release of this will for action, and to the realisation of plans. Moderate financial assistance immediately and in the right place would avoid the need for far greater sums to meet much more difficult situations within a few years.

The needs of Africa might therefore be summarized as follows : a survey to assess and define wildlife conservation areas or valuable habitats, and to determine priorities for which outside aid could best be used; regional bureaux of wildlife management to collect and disseminate all available information on relevant work in this field, and to keep " Project Registers " in order to co-ordinate action among research

workers and avoid wasteful and costly duplication; an established channel through which local needs, especially of qualified staff, could be made known; a field handbook to promote and standardize techniques for collection basic information; and last but by no means least, a world fund through which money could be made available, with a minimum delay and difficulty, to meet emergencies facing Africa's wildlife. It is this last-mentioned need which the World Wildlife Fund, launched within two months of the end of the Arusha Conference, bids fair to meet.

This is indeed a most welcome development, for as Sayed Kamil Shawki pointed out, " foreign aid programmes are particularly prone to lack of consideration of the conservation aspects, and a special effort is badly needed for co-ordination and active observation of the long-term view of rational use of resources. "

*Discussion Leader:*

J.G. Baer, Switzerland.

*Rapporteur:*

G. G. Watterson, IUCN.

## CHAPTER IV

# THE CONFERENCE TOURS

*Objectives:* The purpose of the study tours, organized as an integral part of the Conference and sponsored by the Tanganyika and Kenya Governments, with financial assistance from the Swiss and Swedish Governments, UNESCO, the Deutsche Afrika-Gesellschaft, the Fauna Preservation Society and the American Conservation Association, was essentially to illustrate and emphasise the basic conservation principles discussed. A detailed Tour Guide entitled " An Introduction to the Landscape, " compiled by Mr. and Mrs. Lee M. Talbot of the U.S. National Academy of Sciences' Wildlife Research Project, and Mr. H. Lamprey, Tanganyika's Game Biologist, with the help of a large number of individuals and organizations, provided the participants with background information at all points of significance along the field trip routes. The Guide included a useful section on such basic principles as climate and desiccation, vegetation succession and stability, grazing and over-grazing, food preferences of wild and domesticated herbivores, the effects of fire, and water conservation.

The mid-Conference tours served to illustrate the more technical subjects, which were considered during the first part of the Conference, namely the present role of natural resources of wild lands in local economy and the possibility of its increase, patterns and problems of research, conservation and development and the place of nature conservation in land-use planning. They also provided a background for the more general subjects namely the cultural and economic asset of African wildlife, the integration of the conservation and development of wild resources within the programme of economic development in modern states, local human attitudes to natural resources and their use, and development of an appreciation for the need of conservation of nature and natural resources, which was the theme for the second part of the Conference.

The post-Conference tours furnished diverse examples of both good and bad land-usage and project development, and brought home a deeper

and more vivid appreciation of the resource, its value, and the manner in which it can be fully and properly exploited to provide long-term sustained yields and contribute effectively to economic and social development. They demonstrated that the alternative, under present circumstances, is an intensification of primitive land-use practices which threaten to reduce the actual subsistence standards of living yet further, result in accelerated deterioration and a lowering of the soil's already meagre capacity for supporting human life, at a rate far in excess of any capital input which could provide alternative means of livelihood.

The identity of the natural resources was made evident; their values, direct and indirect were stressed; the ways in which they are being exploited and their potential under sound methods of development and use, were illustrated; and the results of both constructive and destructive usage were clearly brought home by visits to originally comparable areas that had degenerated more or less severely according to the usage to which they had been subject.

#### *Tour Itineraries*

*Mid-Conference:* The first of these took the participants from the rapidly growing township of Arusha westward to the Lake Manyara National Park, thence up to the Ngorongoro Crater Highlands and into the Ngorongoro Crater itself. The second led from Arusha, through the progressive and wealthy township of Moshi, to Marangu situated on the lower slopes of Mt. Kilimanjaro where, as on Mt. Meru in the Arusha District, intensive cultivation of coffee and terraced bananas plantations thrive; thence through Loitokitok in Kenya Masailand dry country, much eroded by bad management of domestic livestock; and ending with a night in the Masai Amboseli Game Reserve before the participants returned to Arusha via Namanga.

*Post-Conference:* The main study tour was of ambitious conception. After following the same route to the Ngorongoro Crater, where one night was spent on the rim, the safari continued to the Obalbal depression and onto the open Serengeti Plains, passing Olduvai Gorge, where Dr. Leakey has unearthed a most significant series of relicts of prehistory.

After traversing the harsh, dry country of the eastern Serengeti, all too often devastated by misuse, the travellers reached the welcome contrast of a naturally balanced environment which characterises the Seronera Camp of the National Park. After a night's stop the route led northwards into the Kenya Mara Reserve, recently handed over to Masai responsibility

and administered by the Narok District Council, where a night was spent in a tented camp near the well-wooded Mara River. From there the participants proceeded across the Loita Plains to Narok at 6,200 feet elevation, up to the Mau summit at 9,500 feet and down again to Nakuru in the Great Rift Valley. It is on Lake Nakuru, famed for its flamingoes, that a bird sanctuary, under the aegis of the Royal National Parks of Kenya, has recently been declared. Leaving the Rift Valley via Thomson's Falls, the party travelled to Nyeri, where a brief morning visit was made to "Treetops," one of the best game-tourist attractions yet established anywhere in the world. The route then led up through the highland forest and moorlands of the Aberdares, down into the Great Rift Valley again and finally to Nairobi, whose Royal National Park, although only 40 sq. miles in extent, well illustrates the variety of habitat required by a typical group of animal species and, also, the strong popular demand which so readily springs up in urban areas for recreational facilities in natural surroundings.

Other post Conference tours gave those with less time at their disposal opportunities of visiting local points of interest in the Arusha neighbourhood, which they had been unable to see during the Conference and the mid-Conference field trips.

## CHAPTER V

# THE RECOMMENDATIONS

### I. AFRICAN SPECIAL PROJECT (ASP) - STAGE III

The Conference has clearly brought out the earnest desire of modern African States to continue and actively expand the efforts already made in the field of wildlife management.

These countries RECOGNIZE their responsibilities, and the rightful place of wildlife management in land-use planning.

The Conference is encouraged by the numerous offers of technical and financial help from international, national and private sources.

It STRESSES, however, the overriding need for ensuring that such necessary assistance be channelled in such a way as to avoid wasteful application, and thus encourage outside aid.

It therefore warmly COMMENDS the implications of Stage III of IUCN's African Special Project as an essential follow-up to this Conference and the change of attitude which it has so clearly brought out.

The establishment of Stage III is the only known effective means whereby situations and needs in Africa can be analysed and assessed, priority determined, and help from outside adequately and impartially channelled.

The Conference URGES Governments who wish to integrate wildlife management in its proper place in their overall plans for land-use and development, to consider IUCN as the organization responsible for advising such Governments on how best to proceed, and for guiding all aid so that it can be most effectively used in the overall interests of the Continent and its peoples.

The effective establishment of IUCN's ASP Stage III requires not only the moral support of African Governments and cooperation from all sources of outside aid for specific projects, but it requires financial assistance for which the Conference looks to outside bodies and especially to the United Nations. The effective application of such assistance

will depend on the adequate support of existing governmental services concerned with wildlife conservation.

## II. EDUCATION AND TRAINING

Education and training in conservation at all levels, up to and including University, have been fully recognized by this Conference as essential to the successful development of wildlife conservation in Africa. Education should reach everyone, from the local rural communities living in close contact with wildlife to the highest levels of government authority.

Governments can, with guidance and a minimum of financial aid, go a long way towards arousing public awareness.

The Conference looks to UNESCO for support in this direction, by assisting Governments in the preparation of teaching material, related to the local environment and to the principles of conservation in terms of local needs and possibilities and by affording guidance and help in mass education media. At the same time facilities and qualified technical staff are needed for the training of personnel directly responsible for all aspects of wildlife management. The conference looks to FAO and CCTA for support in this connexion.

Facilities must be made available quickly, and in an appropriately-distributed pattern, in Africa. They must cater separately for students at the sub-professional and professional levels.

The Conference therefore URGES interested Governments, with the support of, and in consultation with, IUCN, to seek technical and financial assistance from the U.N. Technical Assistance programme and Special Fund, and other sources, in their efforts to establish these national facilities for regional use.

## III. LAND USE POLICIES

Recognizing that there is already a serious deterioration and destruction of vital natural resources of Africa and that increased medical facilities and a rise in general living standards will, in the future, inevitably lead to expansion of human populations at greatly increased rates;

Recognizing that there is an urgent need for the investigation of land-use systems and techniques in Africa; *The Conference RECOMMENDS*

a) that the Governments should give immediate and active consideration to further investigations and research on the *integration of wildlife with domestic livestock* on an economic and conservation basis;

b) that Governments should establish planning organizations to prepare *land-use policies* based on sound principles, and to *avoid the occupation by agricultural and pastoral communities of land unsuited for such use in the long term*;

c) that Governments should draw up *written wildlife policies*, in relation to their general land-use policies as has been done in Northern Rhodesia;

d) that Governments should take note of the *great potentialities of wildlife* in the development of an expanding Tourist Industry, and the *desirability of direct benefit from such sources to the local human populations* of the areas involved.

#### IV. ECONOMIC ASPECTS OF THE DEVELOPMENT OF NATURAL RESOURCES

In view of the loss of scarce capital through shortsighted investment in projects which have failed to take account of ecological science, and the needs of conservation;

The Conference RECOMMENDS that the contribution which economists can make to the principles and techniques of development of the natural resources of Africa should be thoroughly reviewed by them in the light of the obligations of trusteeship, modern ecological and conservation studies and recent advances of research into resource economics.

To this end, the Conference STRESSES the need for close co-operation between the international agencies concerned and the economic departments of universities and other similar bodies in Africa and elsewhere.

#### V. CONGO PARKS

Considering the interest hitherto shown by IUCN in the National Parks in the Congo;

Considering it necessary to continue such encouragement;

Considering the resolution adopted by the General Conference of UNESCO at its 11th Session;

The Conference EXPRESSES its warmest congratulations to the Republic of Congo (Leopoldville) for its admirable attitude towards the National Parks, an example without precedent in Africa.

It EXPRESSES the hope that assistance will be forthcoming and that the status of strict reserve of the National Parks will be maintained.

## VI. PRESERVATION OF TYPICAL HABITANTS IN AFRICA

RECOGNIZING the need to create throughout Africa a type collection of natural habitats assured of definite preservation and constituting a representative sample of as many varied environments as possible;

CONVINCED that these types of areas have, apart from their obvious scientific value, a special significance as enduring products of natural evolution in contrast to areas subject to modification by man;

The Conference EXPRESSES the wish that in every country the concept of Strict Natural Reserves as officially laid down by the London Convention of 1933 will be applied wherever possible, and that all necessary precautions will be taken in the setting up and managing of such reserves and, in particular, that a qualified scientific body will advise both on the choice of the areas selected and on the research to be undertaken within them.

## CHAPTER VI

### THE FOLLOW-UP: ASP STAGE III

The discussions that took place at the Arusha Conference, and which have been summarized in Chapter III, concluded Stage II of IUCN's African Special Project. But, as the President of IUCN, Professor Jean Baer, said in summing up the last item on the Conference agenda, the end of the Arusha meeting may be regarded as the beginning of a fresh era, a " new look on wildlife " for the African Region—and indeed for the rest of the world. "

" It is even more than that, " he continued. " We have met here among delegates from nearly all parts of Africa and have learned to appreciate one another and to come to a better understanding of our individual problems. I feel that this human approach to the problem has been the indispensable prelude to our future activities on an official and administrative basis. But we have also gained a greater confidence in our own activities through the echoes we have heard from the emerging African States from men who are fully aware of the present and future responsibilities that rest upon their shoulders. "

" The Conference has " in the words of Mr. Peter Scott " not only been a success; it has also provided a tremendous stimulus to conservation. Without doubt, great difficulties still lie ahead. But without your work, your presence here, your active participation in the Conference, your will to attain lasting results—all this would have remained as it stood yesterday. The success of the Arusha Conference and the follow-up that begins immediately is your work. It is a confirmation of the confidence with which IUCN accepted this task, and IUCN thanks you. "

The concept of IUCN's African Special Project was such as to ensure a series of actions leading from the initial arousing of interest at Government level, through a fact-finding Conference, to an action programme in individual interested countries of Africa where responsible Government services would be shown how to help themselves develop and integrate their wildlife resources into their economic and social expansion

plans—and where outside aid would be encouraged along the most effective lines.

From the Conference Stage II, we therefore move to Stage III, the formation of a team of two consultants, selected because of their long practical experience in Africa—the one in ecology and wildlife management, the other in fields of land-utilization which, in some circles or under certain conditions, may be regarded as conflicting with the development of wildlife as a proper, justifiable form of land-use : namely, agricultural crop production, forestry and domestic livestock breeding. The two consultants thus complement each other and constitute a unit which, in close consultation with local interested technical services, is well qualified to assess the wildlife resources of a country, and their economic potential as a basis for land-use in selected areas, compared with other possible forms of utilization, or, alternatively, as one of several under a system of multiple use.

Specific objectives will vary with each country and the level of approach will also vary depending on the extent to which conservation and wildlife servicing activities are already developed. They include :

- i. Obtaining *a)* a broad perspective of the renewable natural resources available, *b)* the extent to which they are exploited, *c)* the various programmes for conserving these resources and *d)* the effectiveness of these programmes.
- ii. Learning the extent to which wildlife is or could be important to the organizations responsible for marginal or wild lands, or connected with tourism.
- iii. Obtaining a perspective of local training needs in those departments dealing with marginal or wild lands; particularly with respect to wildlife servicing activities and, on a broader basis, studying the extent to which conservation education is incorporated into all levels of education.
- iv. Studying the extent to which research is contributing to the solution of conservation problems in which wildlife is involved.
- v. Making contact with existing and potential field investigators, acquainting them with other workers in their field in other parts of Africa, and putting appropriate individuals and organizations in touch with the Stage III handbook project.
- vi. Dealing with any specific requests by governments insofar as this is possible in the time available in each country.

- vii. Paying particular attention, when visiting wildlife areas, to research opportunities or fact-finding activities especially suited to the local field men or biologists and to the problems on which they are working.

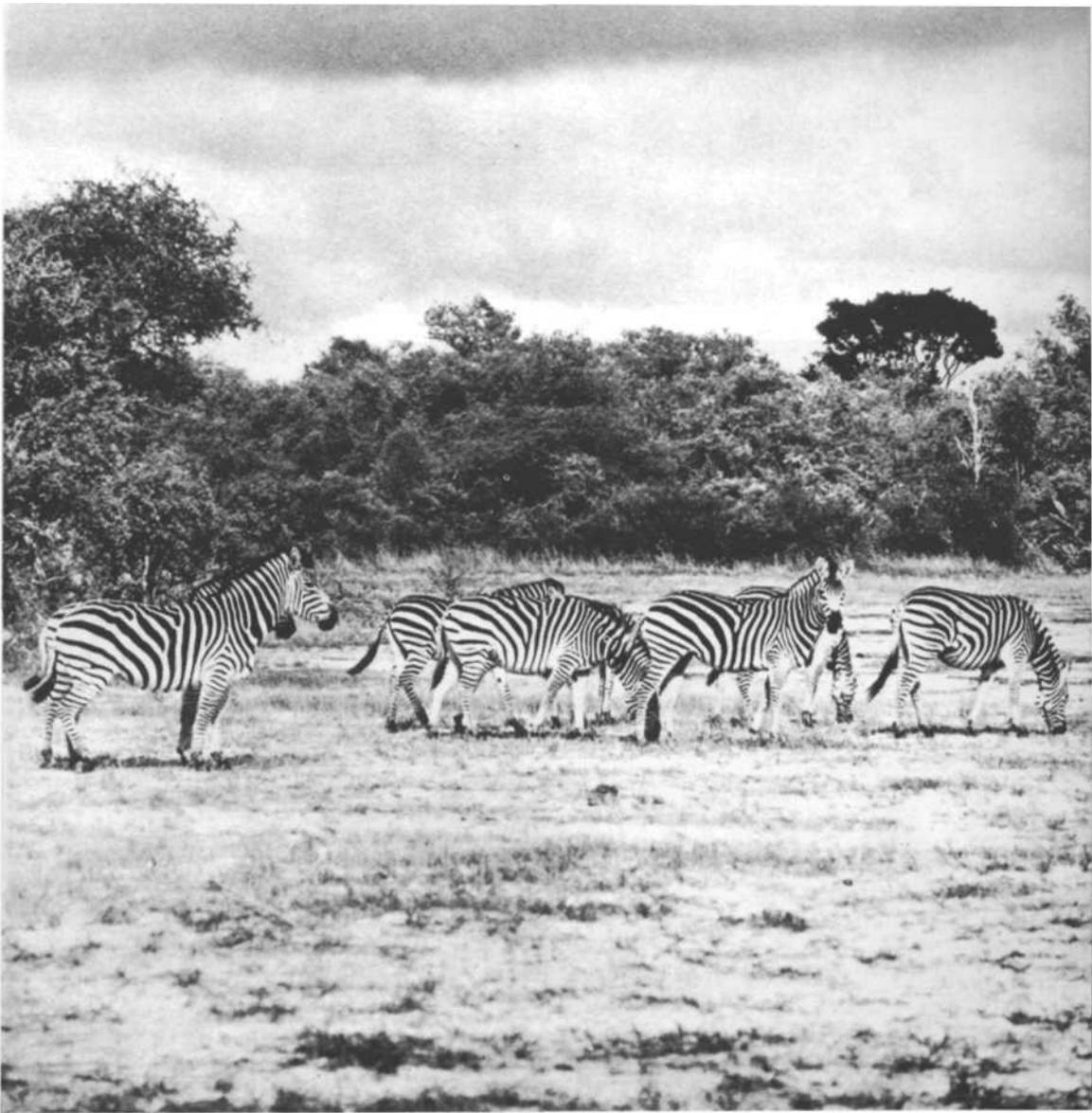
The initiative rests with African Governments. Requests for ASP III aid can be made at any time and will in general have the following *modus operandi*:

1. As far as possible they should specify the scope of the consultations required, and give some indication of the extent to which the means, financial or otherwise, to follow up recommended, conservation projects are available;
2. Requests should be addressed to the Secretary-General, IUCN, Morges, Switzerland, and to the Director of the Forestry and Forest Products Division, FAO, Rome;
3. Requests are examined by the IUCN Secretariat in consultation with the members of IUCN's Advisory Committee for the African Special Project, with a view to assessing priorities and preparing the programme for two tours each year by the Consultants;
4. Priorities are determined in the light of factors such as :
  - a) time of year most suitable for the survey;
  - b) the extent to which requesting Governments are considering integration of wildlife into the overall economy;
  - c) the mechanism already established for following through the results of the mission;
  - d) the degree of applicability of certain aspects of wildlife conservation work to large areas both within and beyond the limits of the country in which the survey is to be made;
  - e) the availability of persons whom it is important to contact in the country concerned (which will partly depend on such factors as University terms, current research programmes and development projects).

#### CONCLUSION

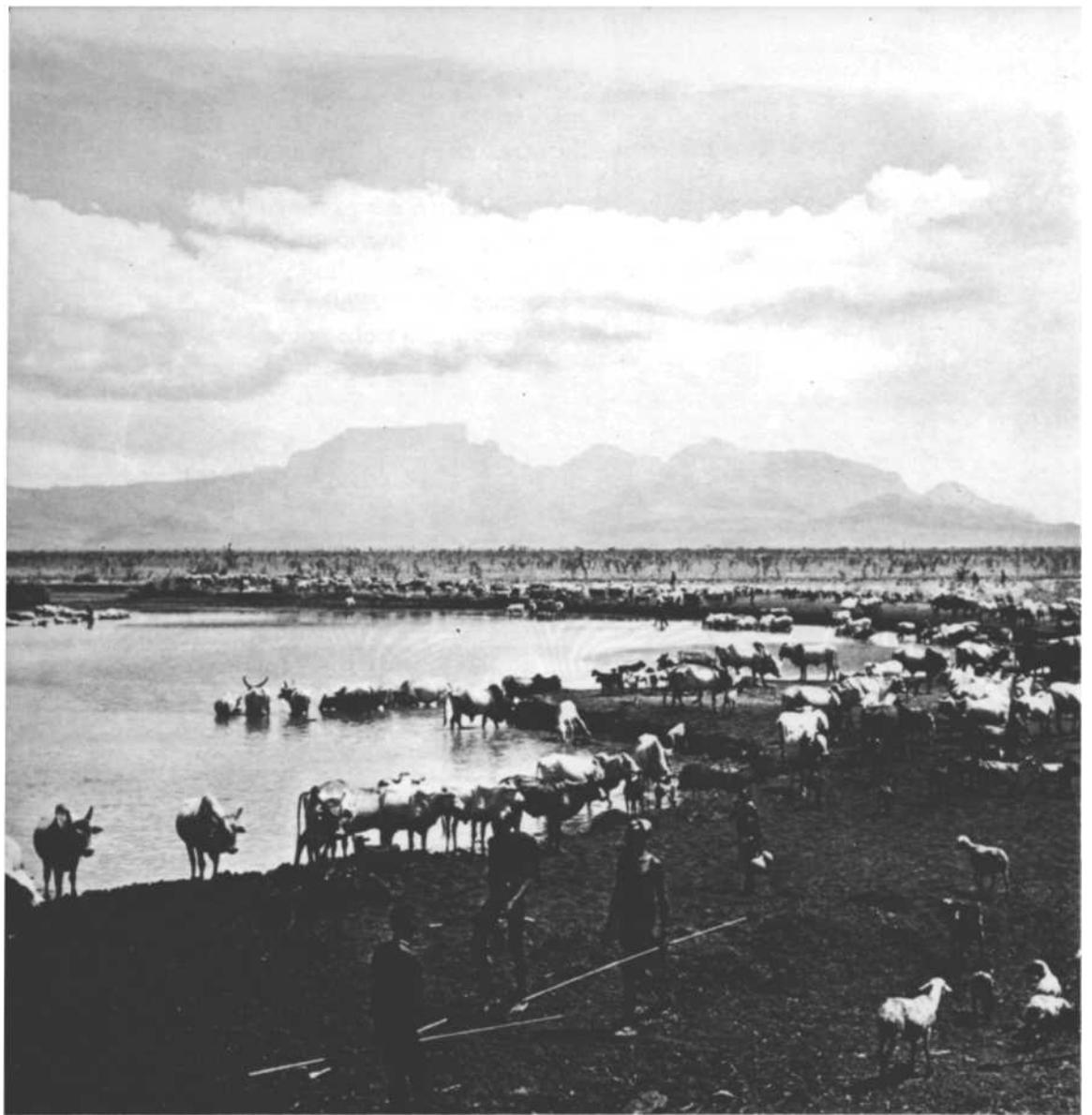
The success of a Conference must eventually be gauged, not by the number of participants, the volume or quality of the documentation, or the contents of the recommendations formulated, but by the amount of positive action that it has promoted. Upon the support given by African

Governments to the Arusha Conference recommendations, depends the degree of opportunity for constructive work that will be given to the ASP III consultative team in the efforts to secure the future of Africa's heritage of wildlife. The success of such efforts is likely in turn to have a far-reaching effect on future programmes envisaged by IUCN in other regions of the world, where wildlife is still unrecognized or neglected as a resource that can contribute to human welfare.



UNESCO/T. Riney. 1961.

Zebra in the Wankie Game Reserve, S. Rhodesia; in excellent condition despite poor ground-cover.



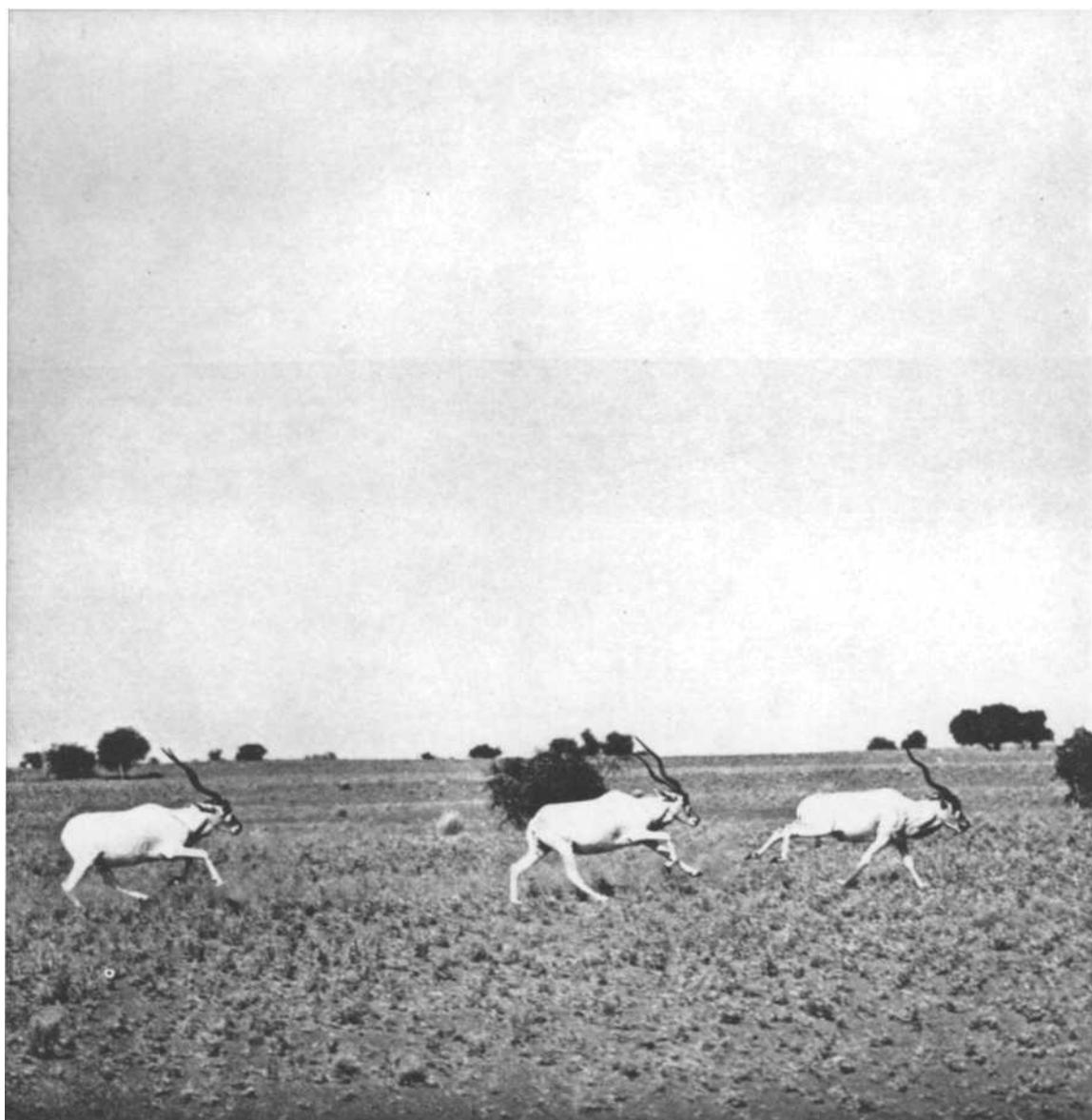
UNESCO / J. H. Blower. 1961.

Cattle at the dam in the Debasien Game Sanctuary, S. Karamoja, Uganda. Destruction of the habitat by excessive numbers of domestic stock in poor condition does more harm than poaching.



UNESCO J. H. Blower. 1961.

Herd of over 160 elephant in the Acholi Elephant Sanctuary, N. Uganda. Despite a bio-mass of some 7,500 tons, the grass cover is in excellent condition, and the soil therefore well protected. Tree cover has however practically disappeared, and research is needed to determine the correct level of numbers for such areas.



T. Riney. 1962.

Addax near the southern limit of their range, at about  $16^{\circ}$  north latitude, in Tchad. This typically Saharan animal is the most drought-resistant of all the African ungulates, being entirely independent of surface water. The major threat to this species comes from alteration of its habitat by large herds of camels which accompany nomadic Arabs into the dunes of the southern Sahara in the wet season.



P. Flizot.

Part of a herd of over a thousand hartebeest in the Waza National Park  
in N. Cameroun.



UNESCO/J. H. Blower. 1961.

Kidepo Game Reserve (now National Park), N. Uganda. Countryside blackened by the passage of a bush-fire, destroying the grass cover and exposing the soil to excessive weathering.



UNESCO / J. H. Blower. 1961.

Suk, W. Kenya. A more advanced stage of gully and sheet erosion resulting from soil exposure through overgrazing by cattle and goats.



UNESCO J. H. Blower. 1961.

Karamoja, N: Uganda. Erosion gully after heavy rainstorm in an area where the grass cover has been largely destroyed.

## Appendix

# LOCAL HUMAN ATTITUDE TO NATURAL RESOURCES AND THEIR USE

by

MAHMOUD ABU SINEINA  
Game and Fisheries Division of the Ministry  
of Animal Resources, Sudan

The Sudan is a vast country extending 1,250 miles North and South and 950 miles East and West covering an area of over one million square miles and ranging through eighteen degrees of latitude. It has got a great variety of climate and physical features producing different game habitat. It covers waterless desert in the north west, the Savannah in the central Sudan, and swamps, mountains, and gallery forests in the south. Each of these areas has its distinctive climate and specialised fauna. On the other hand in spite of the fact that the Sudan is a vast country with comparatively very thin population, there are many different tribes, with different tribal traditions and customs and their attitude towards wild animals is also different. If the details of different attitudes towards fauna are to be discussed accordingly this space will be far too small. In brief some of the tribes are disinterested in wild animals as they have got very few in their parts of the Sudan. Some tribes consider wild animals are there to be hunted and they go after dangerous game to get prestige among their own tribe. Other tribes hunt for the sake of meat and what little money they can get for their trophies. The Baggara tribes who are the nomads of the western Sudan are very keen hunters, their knowledge about wild animals is extensive and their ways of hunting are very tough and dangerous. They have for hundreds of years been traditional hunters—they hunt Elephant, Giraffe, white Oryx, and Addax on horseback riding their quarry down and spearing it. In the eastern Sudan some of the Beja tribes who are living in the region of the Red Sea Hills used to hunt wild sheep and Ibex by chasing them through narrow defiles by dogs. In the southern Sudan, the Nilotic tribes are cattle breeders and they do not take keen interest in hunting wild animals but they happen to hunt animals they find on their way while they are looking for pastures for cattle. Other tribes who live mainly on meat of wild animals used to hunt by different ways including ring fire, pitfalls, and other cruel ways which are now stopped by law.

In the past and as early as the beginning of the century, there used to be a most devastating form of mass slaughter of wild animals commonly used against elephants in particular, and this was the ring fire. Also another indiscriminate and cruel way was the pitfall. Not until 1933 was proper legislation to help conservation of wild fauna passed and the present Game Preservation Service was originated to look after wild animals and enforce laws which give special consideration to the following points :

- a) The protection of rare animals in accordance with the internal and international considerations.
- b) Control of hunting methods and limitation of hunting of certain species.
- c) Protection of life, crops and livestock against damage by wild animals.
- d) Provisions for legal shooting for sport.

Tribal beliefs play a good part in the conservation of some of the wild animals. The Dinka who are the biggest tribe in the Sudan are an example. Most of the Dinka clans believe that they are related to certain wild animals and they treat that animal gently and respectfully and protect it against any harm by other clans. The Shilluks who are also a big tribe in Upper Nile consider that the Mrs. Gray Lechwe are the property of their old King (Reth) and that they should not be touched without his consent—as a result their Fanyikang Island is now over-stocked with Lechwe. The Zande tribe who are very active hunters and depend mostly on Game meat for protein never touch the Bongo believing that it causes leprosy. And there are many other examples.

It is generally realised by both the Government and enlightened Sudanese that wild fauna in the Sudan is a magnificent national heritage which provides economical, scientific, educational and recreational values. On the other hand, the Game laws are not very popular with the ordinary man who hunts to feed himself and family, particularly because they are of recent origin and because he does not understand the reason for restricted hunting. It is perfectly true that the Government encourages hunting but not by the wasteful and cruel methods used in the past. As wild animals provide an essential part of the diet of some of the tribes, the Government is giving permits for about six hundred elephants every year mainly for meat, in addition to unlimited numbers of the smaller and commoner animals for which no permits are required.

At present the whole task of the conservation of wild animals lies on the shoulders of the Game Preservation Staff, helped by enlightened individuals. The penalties for breaking the Game Preservation Ordinance are rather heavy but this is not enough. It is very important to help the ordinary man acquire some sense of the value of his country's wild life by simple methods such as short films and simple literature.

In conclusion, it must be stated that the Sudan still holds big numbers of wild animals of many species and well distributed. There is no conflict between wild animals and livestock while the Veterinary Department shares our hopes and belief that science can enable cattle and game to exist together without spread of disease. The country is vast and there is enough land for agricultural schemes without having to drive wild animals from their wild habitat. The dangers of the tribal hunting and mass killing of animals is now reduced to a minimum. As regards the dangers of the firearms and illegal shooting the situation has improved considerably of late. Poaching by firearms reached a peak after the second World War when a big number of rifles and ammunition came into the hands of outlaws in remote parts of the Sudan. These rifles have caused a great damage to wild animals specially at Dindir and Rahad near the Sudan-Ethiopian border. This has continued for several years and could only

be stopped by armed Police and Game Scouts. There is also a problem with Muzzle-loader guns. These weapons have been introduced in some parts of the Sudan early this century and have come into the hands of some tribesmen by inheritance. They lack the killing power of a rifle and they are dangerous to the persons who use them. There are now about some nine hundred Muzzle-loaders in the country and the people who own them do not want to get rid of them; but we are planning to collect and destroy them as soon as possible. As for the possession of modern rifles in the Sudan the laws are very rigid, and only qualified Sudanese are allowed firearm licences.

Wild animal life in the Sudan still needs much further scientific research. Up to now there is no research branch in the Game Preservation Division of the Ministry of Animal Resources. We were extremely lucky that Professor F. Fraser Darling accepted our invitation to visit the Sudan and give his valuable advice and views. His very constructive report and recommendations are meeting with great interest from the Sudan authorities and we hope that our research branch will be started soon.

## NORTHERN RHODESIA

Special problems of controlled areas,  
national parks, " strict natural reserves ",  
other nature reserves and  
forest reserves which contain wildlife

by

R. I. G. ATTWELL and B. L. MITCHELL  
Game and Fisheries Department, Ministry of Native  
Affairs, Northern Rhodesia

### I. NOMENCLATURE

The *controlled hunting area* as originally planned is a Northern Rhodesian concept which has been adopted by other territories. Subsequently the concept has been modified in Northern Rhodesia by the introduction of first and second class areas. In a first class area both residents and non residents being in possession of a licence may hunt only if granted a permit specifying certain conditions of hunting. Thus both the numbers of hunters operating, and species and the number thereof to be hunted, can be controlled. In a second class area, any resident being in possession of a licence may hunt in accordance with its conditions—only non-residents require a permit as well.

The single *National Park* is situated in Native Trust Land. Such land is governed by the Northern Rhodesia Native Trust Land Orders in Council which contained no provision for national parks. Accordingly a doubt existed as to the status of the national park and a similar doubt existed about the validity of the territorial legislation governing access and control of visitors. These problems could only be solved by amendments to the Order in Council.

There is no *strict natural reserve* in Northern Rhodesia. *Other nature reserves* are represented by game reserves in which hunting, entry and residence, carriage of firearms and lighting of fires are controlled. A special problem is created where an overlapping of interests occurs; in one small game reserve situated on the outskirts of a township, health requirements demanded the clearing of reed beds, thus destroying vital habitat; hippo control was carried out to protect the nets of a fish cropping scheme; nurseries of exotic trees were planted by Forestry authorities who had rights. In such areas, the superimposition of other interests on wildlife conservation requirements detracts from the status required by the definition of game reserve. The game reserve was declared after the Township was established.

## II. HUMAN ATTITUDES

To all wildlife land categories as enumerated in the title, human attitudes are generally such as to show *a lack of appreciation of wildlife* as a primary natural resource requiring conservation for sustained yields. Despite the fact that to Africans, more especially those resident in tsetse areas, many species are important as a source of protein, little notice is taken of the need to regulate the use of this renewable resource.

Education of all age groups in wildlife conservation is at present limited to a very small section of the population; thus it is the more difficult to gain the necessary support when management, or other schemes including wise use of the faunal resources, are involved.

Wildlife lands are the least likely to be mapped because they are often marginal in the agricultural sense, or devoid of human population; and lack of mapping has led to considerable difficulties particularly in the development of the territory's only national park, the Kafue. Here, eleven years after gazetting, boundary issues are still unsettled, but the major difficulties have now been resolved.

More especially applicable in controlled hunting areas, is the problem of the considerable *delays* which can ensue before action is taken on urgent conservation problems; this is due to the necessity for consultations in detail with local tribal authorities. In such consultations tribal authorities are often more conscious of the customary rights of hunters and fishermen than of the need for care for the resource involved.

A *recruitment problem* in respect of conservation staff exists: if recruited from local tribal authorities, often a marked reluctance to enforce regulations among their own kith and kin is noticeable.

## III. FIRE

In all faunal areas only two possible burning policies are open, either to perpetuate the original habitats by following the traditional pattern of firing under which the local biota evolved or, by skilful manipulation of burning patterns based on research, to improve the carrying capacity of the range. Extraneous fire can only damage and nullify these policies ending in severe degradation of the habitat.

Forest Department policy, aimed mainly at conserving a tree cover, is to encourage an annual burn early in the dry season over all areas where such vegetation is desirable. Unfortunately, this policy has been adopted in almost all other areas, and what is good forest policy is not good wildlife policy; amongst ungulates, a period of stress follows extensive early burning, the grazers suffering most whilst the cumulative effort of this policy is bush encroachment and degradation of pastures. The temporary palatability to grazers of the post-burn flush of grass gives a false impression that the policy is desirable. However, some species suffer severely as the dry season progresses. The early-burning policy, leading to the removal of original dry

season forage, causes animals to seek food elsewhere; a likely result being increased destruction of timber trees by elephant.

Adequate protection of boundaries even of the national park is beyond present departmental resources, and other faunal areas, too, are continuously exposed to fires sweeping in on the prevailing wind from outside settlement. Under present conditions fire protection in controlled areas is impossible as they mostly contain villages. This is undoubtedly because of present human attitudes to fire. As Fraser Darling says "... it is so easy to indulge in self delusion that fire is necessary in African land management and that, whether it has been or has not, annual firing is the custom now and it is impossible to prevent it." In fact, where a controlled area adjoins the national park or game reserves, it is necessary for the faunal department itself to sacrifice the former in order to protect the more important latter.

#### IV. RESOURCE UTILIZATION

Controlled hunting areas were devised with a view to allow for cropping protein by residents on a long term basis. Although the law requires the kill to be recorded on the licence, this is frequently omitted due to illiteracy, negligence or dishonesty when overshooting. Consequently it is impossible to obtain an accurate picture of the total kill. This figure is essential not only in the direct interests of game management but also to demonstrate the true value of the resource which at present is not fully realised. In this and other ways, the management of controlled areas, while based on sound principle, is crude. In the second class areas there is no limit to the number of licences sold. There is consequently no limit to the total crop taken. These areas will provide no sustained yield and therefore cannot serve a real conservation purpose indefinitely.

Population increase and industrialisation have led to the development of illegal commercial exploitation of the resource, with a correspondingly greater use of out-lawed off-take methods, more especially snaring. The wide lack of appreciation of the real value of the resource is a main obstacle to wise management.

A management scheme involving the use of the village hunter for cropping game in place of the disciplined Government servant would fail; the success of such a scheme inevitably depends on meticulous methods being used. In addition, local rackets would almost certainly develop.

Hunters always fire the range early in the dry season for better visibility and to attract grazers to the early green bite, and such uncontrolled burning on a large scale is directly opposed to fire policy aimed at proper wildlife conservation.

In the national park and game reserves, tourist requirements call for some early burns, after wet season tall grass growth, for the display of game, and this may conflict with burning policy in areas which cannot stand the luxury of a burn.

We believe that an imaginative, comprehensive plan applied to the faunally rich Luangwa Valley could prove to African Governments to be the demonstration *par excellence* of how faunal resources can be exploited to full advantage.

Probably nowhere else in Africa could all ramifications of the wildlife business be manipulated in one compact area having little apparent possibilities of other economic development. But for full success, resettlement involving considerable financial outlay and other difficulties would probably be necessary.

## V. RESEARCH

Effects of different firing patterns require intensive research and the results of this work, combined with a study of feeding habits and seasonal movements of ungulates, will contribute towards knowledge vital to the game management schemes. A start has been made on this work, but the scope is strictly limited with one research worker engaged in the national park. Conditions vary so much in other faunal areas that results will not necessarily be applicable elsewhere. The national park itself is inadequately covered, the more especially as the time of ranger staff is to a large extent occupied in tourist development; with the result that their contribution to research projects is limited. Recently recruitment of suitable staff has been difficult.

## VI. SPECIAL CONCESSIONS

These include traditional tribal, and mineral prospecting rights, and these together constitute a problem only in some game reserves and in the national park. *Tribal rights* include fishing and rights of way and indirectly can lead to considerable difficulties: the latter, especially, leading to fire raising. Fishing concessions must need allow of temporary residence and—despite the imposition of certain conditions of entry—fire and general wildlife disturbance occur, while habitat wear eventuates as a result of certain vegetable materials being required for fishing practices. Activity at pools obstructs the passage of animals to water, and a direct effect of fishing in pools is the killing of crocodiles; further, breeding colonies of birds in the vicinity may desert. Some of the fishing activity in the national park mushroomed into a large scale commercial enterprise—a complication unforeseen when the rights were first acknowledged at the time of the park's gazetting.

In fact, exploitation of the fish resource has in certain areas brought the exercising of the concession into violent conflict with the general interests of nature conservation, not necessarily because of non-observance of the regulations by the fishermen.

*Prospecting and mineral rights* by holders of licences are especially honoured in the faunal legislation, and as long as these rights exist, the future of sanctuaries is hazardous; the possibility of a rich strike may result in large scale mining operations. Under such circumstances, it is difficult for a government to invest the large sums of money necessary for optimum development.

THE EDUCATION AND TRAINING  
OF AFRICANS FOR SENIOR POSTS  
CONCERNED WITH WILDLIFE CONSERVATION

by

L. C. BEADLE  
Makerere College Kampala, Uganda

It seems to me obvious and supported by experience in more highly developed countries that popular support for wildlife conservation reflects a relatively sophisticated attitude which cannot be firmly established nor defended against shortsighted exploitation in the name of " progress " without enthusiastic support from a sufficient number of educated and influential people. It is also true that the production and training of personnel for work in this field is inseparable from the general educational problem. You cannot expect more than rare and exceptional recruits to these services in the absence of understanding and support from at least a section of the educated public, and conversely the more these posts are filled effectively by Africans the more rapidly will educated and popular support become firmly established. This is the vicious circle which we are working to break.

It is generally true, though there are an increasing number of exceptions, that the attitude we should like to see is rare among the older generation of East Africans, and the basic educational problem, as in relation to many other matters, is to foster attitudes which get no support in the home. But this is a problem familiar to teachers elsewhere and I should say from my experience of university teaching in Britain and East Africa that the difference is one of degree and I would add that amongst teachers here hope for the future is roughly proportional to the amount of teaching previously done in a more advanced country.

We have to consider what are the incentives which bring people into this kind of work and how they can be fostered under the conditions in this country. They are of course attracted, like other people, by high salaries but as much because these indicate public recognition of the relative importance of the work as for the value of the money. During the past few years we have been finding at Makerere some increase in the number of our students who are genuinely interested in Natural History and in the scientific basis of these problems, and this, as we must admit with ourselves, is the most powerful and indispensable motive.

This improvement is no doubt partly due to our own accumulated experience and to the rising standards in the secondary schools. But interest should generally appear much earlier and it will be another generation before children in this country will get inspiration from their parents or elders. No amount of formal courses and examinations will help in this; in fact the problem is to

prevent these from stifling the germs of genuine interest. In this respect we are indebted to our co-examiners in the University of London for the B. Sc. in Zoology and Botany for their support in insisting on the importance of firsthand local knowledge and the use of local examples to illustrate general principles.

There comes then the question of specialised postgraduate training and the time at which this should be done. In general it is preferable after a spell of work in the job itself. This gives the additional insurance that the right man has been chosen, but the most important advantage is that he is more mature and experienced and is able to understand better the relevance of the post-graduate course and to benefit from it.

It is certainly true that a really good man with some experience of the job will be much stimulated and broadened in outlook by a spell of work or study in another country, and at some stage in his career he should have this. On technical grounds, however, it is surely desirable that high level postgraduate training in Tropical African Ecology and Wildlife Management should be conducted in Tropical Africa. I suggest that to develop this properly would be another most effective way of spending money which may become available for training in this field. It would, I am sure, be of great value also to the Agricultural, Veterinary and Fisheries services and might well attract students from abroad. Its presence in this country could do much to enhance the local prestige of Wildlife Management and to stimulate greater awareness of the problems of conservation among the people.

In conclusion I would like to emphasise what I have implied already that the number of African graduates who are both suitable for and want to do this kind of work, is very small indeed. This is due to the as yet small total number of graduates and to competition from other professions. The situation will not be materially improved by offering scholarships for undergraduate or post-graduate training overseas. In my opinion, in spite of the urgency, no real progress can be made until much more is done at the school level to stimulate interest in Natural History in the field and, what is equally important, there is a recognised profession which will be regarded by all, especially the older generation, as of status comparable with that of a doctor, teacher etc., It will be a long time before the approval of the father ceases to be an overriding factor in the choice of a career. The institution in this country of a postgraduate course leading to a Diploma in Tropical Ecology comparable, say, to the Diploma in Tropical Medicine would not only provide the right training but could help to give status to the profession.

# THE PROBLEM OF THE CROPPING OF LECHWE ON THE KAFUE FLATS, NORTHERN RHODESIA

by

C. W. BENSON  
Game Department  
Northern Rhodesia

The general account of the lechwe of this area by Mitchell and Uys was published in the second issue of *Oryx* for 1961. The present note deals with the problem of their actual capture rather than with their subsequent slaughter.

As explained by Mitchell and Uys, on Lochinvar Ranch, the present main area of concentration of lechwe on the south side of the Kafue Flats, there is an undue preponderance of males to females, due to excessive slaughter of the latter in the communal hunts which lasted until 1957. The percentage of adult males to the total population on Lochinvar may be as high as 60 %. By contrast, in the Bangweulu area, where these intensive methods of hunting have not been employed, the proportion is probably not more than 30 %. A considerable number of these excess males could be cropped now, without detriment to the population as a whole. At the same time this would be a first step towards realisation of rational exploitation of this valuable resource.

Cropping by shooting is considered to be out of the question, as the resultant disturbance would be far too great. Dr. Fraser Darling (*in litt.*, 3.4.58) suggested that a method similar to that used on the 1,200 square mile island of Nunivake, Alaska, for the cropping of reindeer might be adapted to local conditions. There, all the able-bodied individuals out of a total human population of about 225 turn out to assist. The animals are surrounded and gradually driven during a period of one week to ten days into an oval-shaped corral of about 300 acres. The entrance is funnel shaped and is one mile wide at the end away from the corral, with an opening a hundred yards wide on the edge of the corral itself. Within the corral there is a further funnel and pens, into which the deer are driven, and those selected for slaughter driven into chutes. About 1,000 of the total population of 5,000 are slaughtered annually.

In the light of this advice, a small scale corralling experiment was tried in 1958. Two wire fences were erected on Lochinvar converging in the direction of the normal aquatic escape route of the animals. The fences were respectively 900 and 1,300 yards long and constructed with five strands of high tension wire, lashed to locally produced wooden poles, the uppermost strand of wire being about 4 ½ feet above the ground. They converged into a holding pen of area about 15×10 yards. The last 250 yards of each fence, towards their convergence, were reinforced with hessian, and had two extra strands added at the top, so that the height in this stretch was nearer 6 feet than 4 ½ feet.

Three trial drives were carried out, with the following results :

1. A small herd of rams was driven with the aid of four Landrovers to within 350 yards of the pen, when they stampeded, some animals passing through the fence, while one jumped it clear and another broke back past the vehicles.

2. A further 850 yards of hessian had in the meantime been added to the fences. Six Landrovers were used on the next trial, each with three passengers. The plan was to drive the lechwe well into the funnel, using vehicles only, after which the passengers were to dismount and augment as beaters the further drive by vehicles. In the event, an attempt was made to drive a herd of several hundred animals, but without success, the whole herd breaking back. It was particularly noticeable that they did so close to the vehicles, and avoided the beaters.

3. On the final occasion 50 beaters were used, at 50 yard intervals. 23 animals from a herd of about 300 were detached and driven with ease well into the funnel. Unfortunately some of the hessian had been blown down, but the lechwe did not cross it even when it was lying on the ground, though all escaped through the wire where a gap had been blown in the hessian.

It was considered as a result of these experiments, that although there had been no positive success, there should be no difficulty in catching lechwe by this technique. But it would be essential to drive the animals on foot rather than with vehicles, and the type of fencing was unsuitable.

Subsequently, it has not been possible to make any further practical progress. However, in October 1960, Mr. B. J. Hartley, while on a mission for the Food and Agriculture Organisation to investigate the economic potentialities of the Kafue Basin, visited Lochinvar. He has advocated :

1. The use of fencing uniformly 6 feet high, made of 4 inch mesh sheep netting, supported with 8 foot lengths of 2 inch piping set 6 feet apart, with two feet in the ground. This should be impassable to any lechwe, so that the use of hessian is unnecessary.

2. The placing of a few tethered decoy lechwe in the funnel, caught by the " tranquillizer shot method ".

3. Digging of three or four holes at 50 yard intervals as extensions to the two fences of the funnel. In each of these a man with a flag is hidden. As soon as the Lechwe are level with the first pair of holes, their occupants stand up and wave their flags. When they are level with the next pair of holes, the occupants do likewise, and so on.

## DEVELOPING AN APPRECIATION OF THE NEED TO CONSERVE WILD LIFE IN UGANDA

by

R. M. BERE  
Former Director and Chief Warden  
Uganda National Parks

World War II and its immediate aftermath saw a general deterioration in the status of wild life in Uganda. Before the War there had seemed room enough for the wild animals in and out of reserves; and several large areas from which human access or occupation was restricted by tsetse (i. e. either depopulated sleeping sickness areas or tsetse areas to which cattle could not be taken) acted as excellent reservoirs. During the War, and in the years immediately following, the human population increased and spread into many of the erstwhile game areas and, with only a minimum of control staff available, poaching had also become a much more serious menace. These trends, typical of a large part of Africa, have continued ever since, accentuated by tsetse-control shooting.

It is not the purpose of this paper to discuss the pros and cons of game elimination as a means of controlling the tsetse fly, except in its public relations angle. But there can be no doubt of its serious effect in this regard. One example should suffice. Early in the nineteen-fifties a conservation-minded district officer asked his district council to discuss game control and preservation in general. This was in the Acholi District where there is a long tradition of highly organised tribal hunting. In due course the council passed a distressing resolution—that from time immemorial the tribe had practised conservation through their traditional hunting system, but that the government appeared to be against the policy of conserving wild animals as was evidenced by the widespread tsetse-control hunting in their country. In fact, shooting as a means of eliminating tsetse becomes intelligible only if the land cleared is immediately put to necessary intensive human use; and this does not always happen, nor is the land indeed always capable of supporting such activity.

Although there were still plenty of good game areas (and there had already been some preliminary discussion on the subject of national parks), the first few post-war years thus saw the wild life as a rapidly deteriorating asset. This was the position in 1952 when the National Parks Ordinance became law and the Queen Elizabeth and Murchison Falls National Parks were established. In spite of the fact that the government made it absolutely clear that the parks were being created for the benefit of the people of the country, they met with a good deal of opposition. This was a period of widespread political agitation, when all government measures were suspect and there was a general, if unreasoned, fear of land being lost to the Europeans. The basis of this fear was the position in the so-called " White Highlands " of Kenya. This land-fear was

behind the agitation against the parks, and clearly the only answer was to make it obvious in practice that the national parks had been established for the benefit of the indigenous people.

At this period, Uganda was the most advanced, politically, of the East and Central African territories. The country's ultimate future as a self-governing African state was assured. Advance towards self-government has been retarded subsequently by highly complicated internal problems and the difficulty of reconciling the relationship of certain parts of the country to the whole. A satisfactory resolution of this problem is of considerable importance in relation to conservation, which could be seriously compromised if the ultimate central government is weakened.

By definition, a national park is a conservation area in which the interests of the general public must be fully considered (London Conference 1933). And, of course, neither a national park nor any other conservation area can exist at all in a democratic society without public support. The general public of Africa is African—and henceforth also its legislators and rulers. It was obvious, therefore, that Uganda's parks would have to be made generally acceptable during their first few years, if there was to be any degree of permanence.

Without African support, the national parks are doomed and every other aspect of wild life conservation is of secondary importance. National parks are certainly not the only areas in which wild life should be conserved; but, as the shop-window of all related conservation measures, they are unquestionably the most important in the present context. In its simplest terms, therefore, the problem is how to assure that degree of public support for the parks which is essential to the continued existence of the wild life.

Development of the Uganda National Parks followed the conventional pattern with perhaps slightly more visitor-amenities that had been possible elsewhere in East Africa. This assured adequate provision for overseas tourists so that the parks could play their full part in a developing tourist industry. Following this, special facilities were organised, and have since been developed, for local educational parties and other organised groups. Indeed it early became a matter of official policy to encourage and provide for these parties. Africans have always been welcome visitors at the Safari Lodges for it is essential that they regard the parks as their own.

There are various aspects to this problem and it is necessary to consider not only the broad lines along which the African public should be approached, but also the best practical means of doing this.

## ECONOMIC

Governments may be expected to require some return for funds voted for wild life conservation, national parks or indeed any other purpose. In the case of national parks, this comes through the tourist trade. In other wild land areas, there is the possibility of developing the production of meat. The writer of this paper, however, believes that there are still great practical difficulties in producing a sustained yield of wild game meat under tropical conditions. Even from animals of such unusual habits as the hippopotamus, there is the problem

of meat and hide processing. It is also probable that given the choice between ranching low-grade domestic stock and game animals, most Africans would still choose the former for a variety of reasons—milk, limitation of damage to growing crops, ease of herding and tradition. Research work is therefore essential and it must be stressed that whenever animals have at present to be shot for any purpose, proper use should always be made of the meat. This is not always done.

There is a very real danger in placing too much emphasis on the economic aspects of conservation. An exclusive appeal to the economic motive has in it the fundamental danger that it could so easily be used to justify the destruction of wild life. On purely economic grounds this would in some cases be justified. It must also be said that the commonly expressed opinion, that Africans are interested only in economic ends, is simply not true. Economic interest (except in its simplest form relating to the pecuniary advantage of the individual and then only to a limited extent) is a sophisticated interest still largely undeveloped. If an objective is considered important enough in itself there is inevitably an insistent demand for it, regardless of cost. This does not mean that the best possible economic use should not be made of the wild life. But it does mean that the often indirect benefits of wild life conservation must be given their full importance.

#### THE INCENTIVES

In the above is correct—and it is an opinion based on many years of experience with Africans at all stages of their development—economic interest will not provide the most powerful incentive to conserve wild life. Nor will the scientific or aesthetic interests be sufficient. The former is lacking in popular appeal, and the latter too limited in scope. While none of these interests should be ignored, I think that the most powerful incentives are pride in reputation and status (for the individual, the tribe and the African people in general), as well as what may best be described as culture. Many well educated Africans have great pride in certain aspects of their own tribal backgrounds and certainly do not consider themselves as representatives of a primitive culture. And indeed this is a necessary antecedent to their being able to take their full place in civilised society. The heritage of wild life is part of this background, even if today this may only be apparent in traditional stories and proverbs. Here clearly are points from which to develop an interest in conservation. The conservation of wild life needs to be presented for what is really is : a civilised and cultured interest which is part of the background and personality of Africa. It must be seen as something to be proud of for its own sake, so that Africans themselves may realise that what Africa has to offer to the world in this regard is really unique. At the same time, it must be brought home to them that it is a highly educated interest.

In saying all this, it must of course be emphasised that the people who will control policy are not those who live among the wild animals or upon the borders of national parks or reserves. For the most part they live in towns and heavily populated areas; they are the educated minority, the developing

middle class and their associates. On the whole these people show an astonishing ignorance of the wild life of their own countries. Their lives are almost completely divorced from the wild creatures, and, as children, they lack the visual images which are created by the illustrated papers, television and the other universal amenities of Western Society. Not only have we to find the incentives with which to encourage conservation, but we have also to teach the class of African that matters what it is that they are being asked to conserve.

### POACHING

Poaching has little to do with this problem. Although the ultimate answer lies in education and public opinion, this will take years or even generations to develop. The poachers and policy makers are far apart; and although at present the majority undoubtedly condones poaching, active poachers form only a small section of the total population. The problem of poaching is largely a physical one which can be dealt with only in physical terms and by means of direct deterrents. In the present context it is of vital importance that the leaders should support, and indeed initiate, campaigns against poaching, and help to bring about a change in public opinion. They need to be brought to a realisation of the poaching menace, in order to play their rightful part in trying to stamp it out. Unless poaching can be checked effectively there may soon be too few wild animals for anyone to feel proud about them.

### FINDING THE SOLUTION

The ultimate solution lies in education, using that term in its widest possible sense. And the most important move must be to encourage as many Africans as possible (those capable of influencing public opinion today as well as the leaders of the future, who are still at school or college) to visit the national parks and see for themselves not only the wild life of their country but also the obvious enjoyment that this brings to visitors from overseas. The cinema can augment this but cannot replace it, if only because the cinema cannot indicate scale to unsophisticated eyes. That conservation areas must be of sufficient size is a point that needs constant emphasis.

In Uganda some solid progress has been achieved. A special camp was built in the Queen Elizabeth Park giving rough accommodation for 40 or 50 young people with facilities for cooking and looking after themselves. Visits to this camp vary from a few hours to several days and most of the users are of school age, with a fair number of older groups such as teachers in training, Makerere undergraduates, district councillors and welfare clubs. They pay a nominal charge and provide their own transport with occasional help within the park. Since the camp has become well known, they come almost entirely on their own initiative, and do the same trips as any other visitors, accompanied by a ranger. A launch trip, wild life films, a visit to the park museum room, and a lecture are included in the programme. The latter varies with the audience, **but** emphasis is always placed on the position of a national park as **the** people's

recreation area, the unique heritage of the country's wild life, the economic importance of the tourist industry and the way in which the wild life can enhance the country's prestige in the eyes of the world. Some ecological problem is always outlined, with ample time for stimulating discussion. In the year ended June 1960, sixty-five of these parties booked in the camp and over two thousand individuals slept in it. Similar facilities are being developed in the Murchison Park.

The Game Department has been working on the same problem. The department's animal orphanage at Entebbe receives a constant stream of visitors. The magazine "Wild Life and Sport" speaks for itself and in the number for January 1961 it is pleasing to see that two of the eight articles are by African authors. Whenever the Uganda Broadcasting service is able to include talks on wild life subjects by African commentators these are well received.

#### THE FUTURE

All this is only a beginning, but it is producing "cells of enlightenment" in large sections of the community. It does show what could be done with more personnel and improved facilities. The camps need to be converted into permanent field centres where courses can be run. There is a need for trained staff to take over these educational parties in the parks and make the visits much more instructive; and the visits should be followed up by mobile lecture-units equipped with film- and slide-projection facilities. Funds are needed for these purposes and to finance transport for an increasing number of parties of this type.

Another important need is for improved teaching of local natural history in local schools. Although the educational value is obvious, it is almost completely ignored. This failure may be beyond the control of the local educational authorities and lie with the examination system. All roads must lead to the School Certificate, which does not include East African wild life, or any related studies, among its subjects. Yet there is no good reason why elements of natural resource conservation should not be incorporated in almost every subject in the curriculum. This in turn should facilitate the urgent task of appointing educated Africans to responsible executive posts, such as Park Warden or Game Warden (Game Ranger in Uganda). Suitable men can certainly be found; and this is a necessary part of building up the feeling that the national parks and the wild life are the responsibility of the Africans themselves.

#### POLITICAL

In Africa, politics intrude where least expected, for today African minds are largely dominated by political thinking. And even if the wild life ignores political frontiers, human beings unfortunately do not. African nationalist movements show few signs of tending towards the formation of larger groups. Indeed to most Africans the tribe is still the most important unit. There is plenty of room for help, advice and co-operation. But any move capable of interpretation as detracting from the power of the local people to control their

own affairs, or as suggesting their incapacity to assume full responsibility (save in the purely technical sphere) can only have disastrous results. The goal of internationally controlled conservation areas seems a very distant and not necessarily a desirable one. But then a sense of pride in possession of this unique heritage of wild life must be fully developed. To mature it requires that full control shall be, and be seen to be, in the hands of whatever government the African people may choose for themselves.

#### CONCLUSION

If these political realities are accepted, there is every possibility that a large number of Africans will develop appreciation of the need to conserve for all time the natural wild life of appropriate areas. But if susceptibilities are upset, disaster can only follow. There is not the slightest reason why this should happen. The public can be educated; and then, given a reasonably favourable political climate, there is good ground for hope that Africans themselves will preserve the wild life of their countries for the benefit of mankind.

# DEVELOPMENT AND UTILISATION OF WILDLIFE RESOURCES IN UGANDA

by

J. H. BLOWER  
Chief Game Warden  
Box 4, Entebbe, Uganda

A. C. BROOKS  
Game Biologist  
Box 4, Entebbe, Uganda

## I. INTRODUCTION

Uganda is fortunate, by virtue of her geographical position, in possessing an unusually varied flora and fauna. It includes a wide diversity of ecological communities, ranging from those typical of the rain forests of the Congo basin to others characteristic of the arid semi-desert country of northern Kenya. Thus, in the extreme west we have the gorilla, the forest elephant (*Loxodonta cyclotis*), and other species associated with the western half of the continent. In contrast, the fauna of the low rainfall areas of north-eastern Uganda includes oryx, Grant's gazelle, kudu, cheetah and other creatures representative of the extremely dry areas of northern Kenya and Somalia. Between these two extremes there are a variety of plains dwelling species such as zebra, hartebeest, topi and Uganda kob, and also elephant, buffalo, hippo and various others characteristic of the lush well watered country of the Upper Nile and its associated lakes and swamps.

This extraordinarily rich indigenous fauna includes more than forty different species of primates, ungulates, carnivores and other relatively large mammals. But though the variety of species is impressive, the actual number and range of most of the major game animals is diminishing steadily. Already there are considerable tracts of country in which only a few years ago the larger forms of wildlife were abundant but where today one finds nothing larger than pig and baboon. It is estimated that on average the range of most species has been reduced by at least 75 % in the past 50 years; several important species, including both the black and white rhino are in immediate danger, while the future survival of others such as gorilla, roan and impala is by no means assured.

The continued diminution of wildlife in Uganda, as elsewhere in Africa, is due to a number of factors; among these the prevalence of large scale poaching by means of wire snares, traps, pitfalls, firearms and other means is the most obvious, but the greatest and most insidious threat is undoubtedly from the steady pressure of other competing forms of land use. Of these the spread of human population and associated agricultural settlement is irresistible, and

wildlife must inevitably retreat before it. However, the greatest damage is often less direct; through the dislocation of seasonal migration routes, interference with natural water supplies, injury to the habitat resulting from overgrazing by domestic stock, uncontrolled grass burning and other similar causes.

## 2 THE NEED FOR A NEW APPROACH

It must be admitted that the battle for the survival of African wildlife has not hitherto been particularly successful. If we are to have greater success in the future and if, above all, we are to obtain the cooperation of government and people so necessary to the conservation and development of our wildlife resources a complete reorientation of thought and policy is essential. The problems of wildlife conservation cannot be considered in isolation; they must be viewed in the context of a rapidly advancing tide of human population and the inevitable spread of agricultural and other development necessary to support it. If it is to survive it must be demonstrated that our wildlife itself is capable of making some tangible and worthwhile contribution to the basic needs of the expanding human population.

The average diet in East Africa contains less than one quarter of the animal protein available in the average United Kingdom diet, and only one sixth of the United States average. The African is a realist; if he and his family are short of meat, no amount of conservation propaganda will bring him to think of the fat eland which he sees out on the plains other than in terms of food. Nor are you likely to convince him that the herd of elephant which flattens his banana plantation should be left unmolested on account of their potential value as a tourist attraction. It must be recognised that though governments, politicians and conservationists may play an important part, the survival of African wildlife in areas outside the National Parks must depend ultimately on the cooperation of the peasant farmer in the "bush." We shall only achieve his cooperation provided that we are prepared to accept his utilitarian view of wildlife as a source of food to be harvested, like fish, fruits, wild honey and other natural produce of the countryside: The concept of game as a source of food is, after all, as old as mankind itself, and is far more easily understood than the idea of conserving wild animals for purely aesthetic and sentimental reasons. The harvesting and utilisation of game as a source of protein is not only entirely logical, but also, if properly controlled, provides perhaps the most effective instrument of management. It is only by the planned utilisation of game as a renewable natural resource and/or by its exploitation as a recreational attraction that its conservation can be economically justified in competition with agriculture, stock ranching and other forms of land use.

## 3 LAND AVAILABLE FOR WILDLIFE MANAGEMENT

This paper is primarily concerned with those areas outside the existing National Parks where there is competition from other forms of land use, or where such competition is likely to develop in the future. The problems within the National Parks are different and, in general, less immediate. Nevertheless,

the National Parks cannot be regarded as islands entirely isolated from their surroundings. In most cases they are not self-contained ecological units, and the conservation and management of wildlife and its habitat in adjacent areas is therefore of great importance to them. The ideal to be aimed at from many points of view would be a series of management units each consisting of a National Park surrounded by buffer zones within which game would be utilised either through controlled hunting or cropping.

Outside the National Parks the land available exclusively for wildlife conservation is diminishing rapidly. There is no doubt that if game is to remain in significant numbers in areas outside the Parks it will have to be for the most part on a basis of multiple land use, with wildlife management playing a secondary but none the less useful and productive role in the overall picture. For instance, in some of the extensive pastoral areas a combination of cattle ranching and game management can achieve a much fuller utilisation of the habitat than could cattle alone, and can thereby appreciably increase the productivity of the available land. Browsing species such as eland, giraffe, kudu and impala should be particularly valuable in this respect since they are largely complementary to cattle; semi-desert species such as oryx and gazelle can maintain themselves in waterless country for long periods and can therefore utilise areas unavailable to cattle in the dry season. In many countries, such as Germany, Scandinavia, the United States and Canada, wildlife conservation plays an important part in forest management, and more attention might profitably be paid to this possibility in Africa also. For example, in most territories there are large tracts of non-productive Forest Reserve, the chief function of which is the protection of catchment areas, where wildlife management could provide recreation and food and at the same time produce worthwhile revenue.

#### 4. PLANNING OF MANAGEMENT SCHEMES

The idea of the planned management and utilisation of game as an economic crop is, anyway as far as Africa is concerned, comparatively new and much has yet to be learnt about the techniques concerned. Management in this context will usually aim at production of the maximum annual "crop" of game which an area can sustain without harmful effect either to the animal population itself or to the habitat. The first essential is, of course, to know with reasonable accuracy the numbers of each species in the proposed management area. Data must also be obtained on the population structure and reproductive capacity of the various species concerned, predation, seasonal migrations, the carrying capacity of the range, and various other factors which must be taken into account in determining the optimum offtake from the area. No management scheme involving the cropping of game can be embarked upon without a great deal of preliminary research by qualified and experienced investigators.

The type of scheme to be introduced in any particular area must be governed by local circumstances; not only on factors directly related to the wildlife and its immediate habitat, but also on the needs and way of life of the local people, the accessibility of the area, tourist facilities, the availability of markets for

meat and other considerations. All relevant data should be included in a written Management Plan in which the objects and proposed methods of management should be clearly stated.

It is important that management and utilisation schemes should provide for the maximum possible participation by the local people, in order to encourage their interest and cooperation and local pride of ownership in their wildlife. It should also be ensured that they benefit as fully as possible from the scheme; either financially, through the direct supply of meat, or in whatever other way may be most appropriate.

## 5. SCHEMES FOR UTILISATION AND DEVELOPMENT IN UGANDA

A start has now been made on the introduction of management schemes in Uganda. They are still very much in the experimental stage and certainly fall far short of perfection, but nevertheless they are perhaps a step in the right direction :

### a) *Hippo cropping scheme*

In the Queen Elizabeth National Park and adjoining areas serious deterioration of grass cover and consequent soil erosion have resulted in recent years from a growing overpopulation of hippo in Lakes Edward and George. Careful censuses showed a total of over 15,000 hippo in the area, which was considered to be greatly in excess of its safe carrying capacity. As a result it was decided to initiate a cropping programme. This was started in 1958 and has been carried out as two separate operations; in those areas within the Park boundaries cropping is carried out by the Park staff. The carcasses of all hippo shot are sold on the site to contractors at an average payment of Shs. 200/- each, the proceeds going to Park revenue. In the adjoining areas outside the Park cropping is carried out by contractors under the supervision of the Game Department; the cropping and disposal of a given number of hippo is advertised for tender in the press, and the contract is then allocated to a suitable person. At present we have a local African butcher who has been given a contract for the cropping of 360 hippo during the course of a year; in return he pays the African Local Government Shs. 150/- per hippo taken. He butchers and then removes meat in his own transport, disposing of it by retail sale in various populated areas within a radius of about 100 miles; there is a ready market for this meat at about 50 cents (six pence) per pound and both the contractor and the retail buyers seem well satisfied. So far these schemes have gone very well and no major snags or difficulties have been encountered. To date the total offtake from the whole area has been approximately 2,000 animals, and it appears probable that the hippo population could continue to sustain an offtake of in the order of 1,000 animals a year indefinitely.

### b) *Uganda kob cropping experiment*

On the Semliki flats, immediately to the south of Lake Albert, there is a population of Uganda kob estimated at about 18,000, partly resident within the Toro Game Reserve and partly outside it. Experimental cropping operations were started in February this year; so far this has been confined to the

selective shooting of male kob in areas immediately adjoining the Game Reserve. Orders are obtained from local butchers for from 20 to 25 animals at a time, and shooting is then carried out on an agreed date (usually twice a month) by the Game Ranger, who shoots from a Landrover using a rifle fitted with a telescope sight. Carcasses are removed to a central camp, where they are skinned, dressed and weighed by Game Department staff; they are then collected by the butcher in his own transport. Carcasses are purchased by weight at -/70 cents per pound dressed, and the meat is retailed by the butcher in local markets at Shs. 1/- per pound. The live weight of the 200 male kob so far taken has averaged 188 lbs. and they have dressed out at approximately 116 lbs. each (a dressing-out ratio of 61 %). Carcasses have fetched an average of Shs. 81/- each, while good quality uncured hides are being sold to a Nairobi buyer at Shs. 25/- each, yielding an average total of Shs. 106/- per animal. Apart from ammunition, the cost of running the Landrover used in the actual cropping, and the salaries of staff, the costs are negligible, and the net profit is in the region of Shs. 90/- per animal.

Local markets are limited, but provided other outlets can be developed there seems no reason why this experiment should not be extended to a full scale scheme giving a sustained offtake of some 1,500 animals per year, yielding an average net income of about £ 6,700 per annum. Proceeds from the scheme, less management costs, are paid to the Toro Local Government.

c) *Bunyoro elephant cropping scheme*

In the Bunyoro District of Uganda, lying to the south of the Murchison Falls National Park, investigation by Fulbright workers and others has confirmed the presence of a considerable overpopulation of elephant. Aerial censuses have shown a concentration of over 12,000 elephant in the southern portion of the Murchison Park and adjoining areas at certain times of year; this build-up has been due partly to the protection of elephant in the Murchison area and partly to the steady pressure of agricultural and other development in surrounding areas formerly but now no longer available to them. The consequent concentration of elephant in this comparatively restricted area has resulted in heavy damage to crops and forest plantations as well as causing marked deterioration in the wild habitat. It has therefore been decided to reduce the elephant population to an appropriate level by limited cropping in that area lying outside the boundaries of the Murchison Park. It is the intention to take up to one thousand animals per year of both sexes and all age groups over an initial period of three years; subsequently further censuses will be carried out and the desirability for further cropping will be reviewed.

Elephant are shot by trained Game Department staff using .404 rifles. Ivory is the property of the Central Government, but 10 % of the proceeds from its sale are paid to the Local Government. Carcasses are the property of the Local Government who are authorised to dispose of them through approved local contractors; at present we have one African contractor who purchases carcasses from the Local Government at Shs. 100/- each, and is authorised to dispose of the meat by retail sale to local buyers. The price obtained by the Local Government is low in comparison with hippo (Shs. 150/- to

Shs. 200/- each) but this is inevitable in view of the comparative inaccessibility of the area in which the cropping is taking place and the consequent cost to the contractor of recovering carcasses.

The scheme is not as yet in full operation since the single contractor is able to cope with only a very small number of carcasses, and as local markets for the meat are at present limited. The utilisation of elephant, in particular, presents considerable practical difficulties due to the size of the animal, the type of terrain in which they are normally found, the fact that operations are almost inevitably scattered over a wide area, and the limited demand for this type of meat. At present most of the meat from this scheme is sold fresh by the contractor direct to the local inhabitants. However, if the proposed offtake is to be fully utilised it will be necessary to process the meat by drying or other means and to export it to other areas.

#### d) *Controlled hunting areas*

Certain of our game areas outside the National Parks, which were formerly closed as Reserves or Sanctuaries, have recently been opened to restricted and closely controlled hunting. The maximum safe annual offtake of trophy species is determined by periodic counts and other investigations, and hunting quotas are fixed accordingly. Sportsmen wishing to hunt in these areas are issued with special permits, for which they pay appropriate per capita fees in respect of those animals which they wish to hunt; all animals taken count against the annual quota for the area concerned, and when the quota for a particular species has been filled no further permits are then issued for that species for the remainder of the season. Fees vary according to the trophy value of the animal concerned; e. g. lion and leopard Shs. 500/-, kudu Shs. 200/-, buffalo Shs. 100/-, and so on. Revenue from these special fees (which are over and above the cost of the game licence) is credited to the Local Government of the District concerned. Fees are not normally charged in the case of local residents, although they are required to obtain free permits for hunting in a Controlled Area and any animals they take are counted against the overall quota.

Controlled hunting schemes have now been introduced in three Districts in Uganda, and have in general proved both successful and popular. By bringing in appreciable revenue to local authorities they have provided a valuable demonstration of the economic value of wildlife, and have generally resulted in a much more cooperative attitude towards conservation measures.

This provides but a brief and very general outline of the schemes we now have in operation in Uganda and does not by any means cover all the problems involved. These schemes are still in the experimental stage, and much yet remains to be done both in perfecting them and in introducing others. Though this paper emphasises the utilitarian value of wildlife this does not imply any lack of appreciation of its scientific, aesthetic, educational and other undoubted advantages. However, the fact remains that these alone are unlikely to carry sufficient weight against the growing competition from agricultural and other developments, and if African wildlife is to survive it is essential that its management and utilisation must be accepted as an economic and productive form of land use.

# THE WILD UNGULATES OF AFRICA : ECOLOGICAL CHARACTERISTICS AND ECONOMIC IMPLICATIONS

by

F. BOURLIÈRE  
Faculty of Medicine, Paris

Tropical Africa has always been known for its wealth of ungulate fauna, but only the systematic researches of recent years have brought a realisation of the extent of the phenomenon and enabled its particularities to be defined. This note does not set out to summarise, in the limited space allowed to each of the rapporteurs for the Arusha Conference, the results of studies of fauna populations conducted chiefly in east and central Africa, but confines itself to reviewing some of the fundamental ecological characteristics of the game populations revealed by those studies and underlining their potential economic implications.

## *Population densities and standing-crop biomass of the various African habitats*

On the basis of censuses taken in the various parks and reserves in eastern and southern Africa, it has been possible to calculate overall population densities for these " control zones " maintained in a state of more or less complete protection from human intervention. Though of unequal value (some of the figures are based on a single numerical estimate, while others represent the mean of a series of censuses), these results at once bring out the great differences in population densities which exist as between different regions on the one hand, and between the different habitats within a given region on the other. Thus we find  $\pm 11$  animals per sq. km. in the Kruger Park,  $\pm 34$ /sq. km. in the Albert Park (Rwindi-Rutshuru Plain),  $\pm 36$ /sq. km. in the Serengeti and  $\pm 67$ /sq. km. in the Nairobi National Park. In the plain south of Lake Edward, the density varies with the type of plant cover, from 17-18 ungulates per sq. km. in thickly wooded savannah to 77-86 per sq. km. in open low savannah. These figures by themselves, however, do not suffice to evaluate what stock-farmers call the " grazing capacity " of the different plant formations. To do this we must calculate the standing-crop biomass by multiplying the number of individuals of each species by the minimum weight of the adult. In this way the excess involved in reckoning immature individuals at minimum adult weight is roughly compensated by the underestimation of the weight of the oldest individuals. Results thus obtained for various regions of tropical Africa are given in the attached table.

Two facts of utmost importance at once stand out. First, the " grazing capacity " of the different regions in respect of wild ungulates varies very widely

and these variations are far greater than variations in overall population density. In the Sahara and the pre-desert steppe the standing-crop biomass is very low, from 0.3 to 190 kg./sq. km. In the more or less wooded steppes of southern and eastern Africa, as in the forest/savannah mosaic of southern Kivu, the range is already from 2 to 6 tons/sq. km. In the Acacia savannahs of Kenya, the figure reaches 15 tons/sq. km., and in the western Uganda and northern Kivu savannahs at the edge of the Congo forest reaches the record level of 18 to 31 tons/sq. km. In the dense forest of the west the " grazing capacity " appears to be very limited.

The second fact which stands out from this table is the unique character of these standing-crop biomass values as compared with other parts of the world. In this connection, certain figures from other parts of the world may usefully be recalled. In the prairies of North America, the only other habitat which can rival that of Africa in wealth of wild ungulates, the " grazing capacity " must have been  $\pm 3.5$  tons/sq. km. The deer forests of Scotland support a standing-crop biomass of red deer of the order of 1 ton/sq. km. The " primeval forest " of the Pol'ana mountain in Slovakia supports only  $\pm 500$  kg/sq. km. of herbivorous mammals, and the great herds of saiga antelope on the steppes of southern U.S.S.R. represent only a standing-crop biomass of  $\pm 350$  kg./sq. km. in their winter concentrations. In the " barren grounds " of the Canadian far north, the caribou give a standing-crop biomass of  $\pm 800$  kg./sq. km. Nowhere else in the world is so high a value of " wild " proteins in kg. per hectare found as in the African savannah.

*Specific wealth of wild ungulate fauna of savannah areas*

As was pointed out long ago by J. Lebrun and F. F. Darling, the chief reason for the high values of standing-crop biomass per sq. km. noted in the preceding pages lies in the *variety of ungulate fauna* cohabiting in the different " open " regions of tropical Africa. It is not unusual to find *ten to twenty species living together*, as may be seen from the accompanying table. Each of these animals exploits to some extent a different category of plant foods produced by the environment. The young shoots are grazed by small antelope, thorn-bush is eaten by the black rhinoceros, giraffes browse on the foliage of medium-sized acacias, and the elephant can digest practically anything—twigs, leaves, fruits and various grasses, including some that are not wanted by other species. Thus *the total " load " of herbivores is distributed over the whole of the plant standing-crop biomass* and not concentrated on a single constituent (the graminaceous carpet) as in the case of domestic livestock. The use of plant foods by the wild ungulates of the African savannahs is, indeed, so perfect that they constitute the dominant " consumer " element in this biotic community and leave little room for herbivorous competitors, among the vertebrates at least. Thus in the low savannahs of the Rwindi-Rutshuru Plain, the standing-crop biomass of the rodents and lagomorpha does not exceed 137 kg./sq. km. (against 20,485 kg./sq. km. for the ungulates living in the same place), whereas in the clay steppes of Trans-Volga there may be 32,500 susliks and voles per sq. km. against 0.4 saiga antelope!

Another possible reason for the size of the " grazing capacity " of the East African savannahs in respect of wild ungulates lies in the nutritional efficiency of the species in question. The fact that the majority of them have a less developed digestive tract (from 36.8 to 49.4 % of total weight) than domestic ungulates of comparable weight (in which it is generally greater than 50 %) implies on the whole a better utilisation of plant food (L. M. Talbot, H. P. Ledger and W. J. A. Payne).

*Rate of turnover of savannah populations of wild ungulates*

Our knowledge on this point is still rather limited, and we need to determine rates of growth, fecundity and average life of each species in each type of habitat before seeking to draw practical conclusions allowing of rational management of the populations without risk of seeing these decline.

Already, however, one thing is obvious. The highest standing-crop biomass values observed (W. Uganda and N. Kivu) always correspond to ungulate populations where 70 % by weight is made up of two slow-growing, late-maturing species of large dimensions, the elephant and the hippopotamus. In such cases, therefore, the turnover of population is slow. In medium " loads " (savannahs and steppes of Kenya, Tanganyika and the Rhodesias) the situation is quite different: the small ungulates, fast-growing and early-maturing sexually, are in a very big majority here, species weighing more than a ton represent no more than a minute proportion of the total standing-crop biomass. In this case, the population turnover is very rapid, the more so in that the greater " nutritional efficiency " already referred to permits of a daily increase in weight generally greater than that of domestic species.

*Nomadism and migration*

Mobility of the different African ungulates varies greatly not only as between species but as between habitats for a given species. In the Albert Park, a marked elephant lived for several years consecutively within a radius of a few dozen km., whereas large-scale and fairly regular movements were observed among elephants from the Murchison Falls National Park and the Garamba. Wildebeest and zebra migrations in the Serengeti are of spectacular dimensions, while these animals in the Kruger Park are much less mobile. These movements are all motivated essentially by seasonal variations in plant resources but they are also governed by the remarkable resistance of many wild species to lack of free water. This enables them to travel distances of which domestic livestock, unable practically to remain more than 2 to 3 days without drinking, would be incapable.

These are the main observations which emerge from the first systematic researches on the ecology of wild ungulate populations of Africa. They lead one to suspect remarkable physiological adaptations, thanks to which these populations appear infinitely more prosperous than congeneric domestic species. Stock-farmers and nutritionists would do well to bear this in mind.

*Number of species and standing crop biomass of wild ungulates in kg. per square kilometer in different African habitats*

Vegetation type	Number of ungulate species	Biomass in kg/km <sup>2</sup>	Type of census	Area studied (km <sup>2</sup> )	Year	Author
Sahara (Rio del Oro) Salsolaceae Reg	1	0.3	Ground	100	1955	Valverde
Sahara (Rio del Oro) Aizoon Reg after rains	2	190	Ground	100	1955	Valverde
Sahara (Mauritania) Majabat al Koubra Erg	1	5 and 20	Ground	1360 & 816	1960	Monod
Tchad (W. of Oum-Chalouba)	4	80	Ground	1200	1961	Dragesco
Sub-Desert Steppe	15	4418	Ground	125	1959/60	Dasmann and Mossman
S. Rhodesia open Mopane Woodland	>15	4692	Aerial	10 000	1958	Grzimek
Tanganyika Acacia/Commiphora Steppe	>5	5800	Ground	75	1953/54	Pirlot
S. Kivu Forest/Savanna Mosaic	18	13 215	Ground	116	1960/61	Ellis
Kenya (Nairobi Nat. Park) open Savanna	?	15 760	Ground	?	1960	Talbot
Kenya Acacia Savanna	11	18 795	Ground	1670	1960	Bere
W. Uganda (Queen Elizabeth Nat. Park) Ecotone Forest-Savanna	7	11 100	Ground	30	1956/57	Petrides & Swank
— undergrazed Area	9	13 360	Ground	14	1956/57	Petrides & Swank
— moderately overgrazed Area	8	31 028	Ground	23	1956/57	Petrides & Swank
— heavily overgrazed Area						
N. Kivu (Parc nat. Albert-Plaine des Rwindi-Rutshuru) Ecotone Forest-Savanna (partly overgrazed)	11	23 556	Ground	600	1959	Bourliere and Verschuren
Ghana (Tanonimiri Forest Reserve) Western Rain-Forest	3	5	Ground	250	1954	W. B. Collins

## SOCIOLOGICAL AND HUMAN FACTORS

G. BRASSEUR

Director, Department of Geography, IFAN,  
and Dakar University, Senegal

The phenomenal growth of human population today, in Africa especially, poses a considerable problem for nature conservation. Africa is thought to have had 120 million inhabitants at the start of the century and now to have 240 million. More reliably, detailed studies like the demographic survey in Guinea in 1955 reveal annual rates of increase in the neighbourhood of 2 % equal to the doubling of the population in less than 35 years.

As an over-all rate for the whole of Africa, these figures are not particularly significant, since they would only give an increase in density from 8 to 16 per sq. km. But if we take into account the proportion of desert, the whole picture is altered. Moreover, the population is very unevenly distributed—West Africa affords a significant example. It is interesting to consider our subject according to the habitat—whether sparsely, moderately or heavily populated, which corresponds to the foreseeable trend of evolution.

Apart from exceptional cases which will be referred to later, the useful area of West Africa has been and remains sparsely populated. Over the greater part (south of the Sahara) there are less than 10 inhabitants to the sq. km. Human settlements have been established in relation to the potentialities of the habitat but perhaps more still according to the vicissitudes of history. However, with plenty of space available everywhere, extensive cultivation is the general rule. The basic technique consists in burning to clear the land. On the one hand, bush fires are used to burn the whole of the savannah in the dry season—these are responsible for the type of degenerate vegetation which, however, is so long established in the region that it must be regarded as being in equilibrium. On the other hand, there is the weedburning system which consists in preparing a field for cultivation by burning all vegetation (except for a few useful species) to free the useful soil while adding the fertilising elements contained in the ashes.

This method, very impoverishing in the long term, nevertheless has no major drawback when one realises that with the areas used and the possibilities of rotation in cropping them, fallows of thirty years and more are often found, which allows for reconstitution of the soil and of the plant cover in conditions of equilibrium of the habitat. The period is doubtless not long enough for forest; but the tendency being to return to previously cleared sectors where fresh cultivation or improved farming present less difficulty, large forest enclaves remain intact as do, in the savannah, gallery forests and certain parts which are inaccessible on account of topographical circumstances, unhealthiness, or remoteness from the villages. These continue as favoured zones for

wild life. Plant species normally eliminated by man from cropped land here survive, as does the fauna, in the conditions necessary to its existence. Probably there is no place, leaving aside religious taboos in respect of mountains or forests, unvisited by man however transiently, so that he is in contact with nature everywhere.

Nevertheless, as regards game, there remain numerous safeguards: the majority of species can flee or hide, and to this is added the limited efficiency of means of killing even when "trade" guns are used (striking power and, above all, range); then there are special sociological conditions—apart from a few big mass drives in the dry seasons each year, hunting is often the preserve of fraternities or castes which have their own rules and traditions (one has only to think of the Nigerian Sorko in their attitude to the hippopotamus), not forgetting the customary dues to chiefs in respect of game taken.

In contrast with these low-population countries, West Africa includes some very densely populated regions, such as the Yoruba countries (Dahomey, Nigeria), those of the Hausa (Northern Nigeria) and the Serere (Senegal), whose particular demographic dynamics are as yet unknown, or certain peoples anchored to defensive sites like the Kabre (Northern Togo) or the Dogon (Bandiagara sandstone massif, Mali). These are extreme situations which call for consideration in view of the lessons that they may furnish.

As countries *a priori* without excessive natural wealth, one might have thought them destined to the greatest difficulties, to the loss of substance by exhaustion of their soil, and to ruin. But, in fact, each and all of them continues to be able to feed itself and even to produce for export, whether the crop be groundnuts or the product of the oil-palm.

Agriculture has been sustained by the wise action of populations in gradually adapting themselves, as necessity dictated, to the conditions even of the most rugged habitat—for instance, of mountains where a kind of terracing is constructed to retain the soil and where the available water is impounded to water the plots thus formed. Every source of fertility is mobilised; animal or plant refuse is gathered to manure the soil and the livestock is more or less associated in this cycle. Without achieving a modern system of agriculture, since all the labour is still provided by man, these populations nevertheless practise intensive methods, in which the whole of the land is exploited with carefully determined rotations and constant regard to conserve the soil capital. It is under this heading that trees are most often associated—the "kad" of the Serere, the oil-palm in the Gulf of Guinea, both protecting and enriching the soil and affording supplementary resources, grazing material in the one case, much sought-after oil-bearing crops in the other.

Nature is obviously much transformed from its primitive state, but a new equilibrium is substituted, with its landscape and its resources which, as in the environs of Porto-Novo, support up to 500 people per sq. km. Only a few forest enclaves are enabled to survive here and there by the will of man, but wild animal life is no longer thinkable in habitats so closely settled by man, at any rate, as regards mammals of medium size upwards. These zones are as yet somewhat restricted and others round them generally remain little exploited if at all.

This brings us to consider the zones still sparsely or moderately populated, but in process of rapid increase. The former present generally difficult conditions of habitat: poor soils, unhealthiness due especially to swamps or a type of vegetation favouring proliferation of insect vectors of serious diseases. These are the areas in which, because they are practically uninhabited, it has been possible to establish without undue difficulty the great nature reserves or national parks (Niokolo-Koba, Baoule, West of the Niger), which are the refuge of flora and fauna in their primitive state and likewise a heritage safeguarded or prepared for future generations.

However, there is a danger of riparian populations casting greedy eyes on these zones, either for their accumulated capital since being placed under protection, or because they have become more accessible with technical progress (roads, drainage), or again on account of workable minerals, or simply, in forest areas, the presence of trees of trade value.

Pioneer settlements, like extensions of cultivation in zones already moderately populated, while indispensable, are especially to be feared because they are effected without thought for the morrow, with the sole aim of extracting the maximum yield from the newly broken land, even in the case of peoples originally very much alive to soil conservation. They lead to exploitation of the whole of the land, whatever its value and whatever it is fitted for, wiping out forest enclaves, galleries, mangroves, etc.

The result is the wholesale devastation of the natural habitat. While in theory the subsequent reconversion of the landscape may be possible as in the previous case, in view of the speed and scale of present means of destruction there can be no doubt but that irreversible processes are set in motion, too. There is now a danger not only of exhaustion of the soils but of their removal. Certain plant formations will disappear irretrievably for the sake of short-lived and ever diminishing profit. The haunts of animal species are disappearing while, with the withering of the power of custom and the development of means of killing (improved guns), they face an increasingly merciless struggle justified partly also by the need to protect more intensive cultivation and stock-breeding.

This reveals the need for development planning not so much by local authorities as by governments whose business it is to think ahead. A complete survey of the countries of Africa in terms of population density and the special vocation of different soils should lead to consideration of what can best be left to cultivation and what preserved for the future as a control sample of the natural habitat (total reserve) or potential resource, with spontaneous and if need be assisted enrichment and carefully regulated exploitation. Propaganda campaigns and technical information will undoubtedly be needed, to complement schemes for aiding the more rational farming of land really suited for agriculture and the opening up of new regions capable of irrigation and of bearing especially profitable crops.

# WILD ANIMALS, AGRICULTURE, AND ANIMAL INDUSTRY

by

L. H. BROWN

Acting Director, Agriculture Dept., Box 30028, Nairobi, Kenya

Wild animals, in the present conditions of exploding population in the world, can scarcely hope to retain any large area of land in the face of possible competition from intensive agriculture in the form of valuable plantation crops, dairying, mixed farming, and related enterprises. These, in East Africa, can be efficiently developed on land which has more than 30" annual rainfall, good soil, and where low temperature is not a limiting factor on the growth of crops. Practically all such land in East Africa was relatively densely inhabited long ago, and settlement has taken up much of what remains. Exceptions may be found in parts of Uganda and Tanganyika, and there is one large area of land of this type unexploited in Kenya—the southern Mau area of Masailand which is only used by the Masai as pasturage for uneconomic stock.

There is no intention of belittling the problem of settlement of increasing populations, but there are far greater possibilities for absorbing extra population by the more intensive development of areas already partially developed than there are in attempts to develop new areas as yet unpopulated. An area in Kenya, for instance, which is constantly suggested as a possible settlement area is the Trans-Mara area of Masai which has an adequate rainfall and is warm. However, it is heavily infested with tsetse fly, and has almost throughout very poor soil, a few inches of topsoil overlying impervious clay or gravel, which is a swamp in the rains and becomes like cement in the dry season. It is improbable that settlement in this area could be undertaken on an economic basis. There is evidence also of attempts to provide new settlement areas on land too wet or cold for intensive agriculture, and which would be better left under forest.

The land with a rainfall of less than 30" per annum, and that with a rainfall of more than 30 inches but which is for some reason (such as poor soil, steep slopes, or low temperature), unsuited to intensive agriculture can be classed as range land, suitable for stock keeping. The 30" isohyet acts in most areas as a threshold below which cropping becomes increasingly unreliable, and intensive agriculture will not pay, or provide a decent living for those who try to practise it. This threshold is more clearly defined in Kenya and north Tanganyika than in south Tanganyika, because in the equatorial belt the annual rainfall comes in two seasons with a sharp drought in between, so that the effective rain for each cropping season is less than twenty inches and usually less than fifteen. Even where most of the rain falls in one season, it is generally unreliable in areas where the total is less than 30" per annum, and the intervening dry seasons are so severe as to make conditions for agriculture

—particularly intensive stock keeping—very difficult. An ecological classification of vegetation types, dependent on a combination of soil, rainfall, and temperature conditions is a surer guide but is too complex to describe here, though it is the basis of agricultural policy in Kenya.

It is in the range-lands that the potential competition between wild animals and agriculture or animal industry becomes most intense. Much land with less than 30" of rainfall per year is being used at present for subsistence agriculture by Africans, and some has even, in recent years, been opened up as costly settlement schemes. Arable agriculture, in such country, cannot at present or in the foreseeable future, provide much more than a subsistence for its inhabitants, and certainly no opportunity for a high standard of living. The inhabitants are thus condemned to a choice between a continued low standard of living or migration to other areas where they may be able to do better. For in such areas increasing population inevitably means impoverishment of the soil to a point at which it will not support the present population on its present standard of living. As things stand there is competition in them between subsistence cultivation and wild animals, with the result that there are constant demands for the control of the latter on scattered plots of cultivation often many miles from any house and unprotected by any fence. The point which I desire to stress here is that the present subsistence cultivation systems represent unsound land use and cannot provide a good living for the people anyhow. In the long term, in such areas, it would be more rational to look for other outlets than to slaughter the wild animals so that a few more people can subsist miserably.

When such range land is used for its proper purposes, i. e. stock raising, the conflict between human and wild animals is just as acute—often more so. Ranchers wish to fence their land for stock management, develop water supplies and so on, and to justify these developments must make money from their land. They will not tolerate large numbers of wild animals in direct competition for the available grazing, which also break the fences and drink the water so laboriously pumped from one place to another. Where such range land can be economically developed to a high level of stock production, wild animals will therefore need to be controlled, though not necessarily entirely eliminated.

African pastoral usage of such country is almost invariably destructive and usually results in destruction. African stock are, by and large, of poor quality, and have deteriorated over the last fifty years because, in the absence of periodic epizootics, they have increased in numbers to such an extent that they have eaten out the country, caused widespread erosion and favoured the invasion of useless bush on what was once grassland. The Baringo district of Kenya and the Longido area of Tanganyika Masailand are cases in point. In Baringo the destruction has long passed the point of economic return, and although this point may not have been reached around Longido it is not far off; before long that area will be covered with a blanket of bush, and it will never have the potential to pay for the removal of that bush in the foreseeable future. There is no answer to the prevention of such deterioration but to limit the numbers of stock, and control their movement by some form of grazing management which will maintain the land in good productive condition. Any idea of

attaining sound land usage without control of numbers and movement is mere wishful thinking. In such areas, therefore, and particularly on newly opened, hitherto unused land, it is essential to have control before providing benefits in the form of bush clearing, water supplies, removal of tsetse and so on. To do otherwise is merely to invite the destruction of another area which may have been of potential value as a wild life area, but which in human hands will inevitably be destroyed. In Kenya, in recent years, very large areas (7,000,000 acres) have been brought under some form of grazing control, but it is in general too early to say whether badly devastated areas such as Baringo will recover by this means alone.

The contrast between economic ranching and primitive destructive pastoralism can be illustrated by figures. In very round terms the extensive or range stock industry in Kenya is worth some three and a half million pounds per year. Of this about half comes from about 4000 square miles of European ranches, and the remaining half comes from the huge area, totalling 183,000 square miles, which is potentially available to pastoral tribes and most of which is used, at least sporadically; the return is largely in the form of hides and skins. In the one case the gross return per acre is about Sh 13/50, and in the other about 30 cents. There are areas of African pastoral land which produce more than this, but the highest economic return per acre of African land would not exceed 3/- per annum gross, on land which is as good as and often better than the European ranches.

Production at this miserable level is not a sound excuse for the destruction of large numbers of wild animals, or the destruction of their habitat, and the direct adverse consequences on more productive neighbouring areas. To open up an area of tsetse bush for use by pastoralists may involve a minimum cost of 60 shillings per acre for a possible gross return of 1/- per acre per annum. Unless such development schemes are closely supervised, involving some regimentation of the pastoralists, they are doomed to failure anyway and the initial capital expenditure will be wasted. No example is known in East Africa of hitherto unused land opened up for grazing which, in the absence of such control, has not degenerated or is not degenerating to an eroded waste. In such cases it would have been far better for the land to have been left as it was, when the game on it could have brought in some revenue to the country without any considerable capital expenditure, and the land itself would not have become an eyesore and an economic liability.

The relative value of land usage in terms of wild life as opposed to stock has not been accurately computed, but if it is assumed that the tourist industry based on wildlife, and the African stock industry, make use of roughly the same areas of land, then in East Africa the tourist industry is clearly a far more valuable form of land use. For Kenya alone, it has been computed at about five and a half million pounds per annum and it is capable of rapid expansion. At the worst, therefore, it is worth about three times as much per acre as is the African stock industry. When one considers, in addition, that it is concentrated on a few relatively undamaged areas where game, in the absence of domestic stock, is still relatively abundant, it becomes plain that the return per acre from wild animals through tourism is far greater than that of the African stock industry. The Nairobi National Park makes a gross revenue from actual

receipts of about 45/- per acre, not counting any revenue that may come in indirectly from tourists who visit it. Although no figures are available to me, I have no doubt at all that the value of Amboseli as a tourist attraction far exceeds its value in terms of production of African stock in the same area. And this is simply considering the sightseeing and hunting tourist, and takes no account at all of the potential value as a source of game meat on a sustained-yield basis. In some other areas of Africa game-meat production has been shown to be as high as could be obtained by developing the area as a cattle ranch, and though this aim has not yet been achieved in Kenya it doubtless will be when satisfactory market outlets have been found for the products of wild animals.

Thus, when it comes to an assessment of the value of wild animals in competition with stock rearing it becomes evident that they can produce a potentially much greater return per acre than can primitive pastoral usage and even, in some areas, than efficient ranching which may have been developed at great cost. It should also be mentioned that there is some indication that even the most efficient ranching methods may cause some deterioration in the pasture and open the way to encroachment by undesirable bush species. This phenomenon does not occur in areas devoted wholly to usage by the natural range of wild animals.

From the point of view, therefore, of the economy of East African territories it would appear to be irrational and irresponsible to jeopardise the natural resource represented by wild animals, either as a source of protein or as a tourist attraction, or both, for the sake of primitive pastoralism, or even, perhaps, of organised capitalist ranching, which may be unpopular anyhow. Rather, means should be sought for increasing and restoring the wild life resource in areas where it has diminished so that it may play an increasingly important role in producing revenue for the territories concerned. In many cases this can be done (without actually harming the interests of primitive pastoralists or cultivators, but rather by protecting them and preventing them from destroying themselves, as they have been busily doing for the last half century) whilst simultaneously protecting and developing local communal rights and enhancing the sources of revenue and economic production potential, and thus affording every prospect of improvement in local standards of living, instead of condemning local populations to exile or to a deterioration of their local means of livelihood.

# TRAINING PROGRAMMES FOR PERSONNEL CONCERNED WITH CONSERVATION OF AFRICAN WILD ANIMALS

by

HELMUT K. BUECHNER  
Department of Zoology  
Washington State University  
Pullman, Washington, U.S.A.

It is gratifying to note this Conference's attention to the problem of staff and staff training required for effective conservation of Africa's wild animal life. The entire field of wildlife biology is so new that adequate and thoroughly trained staff is still in short supply even in North America. For this reason relatively few administrators and field personnel in Africa have sufficient background in education and experience for the tasks ahead. Many persons in key positions frankly admit their limited knowledge, and there is genuine interest in learning. Those who devote their lives to the conservation of wild animals do so out of keen interest and desire to help rather than for monetary or other considerations. Indeed, for most persons conservation is a life of sacrifice and hardship with rewards derived primarily from the satisfaction of working with nature and of accomplishments in conserving wild animal life. There seems to be a thirst for knowledge at all levels of personnel engaged in wild animal conservation, and therefore it may be expected that training programmes at all levels will be accepted readily.

Top priority should be given to imparting appropriate knowledge of techniques and ideas at each staff level within government departments. Most of this training can be accomplished through short courses at universities in Africa and at field locations in national parks and elsewhere. But there is a need also for full degree university training and postgraduate studies for the top positions.

Second in priority, but equally as important in the long run, is the training of primary and secondary school teachers. A recent Ford Foundation survey of secondary schools in East Africa showed that education in biology was inadequate and had little basis in the local African environment. It is hoped that as corrective measures are taken a new African awareness of African wild animal and plant life will develop.

## *Staff Required*

In the earlier evolutionary levels of wild animal conservation in all countries of the world, law enforcement has been prominent; and the general public looks upon the operation of a national park system or department of game as one that is essentially policing in nature. National parks were established in order that wild animal life could be saved by complete protection. The control of wild animals that damage agricultural crops followed protection. In Africa

intensive efforts have been made to destroy wild animals in order to control sleeping sickness and thereby permit the grazing of domestic stock. This has been done without consideration for the destruction to natural vegetation by domestic stock and the values of husbandry of wild animals. The types of administrative and field personnel needed to operate national parks and departments concerned with the protection and control of wild animals have been well established. Recently there has been an emergence of three additional needs : (1) husbandry of wild animals, (2) acquisition of knowledge through research as a basis for manipulating animal populations and vegetation to conserve wild animals in the best interests of African peoples, and (3) mass education of the general public to an awareness of the values of African wild animals and natural plant life.

#### *Staff Training Required*

Educational requirements obviously vary greatly for the different kinds of personnel. But it seems that all need to have some knowledge of the plants and animals around them. Concepts of " population, " " vegetation ", and natural " communities " probably can be developed without great difficulty. The inter-relationships between populations, communities, and physical environment may be more difficult to communicate; but there may be ready reception on the part of some Africans who have lived close to nature, similar to that of Americans and Europeans who have farm backgrounds. The structure and performance of animal populations should be understood by those persons engaged in the husbandry and control of wild animals. In addition, knowledge of techniques for gathering field data will be required. Those engaged in research will need university training. At all levels of staff personnel conscientious efforts should be made to teach principles, concepts, and ethics of conservation.

A knowledge of the function and objectives of various governmental agencies in such fields as agriculture, forestry, veterinary services, tsetse and trypanosomiasis control seems essential for all staffs. Furthermore, some knowledge of local land tenure law and local hunting and fishing rights is important in the understanding of problems associated with national parks and management of wild animals in surrounding areas.

#### *Meeting the Challenge*

The immediate need is to bring the available ideas and techniques to the personnel concerned with African wild animal life in the shortest time possible. The task involves a numerous staff. The plants and animals they want to know more about are in Africa, and the principles and concepts need to strike chords in an African context in order to save time and to come to grips with relevant problems. For these reasons, which are both pedagogical and economic in nature, the major training effort should be developed in Africa. Some training can be in-service with personnel already available or with specially employed experts to aid in the programme. The next higher level perhaps consists of short courses given at universities in Africa or at suitable stations in the field. Some training may be accomplished best at field stations, while other types

may require museums or the laboratories, libraries, and faculty available at a university campus. Emphasis should be placed on principles of land use and conservation, identification of plants and animals, methods and techniques for gathering field data, preparation of botanical and zoological specimens, and utilisation of fish and terrestrial vertebrates in the economy of the country. Effective training may require attendance at more than one short course. Annual personnel meetings could provide a mechanism for keeping abreast of new developments through lectures and special training. Study tours, such as those being conducted at this conference, under the direction of qualified men with knowledge of the country provide an effective teaching medium.

For the immediate future the bulk of the training programmes probably will be short courses designed to bring existing staff up to the various levels of knowledge required of them with the least delay in time. But in the long run one must also look ahead to evolving better staff with better training, if conservation is to succeed and to contribute maximum benefits to the African people.

#### *University Training*

Undergraduate university training emphasizing the biology of wild animals can be accomplished best at universities in Africa, since the perspective of the African setting is an essential part of the educational experience. The African student must learn his plants and animals and understand the particular problems that he has to solve. Studies abroad may help to broaden viewpoints and knowledge, but ultimately the student must gain depth in knowledge with African animal and plant life.

Programmes at universities in Africa can be designed around the basic liberal arts education already available. Such universities as Makerere College, the University of Khartoum, and the University College of Rhodesia and Nyasaland provide excellent centres for the development of curricula in wild-life biology. Additional faculty personnel with the requisite teaching and research experience may be required for the advanced courses and direction of field research. The new faculty should have an opportunity to become acquainted with African animal life and vegetation through research and travel. The short courses can be organised and directed by the faculty in wildlife biology. African universities must expand their library facilities, laboratories for teaching and research, field equipment (including four-wheel drive automobiles), and clerical assistance, and must increase operating costs. Such expansion probably will require support from private foundations.

The curriculum should be designed for broad liberal arts education, with concentration in the natural sciences, and not primarily for professional training. The physical sciences, including mathematics, chemistry, physics, and soils, form the core of the programme. By adding introductory botany and zoology and blending in courses in the social sciences and humanities, a broad base is provided for intermediate courses such as the anatomy of animals, classification of plants and animals, geology, principles of conservation, genetics, and forestry. Techniques for obtaining data on wild animals can be learned in laboratory and field studies. The top of this pyramid of education should include zoophysiology, vegetation science, the dynamics and ecology of

vertebrate populations, and mathematical statistics with emphasis on biological problems.

Postgraduate studies are usually essential for leaders in top administrative and research positions. Ideally, graduate studies at the Master of Science level (or its equivalent) should include : (1) one academic year of courses; (2) a field research project in Africa, including publication of results; (3) return to the university (if abroad) for completion of the degree; and (4) travel in western North America, or other parts of the world where environments and animal life are similar to those in Africa, to gain perspective through observations in national parks, federal refuges, national forests, and private lands.

Travel during the summer would also be valuable for African students studying abroad in disciplines other than biology of wild animals. As future economists and political leaders in Africa these students may have significant influences on the conservation of wild animal resources.

#### *Sources of Finance*

In-service training and short courses probably can be financed through existing government agencies and universities, although the initial task may require additional financial support from other sources. University training will depend considerably upon financial aid from foundations. In recognition of the role of higher education in the future of African countries, opportunities for study in a variety of subject areas, including the biology of wild animals, are developing rapidly in several countries. It was impossible, in the short time available, to prepare a full report on the various sources of financial support available to African students for study at home and abroad. Seemingly, it would be a worthy project for the IUCN and CCTA to announce annually the variety of support available. With the livening world interest in Africa, financial aid to education will undoubtedly increase greatly each year, and information about opportunities in various countries would be extremely useful.

Two new sources of finance have been established for American universities—one under the African Wildlife Leadership Foundation; the other under the African Scholarship Programme of American Universities. Both function through the administrative agency of the African-American Institute with headquarters in New York, an operational office in Washington, D.C., and field offices in many African countries. Under ASPU auspices scholarships were provided to 200 African students in all fields of study at approximately 100 universities during the 1961-1962 academic year. In this cooperative arrangement tuition and fees are remitted by the various universities, maintenance is provided by the U.S. Government under the International Cooperative Administration, and travel allowances are provided by the various African governments. The financial resources of the AWLF, although modest, probably will contribute substantially to the development of curricula at universities in Africa, practical field short courses, and the education of a few graduate students and probably some undergraduate students in American universities. It is important, to the extent possible, that the governments of African countries themselves make some financial commitment to these programmes.

# OBSERVATIONS ON NUMBER, MORTALITY, AND REPRODUCTION OF ELEPHANTS IN UGANDA

by

IRVEN O. BUSS and ALLAN C. BROOKS

Department of Zoology, Washington State University, Pullman;  
Game and Fisheries Department, Entebbe, Uganda

Data for this study of the African elephant (*Loxodonta africana*) were secured from two principal sources : (1) the Annual Reports of the Game and Fisheries Department of Uganda, and (2) an investigation of the elephant conducted in Uganda between June 1958 and June 1959 (Buss, 1961). Supplemental data were provided by district rangers and other members of the Game and Fisheries Department of Uganda.

These data are being presented primarily for the purpose of broadening our current knowledge on the following aspects of population ecology : (1) a more realistic estimate of elephant numbers in Uganda, (2) a summary of known elephant mortalities in Uganda between 1927 and 1959, (3) the proportion of immature and breeding elephants observed during 1958-1959, (4) the percentage of calves observed during 1958-1959, and (5) an estimate of reproductive gain for Uganda's 1959 elephant population. Secondly, it is hoped that this information will aid in the formulation of a better management program for the African elephant, and that it will stimulate future generations in Africa to produce a more definitive study emphasizing the elephant's value to all the peoples of Africa.

Acknowledgment is made to William O. Pridham and Hohn B. Heppes, Game and Fisheries Department, Entebbe, Uganda, for field data; and to C.R.S. Pitman for providing valuable historic information obtained during his long tenure as Game Warden for the Game and Fisheries Department of Uganda. Acknowledgment is also made to Henry P. Grosshans, Oscar W. Johnson, and Neil D. Smith, Washington State University, for editorial suggestions and assistance in preparing the manuscript.

*Estimated number of elephants in Uganda.* — Twelve aerial counts of elephants have been conducted in Murchison Falls National Park and vicinity of north Bunyoro District since 1957 (Buechner, *et al.*, unpub. ms.). These counts, plus records provided by district rangers and other members of the Game and Fisheries Department, several reconnaissance flights in Ankole and Toro districts, and our own field observations suggest that there were approximately 23,500 elephants in Uganda during 1959 (Table 1).

We believe that this estimate is conservative. The extensive forests and other dense cover in parts of Toro, Mubende-Mengo, and Acholi conceal the elephants so effectively that appraisal of their numbers is virtually impossible. Despite the dense and extensive cover, consistently high numbers of elephants

were shot on control operations in these districts since 1927 (Brooks and Buss, 1961). This sustained high kill and the abundance of trails and droppings suggest that our estimate is low.

The annual distribution and numbers of elephants in Uganda varied as a result of seasonal movements which have been shown and discussed by Brooks and Buss (1961). Movements across the northern borders of Uganda (Karamoja-Sudan, Acholi-Sudan, West Nile-Sudan) and the western Uganda-Congo border are particularly notable in causing annual variations in population numbers. After considering possible sources of error, it is apparent that our estimate is subject to considerable variations. Nevertheless, 23,500 is probably closer to Uganda's actual elephant population than other estimates made during the last 10 years.

*Known minimum mortality of elephants.* — From the records of elephants shot by licensed hunters (Brooks and Buss, 1962), elephants shot during control operations, tusks found, and tusks confiscated following contraventions of the Game Ordinance (Brooks and Buss, 1961), a total figure can be attained which we define here as the *known minimum mortality* of elephants in Uganda.

The data, which show a known minimum mortality of 46,387 elephants for the years 1927-1959, are summarized in Table 2. Data pertaining to the elephants found dead outside and inside of Murchison Falls and Queen Elizabeth National parks (col. 4 and 5 respectively of Table 2) are based both on tusks found and those confiscated following contraventions of the Game Ordinance. These numbers have been corrected by applying to them a factor equal to the proportion of single tusked (3.5 percent) and tuskless (0.1 percent) individuals among the 33,460 elephants shot on control (col. 3 in Table 2). Table 2 shows that annual known minimum mortalities ranged from 832 (1952) to 2,055 (1956) and averaged 1,405 elephants. The average annual known minimum mortality for the last five years is 1,444 elephants.

*Proportion of immature and breeding elephants.* — Whenever possible, while conducting an investigation of the elephant in Bunyoro and Toro districts of Uganda between June 1958 and June 1959 (Buss, 1961), all elephants observed were classified and recorded according to their size. These observations were obtained at relatively close range with the aid of binoculars under favorable cover and light conditions. Nine hundred and eight elephants were recorded and placed in the following four groups: (1) 70 calves estimated at not over a year in age—small enough to walk between their mother's forelegs, (2) 152 intermediates judged to be between one and 12 years in age—weighing up to approximately 3,500 pounds, (3) 142 sub-adults estimated to be over 12 years in age—not yet fully grown, and (4) 544 adults estimated to be relatively old age—fully grown.

The first two groups which were judged to be immature animals totaled 222 elephants or 24 percent of the 908 observations. The last two groups, which were appraised as breeding elephants, totaled 686 individuals of 76 percent of the total observations. When data from 127 elephants (27 immature, 100 mature), which were collected from the Murchison Falls National Park region during this same period of time (Buss, 1961), are added to the 908 observations, the percentages of immature (24) and mature (76) elephants remain unchanged.

*Percentage of calves observed.*—In addition to the 908 elephants just mentioned, 119 elephants were classified into two groups : (1) 14 calves or individuals judged to be not over a year in age, and (2) 105 animals appraised as being more than one year old. These 14 calves plus the 76 others recorded above (70 observed, 6 collected) provide a total of 90 calves or 7.8 percent of the 1,154 elephants observed and collected.

Additional data were obtained on the percentage of calves during an aerial count of elephants on about 1,500 square miles of savanna lands in the Murchison Falls National Park region on May 12, 1959. Calves were recorded for 106 groups of elephants which were in cover and light locations that permitted these determinations. The 106 groups, which ranged from 1 to 97 individuals and totaled 2,067 elephants, included 150 calves or 7.3 percent of the total counted.

Thus on the basis of the 3,221 ground and aerial observations, the proportion of calves to other elephants observed in this region of Uganda during 1959 was approximately 7.5 percent.

*Estimation of reproductive gain.*—In computing the reproductive increase for Uganda's elephant population, Simpson and Kinloch (1954) based their projections on the following seven factors : (1) an initial breeding age of 12 years, (2) a gestation period of approximately two years, (3) a post-parturition pre-conception interval of approximately two years, (4) an infantile or juvenile mortality of 15 percent, (5) annual adult mortalities of 10 and 20 percent, (6) a terminal breeding age of 72 years, and (7) a sex ratio of 1 : 1. When they postulated a 10 percent annual adult mortality (p. 138), they found the (p. 137) " ... a population of 4,184 immature and adult female elephants in year 0 is capable of increasing to a total female population of 7,472 females in 60 years. " When they increased the annual adult mortality to 20 percent (p. 140) and started with a total population of 2,418 in year 0, the numbers declined steadily to a total population of 518 in 60 years.

We believe that a more exact estimation of reproductive gain can be achieved, at least for the 1959 population, by utilizing the data obtained in our study to modify some of the factors used by Simpson and Kinloch (1954). Table 3, which shows only female elephants, is based on : (1) a total of 11,793 adults or approximately half of the 23,500 elephants estimated for Uganda in 1959, (2) 2,859 immature elephants or about 24 percent of the total female population, (3) 8,934 adult females or about 76 percent of the total female population, and (4) an annual adult mortality of 6 percent, which is approximately the average known minimum mortality between 1955 and 1959. The 2,859 immature (approx. 24 percent) females in year 0 represent about a 36 percent juvenile mortality. This appears to be a realistic mortality, considering that it is distributed over nearly a 12-year period.

By using these values (Table 3), the population of 11,793 immature and adult females of 1959 is capable of increasing to a total population of 26,878 females in 60 years.

*Management implications.*—A summarization of our data suggests the following useful steps for management : (1) protected areas such as the present national parks are paramount for preserving the African elephant; this conclusion is based on the fact that about 95 percent of Uganda's 1959 elephant population

lived in national parks, sleeping sickness areas, game reserves, and crown forest reserves (Brooks and Buss, 1961); (2) at present nearly 1,300 elephants of both sexes can be harvested annually in Uganda for ivory and meat without endangering population increases, and (3) a management program for elephants based on modern concepts of population ecology should be established within national parks and other protected areas to assure the maintenance of elephants in harmony with rich and diversified biotic communities.

*Table*

*Estimated 1959 elephant population in Uganda*

Districts	Numbers
North Bunyoro . . . . .	12 000
South Bunyoro . . . . .	630
Toro . . . . .	2 500
Mubende-Mengo . . . . .	600
South Masaka . . . . .	70
Ankole-Kigezi . . . . .	2 300
Bugishu (Mt. Elgon) . . . . .	50
South Busoga . . . . .	150
Karamoja . . . . .	200
Acholi . . . . .	4 000
West Nile (transient Sudan population)	1 000
<b>Total . . . . .</b>	<b>23 500</b>

Table 2

*Known minimum elephant mortality in Uganda, 1927-1959*

Years	Numbers shot as Trophies <sup>1</sup>	Numbers shot on control	<i>Elephants found dead</i> <sup>2</sup>		Totals
			Outside of Nat. Parks	Inside of Nat. Parks	
1927	169	604	184		957
1928	227	657	281		1 165
1929	211	1 033	170		1 414
1930	97	892	135		1 124
1931	105	1 211	130		1 446
1932	143	1 210	179		1 532
1933	75	1 380	150		1 605
1934	100	1 603	292		1 995
1935	159	1 546	149		1 854
1936	296	1 626	133		2 055
1937	337	1 519	128		1 984
1938	331	1 053	103		1 487
1939	267	1 008	149		1 424
1940	226	1 219	133		1 578
1941	183	1 040	97		1 320
1942	169	980	59		1 208
1943	170	885	133		1 188
1944	280	971	147		1 398
1945	266	1 301	92		1 659
1946	287	853	76		1 216
1947	379	737	52		1 168
1948	441	970	135		1 546
1949	383	774	121		1 278
1950	533	781	81		1 395
1951	589	723	103		1 415
1952	263	477	92		832
1953	205	660	90		955
1954	206	696	66		968
1955	207	681	168	47	1 103
1956	258	865	106	69	1 298
1957	244	892	69	80	1 285
1958	219	1 119	76	76	1 490
1959	259	1 494	104	188	2 045
	8 284	33 460	4 183	460	46 387

<sup>1</sup> Excludes 145 elephants shot in 1925-1926.<sup>2</sup> Based on number of tusks found, and corrected for single-tusked (.035) and tuskless (.001) elephants (Brooks and Buss, 1961).

Table 3  
*Theoretical increase of 11,793 female elephants during a 60-year period  
 (6% annual adult mortality, 36% juvenile mortality)*

Time scale in years	Age in years																		Total			
	0	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68		72	Imm	Ad
0	2859			2000	1561	1218	950	742	579	451	353	275	214	167	131	102	80	62	49	2 859	8 934	11 793
4	2204	2859			1561	1218	950	742	579	451	353	275	214	167	131	102	80	62	49	5 063	6 889	11 952
8	1719	2204	2859		1218	950	742	579	451	353	275	214	167	131	102	80	62	49	6 782	5 373	12 155	
12	2245	1719	2204	2859		950	742	579	451	353	275	214	167	131	102	80	62	49	6 168	7 014	13 182	
16	2445	2245	1719	2204	2859		742	579	451	353	275	214	167	131	102	80	62	49	6 409	7 641	14 050	
20	2247	2445	2245	1719	1721	1743		579	451	353	275	214	167	131	102	80	62	49	7 137	7 646	14 783	
24	2617	2447	2445	2245	1342	1344	1361		451	353	275	214	167	131	102	80	62	49	7 509	8 176	15 685	
28	2812	2617	2447	1445	1752	1047	1049	1062		353	275	214	167	131	102	80	62	49	7 876	8 788	16 644	
32	2974	2812	2617	2447	1908	1368	844	819	829		275	214	167	131	102	80	62	49	8 403	9 295	17 698	
36	3148	2974	2812	2617	1910	1490	1068	658	640	647		214	167	131	102	80	62	49	8 934	9 835	18 769	
40	3348	3148	2974	2812	2043	1500	1164	834	514	500	506		167	131	102	80	62	49	9 470	10 464	19 934	
44	3552	3348	3148	2974	2195	1595	1166	908	651	401	390	395		131	102	80	62	49	10 048	11 099	21 147	
48	3768	3552	3348	3148	2322	1714	1245	910	710	508	313	305	308		102	80	62	49	10 668	11 776	22 444	
52	4006	3768	3552	3348	2457	1813	1338	981	712	554	397	243	239	242		80	62	49	11 326	12 515	23 841	
56	4252	4006	3768	3552	2614	1919	1416	1045	766	556	433	310	189	187	188		62	49	12 026	13 286	25 312	
60	4514	4252	4006	3768	2774	2041	1498	1105	816	598	435	338	243	148	146	147		49	12 772	14 106	26 878	

# ECOLOGICAL RESEARCH AS A BASIS FOR MANAGEMENT

by

KAI CURRY-LINDAHL

Zoological Department

Nordiska Museet and Skansen, Stockholm, Sweden

No continent in the world possesses such rich wildlife as Africa. More species of terrestrial vertebrates live there than in any other part of the globe. The great variability among the species of large mammals occurring on the African savannahs is unequalled elsewhere.

The background to this extraordinary faunal diversity is to be found in time and environment. During millions of years the fauna of tropical Africa has evolved under an almost continuous climax of natural conditions, though with repeated climatic changes (dry and pluvial periods), which, in their turn, have altered the environment and, as a consequence, the ranges of animals. These processes have favoured speciation.

As long as man was a rather uncommon species on the African stage it was of no account for the forests and savannahs how he lived. Today this harmonious situation does not exist. Man is rapidly increasing. He and his domestic animals compete directly and indirectly with the wild animals. In this competition modern man is the strongest. He exterminates or reduces the wild animals directly by killing or indirectly by destroying their habitats. This evolution has now gone so far that one is able to judge if such a development is of any real advantage to man himself. The gradual change of the landscape structure in tropical Africa must be analysed from economic and biological view-points in the interest of humanity. In fact, this is a serious question with importance for human survival not only in tropical Africa but everywhere in our world where the same problems occur. The future of human existence depends on the natural environment, of which man is only a part.

Successful actions must be based on knowledge. Ecology is the science of the interrelation between living organisms and their environment, including both the physical and the biotic environments, and emphasizing interspecific relations. Therefore, ecology is a scientific discipline which is extremely important and indispensable in connection with all development planning and exploitation of renewable natural resources, especially in tropical Africa, where unwise use of land and water may have catastrophic results for the whole biocommunity, including man.

There are already too many examples, both in Africa and elsewhere, of human actions for industrial or agricultural purposes which have failed completely economically, and have only produced landscape ruin where formerly existed a flourishing, highly productive area in its natural state. The reason why such disastrous schemes have been launched and even partly initiated is

often dependent upon the fact that biologists have not been consulted or that their advice, based on objective ecological data, has been neglected. Therefore, biological and ecological viewpoints must be taken into consideration by the governments and respected on the same level as pure economic arguments. In fact, ecology in this connection is a synonym with conservation of nature, and conservation may as well be interpreted as human bio-economy.

In no way does mankind know enough about natural environments, neither its own, nor those of other creatures. Ecological research therefore must be intensified on a much larger scale than has hitherto been the case.

The management of natural resources is essential for the well-being of human populations, and must be based on the modern concept of conservation of nature that from the human point of view is a wise, long-termed utilization of nature's renewable resources (water, soil, flora and fauna). The goal must be to reach a biological balance between man's demands on one side and nature's possibilities of constant production of the requirements on the other. Not only the pure economic values belong to human necessities, but also the recreational and cultural values must be considered as important items in the yield produced by nature.

How to act in order to reach an ideal bio-economic equilibrium between man and his natural environment is not simple. There is no general method which can be applied to all areas of tropical Africa. One geographical region differs from another, and every habitat is in some way different from the others. In addition, a given biotope of a certain area is in no way stable; there are always, in the long run, greater or smaller changes in a biocommunity as a result of an endless chain of reactions, dependent upon seasonal and environmental conditions as well as on the population dynamics of all organisms living in the area—and sometimes also outside it.

Only ecological research can give an objective answer to the tremendous number of questions which will constantly be raised in connection with management problems. We really do not know enough at present, and we do not understand many of the natural processes which annually take place before us. However, ecological research work in tropical Africa during the last decade has opened our eyes to many things, which until recent times were not fully understood. The most important of these new results emphasizes a bio-economic necessity for the future of tropical Africa. It concerns the land-use of the so-called marginal areas, e. g. nonoptimal areas for grazing livestock. Most of the land in tropical Africa belongs to such marginal areas. They also include tsetse-infected regions. Hitherto it has been taken for granted that agriculture and cattle husbandry are more productive than the natural flora and fauna, which have evolved through natural selection and, thus, have reached an advanced adaptation to different environmental conditions. The opinion that domestic livestock always is the most productive item among animals is not realistic. A very large number of wild ungulate species utilize the vegetational niches of an area, even a poor one, in a very rational way, using almost all vegetational resources, and convert them to proteins without destroying the flora and the soil, and without causing any considerable competition between themselves. When cattle moves in on such an area, the picture is quite different. In spite of the fact that cattle do not graze more than a part

of the vegetation, thus an uneconomic use of the area, their grazing and trampling activities often ruin the flora and precede erosion of the soil. Moreover, cattle on marginal lands in tropical Africa are almost always half-starved, the mortality is high and the reproduction is low compared with most species of wild ungulates. Thus it is clear that, in general, domestic cattle cannot stand the tropical environment in Africa, and the habitats there cannot stand domestic cattle. The hippopotamus may serve as an example of a highly productive wild mammal. This species has a shorter gestation period than cattle and, according to *von Anghi* (1940), it needs much lesser quantities of food (only 10.7 calories per kg body weight) to build up its enormous mass of proteins.

That natural vegetation can be utilized far more efficiently for protein production by wild animals than by domestic cattle is shown by the fact that the carrying capacity of rather poor African savannahs in relation to wild ungulates is equal or even higher than what is the case for optimal artificial grazing areas in relation to domestic cattle. The total ungulate biomass in the Albert National Park in the Congo is 24,406 kg per sq. km. (*Bourlière and Verschuren* 1960) and in the Queen Elizabeth Park in Uganda as much as 34,944 kg per sq. km. (*Petrides and Swank* 1958).

These facts seem to give support to the idea that the protein production of wild ungulates within a given area is considerably higher than that of domestic cattle living in a comparatively equal area, and there can be no doubt that wild animals do not destroy their own habitats, which domestic livestock apparently do, which can be seen almost everywhere in tropical Africa.

If we accept the concept that wild ungulates are much more productive than cattle, one may ask if the productivity of the former would not be increased if animal predators sharing the habitats of the wild ungulates could be eliminated and replaced by man, thus achieving a larger benefit. The answer must in general be no. Man is unable to prey in the same effectively selective way as an animal predator. He would on the contrary act negatively on the species he is preying upon, lowering its genetical and constitutional quality, because lack of natural predation pressure will in the long run cause a deterioration of animal populations. Predators as fur animals are useful in many ways in addition to the direct economic value they represent in the general animal crop.

The basis for management of wild animal populations in tropical Africa must rely upon ecological research. Investigations must be carried out in different habitats. They must cover all parts of the ecosystems and the biotic communities including the role of predation and other interspecific relations, e. g. foodchains, habitat needs, etc., as well as physiological adaptations to environmental conditions. Inventories of all plant and animal species must be set up in the same extensive way as the Belgians have done during 35 years of outstanding work in the very large and representative National Parks of the Congo. Research must pay attention to the best utilization of the land for converting plants to animals, e. g. to increase the protein production and to learn the optimal terms of the carrying capacity of a given area in relation to the biomass produced. The same principles may be applied to the bioproduction of aquatic habitats. Restoration of biologically destroyed areas may be a result of such activities. Also technical questions as methods of harvesting

wild animals and how to distribute the meat to the final consumers must be studied scientifically. The recreational, cultural and touristic values of the tropical landscape with its remarkable flora and fauna must be considered.

It is essential in all work of exploitation and development of natural resources that the foundation upon which human existence is based—water, soil, vegetation and animals—is in principle understood in all its implications, not only by biologists but also by governmental administrators and advisers. It is quite unrealistic to regard conservation of nature and wildlife as something exclusive without any importance for human populations. Ecological research on every continent of this interesting globe of ours has hitherto confirmed that conservation of nature is a fundamental necessity for mankind.

Tropical Africa seems to have far larger possibilities than any other area of the world to utilize its living natural resources in a highly productive way for its human inhabitants not only from economic view-points but also from ethical ones. Such an achievement can without a doubt be realized if one fully cooperates with nature and does not fight against it. " Cooperation with nature " is a slogan, which I hope may characterize the future work in Africa.

# THE IMPORTANCE OF GAME-MEAT CONSUMPTION IN THE DIET OF SEDENTARY AND NOMADIC PEOPLES OF THE SENEGAL RIVER VALLEY

by

P. CREMOUX

Head of the Forestry Division, Richard-Toll: Ministry of Rural Economy  
and Cooperation, Senegal Republic

The following data cover the Senegal River valley from the delta to the middle reaches (i. e. the sphere of activity of the Fisheries Research organization). They apply to the Senegal bank of the river only.

The population of the whole region (based on the figures quoted by C.I.N.A.M. in 1959, and allowing for natural increase), is estimated at:

<i>A. Population</i>	Delta	Mid valley	Upper valley	Total
Urban . . . . .	38,903	—	—	38,903
Rural (high density) . . . . .	1,782	18,348	3,759	23,889
Rural . . . . .	<u>17,300</u>	<u>240,840</u>	<u>15,400</u>	<u>273,540</u>
	<u>57,985</u>	<u>259,188</u>	<u>19,159</u>	<u>336,332</u>

## *B. Distribution of population (St. Louis excluded)*

	Delta	Mid valley	Upper valley	Total
Sedentary . . . . .	13,037	187,336	18,349	218,722
Nomadic . . . . .	6,045	71,852	—	77,897
	<u>19,082</u>	<u>259,188</u>	<u>18,349</u>	<u>296,619</u>

## *I. Consumption of game-meat*

*a)* M.I.S.O.E.S. estimate of game-meat consumption by the sedentary population of the Middle Valley, in grammes per day :

	Wet season	Dry season	Mean
Birds . . . . .	4	9	7
Game animals . . . . .	2	2	2

These figures would also be applicable to the Upper valley.

*b)* In 1955, accompanied by an ethnologist on a study in the Linguere district, we had estimated the level of consumption of game-meat at:

Birds . . . . .	2.5 Kg per year
Game animals . . . . .	1.2 Kg per year

Consumption by the nomadic element of the population would probably be rather lower.

c) According to two geographers who carried out research in the Delta, consumption of game birds would be approximately equal that of beef, namely 4 grammes per man per day.

On the above basis total consumption of game-meat can be calculated as follows (in metric tons) :

	Delta	Mid valley	Upper valley	Total
Sedentary population				
Birds . . . . .	18.773	47.208	4.623	70.604
Game animals . . . . .	—	13.488	1.321*	14.809
	<u>18.773</u>	<u>60.696</u>	<u>5.944</u>	<u>85.413</u>
Nomadic population				
Birds . . . . .	15.112	179.630	—	194.742
Game animals . . . . .	7.254	86.222	—	93.476
	<u>22.366</u>	<u>265.852</u>	<u>—</u>	<u>288.218</u>
Total				
Birds . . . . .	33.885	226.838	4.623	265.346
Game animals . . . . .	7.254	99.710	1.321	108.285
Grand Total . . . . .	<u>41.139</u>	<u>326.548</u>	<u>5.944</u>	<u>373.631</u>

\* Actual consumption is probably higher, but there is insufficient data on which to determine this.

*Comparison of mean consumption of animal products*

(based on mean M.I.S.O.E.S. statistics adapted to cover the whole valley)

Type of Meat	Consumption in metric tons	% of total meat consumption	% of total consumption of meat + fish
Mutton/goat . . . . .	1,981	61.1	11.2
Beef . . . . .	433	14.7	2.4
Fowls/ducks . . . . .	162	5.5	0.9
Game-meat . . . . .	374	12.7	2.1
Fish* . . . . .	<u>14,867</u>	<u>—</u>	<u>83.4</u>
Total . . . . .	<u>17,817</u>	<u>100</u>	<u>100</u>

\* Excluding exports, consumption in St. Louis and by the population of the Mauretianian bank of the river.

II. Analysis of damage caused to crops by animals in the Middle Valley  
of the Senegal River  
(M.I.S.O.E.S. figures)

Expressed as a percentage of the cultivated area :

A. Flood-plain cultivation

Gtade of damage	Species	Upstream	Downstream
<i>Total</i>	Birds . . . . .	.9	.1
	Locusts . . . . .	2.0	.1
	Monkeys, wart-hogs . . . . .	.2	—
	Others . . . . .	4.5	.6
		<u>7.6</u>	<u>.8</u>
<i>Sporadic</i>	Birds . . . . .	15.3	14.4
	Locusts . . . . .	—	1.7
	Cattle, monkeys, wart-hogs . . . . .	10.7	.2
	Birds and locusts . . . . .	.3	—
	Birds, monkeys and wart-hogs . . . . .	5.9	2.0
	Cattle, monkey, wart-hogs . . . . .	3.1	.2
	<u>35.3</u>	<u>18.5</u>	
<i>Partial</i>	Birds . . . . .	.2	.1
	Locusts . . . . .	.2	.2
	Monkeys, wart-hogs . . . . .	1.0	.4
	<u>1.4</u>	<u>.7</u>	

B. Wet-season cultivation

Expressed as a percentage of the total area of cultivation destroyed :

	Downstream	Upstream	Valley
Locusts . . . . .	84.5	62.5	74.0
Cattle, monkeys, wart-hogs . . . . .	5.5	9.5	8.0
Others . . . . .	<u>10.0</u>	<u>28.0</u>	<u>18.0</u>
	<u>100</u>	<u>100</u>	<u>100</u>

*Note:* The upstream sector starts on the boundary of the Podor and Matam districts.

# THE HABITAT

by

F. FRASER DARLING  
The Conservation Foundation  
New York City

Habitat is the totality of the environment in which plants or animals live in optimum conditions or as near optimum as can be reached for each species. A plant thrives if its germination has occurred in the set of conditions to which it is adapted; it exists in a state less than thriving if some or all the conditions are not fulfilled and it dies or does not even germinate if some or all the conditions are above or below a certain level of tolerance. Therefore, although plants cannot move or choose their habitat, they appear in such conditions as suit them and in associations which are recognizable by us as being characteristic. When we speak of a papyrus swamp, we have an immediate mental picture of the relatively shallow water covered with a mat of water-loving vegetation of which papyrus is the dominant plant. We know we shall not see the papyrus growing anywhere else than in such a set of conditions or habitat. A marsh shows a different assemblage of plants, a seasonally inundated flood plain, a different one again, and once clear of the flooding we find several kinds of "bush," land where trees and shrubs and characteristic grasses grow. Then there are the plains where trees are few except along the drainage lines. Those of us who know Africa have immediately in our minds the expanses of red oat grass, not that this is the only one present but the plains are its habitat, where it is dominant, and to a large extent maintained by the passage of light fire. Then, when we climb some range of mountains to between 7,000 and 10,000 feet we come—if we are fortunate—to high montane forest, not dominated by any one tree, but showing a closed canopy made by the crowns of many species.

These several habitats, of which we so easily imagine the distinct pictures in our minds, are not static phenomena, although they may endure through long periods of time. The farmer, forester and pastoralist see the several habitats from the point of view of the plants which interest them most, but the naturalist sees each habitat as a dynamic community of plants and animals which, living together, by their various habits and activities maintain the habitat. The animals, we find, are closely adapted to their chosen set of conditions or habitats, though the capacity of some animals to occupy several habitats is of great interest. Man is the most adaptable animal of all; there are few natural habitats he cannot occupy either temporarily or permanently, adapting clothes and shelters to buffer the habitat in some measure, and it is worth thinking how near to man is the elephant in capacity to occupy widely different habitats.

But in general, we can associate so many of the better known African animals with definite habitats, and we know well enough how remarkable it is if we see an animal out of place; we wonder what has happened. Most of the small and less well known creatures are even more closely bound to their habitat, or in other words, the range of conditions under which they can live is narrow. This fact is the basis of tsetse-fly control, for example: comparatively little disturbance of the vegetation and reorientation of human settlements so upset the breeding conditions that the fly cannot be successful.

Conservation, however, is concerned with the maintenance of habitat as the fundamental first principle in maintaining populations of animals and plants. This can be done only by understanding thoroughly the interactions of the components of the habitat—physiography, geology, climate, and of all the animals and plants within the habitat. This composes the study of ecology, and quite obviously there is an immense field of work to be covered. We are only beginning to apprehend rather than comprehend the intricacy and delicacy of the poise of the world of nature.

One of the most important things to remember when contemplating habitat is the unconscious co-operation between all the organisms within it to maintain it, accepting the premise that the climatic influences remain constant. A simple example of this truth is in the great herds of grazing animals which until now have covered the plains of Africa. The vegetational habitat of the plains would not persist were it not for the constant passage of the herds to and fro and round and about. Their grazing perpetuates the grass and limits the spread of bush. If the herds are too severely depleted the habitat as we know it would change and a different community of plants and animals would take over. Another example is montane high forest. The trees standing together with their closed canopy create a very special set of environmental conditions within the forest; a deep soil builds up, rich in organic matter, holding its own community of small invertebrate animals; within the forest the temperature remains more constant than outside and so does the humidity. Many species of both plants and animals found there can begin their lives only under these conditions of shade. If the forest is wounded by excessive felling or by the intrusion of fire, the conditions for its regeneration and maintenance are lost and the forest dies on its feet, as it were. We know too well how often this has happened and we tend not to observe that such a habitat is very tender on the edges. Unless such forest has a good protective skirt of graded height of vegetation, it wears away. How often can we see a tree of the forest standing far out in grassland and degenerate bush! Such a tree is now out of its habitat and we know that even if it produces seed, that tree will not reproduce its kind. The tree has a long life to live out and cannot change its position, so there it remains as a relic of a different habitat. Had the tree been an animal like a bongo or a gorilla or a blue monkey, it would have retreated into what of its chosen habitat remained and if the area became too small, its kind would die out.

The corollary of the statement of unconscious co-operation between the members of the biological community occupying and making up a habitat, is that each species serves a function within that habitat. The biological community distinctive of each situation represents a system of conversion of matter, of circulation of energy, and it is a phenomenon of natural habitats that they

represent the maximum conversion rate or energy flow within the given climatic and physiographic situations. Evolution by natural selection rests on the phenomenon of differentiation of plant and animal forms. It is not merely that living things become *adapted* to their environment, but that their variability allows forms to take advantage of unfilled niches occurring in the complex of conversion of matter and which, once filled, increase the rate of conversion and circulation. A tropical rain forest represents one of the oldest life forms on the planet, so complex and rich in species of plants and animals that turnover is very rapid indeed : the most permanent physical material in such a habitat is the lignified cellulose represented in the trunks of the trees.

Competition, so often stressed in speaking of evolution, comes when two species do exactly the same thing. Avoidance of that kind of competition is by differentiation and we find in fact that within any one habitat and its biological community no two species do fill exactly the same niche or perform exactly the same function. It is so easy with imperfect knowledge and by superficial observation to think some species do make the same demands on and the same contributions to the habitat, but this is the task of ecology, finding out exactly what different plants and animals *do*. For example wildebeest and zebra are so often seen together and we class them as grazers, a very broad classification. Where, when and how do they graze ? The very mouth parts of the two species make for different grazing action, and if you have watched the creatures long enough you will know that sometimes the zebra will be found where the wildebeest are not.

It is possible already to construct a chart showing the stratification of function of the twenty to thirty species of hoofed animals which may be found in any one African habitat, from the pathmaking elephant which by breaking and topping trees creates browse conditions for other species, to the very particular rough browsing and grazing habits of the antelopes. Each species is helping to conserve the habitat. If we, in our lack of wisdom, cut down the number of species of animals in a habitat, we render it harder to maintain. In a practical, economic example, this is why many so-called pastoral areas of Africa are breaking down. The twenty or thirty natural species of grazers and browsers have been replaced by two or three exotic species. The niche structure is so incomplete that degeneration of habitat takes place. Even without pastoralism, as in national parks and reserves, the wildlife manager has a difficult task in maintaining habitat, which is the very basis of conservation. And on so many of the poorer lands of Africa that means conservation of the human habitat as well.

# GAME RANCHING IN AFRICAN LAND-USE PLANNING

by

RAYMOND F. DASMANN  
Museum of Vertebrate Zoology,  
University of California, Berkeley  
California<sup>1</sup>

The production of game for meat and economic profit has now been tried out in various areas of Africa. In the Union of South Africa game ranching, using most commonly one or two species of antelope, is an established and profitable practice. In Uganda, W. L. Longhurst has shown the feasibility of cropping and marketing hippos to reduce overpopulations in national parks. Lee M. Talbot has investigated the commercial value of game in Tanganyika, and in Kenya, the Waliangulu pilot game management scheme, using game as a source of meat and income in a tribal area, is well under way. In Southern Rhodesia, from 1959 to 1961, methods of cropping and marketing game have been developed, and it has been shown that in some areas now devoted to cattle production, more meat per acre and a higher financial return to the landowner will be produced from game animals. Yet, the production and commercial sale of African wild game is a form of land use that has not been given sufficient consideration in planning for the management of African lands.

## *The Henderson Ranch Study*

At the Henderson ranch in Southern Rhodesia, A. S. Mossman and the writer found that a wild ungulate population, supported at an estimated density of 76 per square mile, produced more meat per acre than would be obtained by converting the same area to cattle production. Game animals were found to produce more meat in relation to live body weight than most domestic cattle breeds. Game production did not involve expensive land development or high operating costs. Cropping through shooting or trapping, and transportation to markets were carried out without great difficulty or expense. Thus, although beef commanded a higher price on the market than game meat, the lower cost of producing and marketing game brought a much greater net profit to the land owner.

The Henderson Ranch supports less game than some other areas in Rhodesia and much less game than has been reported from various areas in east and central Africa, where seasonal drought is less of a limiting factor. The estimated weights of wild ungulates in pounds, live weight, supported per square mile in some of these areas are as follows :

<sup>1</sup> Fulbright Research Scholar, National Museum, Southern Rhodesia, 1959-1961.

Location	Ungulate Live Weight lbs./Sq. M	Authority
Queen Elizabeth National Park, Uganda . . . . .	200,000	Swank and Petrides (1958)
Serengeti Plains, Tanganyika . .	29,800	Grzimek (1960)
Albert National Park, Congo . .	139,000	Bourlière and Verschuren (1960)
Kivu, Congo . . . . .	34,000	Pirlot (1956)
Nairobi National Park, Kenya . .	38,800	Petrides (1956)
Henderson ranch, Southern Rhodesia . . . . .	26,500	Dasmann and Mossman (1961)

In the above table the figures are adapted from the calculations of Bourlière and Verschuren (1960). For purposes of comparison we have used the same body weights for animals as were used by these authors. The actual weights of animals taken from Henderson Ranch, however, are somewhat lower than these estimates, and the actual live weight supported per square mile at Henderson's is 18,700 pounds of wild ungulates. It is likely that some of the above estimates will undergo a corresponding reduction as more animal weights are determined, but the relative values will remain as shown.

The yield of game meat from Henderson's Ranch has been calculated at 2,366 pounds per square mile. It is obvious that the potential annual yield from the other areas shown in the table could be much higher than this. The Henderson ranch estimates, however, are conservative, and the game population in this area is far reduced from its original levels. Elephants have been driven out, and the sable and roan antelope are no longer present. The numbers of wildebeest are reported to be much less than in earlier times. With proper management the yields from Henderson's could doubtless be increased.

#### *Game in Land-Use Planning*

The place for commercial game utilization in land-use planning needs to be examined. A primary wildlife conservation requirement in Africa is the protection of representative areas of African land with their total biota. This has been attempted through the establishment of national parks. The maintenance of these parks through careful protection deserves a high priority in any scheme for land-use. The economic and aesthetic values of these parks can best be realized through encouraging their use by tourists. Their scientific value, which is high, can be realized through setting aside of areas within the park that are not developed for tourists but retained in a wilderness state for scientific studies. Commercial game production for meat yield has only a minor role to play in national parks. It can bring in some occasional income when game herds must be reduced or culled to protect other elements of the biota.

The place for commercial production of wild animals in urban and high-yield farming areas is also minor. Some species can adapt to such areas without serious conflict and prove to be of value. In general, however, commercial game production is best adapted to the great areas of pastoral lands; the deserts, savannahs, and woodlands, outside of the urban-agricultural lands and apart from the national parks or wilderness reserves. In some of these lands, use of game for sport hunting, through organized safaris or the sale of hunting permits, will prove to bring the highest monetary yield. In other areas, where the demand for meat production exceeds other demands, or where the demand for safari-hunting or other types of sport hunting are low, the direct production of game for meat should be considered first. All lands of these types should be examined critically to see which uses of the land will give the highest benefits to the country. In some, a combination of forest management with game production may prove most profitable. In others, various species of game may be profitably combined with the production of domestic livestock. Where the social or cultural values of cattle exceed their other values, this will be true. In many areas, however, the use of livestock creates more problems than it solves, and yields cannot be sustained at a high level. In such areas, the production of various kinds of game animals alone will prove to be the most profitable land use.

#### *Establishing Game Ranching*

In most countries in Africa, government finances are limited, and extensive programs of research or development for wildlife resources cannot be undertaken at the present time. It is urgent, however, that game production be started as soon as possible, while existing breeding herds are still large enough to produce encouraging initial yields. Fortunately, further research is not required to initiate game ranching programs, and the costs of starting them can be kept low. A quick survey of lands with game ranching potential will provide an estimate of the numbers of animals that can be safely removed in an annual cropping program. First estimates can be conservative, to avoid danger of overshooting, but once the program is started the cropping rate can be gradually increased until it approaches the maximum that can be sustained without reducing the herds. Much more research is required before the full potential of big game herds can be exploited, but it is not necessary to start the program. Arranging the legal framework within which game ranching can be carried out, and providing the proper channels for handling and marketing game meat and products, are more immediate needs.

There is a danger in allowing the hunting of game for the market, that we will encourage lawlessness. By permitting the legal sale of game meat, the way can be left open for widespread game extermination. Land owners may want to take advantage of the program to make a quick income from their present game herds as a step to clearing the land for cattle. Poachers may attempt to market illegally taken meat, once the way has been cleared by the sale of meat from game ranching areas. Tight legal control is therefore necessary, if a program aimed at game restoration and maintenance is not to be changed by the unscrupulous or ignorant into a program of game elimination. Permits to produce and market game meat can only be issued after investigation shows that

such a program can safely be undertaken in the area, and that the permit will not be abused. Periodic checks must be made to see that reduction of game is not being carried out in the guise of sustained annual cropping. Proper legal safeguards must surround the marketing of game meat to prevent illegal sale.

However, although risks are involved in a program of commercial game production and marketing, greater risks lie in a failure to institute such programs. To date protective game laws have failed to protect game. Appeals based on the aesthetic, recreational, and scientific value of wildlife, have not saved that wildlife. An approach based on the proved commercial value of game as a product of the land has more hope for influencing land owners, land managers, and land-use planners, than any appeal based on intangible values. In the absence of a program encouraging the commercial use of game as a sustained crop, large mammals will certainly vanish from many areas where they could have been maintained. They will vanish to make way for traditional types of food production of lower value and lower yield. Commercial game ranching involves a risk of reducing game numbers. Its continued absence, in many areas, brings the certainty of reduced numbers of wild animals.

# INTEGRATION OF THE CONSERVATION AND DEVELOPMENT OF WILD RESOURCES WITH PROGRAMMES OF ECONOMIC DEVELOPMENT IN MODERN STATES

by

P. GORDON DEEDES, O.B.E.  
Chairman, Natural Resources Board of Southern Rhodesia

This Paper covering the integration of the conservation and development of natural resources with programmes of economic development relates only to Southern Rhodesia, a territory 150,000 square miles in extent, with a population of some 2.8 million of which 225,000 are Europeans, forming part of the Federation of Rhodesia and Nyasaland which in turn is bounded on the north by the Congo Republic and Tanganyika, on the west by Angola, on the east by Mozambique and on the south by the Republic of South Africa.

The responsibility for the conservation of natural resources of any country is great, and the problem of integrating them with the economic development of that country carries a heavy responsibility, and in this Paper an endeavour will be made to bring to light the procedure followed in Southern Rhodesia and to record the successes so far achieved in the hope they may prove of value to members of this conference.

By 1938 it became apparent that Southern Rhodesia's natural resources, including its wild life resources, were rapidly being dissipated or destroyed and that stern measures would have to be taken if the situation was to be saved and a future for the country assured.

The outcome was the setting up, in 1941, of the Natural Resources Board constituted by act of Parliament, which was in essence a Board recognised as the Public Trustee for the natural resources of the Colony.

The Board is a non-political, independent body comprised of members appointed by the Governor and chosen with regard to their knowledge and experience of matters with which they are likely to be called upon to deal, such as agriculture, mining, wild life and the like.

Neither the Chairman nor Members of the Board are Civil Servants although the staff of the Board are drawn from the ranks of the Civil Service.

The Board has three main functions as defined in the Natural Resources Act:

- a) To exercise general supervision over the country's natural resources.
- b) To stimulate by propaganda and such other means as it may deem expedient, a public interest in the conservation and improvement of natural resources.
- c) To recommend to Government the nature of legislation or measures deemed necessary for the proper conservation, use and improvement of natural resources.

The Natural Resources as defined in the Act are :

- a) The soil, water and minerals of the Colony.
- b) The animal, bird and fish life of the Colony.
- c) The trees, grasses and other vegetable products of the soil.
- d) Such other things as the Governor may, by proclamation in the Gazette, declare to be natural resources, including landscapes and scenery which in his opinion should be preserved on account of their aesthetic or scenic value.

The Board claims no technical qualifications. Advice on technical matters is supplied by the Federal and Territorial Government Departments such as Research and Specialist Services, Wild Life Conservation, Irrigation, Conservation and Extension, African Affairs including African Agriculture, Mines and Forestry. In addition, the Board has powers to consult experts who may be qualified to advise on technical questions and, in case of need, have the same powers as a Magistrate's Court to summon witnesses and to examine them under oath and call for the production of documents.

No public revenue of the Colony may be spent on soil and water conservation projects which involve an estimated expenditure in excess of £ 15,000 unless the Board has favourably reported on such projects.

The Board is committed to furnishing Parliament with a report of its work during the year and to show to what extent its recommendations have been adopted.

Of equal importance is the fact that in terms of the Act the Chairman of the Board has direct access at any time to Ministers of the Crown.

The Board has extremely wide powers in that it can give orders to the owners, occupiers or users of any land to adopt such measures as it may deem necessary for the conservation and protection of the resources. Whilst an appeal to the Courts against such orders is provided for, the Board relies upon persuasion rather than compulsion and depends upon the goodwill and common sense of the people to ensure a future both for themselves and for those who are to follow.

What in fact the Board endeavours to instill into the minds of the people is the fact that, whilst we during our short lifetime have every right to make reasonable use of the country's resources, we must also regard ourselves as their trustees neither entitled to mistreat, squander nor destroy regardless of the consequences to future generations.

That is the whole essence of the Board's approach to the conservation of this country's resources and applies equally, of course, to wild life as it does to soil, water, minerals and other natural resources of the Colony.

The first essential is to gain the confidence both of the Government and the people, and once having won that confidence there is no limit to the steps which can be taken to ensure the wise utilization of the country's resources.

The Board works at all times in the closest co-operation with all concerned in one way or another with the conservation of the country's resources, whether Government Departments or others outside the sphere of Government. In fact, by virtue of its independent status, the Board is invariably able to resolve

matters concerning a particular resource which, due to political or other considerations, might otherwise become obscured or overlooked.

Under the Act, the Board is empowered to set up high level committees dealing directly with specific natural resources to which senior members of the Civil Service and other experts in their particular field are appointed. These committees cover such subjects as Wild Life Conservation, Water Resources, Mineral Resources, Conservation, Education, Catchment Protection and Sub-Division of Land in the Rural Areas. On the advice of these committees, the Board is enabled to make recommendations to Government for the conservation and improvement of natural resources. These committees play an important part in recommending to the Board steps considered expedient for the wise utilization and integration of the resources into the economic development of the country.

As an example, the Wild Life Conservation Committee have drawn attention to the need for research into wild life utilization and land use based on sound farm planning techniques. They have urged the need for training courses in wild life for non-graduate field men and, at a higher level, for post-graduate courses on wild life conservation at the University College of Rhodesia and Nyasaland. They have also stressed the need for preservation if only to give time for research before the irrevocable destruction of the wild life takes place. And last, but by no means least, they have kept to the fore the need to conserve the wild life resources of the country as a tourist attraction.

Realising the Board could not properly carry out its duties over a territory of some 150,000 square miles without outside assistance, the Act provides for the formation of Intensive Conservation Area Committees of which some 120 are at present operating in the European and certain of the African areas of the Colony.

These committees which are "bodies corporate" form the chief executive agents of the Board in the rural areas and assist the Board in carrying out the objects and purposes contained in the Natural Resources Act.

It is important to note there is no compulsion attached to the formation of these committees and the Act provides that they cannot be recognised unless on their own initiative landowners express the wish to undertake measures for the conservation and improvement of natural resources within their particular area.

Committee members are elected from amongst their own local farming community and it is to the credit of African and European members alike that they provide their services free of any monetary reward but simply in the knowledge that by serving the community in this way they are ensuring a future both for themselves and for future generations.

These committees rely for technical advice on the services provided by the Federal Department of Conservation and Extension and the Department of African Agriculture.

The duties of the I.C.A. Committees include the conservation of the resources within their particular area, ensuring the protection of the soil by contour ridges and other means, the development of water resources, the conservation and protection of the animal, bird and fish life, the prevention of uncontrolled grass fires, education of the youth of the area by the establishment of Young

Farmers' Clubs and similar organizations and generally raising the standard of agriculture.

*Following the example set by their parent body, the Natural Resources Board, Committees carry out their duties in a spirit of advice and persuasion rather than direction and control. In fact, this approach to the conservation of the country's natural resources has been the key to success in Southern Rhodesia.*

One of the most important duties assigned to the Board is that of publicity and propaganda or, put more simply, the need to educate all sections of the community in their responsibilities towards the conservation of the natural resources. This aspect of the Board's work has been adequately dealt with by the Board's Public Relations Officer, Mr. J. A. Pile, in a Paper under Item II. 4—" Developing an Appreciation for the Need of Conservation of Nature and Natural Resources " and so will not be enlarged upon here.

To those members of this Conference who may wish to give further thought to the approach Southern Rhodesia has adopted towards the conservation of her natural resources, a word of warning is offered. Success can only be achieved if the Board, or similar body, is free from political influences. Once political considerations are permitted to encroach the co-operation and goodwill of the people are endangered. Southern Rhodesia accepts the value of her natural resources as a priceless asset far removed from the realm of party politics.

# THE PHYSICAL AND HUMAN ENVIRONMENT IN WEST AFRICA

by

P. L. DEKEYSER  
I.F.A.N., Dakar

West Africa is characterized by— (1) great biogeographic diversity; (2) a corresponding diversity in ways of life; and (3) the varying degree of its cultural development.

1. This is not the place to enlarge on the well-known fact that, in West Africa, the main vegetational zones succeed one another from north to south, running parallel with the Equator. It is enough to recall that one passes, fairly steadily, from desert to heavy forest and moreover, in an over-all distance of about 2000 km. (from the Tropic of Cancer to the Gulf of Guinea) from 50 to more than 3000 mm. annual rainfall, and highly arid to extremely lush vegetation.

2. In the steppe and dry savannah region there are of course some sedentary populations; concentrated chiefly in the relatively fertile valleys, these are composed of millet growers and fishermen. But the characteristic of such zones is nomadism and pastoralism. Where the country outside the forests becomes less arid and better supplied with springs, for example in part of the Soudanian and especially the sub-forest types of savannah, in fact at the latitude where the hostile element of trypanosomiasis first makes its appearance, cultivators naturally become dominant. In proportion and to the extent that from north to south the vegetation thickens, so the density of human population increases and agriculture becomes their primary occupation.

3. One can further state that cultural evolution, with its modern ideas and implications of technical, productive and economic progress tends to have a somewhat " constricted " character in Africa. It usually originates in the big urban centres, where it generally develops in a satisfactory manner, but as it spreads into the rural scene meets a situation in which tradition and mystical beliefs have a large influence.

Starting with these three premises, one sees that problems of conservation and rational utilisation of natural resources are particularly difficult to solve.

In the first place the fact that West African countries have inherited boundaries fixed by Colonial administrations by reference to simple topographical convenience, means that their territory does not fall within the criteria which considerations of geographical or ethnic unity would have imposed. With only a few exceptions, none of these States lies within a single zone of vegetation. Thus Senegal ranges from Sahara, to Soudanian-type savannah, sub-forest savannah and full forest (the forested islands of Casamance). Mali extends from

desert to humid Soudanian savannah, Cameroon from the Tchad steppe country to heavy forest, etc. Each of them contains examples of flora and fauna which are worlds apart, quite separate within the limits of the State in question, yet shared by the whole group of States. For example, in Senegal, the problem of the *Quelea* finch only affects the Sahelian zone in which it nests, but this zone, and hence the problem, extends throughout the dry areas of Senegal, Mali, Niger, Tchad, the Sudan, etc. The result is that most of the main themes of research which are concerned with the struggle against such major plagues as the invasions of locusts—the "millet-eaters"—or against other epidemic and enzootic pests, are in fact of international significance. E. B. Worthington has recently emphasized the problems created by the rivers which so often form inter-territorial boundaries. Indeed any modification effected by one country on the flow of a river within its own territory (by barrages, irrigation works and the like), can have most serious consequences on the hydrological stability of a neighbouring state, which happens to be bordered or traversed by the same river.

Variation of regional biogeography and of ways of life, lead to a multiplicity of problems. There will be questions of overgrazing, of bush fires, of soil deterioration, demanding special attention in semi-arid regions and dry savannah, questions of deforestation, or of climatic changes and, again, erosion induced in forest country, research into ways of obtaining the necessary balance between pasture, agriculture and wild life, wherever pastoral and agricultural interests encounter one another; to which may be added, everywhere, the possible repercussions of water development works on the fishing industry or water conservation, the effect on the environment of the introduction of monoculture or development plans, and, generally, the desire on the part of all countries to exploit their resources to the utmost without mortgaging the future. Anyone concerned with preserving, and utilizing, wild animals or native vegetation, will meet with problems as numerous and diverse as the environments and basic human activities mentioned above.

There has long been a tendency, when the protection of any species, particularly of animals, has been under consideration, to ignore the environment and the relationship of the species with man. Admittedly this is better than nothing, but it is recognised today that in fact the conservation and utilisation of natural resources falls within the scope of human ecology, as distinct from animal ecology, in the sense that psychological and cultural factors play a part in the interrelationships of the natural order.

It is well established that under-development is closely tied up with retarded evolution and that in the last analysis achievement of any conservation or utilisation project requires first and foremost that the people concerned should be sufficiently persuaded to cooperate. There can be no doubt that too much of the effort which could be directed into useful channels is nowadays wasted in conflict with deep-seated pastoral or agricultural traditions, not to mention certain religious dogmas.

It is generally appreciated today—and borne out by the reports of many an international conference—that arid regions are tending to turn into desert, that forests are tampered with and diminishing, that arable soils are being lost, that, despite substantial increases of flocks and herds due to improved animal husbandry, people are paradoxically suffering general deficiency of animal protein,

that flora and fauna are in great danger, and that the human race, almost everywhere in the world, is multiplying at a considerable rate without achieving anything very obviously equivalent in the way of increased natural resources utilisation. Much of this state of affairs is due to the persistence of traditional methods of using soil and vegetation, and to the almost mystical attitude to pastoralism in the greater part of the area where it dominates human activity.

If examples are needed, there are plenty of only too well-known ones available. The African peasant farmer is well aware from experience that the earth gets exhausted if it is cultivated too long under the same crop, but he fondly imagines that the supply of cultivatable soil is inexhaustible and that there are enough trees in the forests to allow him to continue felling them as often as he finds necessary. He is very loth to agree that he should be deprived of his hunting grounds in the interests of maintaining herds of animals he regards as useless since he is not allowed to eat them, and some of which do harm to his crops (some national parks being the refuge of those troops of baboons which are outstandingly destructive). It is like the restaurant manager who having come to the big city to purchase one or two more head of cattle, has no intention of immediately handing over to the butcher what he regards as part of his own capital to manage as he pleases. The cattle-owner does not think twice about burning and destroying trees provided that he gets a crop of fresh grass in the ashes of the conflagration he has kindled. Utilisation of game meat is in fact often talked of as a normal source of protein. Under this head the wart-hog, in the drier areas and western savannahs, would receive particular attention. In most of these areas it is certainly one of the most important elements in the mammal population : it is highly prolific and it does well, as happens with many species of wild life, in areas where domestic stock cannot flourish; its hide is tough, its flesh when salted keeps excellently; it appears to be able to adapt itself easily to captivity and can be perfectly easily handled. But it is a pig and the greater part of the population which could make use of it is prevented from doing so by its Muslim faith.

It is natural and in conformity with the basic principles of human ecology that, living as he does in his own little world, into which few outside influences have penetrated (and those only for a comparatively short span of years) the African peasant should continue to be tied to the same economic practices as his ancestors, practices which when all is said and done seem the most sensible to him because they have enabled his group to survive to the present day. Too simple in his reasoning, from our point of view, thoroughly logical in his own estimation : we would doubtless have exactly the same outlook if we had always lived in similar circumstances and environment.

Some of the dogmas and traditions dating from an epoch now for all practical purposes ended, could have practical utility or at least be relieved of harmful effects, being amended and brought up to date to the extent that the intellectual awakening of the individual allows. It is to be hoped that the emphasis on schooling, which occupies so much attention in the modern West African states, will have important repercussions on the development of their people in this particular field. Individual progress seems in fact to be only a question of time. At present, however, where the economical use of natural resources is concerned, time is not on our side.

THE IMPORTANCE OF WETLAND HABITAT FOR EUROPEAN  
AND ASIATIC MIGRANT WATERFOWL  
WINTERING IN AFRICA

by

JEAN DORST

and

LUC HOFFMANN

National Museum of Natural History, Paris, and Biological Station  
of La Tour du Valat, Le Sambuc

Africa is of front rank importance in the migration of palaeartic birds, since many of them winter there. In fact the African continent offers an area of more than 20 million square kilometres of an environment which is ecologically favourable to winter migrants, of which the majority for obvious reasons are from Europe, whereas those birds which nest in Northern Asia are more inclined to migrate towards South East Asia and to winter in the area stretching from India to Malaya. Paradoxically enough, however, there are also certain types of birds which travel each year from Eastern Siberia to Africa rather than follow the shorter Asian routes.

The Anatidae and Charadriidae, in particular, migrate in great numbers during the Northern winter to the marsh and lake areas of Africa South of the Sahara. Counts have been made of no less than 6 ducks and 23 waders in Senegal (by Roux), 3 ducks and 17 waders in the flood area of the Niger and 5 ducks and 18 waders in Chad (these lists are doubtless incomplete; they include only the species found in fresh-water areas, and not those which are restricted to the sea coasts). 11 ducks and 33 waders are known to winter in East Africa. One must add 1 duck and 30 waders in the Congo, and 1 duck and 27 waders in South Africa. These figures alone are sufficient proof of the importance of Africa in the wintering habits of palaeartic water birds.

Those ducks which winter regularly and in large numbers South of the Sahara are principally the Garganey (*Anas querquedula*), which is the most abundant of all, the Shoveler (*Anas clypeata*), the Pintail (*Anas acuta*) and the Teal (*Anas crecca*).

Several other species also appear during the winter, but in rather fewer numbers. This is the case notably with Ferruginous Duck (*Aythya nyroca*), the Pochard (*Aythya ferina*), the Mallard (*Anas platyrhynchos*), the Gadwall (*A. strepera*) and the Wigeon (*A. penelope*). These ducks winter in quite large numbers in Abyssinia and Sudan, and in smaller number are found even further South in East Africa; they also appear in the West, particularly in the lower valley of Senegal. The numbers seem to vary from year to year, probably as a function of the climatic conditions in Europe and Asia.

The waders wintering South of the Sahara are even more numerous than the ducks, and unlike them, a considerable proportion of waders travel as far as South Africa. There are at least 30 species, and many among them migrate regularly and in large numbers. Notable cases are the Godwits (*Limosa*), the Ruffs (*Philomachus pugnax*) and several Sandpipers (*Tringa*).

While the majority of migrant waders come from Europe, there is nevertheless a significant proportion from Siberia. A striking case in point is the Black-winged Pratincole (*Glareola nordmanni*), which has only been found wintering on the African continent, mainly in the eastern and southern parts. Other Asian migrants, while less exclusive in their choice of wintering grounds, are also frequent visitors to East Africa, notably certain Plovers (*Charadrius mongolus*, *Ch. leschenaulti*, *Ch. asiaticus*, *Ch. fulvus*), the Sociable Plover (*Chettusia gregaria*), one of the Pintail Snipes (*Capella stenura*), and even one duck, the Ruddy Sheld-Duck (*Casarca ferruginea*).

Although the waders generally are as much at home on the sea shores as in fresh water areas, nevertheless most species are very abundant inland wherever the environment is favourable. Indeed certain species are very closely attached to a fresh water habitat (for example, the Green Sandpiper—*Tringa ochropus*).

It should be noted that there is quite a large group of waders which remain at the wintering grounds even during the mating and nesting season. These are immature, non-mating birds, which thus spend their first year without returning to their home breeding grounds. This phenomenon of passing the summer in Africa is no doubt more widespread than was at first thought to be the case.

In general, therefore, Africa offers a highly advantageous wintering ground to a number of migrant water birds whose breeding grounds are situated across Europe and northern Asia. It has long been thought that Eastern Africa received larger number of migrants than the West, but it now seems that this opinion must be revised to take account of recent observations. The Mediterranean and the Sahara no doubt constitute considerable obstacles to migrants, whereas the Nile valley has large tracts of land offering a favourable environment, and is therefore a most important migration route. Furthermore, we have seen that the waves of migrants to East Africa include a greater number of species, since one must allow for the presence of birds migrating from Asia, which in West Africa are practically unknown. But an increasing number of observations are beginning to show that a substantial number of migrants cross the Sahara, even at its widest point, and proceed to winter in Western Africa, particularly in the lower valley of Senegal and the flood zone of the Niger. Observations carried out by F. Roux in Senegal (see *Terre et Vie*, 1959, No. 4, pp. 315-321) have drawn attention to the vast numbers of ducks and waders in this part of Africa, which is the main wintering area notably of the Black-tailed Godwit of Europe (*Limosa limosa*); several hundred thousand make their way there in October and November. The Ruff appears in even greater numbers, and the Wood Sandpiper (*Tringa glareola*) is scarcely less abundant. Of the ducks, the Garganey probably accounts for at least two thirds of the population of Anatidae, the total of which is estimated by Roux at more than 150,000. Similar concentrations can be seen in the Niger flood areas, where they were observed by Guichard (*Ibis*, 89, 1947, p. 450), who

speaks of flocks of Ruff and Black-tailed Godwit running into thousands, and enormous colonies of Garganey.

An important point to bear in mind is that while palaeartic water birds may be found over the greater part of the African continent during the wintering period, their distribution is far from uniform. On the contrary, they seem to be concentrated within well defined areas, by reason of their strict ecological requirements. They avoid the deeper lakes with steeply shelving banks, such as the oligotrophic lakes of Graben (there are, for example, virtually no water birds to be found on Lake Kivu; see Lippens, in Gerfaut, 1938, Supplement). They prefer marshy depressions, lagoons with gently sloping banks, and the areas covered by the flood waters of the great rivers. Consequently, they gather in a limited number of locations, and above all in the great flood depressions in that part of Africa situated in the Northern hemisphere and stretching from Senegal to the Sudan; in Eastern Africa their wintering grounds reach somewhat further south. The principal concentrations are therefore the lower valley of Senegal, the flood area of Niger, the Chad depression, the Bahr el Ghazal, and a series of lakes in Kenya, Uganda (Lake Wamala) and the Eastern Congo. None of these wintering areas is in the forest zone.

One cannot fail to note the parallel between this phenomenon and the annual cycle of these regions; the considerable seasonal variations in climate have profound biological repercussions, particularly on the abundance or otherwise of the general mass of flora and fauna. When the migrant water birds arrive—beginning in September—the rainy season has just ended or is about to end, throughout this vast area. The carpet of vegetation has developed under the influence of the rains, and is partially covered by shallow pools of water, thus providing the favourite environment of ducks of the *Anas* type. Elsewhere, as the waters recede, they expose stretches of mud rich in micro-organisms of all kinds, which is the habitat preferred by the smaller waders. Aquatic micro-fauna, mollusca, crustaceans, worms and insects, are reaching maximum numbers. This vast increase of flora and fauna thus coincides with the arrival of the migrants. The number of native, non-migratory African duck is limited, in West Africa at least, where several species native to the northern and eastern parts of the continent do not appear. And very generally speaking, the numbers of African duck seem to be less than those of migrant duck in the main wintering grounds.

During the northern winter the stretches of water dry out progressively, and the production of organic matter is at the same time reduced. At the end of the dry season resources are at their minimum. This is in fact the period when the ducks and waders begin their return journey to the tundras and marshy areas of northern Europe and Asia, the very place where the mass of both vegetation and fauna is about to reach its maximum, for a limited period, it is true, but also a period marked by a great abundance of organic matter.

This complete cycle seems therefore to suggest that a large population of ducks and waders is unable to subsist throughout the year in a single region of the globe. The population therefore shifts, in accordance with the seasons, between two regions, each of which has marked cyclical fluctuations in its biological activity, but at a different time of the year, such that the birds arrive in each case at the optimum period.

These facts are of great significance to anyone concerned with protection and " management " of our populations of ducks and waders. One cannot hope to maintain them if the environment which they favour is to be destroyed, or restricted, at one end of their long journey of migration. The development of certain crops, such as rice, and hydrological improvements, which may have far reaching consequences, are liable to bring about serious modifications to the ecological characteristics of the winter colonies, the extent of which as we have seen, is relatively restricted. The steps which have been taken in Europe and Asia to protect the breeding grounds, and the setting up of reserves at stages along the migration routes would be worthless if the character of the wintering grounds were to be altered indiscriminately. The conservation of our great migrants is an international problem, which must be resolved by a coordinated action on a vast scale, as vast indeed as that of their prodigious journeys.

## EDUCATION AND TRAINING OF STAFF

by

Prof. E. B. EDNEY

Zoology Department Univ. College of Rhodesia and Nyasaland

This paper attempts to consider the function of universities in the education and training of staff for work in the field of conservation, and with particular reference to wild life conservation.

The education and training of non-graduates, although of interest to universities, is not part of their main purpose, and therefore, apart from a brief reference to non-graduate training, I shall deal with the education of graduate professional staff.

First, then, a word about non-graduates. There will always be a need within the field of wild life conservation for non-graduate field officers. Indeed, a wild life organisation can only function efficiently if its field officers are of a very high calibre. The great value of such people lies in their deep and intimate knowledge of local situations, and, on the subjective side, their love and sympathy with the land and its products, plant and animal. I do not think that these people need the wide and rigorous systematic training that is implied in a degree course—at least in a university in the British tradition. But there is one very important way in which universities can be of use. I am thinking of the provision of short "in-service" courses for working field officers.

After a spell of work in the field, a keen officer will feel the need for a wider view; the need as it were to be put into the picture, to get to know something about the scientific principles and the basic problems which lie behind the direction of his work. This is just what the universities, in co-operation with professional graduate wild life workers, can give him. I think that the universities must be involved in this, particularly in Africa, where the professional staff of wild life departments is still very small indeed and very fully engaged in day-to-day problems.

With these ideas in mind, my own organisation, the University College of Rhodesia and Nyasaland has recently tried the experiment of offering such a course, and we were very fortunate in having the whole-hearted co-operation of Mr. Thane Riney, the National Museums and the professional staff of several government departments.

The course was a short one—a week—and students were resident at the College. This had the great advantage of providing opportunities for much informal group discussion. The course consisted of lectures, a field excursion, and practical work, and it was designed to move progressively from the general to the particular. Thus the early lectures provided a general background of aims, later ones discussed the utilisation and management of particular resources, and finally specific techniques used in the accumulation of

field information were discussed and demonstrated. I think I can say that it was a great success. Some forty people including Africans attended the course from a number of departments and it is hoped that a handbook for field officers may emerge from the technical part of the course. Certainly copies of all the lectures and discussions are to be circulated to members of the course and other interested bodies.

However, I must now turn to my main thesis, the role of universities in professional training.

I imagine that there will be no disagreement about the need for full university type courses for professional staff of wild life departments. There is room for discussion, however, as regards the length and structure of such courses, of the extent to which they should be specialised, and as to where they should be offered. I shall give my own answers to these questions, and try to justify them in what follows.

*How long should university courses be ?*

The answer to this question involves the consideration of several factors—including where they are given. For the present I propose to pre-judge this issue and assume that they are given in a university run on British lines.

The British and American school and university systems differ fairly widely. In the first place the American youth enters college at a much lower standard than his British colleague, who is more advanced on a much narrower front. The man who wants to read science in a British university has already been doing practically nothing but science during his last two or three years at school. Secondly, the first degree of an American university usually covers a much wider ground and is taken at a much lower standard than the British first degree; thirdly the American "course - credit" system permits a very wide choice of disciplines and parts of disciplines, while the British degree structure is on the whole much more stereotyped. A man with a British degree in science will have covered *all* Zoology or *all* Botany or *all* Chemistry, while an American may have done only a course in (e. g.) invertebrate zoology or animal physiology, together with a large number of other more or less related subjects.

We are not concerned here with the relative merits of these two systems—only with the fact that they differ.

Another relevant, though different, consideration, is the importance we attach to education and training. I do not want to define these terms very precisely, but it is important to recognise that they both play a part in a university curriculum. A man who is trained can deal very efficiently with a given number of situations which require decisions, but a man who is educated as well as trained can adapt himself to new situations and can see the significant relation between things that would escape the other. He is perhaps better able to take a disinterested view of a question, and this is of the greatest importance.

I take it, however, that we shall all agree that some educational content in a wild life conservation course is vitally necessary. The question is how much, because this affects the length of the course.

It would probably be possible to train a professional officer in two years from entry to a university, but if he is to be educated a longer time is necessary. I recommend four years as minimal: three up to the first degree, and one post-graduate year.

*Structure and degree of specialisation*

These questions may be taken together. My own view is that every wild life conservation man should have a first degree in the relevant sciences, i. e. Zoology and one other, usually Botany—or a first degree in Agriculture, and that there should be no specialisation up to this point. Thereafter he should have at least one post-graduate year in special training for wild life work, leading to a Diploma. The few who are so inclined will then go on to research for a Ph. D., the rest will go into administration, advisory extension or other work in relevant departments. It is, however, very important to recognise that not only the "research" man at a university or institute needs the power of independent critical thought, for many of the professional officers in government departments will also be engaged in research. This re-emphasises the need for a full education in basic scientific disciplines. Training is not enough.

We turn now to the question, where? I want to make a plea for this to be done very largely in Africa. There is no doubt at all that North America is more advanced in Wild Life Conservation, both in training and in research, than Europe, and still more so than Africa. Yet, if university training and education at an adequate level can be offered in Africa, there are clearly very great advantages in doing so. Firstly, it is important that the future worker in Africa shall be educated in the midst of the problems he is to face—and the African environment and its problems are vastly different from European or American ones. Secondly, where there is education there are educators, and in universities part of every educator's time is devoted to research. So the more men there are in Africa, teaching, the more research will be done, and research in African wild life problem is urgently needed.

*Content of the course*

As regards the details of the syllabus, I can only speak in general terms—much assistance from people with experience in such courses will be needed if wild life courses are to be offered in African universities. However, if we start with the assumption that all students will have either a first degree in pure science with Zoology and Botany as major subjects, or a first degree in Agriculture, we can usefully say something about the fourth, postgraduate or Wild Life year.

Remember, then, that students in this year will already have some acquaintance with those aspects of biology which are included in first degree courses, i.e. the principles and practice of comparative morphology and systematics, a good deal of comparative physiology (including behaviour), the principles of plant and animal ecology, genetics, evolutionary theory, histology, and embryology; together with practical work in all these fields.

We can, therefore, build on this experience, and concentrate on those aspects of biological science which are particularly relevant to wild life conservation.

Thus, for example, further more detailed treatment of the comparative morphology and systematics of African mammals, birds and fish would be included. So too would be courses in advanced ecology with particular reference to terrestrial and fresh-water environments in Africa. Particular stress would be laid on the physical, chemical and biological methods used for the study of these environments and their populations. Population dynamics, and statistical methods would certainly find a place in the course, and as a background, lectures on local geology, pedology and climatology would be included. Special topics would be the utilisation of fish and mammal resources, and practical instruction in methods of fish production and game management applied to African conditions would be given. There would also be reference to the administration of Game Reserves and National Parks, and to Conservation legislation.

*The University College of Rhodesia and Nyasaland*

So much for an outline of a syllabus. I should like to conclude by saying something of the interest of my own organisation, the University College of Rhodesia and Nyasaland, in these matters.

Briefly, we are not only willing but anxious to offer a post-graduate course in Wild Life Conservation. Ultimately I would like to see a full department concerned with this subject, but I believe it possible to make a start with two lecturers, one of whom should be a rather senior man with teaching and research experience. We have the buildings, the laboratories and the general equipment. We do not, because we are a small college with a high academic standard and a low income, have the money. But I estimate that we need only £ 5,000 a year and £ 4,000 at the outset for capital equipment.

We are favourably placed, in the midst of wild life problems, and our students are about equally representative of the two main races, European and African. This I believe is important, for the education of the whole population is necessary, not only of one group.

Finally, I would re-emphasise what has often been said, that we must, in Africa, tackle this education problem urgently. I have been concerned in this paper mostly with university education. I am aware of the great need for education of the masses of course—but education of the masses means teachers, and teachers need university education. All in all, therefore, the provision of university educational facilities in Wild Life Conservation is indeed crucial.

# WILD LIFE MANAGEMENT AND ECONOMIC DEVELOPMENT : POSSIBILITIES AND LIMITATIONS

Memorandum by the Secretariat of the Food and Agriculture Organization  
of the United Nations

## *I. Introduction*

1. Member Governments of FAO have as a major aim the raising of levels of nutrition and standards of living of their peoples, particularly the rural population. In order to help governments to fulfil this aim, the Organization makes recommendations for national and international action with respect to research, education, administration and institutions in the fields of farming and forestry, and more specifically the conservation of natural resources and the adoption of improved methods of farm and forest production.

2. During its last session, the FAO Conference stressed the importance of studies on natural resources, the sound management and conservation of which should be an integral part of land planning, land use policy and economic and social programs.

3. There is no doubt that the originators of the Charter and the recommendation on natural resources referred to above intended to emphasize the double role of FAO—on the one hand, to use to the best advantage the existing natural resources through sound management; on the other, to speed up productive processes in agriculture, forestry and stock raising through the increased intervention of man by means of improved techniques. In this context, wild animals can be considered first of all as a natural resource to be used to the best advantage, either as the principal form of land use, or as a subsidiary form associated with agriculture, stock-raising or forestry. Wild life management may then become the starting point of more intensive stock raising through the domestication of certain species and the improvement of natural grass-lands.

## *II. Natural Resources in general and economic and social development*

4. Before commencing the study of the place of wild life management in a programme of economic and social development, it may be useful to recall in broad outline the role which can be played by natural renewable resources in more advanced countries as well as in developing countries.

5. In developing countries not completely opened to a monetary economy and irrespective of the possibilities offered by natural mineral resources, natural renewable resources play a basic role and their management is an absolute necessity. Indeed, natural renewable resources provide the means of growth

for young countries before they reach the stage of using technical methods, technicians and capital essential for the most productive use of the land. As such development may sometimes be long in coming, the exploitation of natural renewable resources must be carefully managed so that they are not exhausted.

6. Such management is all the more necessary as natural resources are limited whether we are speaking of land and water, or flora and fauna, while the population continues to grow. The situation of countries in the arid and semi-arid zones is particularly critical; a good example is the Mediterranean region, where ancient civilisations exhausted a large part of natural resources before the countries concerned reached the era of the industrial revolution with its developed techniques and availability of power.

7. In fact, the necessity for careful management of natural resources which can be considered as an ecological type of land use, in some regions led to the evolution of certain special ways of life; for instance nomad pastoralism or shifting cultivation, which are as much ways of life as are industries, and give to the use of natural resources their rhythm in time and space. In primitive African societies, hunting has been, even up to the present time, regulated by tribal traditions which affected also the ways of life. This body of customs relative to hunting could be considered as empirical game management.

8. It is a point of view, however, that the rapid developments of Science and Technology will take care of the future so that large scale and accelerated exploitation of natural resources may be undertaken to provide capital for investment in other forms of production, action which may be reasonable from the economic point of view. Such an attitude is theoretically justifiable, but countries which adopt it are exposed to a serious risk. The disappearance of natural renewable resources leads to the disappearance not only of the direct benefits they provide, but also of accessory or indirect benefits. If the country which has depleted its own plant and animal natural resources has not reached the stage of development which enables it to provide substitutes for those by farming, tree-planting and stock-breeding, it will not even possess the resources for a subsistence economy, and even its political independence may be compromised. If, on the other hand, the country has reached a stage of technical and economic development which enables it to alleviate the disappearance of direct benefits which resulted from its natural resources, it will nonetheless feel the loss of the indirect benefits, the re-establishment of which would certainly need considerable investment, taking into account the new criteria imposed by its economic and social development. We know today the price which developed countries are having to pay for the re-establishment of green belts near big cities, for the planting of shelter-belts to improve farm production, for the conservation of soil and water resources, for the protection of hydroelectric installations against silting and for the conservation of animal or vegetable species threatened with extinction but necessary for scientific and technical research and future exploitation.

9. In developed countries it is also obvious that needs can no longer be met in quality and quantity by natural resources alone : it is necessary to speed up

the production processes. The importance of natural resources for the direct satisfaction of requirements tends to diminish through the intervention of man with all his technical knowledge and equipment, though mankind still faces the need for the indirect benefits which flow from these same resources.

10. One may then ask whether natural products (such as game) can compete with those resulting from human intervention (such as livestock) when countries are first opened to a market economy. The answer is a qualified yes, for the competition develops slowly, intensifying as productive techniques are developed and applied. During the first stages the cost of placing natural resources on the market stem primarily from cropping and transport expenses, while the product that is intensively produced must bear not only these charges, but also all the normal input expenses, including management and rental payments. Thus buffalo meat from the Great Plains of the United States—essentially a free good—was very inexpensive during the late 1800's, far cheaper, in fact, than even western produced beef.

11. As countries develop, however, two things normally occur, and occur quite rapidly. First, as the natural resource diminishes in abundance procurement costs rise and the skills required for the harvesting (hunting) are less frequently passed on to the younger generation. Second, as productive techniques are developed, acquired, and applied, the production cost of the intensively managed product drops substantially, with the result that in most developed countries the naturally produced item is driven from the market. Buffalo meat today is for all practical purposes unobtainable in the United States.

12. There are some zones, of course, where prolonged competition between the natural product and that derived by intensive human management is possible. In certain regions of southern USSR, for example, the price of wild antelope meat is the same as that for meat from domesticated animals, in spite of difficulties in transport and stocking. An even more interesting example can be found in Southern Rhodesia, where results gained from game ranching on a 50-square-mile area showed that the net profit from game meat for the entire ranch could exceed \$ 40,000 annually, and would exceed the profit obtained from cattle. The annual yield of game meat would be greater than of beef at a reasonable stocking rate. In addition, the veldt needed no developing or improvement for use by game, whereas for cattle the land must be fenced, watered, and improved<sup>1</sup>.

13. This very general and brief comparison should not blind us to the fact that in highly developed countries the natural product which has practically disappeared is much sought after : prices for game in the US and in many European countries are very high, and in some areas " commercial " game production competes very well with livestock or any other type of farming.

<sup>1</sup> United States Department of Agriculture, *Foreign Agriculture*, May 1961. Article entitled " Game Ranching in Rhodesia, " page 26.

### III. *Wild life Management in Economic and Social Development Programmes*

14. Having stated these few general considerations, we will examine more particularly the case of wild life in Africa south of the Sahara, and its possible place in economic and social development. The aesthetic, scientific and touristic aspects of the problem are not overlooked but they have already been thoroughly examined in a Note (C 59/FO-2), presented to the FAO Conference by its Secretariat in 1959.

15. In the first place, considering that 90 % of the population in Africa south of the Sahara is rural and more than three-quarters of this population are dependent on subsistence agriculture, hunting provides and will continue to provide an important qualitative if not quantitative addition to the food supply. This role of hunting is particularly significant in regions where the tsetse fly makes stock-raising practically impossible.

16. However, in the policy for wild life management that is advocated, it must be taken into account that the tsetse fly zone is surrounded by a vast area of steppe where stock-raising offers immense possibilities. It may therefore be considered that the development of stock-raising outside the zone together with improved means of access to the zone itself where stock-raising is out of the question, supplemented by other sources of protein developed within the zone, such as aviculture and pisciculture, could make it possible to meet the protein needs of the communities in these tsetse areas.

17. On the whole it seems that the most promising and constructive approach to wild life management, particularly in Africa south of the Sahara, would be to tackle the problems simultaneously on two fronts : first by a rational programme of land-use planning for agricultural, grazing and forestry development with stress upon a careful selection of the areas in which such development is to be encouraged and concentrated; and secondly, a positive long-range policy establishing clearly delineated wild life reserves. In these reserves there would be proper management of fauna and flora, with due consideration to scientific and tourist interests; outside such reserves there must be appropriate wild life protection and management provisions, including indemnity for crop damages.

18. In the long run, taking into consideration the developments likely to take place, there is little doubt that game will diminish in importance due to the possibilities of increase of stock-raising and perhaps also partly due to gradual change in the taste of the consumers. But the necessity for game management will remain for a long time in inaccessible areas where the essential proteins for local communities have to be produced on the spot. Wild life management is also likely to remain in marginal areas, connected to a greater or lesser degree with stock-raising, either through domestication of new species, or combination of stock and game so as to take full advantage of the vegetation not used by domesticated species. It seems furthermore that there is a move towards such solutions, and research carried out mainly in Rhodesia and South Africa gives examples of this tendency. Such a combination of wild and domesticated species will allow a certain flexibility and make it possible to pass to increasingly intensive management or stock-raising, as the need is felt and technical, economic and institutional conditions permit it.

19. However, one aspect of the management must be kept clearly in mind when weighing up the economic possibilities of farming wild life, either in connection with domestic livestock or separately in their own reserves; that is, the health of wild life, or what is frequently more important, the health of livestock populations in contact with wild life. Generally speaking, disease control, even in mismanaged herds of domestic stock, is economically practicable. In wild life, unless great expenditure is put towards the limitation of movement by fencing, disease control is difficult, if not virtually impossible. The indirect losses to agriculture through disease transmission and in some parts through crop destruction are well known.

20. It may, however, be sound policy in certain regions to abandon stock-raising and even agriculture and return the land to use by wild life under proper management. This would be to some extent a return to an economy based on gathering natural resources. Such a step would be justified by the spread of erosion or the diminution of soil fertility brought about because agriculture or the development of stock-raising were not carried out successfully, either through insufficiently perfected techniques or because investments granted were not sufficient to meet capital needs.

21. But this would not be the final solution, at least in many parts of Africa. While in certain regions, and particularly those infested by the tsetse fly, game management may appear in the long run to be the only possible form of land-use, due to the high cost of tsetse fly control, it has to be admitted that the economy of these regions, based solely on wild life, offers limited possibilities. The size of the population would have to be controlled so as not to upset the ecological balance, while assuring them at the same time a satisfactory standard of living, and areas managed in this way could only be looked upon as hinterlands of more favoured districts.

#### IV. *Conclusion*

22. Communities will settle mainly in regions where the combined play of natural forces and the intervention of man, with his technical knowledge and work either applied directly or through mechanization, can lead to a cumulative process of autonomous development, likely to open the way to economic and social expansion. Outside these intensively exploited areas will remain regions of varying size, which should be kept as intact and stable as possible, as reserves for the future and also as areas for soil and water conservation, recreation, hunting and leisure; their management should be as inexpensive as possible. In this context wild life management is revealed as being of importance, particularly in East Africa where tourism can constitute an important source of foreign currency.

23. Accordingly, the necessity of carrying out action in three ways can be seen. First, there should be demarcated parks or natural reserves where the main aim will be the conservation of wild life for aesthetic, scientific or touristic reasons. Secondly, outside these parks there are areas on which wild life should be managed as the principal form of land-use or as an accessory land-use, being combined first with shifting cultivation, forest exploitation and

extensive stock-raising, then eventually with intensive stock-raising, tree plantations or even settled agriculture. During this period of transition, animal health measures such as fencing, must be so developed to ensure that valuable domestic livestock interests are protected. Thirdly, there are areas intensively developed in which wild life would have no place.

24. The demarcated parks and natural reserves should constitute a network covering the whole region under consideration and include all the species and habitats to be conserved. Outside these parks and natural reserves, wild life management will be more or less intensive, varying with the stage reached in economic and social development.

# AFRICAN WILD LIFE AND THE TSETSE-FLY-BORNE DISEASES

by

J. FORD

Department of Veterinary Services  
Federal Ministry of Agriculture  
Salisbury, Southern Rhodesia

About 3  $\frac{3}{4}$  million square miles of tropical Africa are infested with tsetse-flies (*Glossina*). This means that the continent contains an area larger than the whole United States in which, with minor exceptions, cattle and other domestic animals cannot be kept unless given artificial protection. In about 75 % of this area human beings may also be subject to fatal diseases caused by infection through tsetse-fly bites.

The consequences of this vast infestation were summed up by the late Professor P. A. Buxton. " It seems, " he wrote, " reasonable to attribute a considerable share of the lack of development of Africa to infection of man and animals by these insects. Having regard to the seriousness of the diseases which they convey, we believe it to be legitimate to say that civilization could not have developed under this immense handicap. In some considerable measure Africa's lack of progress... may be attributed to the tsetse-flies. " This judgement is shared by the majority of scientists who have studied the tsetse-borne diseases and it forms the basis of policies which have been followed by all colonial governments in Africa in setting up organisations to carry out research on, or to attempt to control, these diseases in man and his livestock.

While it is possible to dispute the validity of this widely held opinion on the role of *Glossina* in preventing African advancement, it is nevertheless true that domestic cattle introduced into a tsetse-fly belt will generally die within a few weeks, while there is little doubt that in many parts of Africa any attempt to alter the present pattern of land-usage, unless accompanied by appropriate prophylaxis, would be followed by extensive epidemics of sleeping sickness.

These diseases are not, of course, caused by the tsetse-fly itself. The insect is the vector which carries disease-causing protozoa—the trypanosomes—from the blood of wild game animals, where they are usually harmless, to domestic animals or to man himself, where they cause fatal diseases. The reservoir of trypanosomiasis is the wild game. However, transmission of the trypanosomes from one wild animal to another is also effected by the tsetse-flies and it is likely (though perhaps not certain) that eradication of these insects would result in the disappearance of trypanosomes from the game population which would then, in this respect, become harmless to man and his farm animals.

It has been claimed that more is known about tsetse-flies than any other group of insects except, perhaps mosquitoes. As a result of investigations

carried out during the last sixty years, it is now possible to control or sometimes eradicate *Glossina* by various methods at costs which are low when compared with the costs of dealing with the commoner agricultural pests. These methods fall into three groups. The first follows from a matter of common observation, namely, that treeless grassland, if sufficiently extensive does not support tsetse-flies. They need trees in order to survive. Why this should be so is not fully understood; nevertheless, by felling trees, in various ways according to the species of *Glossina* or the kind of bush involved, one may eradicate populations of these insects. It is usually the most expensive and most difficult method to apply, but much attention has been given to it because, until recently, it provided the only alternative to the second method. This is to deprive the tsetse population of its food supply by destroying the wild game animals. It appears that to achieve a level of starvation which will affect the rate of reproduction of *Glossina* sufficiently to cause its population to decline to the point of disappearance, does not require total extermination of the game population. So far this method is the one which has produced the greatest successes as measured by the area reclaimed from tsetse-fly. The third group of methods, involving a direct attack on the individual insect, has only become important since the discovery of DDT and other insecticides. Particularly when endowed with a residual effect these chemicals need only be applied to limited portions of the natural vegetation to come into contact with a sufficiently large number of tsetse-flies when at rest to cause eradication of the population. The method is, apparently, less destructive of, at least, the larger flora and fauna and can be applied over large areas at greater speed than either bush clearing or game slaughter.

Generally the tsetse-fly control officer cannot, without prior field trials, be certain that any method or combination of methods will yield 100 % success. He can, however, if given a free hand in the methods used, usually rely on obtaining a reduction of the tsetse population of well over 90 %. Such a degree of control would generally be sufficient to break an epidemic of sleeping sickness in a human population, but until comparatively recently any result short of 100 % success was useless where cattle were to be introduced into the treated area. The widespread use of new curative and prophylactic drugs during the last ten years has profoundly altered the position in this respect. It is now possible, where new pastures are required, to begin the introduction of cattle before all tsetse-flies are eliminated, thereby allowing the immigrant stock-owner to complete the process of mopping up residual tsetse-flies by his own farming activities.

With these points in mind we may now examine, in broad outline, the ecological relationships existing between African societies on the one hand and what we may call the bush-game-tsetse ecosystem on the other, especially in the wooded savannah. In this category of vegetation one includes the bulk of the land surface between the northern and southern deserts other than the rain forest area of the Congo and West Africa. If we examine the distribution of human populations in this vast area, we find that localities of appreciable size in which population density is of the order of 100 persons to the square mile or more, are comparatively few and far between. Where they do occur, however, *Glossina* is absent because the very existence of people at such densities

ensures that the first two methods of tsetse eradication i. e. bush clearing and game destruction or exclusion, are automatically carried out. (Exceptions to this statement may occur in areas infested by the river-bank tsetse, *Glossina palpalis*, but since this fly feeds mostly on man himself and reptiles, it is not of importance when considering the larger game animals and trypanosomiasis of cattle.) By and large it is true to say that, in the wooded savannah, where soils and climate are favourable to intensive agriculture, man drives out the tsetse. As a corollary to this we should note that the majority of large scale tsetse-fly advances and the widespread epidemics of sleeping sickness which were so alarming a feature of the first forty years of this century found their historical origins in the disorganisation of African societies consequent upon the European invasion during the last twenty years of the 19th century.

Many of the anti-tsetse operations so far carried out have been, in fact, attempts to restore ecological balances upset during the last hundred years. Although in recent times the African population has grown considerably and pressure on the land is reaching dangerous levels, the main outline of the tsetse-fly belts remains unchanged, as it has remained for centuries. The reason for this is that in spite of our present technical ability to combat the tsetse, it is still not worth while to undertake large schemes of reclamation because either the capital, but more fundamentally, the knowledge of how to exploit the wooded savannah profitably is still lacking. For many years now it has been a principle with colonial governments not to attempt the reclamation of land from tsetse-fly until or unless there is a good guarantee that the land is required for human occupation. To this is, or should be, added a guarantee that the land can be used in such a way that stable and economically sound societies are formed, employing techniques which will not impoverish the soil. Until such techniques are worked out—whether they involve forms of agriculture, of cattle raising or of exploiting the natural fauna and flora, or combinations of all three—it seems unlikely that there will be any demand or any real need for tsetse reclamation on a scale sufficiently large to affect the main outlines of the African tsetse-fly belts. We have the knowledge to deal with trypanosomiasis: it is for others to determine the scale on which to apply it.

# HUMAN AND SOCIOLOGICAL FACTORS AND THE PLACE OF NATURE CONSERVATION IN LAND USE PLANNING

by

H. A. FOSBROOKE

Sometime Senior Sociologist Tanganyika

Lately Director, Rhodes-Livingstone Institute for Social Research, Lusaka, Northern Rhodesia  
Chairman-designate of the Ngorongoro Conservation Area Authority

In the space allotted one can do no more than catalogue the human and sociological factors which occur in the nature conservation sphere of land use planning. For the human factors range from the basic attitudes of mankind towards nature, via, the magical use of rhino horn and pangolin scales, to the interaction of tourists and the indigenous inhabitants. The following notes therefore set out to classify, but not exhaustively, the types of human situation which nature conservation can throw up, in the hope that in a gathering of such wide experience each one of us will find some situation concerning which he has specialised knowledge which he can share with the rest of us, and so add to our general fund of knowledge on the subject.

The humans concerned in the situations can be divided into three broad categories, A) those on or adjacent to the land concerned, B) the general population of the country concerned, and C) the rest of the world. The most intractable problems are of course not those that occur within these groups, but those set up by interaction between the groups.

A. THOSE IN OR ADJACENT TO THE LAND CONCERNED : these comprise :

- i. The hunting groups.
- ii. The pastoral peoples.
- iii. The agricultural communities.

i. *Hunting*

Africa still possesses hunting tribes who by biological control maintain balance with their environment. If they overshoot one area, no food is left for them so they have to move on, thus giving the area a chance to recover.

Enlightened Governments have recognised the rights of such people as when Tanganyika's Fauna Conservation Ordinance gave rights to the Kindiga and other hunting tribes, or more recently when the Kenya Government took steps to convert the Waliangulu from " poachers " to " dynamic conservationists, " see Matheson (1961).

ii. *Pastoral*

In a conference sited at Arusha our thoughts naturally turn to the Masai who have been much maligned by those not fully conversant with the facts. The Masai are indeed amongst the best friends of the fauna as they are not given to hunting, and where the Masai have retained their land against alien encroachment—African and European—there has the fauna remained. Examples are found in the elephant-hunting areas of South Masailand, in the world famed Ngorongoro Crater, and in the Amboseli and Narok Parks which the Kenya Government, in co-operation with the Masai, has recently set aside in perpetuity as conservation areas. Where the Masai have lost their land, as the Laikipia Plateau or the Naivasha Rift area of Kenya or the Sanya ridge between Kilimanjaro and Meru in Tanganyika, there has the teeming game life of the last century been lost. It is indeed heartrending to read the accounts of the early explorers and so-called sportsmen, Johnson (1886), Willoughby (1889), Von Hohnel (1894) and the rest and compare them with the conditions to be found to-day. One quotation will suffice : Johnson (1886 : 301-2) describing an area near Lake Jipe, east of Kilimanjaro, writes " Here I saw more game at once than I have ever seen in Africa. It was a sportsman's paradise—a delicious dream of happy hunting grounds hardly to be realised in this life. Hundreds and hundreds of giraffes scudded before us; herds of elands (the bulls a deep dun colour with glossy hides that looked like satin in the noonday sun) sauntered along, now nibbling the sweet grass, now trotting off as we advanced. Myriads of red harte-beasts, sable antelopes, impalas, and zebra studded the undulating plain, while a small group of ostriches might be observed on our lefthand side, and a rhinoceros stood under the shade of a mimosa to the right of the path, flicking his short tail from side to side, and watching the movements of our caravan with suspicion. " That was when the country was dominated by the Masai, whose attitude towards the game gets well merited recognition from Grzimek (1960 : passim). But not all pastoralists were as kind to the game, as witness the Tatog, another Tanganyika Nilohamitic group, who gain social prestige and economic advantages from participation in hunting parties in which lion, rhino, elephant, buffalo and human beings yield trophies which raise the hunter's social status (Wilson 1952/53).

An equally good friend of the game has been the tsetse fly, keeping human utilisation of the land—both agricultural and pastoral— at bay (through sleeping sickness and *nagana* respectively) but this is a biological rather than a human aspect.

iii. *Agricultural*

Problems arise in two broad groups; firstly the agriculturists who are in immediate contact with the fauna and, secondly those who want to take over land currently devoted to Nature.

Those adjacent to Parks and reserves must obviously be protected from the depredation of the fauna : just as a land owner is responsible for retaining a dangerous animal on his land, so it does not damage his neighbour's person or property, so Park and similar authorities obviously have a moral if not a legal responsibility to restrain their charges. The methods are beyond the

scope of this section, but one human aspect occurs to me. The Park authorities are much more likely to gain the co-operation and help of neighbours if they not only practice "dynamic conservation" (Worthington 1961) but ensure that the neighbours see that this is being done. One of the best and simplest ways of doing this is to let them benefit from the game cropping, as is done in Uganda and as it is hoped will prove possible in suitable areas in Tanganyika, but failing that, as again was done when hippo cropping in Uganda, adequate press preparation should be undertaken before the operation commences.

A second impact of the agriculturist on the conservation problem arises when farmers in the overcrowded areas of Africa cast longing eyes on the areas set aside for Nature. Though the problem is Africa wide a good example of the position is found here in northern Tanganyika. The Mbulu, the Arusha, the Meru, the Chagga, are all similar mountain tribes showing a very remarkable growth of population in recent years. With their tradition of highland dwelling they naturally prefer to expand into a new environment similar to their home country. But uninhabited highlands are few and far between. The only area reasonably accessible to these people in northern Tanganyika is Ngorongoro. The persistent Arusha pioneers in the Winter Hochland area and the Mbulu at Endulen, in spite of official discouragement and prohibition, are forerunners of this movement, and it can be most certainly anticipated that future Governments will be under very strong pressure to make land set aside as Parks, Forest Reserves or Conservation Areas, available for agricultural expansion. Those responsible for policy must resist this pressure, but in a democratic society the resistance cannot be just negative. If such policy were adopted the people would at the next election vote in representatives who could press to get the law changed.

Therefore the electorate themselves must be persuaded it is a good thing to reserve these areas in perpetuity. It will be of little avail if politicians rely on the argument that tourist trade helps to balance the budget and bring in foreign currency. The African voter of the future will be very similar to his European and American counterpart: once the sums in budgets get beyond 5 or 6 figures it matters little whether they have one nought more or less on the end. The amounts are too astronomical for the ordinary man to comprehend, and whilst this argument must be used, others also must be sought.

It is suggested that the best defence for Nature areas is to engender in the voters an affection for these areas, so that they themselves will resist the idea of encroachment. This can be done in two ways; one can either take the areas to the voters by film, newspaper article, poster and the like or take the voters to the area. In the latter connection I would very much like to see an increase in economy tourism of the youth hostel type. This will doubtless require subsidization in its early phases, but such expenditure would be a well invested insurance policy. For the future one looks to the economic advancement of the African countries to throw up a middle class of professional men, business men and Government servants who can afford and will wish to visit the Nature areas of their countries and who will expect and be prepared to pay for facilities, perhaps not as high as the luxury tourist demands, but at least of a reasonable standard. Another means of safeguarding the future is to take the Parks to the people by film, poster and the printed word. This process has already started

in Tanganyika and delegates will see the posters issued by the National Park Trustees, financed by the generosity of the Frankfurt Zoological Society, and the films prepared for this purpose.

These measures apply not only to the category we are currently considering, but with equal force to the second category in our catalogue, viz.

#### B. THE GENERAL POPULATION OF THE COUNTRY CONCERNED

i. The case cited above is one of those where clashes occur between the interests of two groups, the local land hungry agriculturists and the general population of the country, and in which it is hoped that the will of the majority will prevail. But this will occur only if one has an informed public opinion : some means of securing this have been touched on above. Others, which need no amplification at a conference such as this are the utilisation of schools and adult education classes—where the teaching of teachers repays a hundred per cent. dividend—by press articles and photographs, and by the issue of pamphlets, booklets and posters. Many of these techniques are already being practiced in various African countries, e. g. in Northern Rhodesia, where I was for some time Chairman of the Education Committee of the Natural Resources Board. Delegates will have seen our " beauty queen " *Miss Lantana* produced in IUCN Bulletin, Vol. IX—Nos 3-6; a humorous approach to a serious subject may well provide a human approach to the human problems of conservation.

ii. The above excludes the educated element in governments, politics and the professions who are well versed in world affairs; who are aware of the strength of overseas sentiment in conservation matters and who appreciate the value of tourism to their country. This element will grow with the spread of education : obviously a type of publicity must be directed at this section of the community different from that designed for general consumption.

#### C. THE REST OF THE WORLD.

World interest and opinion has exerted and continues to exert a predominant influence on the game of Africa, in both a positive and negative manner.

i. The immigrant hunters, e. g. the South African Boers speedily reduced the teeming game of that country to vanishing point, whilst East Africa did not escape the attention of visiting hunters. Hohnel (1894 : II 315) records that he and his companion Count Teleki shot 99 rhino in the course of their explorations, whilst a party of three sportsmen accounted for a total of 350 head of big game—of which 66 were rhino—in four months hunting in the region of Kilimanjaro (Willoughby 1889 : 261). The use to which the rhino horns were put is nowhere stated, but one cannot believe that these gentlemen, opulent though they were, possessed mansions that would not look overcrowded if adorned by twenty or more mounted rhino horns. It is more likely that they were sold and this brings us on to the second point under this heading viz.

ii. The overseas trade in trophies. The rhino horn trade is first mentioned in the Periplus (1st century A. D.) and is recorded consistently since 1811 (Smee quoted Burton 1872 II 512) : Burton (1872 : 409) gives further details of the

trade as it existed in Zanzibar in 1857-9. The control of rhino poaching can well be compared to the slave trade, which was not brought under control by sending expeditions against the tribes of the interior who caught the slaves and sold them to the traders. It was abolished by getting at the traders themselves, and herein lies the best solution to the rhino poaching problem of Eastern Africa. Much publicity has been given to the Masai killing of rhino in Ngorongoro, and theories produced that there is some deep seated psychological reason for this. Investigation satisfies me that the reason is entirely economic, part of a wide-spread trade that stretches as far as western Tanganyika where 60 rhino were killed in one year in one small district, Karagwe (Tanganyika Government 1959). Appreciating the widespread nature of the trade the Tanganyika Government is taking the sternest measures against such traders as can be caught, whilst the Ngorongoro Conservation Area Authority has offered a reward of £ 50, for information leading to conviction of poacher or trader. Those overseas interested in the preservation of rhino could do much to assist, as did the antislavery workers in the old days, by persuading the importing countries to take strict measures against those illicitly importing rhino horn.

Rhino horn is just one example of how game in Africa may be jeopardized by the fickle fashions of the rest of the world : elephant ivory has been in constant demand, but its uses have varied from a medium of sculpture to piano-key coverings, hippo ivory was exported in 1857 to Europe and America to make false teeth (Burton 1872 II 410) marabout storks provided the " feather boa ", leopard skins the coats for Hollywood actresses. If the production and export of such by-products of the fauna are adequately controlled, they provide a means whereby " dynamic conservation " can be profitably practiced.

iii. The conference will discuss the overseas tourist as a money earner; I would like to mention one human aspect of tourism, namely the personal relationship between the tourists and the local inhabitants. The tourists vary from the indulgent—who submit to the importunities of beggars—via the unconscious offenders, who for instance by their dress, or lack of it, offend the susceptibilities of Mohammedan citizens, to the insufferably arrogant. Steps must be taken to condition the tourists to the circumstances in the countries they are visiting, whilst equally the local inhabitants must be made tolerant of the whims and foibles of the tourists.

iv. World opinion. This is a human element of very considerable strength, which needs no more than mention here as it forms the first item for discussion when deliberations are resumed after our weekend excursions.

SOME ECONOMIC ASPECTS OF THE CONSERVATION  
AND DEVELOPMENT  
OF WILD LIFE RESOURCES IN MODERN AFRICAN STATES

by

S. HERBERT FRANKEL, M. A., Ph. D., D. Sc. (Econ.) Lond.  
Professor of Colonial Economic Affairs in the  
University of Oxford

It is a privilege for me to accede to the request of the organisers of the Conference on the Conservation of Nature and Natural Resources in Modern African States, to write this paper. Unfortunately the time available to me to do so was so brief that I have had to base the paper mainly on some thoughts which developed as a result of my collaboration at an early stage with Dr. Fraser Darling in his efforts to pave the way for this Conference. I wish at the outset to say that I regard this study conference in Africa on the general theme of conservation of faunal resources and areas of natural habitat in relation to land use policy, social and economic development, and particularly nutrition, as of great importance.

From my experience on the East Africa Royal Commission which was appointed under Royal Warrant dated 1st January 1953, to examine problems of African population growth, congestion of population on the land, the adaptations or modifications in traditional tribal systems of land tenure, the social and economic problems arising therefrom, and various other matters connected therewith (as set out in the Terms of Reference published in the Report of the Commission—CMD. 9475), and from studies of similar problems in other parts of Africa, I have come to appreciate the need, in large parts of Africa for new methods of dealing with the use of land and natural resources by the indigenous populations, as part of the growth of a commercialised and money economy.

Broadly speaking, one of the main findings of the East Africa Royal Commission was that modern systems of production, directed towards an increase in standards of living through proper farming methods, could not be fully attained under existing tribal or communal systems of land ownership. These have frequently led to uneconomic deterioration of the land, inability to utilise it as an economic asset in a modern money economy, and preventable overcrowding of the population. Owing to outworn or unsuitable systems of land law, or methods of land use, the people were often condemned to subsistence standards of living from which many desired to escape.

A large part of the East Africa Royal Commission's Report was concerned to illustrate the dangerous situation which had developed, and was continuing to develop, on the land mainly because land was not regarded as an individual

or corporate asset, with the consequence that it was being economically misused, since nobody had the responsibility of the interest to conserve it and use it as a continuing income-earning economic asset <sup>1</sup>.

Thus for example, under indigenous systems of land use, enclosure of land into suitable economic holdings is difficult; land can usually not be bought or sold, pledged, mortgaged or made readily available to those who know how to utilise it to the best purpose.

Since the East Africa Royal Commission reported, great changes have been made, and are being made, in the law regulating the acquisition, disposal, access to and use of land, and a revolution in the outlook of the indigenous people is under way at a tempo and with beneficent results which have astonished all those aware of what has been happening. Certain of these changes are also under way in other African territories.

I have dwelt on these matters because they have a bearing on the problems of the destruction of the native animals and natural habitat of Africa, without regard to their value as a *continuing* economic resource.

I am of the opinion that there is as much need for a revolution in outlook in regard to the natural faunal resources in Africa and their economic utilisation and economic conservation, as has been found necessary in regard to the problems of general land use.

Until recently it is probably not wide of the mark to say that the economic use of the ungulate fauna in Africa has hardly been formally considered. From an economic point of view it has unreflectingly been assumed that modern systems of economic production must of necessity imply the disappearance of wild life resources, except insofar as these might be protected for aesthetic or sentimental reasons, or for sport, and it is significant that such protection has often been regarded as being merely a type of economic luxury. To the indigenous population, and to the pioneer immigrant races, access to game, just as access to land, has been taken for granted without raising any questions of its long-term or proper economic utilisation or conservation. This is so particularly because, over large areas of Africa, game or revenue therefrom is not recognised as an adequately identifiable private or economically viable corporate or collective asset, and its destruction, legal or illegal whenever possible, does not in general involve loss to individuals, or corporate bodies who might

<sup>1</sup> The use of the words individual or corporate ownership has no connection with problems of "private" versus "public" enterprise. The question here is one of legal entities and rights suited to modern forms of enterprise. On page 351 (para. 15) of its Report the East Africa Royal Commission stated: "It should be made clear that in using the word 'individual' we mean to include any association of individuals which can act as a single entity. It would include such associations as co-operatives and companies, and it would not exclude any customary associations of Africans which in fact enable a single and undivided control to be exercised over the use of the land in respect of which the interests are held." Also on page 332 (para. 91) it had stated: "What is needed is a policy deliberately determined to encourage economic usage of land, and to remove the obstacles which prevent this, but not necessarily wedded to any one solution as a panacea; a policy which stimulates different experiments, not only in the technical alternatives in patterns of usage, but also in differing human associations, by individuals, by co-operatives, by schemes under government plan, by partnerships with development organisations, or by clans still wishing to preserve their community ties, but ready to forego the faults in them; a policy seeking progress in a new mobility of ideas and people."

be interested in *preventing* such losses if the assets belonged to, or were in part controlled by them.

It seems to me of prime importance that the whole question of the control, and the exploitation of game resources as economic assets, in such a way as to conserve them so as to yield the highest productivity in terms of proper cropping, requires urgent investigation, and that it may well be found to be a most important source of income to the indigenous population. I am fully aware of the fact that problems of control and administration present very great difficulties but it is a fact that within a few years it has been possible to revolutionise the attitude towards land ownership and use, in areas where this was previously considered impossible. In view of this I feel that there is hope that, given the proper administrative and co-operative approach and educational activity, the indigenous peoples can, although time is running out, still be similarly induced to look upon their faunal resources in a new light, with great benefit to themselves and future generations.

I would here draw attention to an observation of the East Africa Royal Commission, which devoted a section of its Report (see page 298 to 300) to Game Preservation. It referred to the fact that, in the search for more grazing by pastoral tribes, the establishment of game reserves and national parks had sometimes become a subject of a good deal of misunderstanding—very often, due to the fact that the indigenous people were frequently not aware of the issues involved (see Ch. 22, para. 21) or because it was associated in their minds with other forms of European control over land.

The Commission went on to point out (Ch. 22, para. 23) that "... it is fully appreciated that, generally speaking, where the interest of man and game conflict, the need of the former must be considered paramount " and it concluded in the same paragraph, " but as things are, there can be no justification for shooting game out of an area to allow scrub cattle of no economic value the more easily to over-graze it. At least game does not let in the desert. "

I believe that, if the Commission had had at its disposal the long experience and pioneering views of Dr. Darling, it would not have so readily considered the problem of game conservation in the terms it did, i. e. mainly from the point of view of competition between the human and animal populations, which viewpoint overlooks the fundamental consideration emphasised by Dr. Darling : the co-operant ecological interdependence between the conservation of game and the conservation of the land. It may not only be scrub cattle which lets in the desert.

In certain areas the competition between human and animal populations is more apparent than real, and resolves itself into a competition between short run, and often deleterious, uses of the land, and its long run economic conservation and the cropping of its ungulate populations for valuable protein resources. It is beyond my province as an economist to comment upon the biological and ecological issues, but I would stress that, in the assessment of competing uses of land, nothing can be more unfortunate than permitting *ignorance* of the scientific and economic facts to stand in the way of a better assessment of social and individual economic benefits. It seems to me therefore, of particular importance that the proposed conference should consider, *inter alia*, the best means of ascertaining the economic potentialities of wild life

conservation and cropping (especially their long run development) and the legal and administrative changes which will induce them.

Moreover, it should not be forgotten that in Europe, and in other areas of the world, income from hunting has for generations constituted a most important contribution to food supplies and the standard of living of sections of the population, and it is therefore particularly unfortunate that in a continent, so richly endowed in faunal resources, they should be prematurely exhausted because the indigenous population has not been assisted by appropriate legal and educational measures to conserve them, and draw the maximum economic income benefits from them. In Africa, the relatively sudden and increasing availability of modern lethal weapons, and increased access to game through modern communications, has overtaken its peoples before they have been able to take stock of their position vis-a-vis the inheritance of faunal resources from the past, and their responsibility for that inheritance to the future.

In this connection it is also important to bear in mind that these faunal resources are a valuable capital asset which cannot be replaced once it has been destroyed. Moreover it is an asset which through proper and controlled use, can yield income without the need for relatively large additional capital investment. The African continent is characterised by the great poverty of its peoples and the small amounts of capital per head which they have been able to accumulate. The conservation and expansion of resources which can yield income without the need to draw to any considerable extent on local capital resources required for other purposes or on investment from abroad, is therefore of great importance.

There seems little doubt that with forethought and proper allocation of land, faunal resources, extending over large areas, can still be saved. Moreover, it is also clear that at this very moment of time the actual farming of ungulate fauna is developing—in other words that a new vista for the modern economic use of ungulate populations has been opened up. Thus Africa is, in regard to this whole question, literally at the cross-roads of economic decisions, which may have a very great bearing on the future income from hitherto inadequately utilised natural resources and on experimentation with their rehabilitation.

There is here a challenge to scientific endeavour, and individual and collective economic decision, which should not be shirked, not only from the point of view of the food resources of Africa, but from the point of view of scientific ecological advance to bring about a new harmony between man and his natural environment, which may well influence policy in other areas of the world. The point I am trying to make is that, where ignorance can be dispelled, it is our duty to dispel it, since we never know what benefits will result from such endeavours, whereas we do know that opportunities to dispel ignorance, when foregone, may be forever lost.

I should like finally to refer to what is usually regarded as the tourist industry, that is the protection of game in areas to which access is given for recreational and aesthetic purposes. It seems to me that the economic value of national parks and game reserves from this point of view is far greater and of far more importance than has so far been envisaged. The Royal Commission ventured the opinion, in paragraph 22, page 299, of its Report, that tourists in Kenya alone spent £5 million in 1953, despite the unrest in that year in that country.

## TEACHING PEOPLE ABOUT NATURE AND NATURAL RESOURCES

by

A. GILLE

Scientific attache for Africa, Department of Natural Science  
UNESCO

Ever since its foundation in 1946 UNESCO has been much concerned with the problem of the conservation of nature and its resources.

Having soon reached the conclusion that the correct solutions of the many different aspects of this problem would never be found unless they were studied on an international basis, UNESCO instigated in 1948 at Fontainebleau (France) the foundation of the International Union for Conservation of Nature and Natural Resources.

Furthermore, the particular item on our agenda today, namely education in matters concerning conservation, is one which UNESCO has always considered quite fundamental. It is for this reason that the progress and development of IUCN has for the last thirteen years always occupied a very important place in UNESCO's annual programme.

It may be recalled for example that in the year following IUCN's foundation, UNESCO in collaboration with IUCN organised at Lake Success a technical Conference on the protection of nature to coincide with the U. N. scientific conference on the conservation and utilisation of natural resources. One of the chief themes selected for discussion was the education of young and old in the sphere of conservation, and it is worth quoting the following passage taken from the " Record and Report " of the Conference (UNESCO 1950): " Unless people can be made to realise the moral duty and the material advantage of taking proper care of the living things which surround them and from which their own subsistence is derived, there are no rules or regulations, however strict, which can be guaranteed to save this living environment from damage or even total destruction, whenever the profit motive enters into the picture. "

UNESCO has therefore continued to have the deepest concern for education in conservation, and has been happy to note that IUCN has made it one of its principal objectives, as can readily be appreciated by a perusal of the records of its seven General Assemblies. In fact IUCN has never had a plenary meeting in which these questions of education have not come up for discussion.

One may add that UNESCO, which now has 29 member or associate member states in Africa and which is launching a hugh aid programme on their behalf, welcomes the initiative of IUCN, in cooperation with CCTA/CSA, in organizing the important conference at Arusha, in which leading place has been given to conservation education, a subject which is of very special importance in the African continent.

Natural conditions and climatic conditions in particular make the tropical African region highly vulnerable to disturbance of the balance of nature which can have the most serious consequences. Moreover the region has the distinction of possessing natural features of outstanding interest and a magnificent fauna which is unique in the world, constituting a scientific and cultural heritage of worldwide interest.

This is why UNESCO last summer requested the eminent biologist Sir Julian Huxley, who was its own first Director-General, to carry out a survey and submit a report on the big game and natural habitats of central and eastern Africa. In his report, the question of education and propaganda in support of conservation is touched on in numerous places, particularly in Chapter 6 which is devoted to " African attitudes, " and it is in my view eminently desirable that the participants in our discussion of today's agenda should take cognizance of the views there expressed.

The problem before us really involves two questions. Where ought the effort to rouse and develop an understanding of the necessity for conserving nature and natural resources to be concentrated ? How can the effort be made to succeed ?

The audience which has to be convinced is in fact, in every country, the mass of the people. This in turn can be conveniently divided into two sections : schoolchildren and adults.

A different method of approach is needed according to the division of the population with which one is dealing. In the first place there must within the framework of the law be a section devoted to conservation. This section needs to provide whatever measures may be necessary to protect outstanding natural features, sites of scientific, artistic or historic interest, species of animals or plants which are rare or in danger of extinction etc. The safeguarding of these provisions requires, also, the setting up of official advisory bodies (such as Commissions for Sites of Interest), at both local and central government level, including among their members persons of eminence and experience in both the scientific and cultural fields. Secondly, since " respect for the policeman is the beginning of wisdom, " the executive authority must have at its disposal adequate means of enforcing a strict respect for the law.

Those who guide affairs and have the responsibility towards future generations of using wisely the capital constituted by their country's renewable natural resources and handing it on in good condition, must in fact keep constantly in mind the effective application of the provisions of the law. Parallel with these official bodies, private organizations, with public backing, such as national or regional societies for the protection of nature, can play an important role in this field and it is desirable that governments should do everything to encourage their creation and development.

Nevertheless, as Professor R. Heim has rightly observed " Unless it has public support, the law is nothing more than an unworkable text and its translation into practical effect will be quite deceptive. If it is to be effective, the majority of the people must be convinced that it is right. And unless there is education, no one will either be convinced or cooperate. " In short the part played by education is absolutely essential.

In the two sections of the population which I mentioned earlier, that comprising children of school age is particularly important, because children are

very receptive and because they are indeed the citizens of tomorrow. It is therefore vital to inculcate into youth at the earliest possible stage the fundamental principles of conservation. It is specially desirable that school curricula should include special courses or that conservation principles should be introduced into suitable existing courses. It is worth noting in this connection that IUCN, with UNESCO assistance, has drawn up and published on several occasions standard lessons on the subject of the conservation of natural resources designed for the primary and secondary schools of several African countries (IUPN 1952). The special experience which IUCN has acquired in this sphere has in fact been directed to supplying Ministries of Education and the teachers who wish to benefit from advice in this field, with as much useful information as possible. It is much to be hoped, also, that Governments will undertake or increase the production of film strips on the model of those produced by IUCN at the request and with the help of UNESCO (see IUPN 1954, 1956: IUCN 1957), which have already been widely distributed in some African countries.

Out of school activities are another very effective method of inculcating the principles of conservation in children. The organization of meetings, exhibitions, mobile or otherwise (see UNESCO 1953, 1955), film shows, radio programmes, field trips, youth camps (such as those arranged annually with the help of UNESCO by the International Youth Federation for the Study and Protection of Nature), are all types of activity which have produced excellent results. The formation of young naturalists' clubs, on a national or regional basis, which can be described as the crucible in which future conservators can be moulded, is something which one would like particularly to see encouraged in official circles.

Education of adults in matters of conservation is a more tricky problem: partly because it is not so much concerned with putting across new ideas as with correcting bad habits firmly entrenched by the passage of time,—always a more difficult task—; partly because it is less easy to assemble adults for such a purpose than schoolchildren, for whom, moreover, the teacher enjoys the added privilege of being looked upon as an oracle.

In presenting the conservation problem to adults, the approach which has the best chance of eliciting a response is through the economic aspect. As Sir Julian Huxley has observed (1961) : " The young African nations should realise that if they do not pay due attention to the preservation of the vegetation, hydrological and other resources of their countries, these will become barren and useless; they should also realise, conversely, the positive value of their natural resources, and notably of big game and beauty-spots. The first thing to be done is convey to Africans at all levels a consciousness of these riches. "

But arguments from the economic viewpoint are not, in fact, the only ones that could be invoked in the course of a campaign in favour of conservation. Arguments appealing to intellectual and moral values—appreciation of beauty, pride in possessing a wealth of big game which has no parallel in the world—will certainly not be wasted on the adult population.

It is therefore to be hoped that those who have the responsibility for leadership in these matters will organise periodic and substantial propaganda campaigns making full use of the techniques and means of mass information,

such as films and film-strips, posters, pamphlets, radio programmes, lectures and public meetings etc.

In relation to longer-term policy, the establishment of zoological and botanical gardens, aquariums, natural history museums, national parks open to the public at large, ought all to receive Governmental support. Such institutions are not luxuries but, on the contrary, constitute one of the most effective means of education which no modern state can afford to be without. To establish them properly needs the services of really experienced technical experts, which can be obtained, if need be, through one of the appropriate technical assistance programmes. Moreover, a number of non-governmental international organisations, such as IUCN, the International Union for The Biological Sciences, which has sponsored a number of meetings and published various handbooks on the organisation of some of the institutions to which I have referred such as botanical gardens (see IUBS 1953), and the International Museums Council, for example, are in the position, because of their great experience in this field and the considerable documentation at their disposal, to provide useful information and advice to Governments who request such assistance.

# FACTORS OF THE HABITAT

by

P. E. GLOVER

Department of Veterinary Services, Kenya

Weaver and Clements (1938) discussing "factors of the habitat" said that every part of the environment that exerts directly or otherwise a specific influence upon the life of a plant or animal is a factor of the habitat. Thus the habitat is a complex of many interacting factors. To illustrate this point, the factors dealing with plants only have been shown in the diagram (p. 178), for plants provide shelter as well as breeding and feeding grounds for most animals, so that what is true for plants is usually applicable to animals also. This is particularly important as many of us tend to overlook the fact that the preservation of vegetation is the real basis of all wild life conservation.

It can be seen from the attached diagram that the main principle in plant ecology is development or "succession" towards more and more highly organised and complex communities until a "climax," or stable association is reached in which the different members of the community exist in equilibrium with one another, are interdependent, and so are themselves factors of the habitat; in fact the community has become an organism which is greater than the sum of its parts (Clements & Shelford, 1946). An example of a climax community is primeval forest (Tansley & Chipp, 1926).

But this process is reversible and degeneration towards less highly organised stages can be brought about by the influence of such factors as fire, primitive agriculture, overgrazing and trampling, resulting in soil erosion and ultimately a state of almost complete sterility in the form of bare rock or shifting sand dunes.

"Primary" successional development takes place under "natural" conditions where the destructive influence of man or other animals is absent or not strong enough to influence the natural course of events.

"Secondary succession" takes place generally when man's influence is dominant.

Ways of classifying the factors of the habitat vary, depending on whether stress is laid upon their functional aspect, when they are regarded as having a direct, an indirect, or a remote effect on plants or animals; or alternatively upon their origin, when they may be grouped as climatic, edaphic (soil) or biological (Phillips 1934 and 1935).

For the purpose of this conference an academic discussion of all the factors cannot be undertaken and only a few relevant ones are mentioned to show the need for a wide and deep understanding of the environment by those concerned with nature conservation.

Man is the most dynamic biological factor which has ever disrupted the balance of nature on earth, for he has ceased to be an integral part of the environment and has become a controlling factor, disturbing, by one means or another, the natural balance of other living things. Man and his stock, however, still increase unchecked.

Geological changes, sunspot cycles, solar radiation, wind, rainfall and temperature are beyond man's control, but the preservation of soil and shelter are not. Down the ages, in some parts of the world, man, knowing that life depends on water, has practised conservation and the control of run-off. Yet in tropical Africa, where the biological reaction rate is faster than in temperate regions, these basic practices are often spurned or neglected by backward communities.

" The present zonal climate of the world which our experience and records indicate as normal, is highly unusual viewed in geological perspective. Thus modern climates are unstable and have varied much in recent millenia and centuries. " (Allee et al. 1949.) Hence the unpredictable effect of man's activities in making conditions less favourable by ruining the vegetation cover of the earth which feeds and shelters himself and other animal life.

Interesting support of the effect of climate can be found in tree ring studies, throwing light on rainfall cycles, over the past few hundred years.

" The range of temperature tolerance of latent protoplasm varies both specifically from  $-270^{\circ}$  C to  $150^{\circ}$  C and in response to other environmental factors, though its normal range is from warm solid to a warm liquid " (Allee et al, 1949). This is a most important developmental factor in survival as well as growth in tropical Africa where fungal and virus infections play an important role in the incidence of disease, as many organisms live on the margin of their temperature survival range.

Heat budgets of lakes are commonly quoted but heat budgets of the rivers, forests, grasslands, swamps, deserts and volcanic zones of Africa are unknown. Even though some work has been done on temperature records in specific plant communities in East Africa, precise detail on the modifying effects of biological factors is absent. Nicholson (1929), when working in Kenya, said " Forests can influence microclimates and run-off critically, since the dew and mist from the forests' transpiration canopy are not measurable. " The humid and cooling effect of mist and dew are important factors in tropical zones in the preservation of vegetation.

Because of the drying power of the air, life is limited to a biosphere which does not extend more than a few hundred feet above the earth's surface. Yet of the actual area of the earth, about half is eliminated for all but a sparse population as a result of extreme regional and seasonal variations in temperature and humidity. The seasonal flushes of ephemeral vegetation in the Haud of Somaliland and the Northern Frontier of Kenya emphasise the importance of water in limiting the vegetation in those parts (Glover, 1950 and 1951).

Geography plays an important role in influencing the availability of water. Mountains running east to west accentuate the altitude, latitude and aspect effects of temperature and rainfall zones. On the other hand, mountains and escarpments running north to south produce secondary rainfall and temperature zones. The Rift Valley and the Lake Victoria basin exhibit secondary climatic variations.

Some edaphic factors have been given attention in East Africa, where striking results in stock rearing were obtained when the trace element deficiency of cobalt in the soil was identified by Hudson (1944) as being the cause of Nakurutitis (Enzootic marasmus). It would be interesting to know what has been done to investigate the effect of trace elements on game. Experiments on mineral deficiencies carried out as " salt lick " tests might be profitable in game reserves, especially in drought years.

A few of the more important biological factors involving plants, are fire, disease, parasites and the activities of man. Similarly animals influence the habitat for other animals by providing food chains, affecting the vegetation, and causing or transmitting disease. For instance the tsetse fly country of East Africa would provide a very much more amenable habitat for domestic stock and so for man, were there not an interaction between vegetation, the fly, game and the trypanosome. The fact that there has been this interaction, which until recently has excluded stock, has in turn made human settlement difficult and so preserved the natural habitat.

In many parts of Africa burning is used as a means of controlling regrowth and of stimulating pasture. Fire, one of man's most precious tools, has however been so abused that it has become a very destructive agent. In East Africa fire is fast removing vast areas of forest and thicket beyond recovery. The damaging effects of fire upon parts of southern Kenya and northern Tanganyika are all too evident and here rhinoceros, buffalo, lion, leopard and many other animals are in jeopardy, unless the senseless destruction of their habitat by uncontrolled grass fires is effectively stopped.

In Masailand and the adjoining country, an overlarge elephant population created by a restricted environment is destroying its own habitat at an alarming rate by uprooting and breaking the trees. Ironically some African tribes have reacted to a restricted environment by similarly destroying their habitat, with uncontrolled grass fires and cutting the bush to build bomas and manyattas for their excessive flocks and herds, as they possess an intense desire to own unlimited numbers of stock, irrespective of quality or the damage they do. Modern drugs and " Pax Britannica " assist this obsession and man and his animals multiply unchecked to bring about their own ultimate destruction by ruining for ever the land they live on.

In the Mau Forest of Kenya the effect of an unbalanced environment is all too evident. Here a tribesman will enter a piece of forest thousands of years old and burn a couple of acres containing as many as 10 or 20 trees between 70 and 100 feet high, clean-boled and majestic. (Each is worth £50 to £100 in timber.) In a few hours these trees are reduced to charred skeletons to stand for decades as the ghostly evidence of man's wantonness. The soil in the forest, the top layer of which is of fertile organic matter 3 to 6 inches deep and which has taken perhaps centuries to accumulate, is destroyed within two years by primitive cultivation followed by overstocking. The total income from this exploit might amount to £200. Sold for timber, the trees could have realised £2,000 and there would still have been a future in the young undamaged plants coming on. From the bare ground round this cleared and badly cultivated patch, paths radiate to water in the valleys below and in no time erosion gashes scar the hillsides. With an increasing population, man must move elsewhere, so

he goes deeper into the forest. The factors of the habitat reacting upon each other, then follow the patterns shown in the diagram.

What can be done to stop this destruction of our habitat ? In the words of Fraser Darling (1955) : " Ecologists early divided themselves into plant and animal ecologists, and when some bold spirit began talking of human ecology he was promptly excommunicated. But within the last ten years there has been a decided tendency to fusion. The plant ecologist has become increasingly aware of the biotic factor and the animal ecologist has learned that geology and vegetational cover must be well understood. The 'human factor' may now be studied without scientific ostracism, but the young researcher might still be advised to avoid the term human ecology. Quite rightly too; there is but one ecology, and at this "moment in history, the subject of the members of men and animals considered together is ripe for investigation. Nevertheless I am ready to hazard a definition of human ecology as something more than an attitude of mind, as being that part of the science which deals with his animate habitat, of the influence of the habitat as a whole on social structure and behaviour, and of social system on the animal habitat. "

Unfortunately East Africa has lost the best part of twenty years because the importance of co-ordinated ecological work was not recognised early enough, as the following quotation shows : " The methods of ecological survey to produce the most useful results have yet to be worked out for African conditions " (Worthington, 1949). Only now is the real importance of ecology beginning to be understood, although, according to the standard works, modern methods have not changed radically over the past 30 years but in that time large areas have been irretrievably damaged by expanding populations of man and stock. Only a patchwork of isolated records by individual workers or departments covering these areas as they were, can be found. Eggeling (1935) stated that man's interference with the vegetation had been so acute in Uganda that most of the plant ecology was very difficult to interpret. Eyles (1927) said that overgrazing had completely changed the vegetation around Salisbury, Southern Rhodesia.

Fortunately, as a more realistic attitude to ecological research is now developing, the skilled training needed to study the factors of the habitat is beginning to be respected and understood. Given the necessary finance, trained workers may still salvage vital information and repair much of the damage that has been done.

" Of all human activity which has been damned by false education, that of getting food is the worst. The vital part played by the soil and the necessity for its correct treatment are overlooked. Farmers and ranchers are regarded as twentieth century anachronisms and the earth as dirt " (Robertson, 1949).

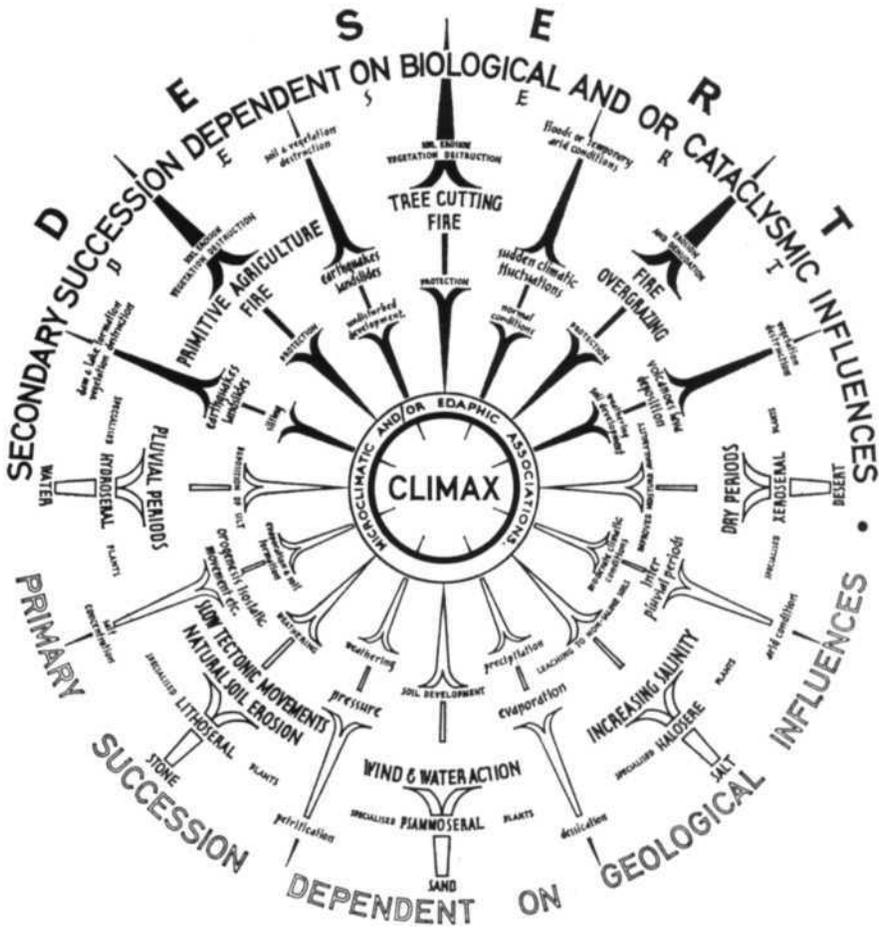
The unreality of modern education is to be seen at its worst in the mental equipment of its final products where politicians, not scientists hold the reins. Add the fallacious belief that in Africa land is inexhaustible and put there for man to exploit at will, and you have disaster.

Ecological knowledge in the hands of those whose influence is greatest, could do much to help restore the balance of nature, as the preservation of the land is no longer a scientific problem but a social one. The problem of saving mankind from self-annihilation by controlling the size of his populations and

adjusting his education, lies in the hands of the politicians who must be made to realise that the only hope for Africa is for the emphasis on education to be shifted from purely literacy skills to a better understanding of the value of scientific knowledge, particularly concerning man's influence upon his habitat and how to preserve it for the future.

Education is a slow process requiring at least one generation, but the situation is too desperate to wait; something must be done at once. Who will do it ?

**ENVIRONMENTAL FACTORS IN ACTION**



# THE FAUNA AND FLORA OF EAST AFRICA

by

I. R. GRIMWOOD

Chief Game Warden, Box 241, Nairobi, Kenya

1. The "Vegetation Map of Africa South of the Tropic of Cancer" published in 1959 on behalf of l'Association pour l'Etude Taxonomique de la Flore d'Afrique Tropicale with the assistance of UNESCO, divides the vegetation of that area into sixteen major types. The fact that eleven of these occur in East Africa helps comprehension of the extraordinary variety of mammals and birds occurring in that region.

2. The broad picture is of a *Desert and Sub-Desert steppe* zone in north western Kenya giving place in the south to a region of *Wooded Steppes with abundant growths of Acacia and Commiphora* which covers most of southern Kenya and north east Tanganyika. This in turn gives way to the "Miombo" i. e. the *Woodlands and Savannahs with abundant Brachystegia and Julbernardia* of southern and western Tanganyika. To the west, surrounding Lake Victoria and covering most of Uganda and the highlands of Kenya *Relatively Moist types of Woodland and Savannah* occur with patches of *Forest-Savannah Mosaic*. In all the foregoing zones *Montane Communities* occur on high ground. Along the coasts of both Kenya and Tanganyika lies a strip of *Coastal Forest-Savannah Mosaic* with intermittent patches of *Moist Forest at Low and Medium Altitude*.

3. Typically each vegetational zone maintains its own faunal community but changes in these are being wrought both by direct but unequal predation by man and indirectly as a result of changes in the vegetation itself produced by agricultural, pastoral and forestry practices, etc.

In attempting to describe the communities as they exist today a paper of this length must confine itself to the larger and more spectacular animals which attract general attention. The table at the end lists some 52 of these and the vegetational zones in which they occur. It has been compiled principally to give an idea of the degree of adaptation various species have been able to display and consequently of one aspect of their hopes of survival. It must be emphasized that the table gives a generalised picture only and suffers from the weaknesses of all generalisations. For instance the decision as to whether an animal is encountered frequently enough to be shown as occurring in any zone has had to be arbitrarily made and is not based on any exact density standard.

4. In the succeeding paragraphs an attempt is made to elaborate on the table by indicating the present day abundance of various animals in the zones in which they occur and factors likely to influence their increase or decline. Arbitrary terms have been used to describe numbers and to relate some of

these to practicalities: it can be taken that " sparse " means an animal is present in sufficient numbers to justify exploitation by sporthunting; " common " that it is encountered frequently enough to satisfy the needs of an ordinary person wishing to observe or photograph it and " abundant " that, when not in a National Park or Reserve, cropping for meat or hides could be considered.

Limitations of space have precluded mention of certain species such as hippopotamus and situtunga, the occurrence of which depends on strict environmental requirements rather than vegetational zones. The former however can be of major importance in some areas as a provider of meat and the latter will always attract the sport hunter.

## 5. DESERT AND SUB-DESERT STEPPE ZONE

### a) *Limits and fauna*

The herbivores of this region, which covers most of Kenya's Northern Province and the central part of Karamoja District in Uganda, are, as is to be expected, browsers, or browser/grazers, rather than grazers. They are typified by reticulated giraffe, lesser kudu, beisa oryx, dikdik, gerenuk, Grant's gazelle and ostrich, all of which are widespread and often common. Beisa oryx and Grant's gazelle are abundant on the high plains between the Ndoto Mountains and the rift valley as are Burchell's and Grevy's zebra. Both zebra are common wherever they have access to water, though the range of the latter species is confined to the eastern part of this zone. Rhinoceros are sparsely distributed throughout the area to the east of Lake Rudolf, but almost absent in the west except for the northern part of Karamoja. They are common in one area on the lake's eastern shore and in a few other favoured localities. Elephant, buffalo, eland, impala and wart-hog cannot utilize this zone proper, but are found wherever occluded mountain or riverine vegetation affords an opportunity.

Isolated populations of topi, numbering at least 1,000 each, occur on the north eastern and north western shores of Lake Rudolf, where they are confined to the mile wide grassy foreshore, and the species is again found in south Karamoja. The larger predators are represented by sparse populations of lion, leopard and cheetah. Primates are more or less absent.

### b) *Factors inimical to fauna*

The major threat to wild life lies in competition with domestic stock for water and forage and the animosity thereby engendered in pastoralists. Though the Karamojong do comparatively little hunting the Turkana are inveterate poachers and have almost eliminated game from the Uganda border to the western shores of Lake Rudolf. The Boran in the north east of the zone also indulge in illegal hunting.

Rinderpest epidemics periodically sweep the area and this disease reduced the population of species such as eland, buffalo, impala and giraffe by from 20 % to 60 % in some areas in 1960.

c) *Factors favourable to fauna*

Though no sanctuaries exist in this zone proper there are large game reserves in both north and south Karamoja and a 22 sq. mile National Park is proposed on the Uaso Nyiro river in Samburu District.

Some sort of sanctuary covering the still unspoilt region on the north east shores of Lake Rudolf would be highly desirable and is under consideration.

## 6. WOODED STEPPE ZONE

a) *Limits and fauna*

This is the area, including the whole of Masailand, which has been famous in the past for the vast concourses of herbivores to be seen on its stretches of open plains, some of which are now preserved as National Parks and other sanctuaries. The vegetation types included vary from close commiphora woodland or thicket, with only sparse grass cover underneath, to open grassy plains. Both browsers and grazers are therefore well represented. Of the true grazers wildebeest, hartebeest and zebra are common throughout and abundant in and nearby sanctuaries. Wildebeest however do not occur in the more arid eastern and south eastern region, where their place is taken by the fringe-eared oryx, which also occurs sparsely in other dryer areas such as the Rift Valley. Topi are found only in the western part of the zone in the region of the Mara River and Serengeti National Park, where they are abundant.

Thomson's gazelle, being more strictly a grazer than is Grant's, is limited to the plains areas where it is common, but Grant's gazelle, like eland and impala, are found throughout the zone, being either sparsely distributed or common. Giraffe and ostrich are common throughout, while gerenuk, lesser kudu and dikdik occur sparsely in the dryer regions. Waterbuck, reedbuck, oribi and Steinbuck are sparse in numbers and restricted to areas where their rather strict environmental requirements are met. Greater kudu are found on the Tanganyika side of the border. Elephant, buffalo and rhino are common in most of the sanctuaries but dwindling in numbers outside, except that elephant abound throughout the eastern part of the zone. All the major predators are present, most of them being common in the sanctuaries, though sparse outside. Primates are represented by the ubiquitous baboons and grey vervet monkeys, with some blue monkeys (*G. mitis*) in the better wooded areas.

b) *Factors inimical to fauna*

Over-exploitation of the land by domestic stock threatens to degrade it to desert, or near desert conditions in many parts, thus rendering it intolerable to grazing animals. To this must be added denial of water by stockowners.

The illegal killing of rhinoceros for the value of their horns has reached proportions which threaten the continued existence of the species.

Endemic rinderpest takes a yearly toll of up to 40 % of the wildebeest calves in the Serengeti and Mara areas.

Severe drought in 1960/61 was responsible for the deaths of many thousands of wild animals in Kajiado District.

c) *Factors favourable to fauna*

The principle tribe, the Masai, are not traditionally hunters or cultivators, nor do they eat game meat, though the same cannot be said for the Wakamba, the Chagga, or the tribes on the western periphery. Representative areas of this zone with its indigenous fauna are preserved by the Serengeti National Park and the Mkomazi Game Reserve in Tanganyika and the Nairobi and Tsavo Royal National Parks of Kenya. Further sanctuaries are provided by the recently constituted and locally run Masai Mara and Masai Amboseli Game Reserves, the latter of which replaces the former Amboseli National Reserve.

## 7. WOODLANDS AND SAVANNAH (MIOMBO) ZONE

a) *Limits and fauna*

This vegetational type extends from southern and south western Tanganyika throughout Central Africa west to Angola. It is therefore not surprising to find similarities between the fauna of the zone under discussion and the latter regions. Greater kudu and sable antelope are widespread and in some places common instead of being represented by a few isolated herds as in the zones already described. The same can be said of roan antelope in the western parts. Eland, Waterbuck, reedbuck, oribi, impala, wart-hog and zebra occur as before but the hartebeest *A. buselaphus* gives way to *A. lichtensteini*, the wildebeest *C. t. johnstoni* replaces *C. t. albojubatus* in the south and the southern reedbuck *R. arundinum* and puku appear for the first time. The country appears to be more favourable for buffalo, bushpig and elephant, but is less hospitable to giraffe and rhinoceros, while arid country forms such as oryx and gerenuk and plains forms such as Thomson's and Grant's gazelles disappear altogether. Topi are widespread and often common in the west but do not occur elsewhere.

The predators are still represented by lion, leopard and cheetah, but the latter is rare and confined to more open areas. Primate are represented by baboons and vervet monkeys, with blue monkeys (*C. mitis*) and red colobus in more heavily wooded areas.

b) *Factors inimical to fauna*

This zone is inhabited by mainly agricultural tribes and though settlement is not yet dense considerable areas are denied to game.

Most tribes also indulge in hunting, both legal and illegal, and their mainly muzzle loading firearms account for many more animals than are authorised by game licences.

Though much of the miombo woodland represents a fire climax the annual fires which sweep the greater part of it present a direct threat to young animals and affect the availability of food.

c) *Factors favourable to fauna*

The Selous, Katavi and Rungwa River Game Reserves and certain controlled Areas in which no hunting is permitted preserve representative sections of this vegetational zone together with its indigenous fauna.

## 8. WOODLAND AND SAVANNAH (MOISTER TYPE) AND FOREST-SAVANNAH MOSAIC ZONES

### a) *Limits and fauna*

These two zones together cover most of Uganda, Tanganyika west of Lake Victoria, and the Nyanza Province and highlands of Kenya.

So much of it has been given over to settlement, both European and African, in the course of which the natural vegetation has been changed and wild life driven out, that it is difficult to generalize about its fauna or its distribution.

The picture is however of the drier climate forms reaching the ecological limits of their distribution and a general reduction in the number of species occurring. Thus roan antelope, greater kudu, Grant's gazelle, giraffe and rhinoceros though still present are greatly restricted in both numbers and range. Hartebeest, Waterbuck, impala, reedbuck, oribi and topi still occur in suitable areas however and in Uganda elephant and buffalo reach perhaps their greatest concentrations in East Africa, as do hippopotamus in the region of the Queen Elizabeth National Park.

Certain West African forms appear, such as the yellow-backed duiker and the chimpanzee, the latter also being known from the west side of Lake Tanganyika. Another new species is the white rhinoceros which occurs in a restricted area on the west bank of the Nile.

All three of the major predators are found and primates are better represented than elsewhere, various races of blue monkey (*C. mitis*), putty nosed monkey (*C. nictitans*) and brazza monkey (*C. neglectus*), as well as colobus monkeys and mangabeys being added to the list.

### b) *Factors inimical to fauna*

Throughout this zone increased settlement and tsetse clearance schemes represent the greatest threat to wild life.

### c) *Factors favourable to fauna*

The Queen Elizabeth and Murchison Falls National Parks together with the Kigezi, Semliki and Aswa/Lolin Game Reserves in Uganda preserve representative areas of this zone together with its indigenous fauna.

## 9. MONTANE COMMUNITIES

### a) *Limits and fauna*

Space does not permit of a description of the various montane communities which occur in all the zones previously described, as exemplified by the Matthews, Ndoto, Marsabit and Kulal mountains of the desert zone; Mount Elgon, Mount Kenya, the Mau and the Aberdares of Central Kenya; the Ruwenzori range of western Uganda; Mounts Kilimanjaro and Meru and the Pare, Usambara and Ngorongoro massives of northern Tanganyika as well as other mountains in the south of that country.

Most of them are forest clad, while on some there is an upper zone of bamboo giving way in turn to open heathland, sometimes with afro-alpine floral communities, and finally scree and snow.

These mountain forests in many cases form refuges for the larger species of animals such as elephant, rhinoceros and buffalo which seem well able to adapt themselves to such a habitat. They also provide the ecological requirements of such species as bushbuck, suni and various duikers of the genus *Cephalophus* or Guevei species, all of which are found in suitable localities at lower altitudes.

In addition there are species which in East Africa are unique to certain of these forests, such as the giant forest hog, the bongo of Mount Kenya, the Aberdares and the Mau, and the gorilla which occurs on the Virunga volcanoes and in the Kayonza Impenetrable Forest of south west Uganda. The major predators are reduced to leopard, though both lion and wild dogs have been seen on high altitude moorlands. Mountain forests provide the main habitat of the colobus monkey. The heath zone, though less valuable, is also utilized at certain times of the year by species such as rhinoceros, buffalo, eland and zebra and maintains smaller forms unique to such a habitat.

b) *Factors inimical to fauna*

The greatest danger to the fauna of montane communities lies in the destruction of forests by trespass by domestic stock and their deliberate replacement by plantations of exotic trees.

c) *Factors favourable to fauna*

Most mountain forests are protected under forestry laws either as production forests or for catchment area purposes and such protection usually extends to the fauna. Additionally, as in the case of the Virunga volcanoes, the Aberdares, Mount Kenya, Mount Kilimanjaro, Mount Meru, Mount Marsabit, the Mau and Mount Elgon, a National Park or other form of faunal sanctuary has been declared covering part, if not all, the mountain.

## 10. COASTAL FOREST-SAVANNAH MOSAIC AND MOIST FOREST ZONE

a) *Limits and fauna*

This zone, which owes its existence to the coastal rain belt, is not remarkable for the variety of animals it harbours, most of which appear to find it marginal to their requirements. It does however seem to satisfy all the needs of elephants, which occur in often embarrassing numbers having regard to the widespread cultivation which they habitually raid from the safety of thick forest patches.

These forests and thickets also provide the natural habitat of bushbuck, suni and certain species of small duiker.

Only one animal is peculiar to this zone and that is the hirola or Hunter's antelope which occurs nowhere outside a very restricted region running from the Tana River northwards a short way into Somaliland. Within this zone the hirola is reasonably common and increasing rather than decreasing in numbers. Another isolated population of topi share the range of the hirola and

Kenya's few herds of sable antelope are also found in the coastal belt amongst the brachystegia woods further south. Sable also occur in coastal areas in Tanganyika. Though not to be numbered amongst terrestrial animals dugong may be included in the fauna of this region. This animal still occurs sparsely wherever suitable in the vicinity of Lamu.

b) *Factors inimical to fauna*

Coastal tribes, being mainly agriculturalists, are antipathetic to game and in areas where they suffer frequent raiding by elephants are generally actively hostile. Most are also hunters and snarers of small animals by tradition.

No sanctuary has yet been created to give territorial protection to the hirola.

c) *Factors favourable to fauna*

Nil.

	Desert and Sub-Desert Steppe	Wooded Steppe	Woodlands and Savannah (Mombo)	Woodlands and Savannah (moist type)	Montane Communities	Moist Forest Coastal Forest Savannah Mosaic
	I	II	III	IV	V	VI
Giraffe ( <i>Giraffacamelopardalis</i> ) . . . . .	T	T	M	M		M
Reticulated Giraffe ( <i>G. reticulata</i> ) . . . . .						
Bongo ( <i>Boocoseuerycerus</i> ) . . . . .		M(R)	T	M	S(R)	M(R)
Greater Kudu ( <i>Strepsiceros strepsiceros</i> ) . . . . .	T	M	M		M(R)	
Lesser Kudu ( <i>S. imberbis</i> ) . . . . .		S	S	T	T	S
Bushbuck ( <i>Tragelaphus scriptus</i> ) . . . . .			S	S		
Situnga ( <i>L. imnotragus spekii</i> ) . . . . .			S	S		
Eland ( <i>Taurotragus oryx</i> ) . . . . .	M	T	T	T	T	M
Buffalo ( <i>Syncerus caffer</i> ) . . . . .		T	T	T	T	M
Yellow-backed Duiker ( <i>Cephalophus sylvicultor</i> ) . . . . .				S(R)	S(R)	
Other duikers of genus <i>Cephalophus</i> or <i>Gueveispecies</i> . . . . .		S	S	S	S	S
Common duiker ( <i>Sylvicapra grimmia</i> ) . . . . .		M	T	T	M	M
Waterbuck ( <i>Kobus ellipsiprymnus</i> and <i>K. defassa</i> ) . . . . .		M	T	T	M	M
Uganda Kob ( <i>Adenotakob</i> ) . . . . .				T		
Puku ( <i>Adenotavardonii</i> ) . . . . .				T		
Bohor Reedbuck ( <i>Redunca redunca</i> ) . . . . .			T(R)	S	S	S

Note: T denotes that the zone provides the typical habitat of the species described.

M that the zone is marginal for it.

S that the species occurs within the zone wherever its specialised ecological requirements are met.

(R) denotes a clear cut restriction of range within the zone indicated.

	Desert and Sub-Desert Steppe	Wooded Steppe	Woodlands and Savannah (Mombó)	Woodlands and Savannah (moist type)	Montane Communities	Moist Forest Coastal Forest Savannah Mosaic
	I	II	III	IV	V	VI
Southern Reedbuck ( <i>Redunca arundinum</i> )						
Mountain Reedbuck ( <i>R. fulvorufula</i> )		S	S(R)	S	S	
Roan Antelope ( <i>Hippotragus equinus</i> )		M	S T(R)	M		M
Sable Antelope ( <i>H. niger</i> )	T					
Beisa Oryx ( <i>Oryx beisa</i> )	M	T				
Fringe-Eared Oryx ( <i>Oryx beisa callotis</i> )	M					
Topi ( <i>Damaliscus korrigum</i> )	S(R)	M(R)	T(R)	T(R)		M(R) T(R) M
Hunter's Antelope ( <i>D. hunteri</i> )		T	T	T		
Hartebeest ( <i>Alcelaphus buselaphus</i> )		T	T	T		
Lichtenstein's Hartebeest ( <i>A. lichtensteinii</i> )		T(R)	M(R)	T(R)		
Wildebeest ( <i>Connochaetes taurinus</i> )			S	S		S
Klipspringer ( <i>Oreotragus oreotragus</i> )			S	S		S
Oribi ( <i>Ourebia Ourebia</i> )	S	S	S(R)	S		
Steinbuck ( <i>Raphicerus campestris</i> )		S(R)	S(R)	S		
Sharpe's steinbok ( <i>R. sharpei</i> )			S	S		
Sunis of the genus <i>Nesotragus</i>			S	S		
Dikdiks of the genus <i>Rhyncotragus</i>	T	M		S		S
Impala ( <i>Aepycerus melampus</i> )						M
Gerenuk ( <i>Litocranius walleri</i> )	T	M	T	M		M

Note: T denotes that the zone provides the typical habitat of the species described.

M that the zone is marginal for it.

S that the species occurs within the zone wherever its specialised ecological requirements are met.

(R) denotes a clear cut restriction of range within the zone indicated.

	Desert and Sub-Desert Steppe	Wooded Steppe	Woodlands and Savannah (Mombo)	Woodlands and Savannah (moist type)	Montane Communities	Moist Forest Coastal Forest Savannah Mosaic
	I	II	III	IV	V	VI
Thomson's Gazelle ( <i>Gazella thomsoni</i> ) . . .		T		M(R)		
Grant's Gazelle ( <i>Gazella granti</i> ) . . .	T	T		M		S
Hippopotamus ( <i>Hippopotamus amphibius</i> ) . . .	S	S	S	S		
Giant Forest Hog ( <i>Hylochoerus meinertzhageni</i> ) . . . . .				T(R)		
Warthog ( <i>Phacochoerus aethiopicus</i> ) . . . . .	M	T	T	T	M	M
Red River Hogs and Bushpigs ( <i>Polamochoerus</i> ) . . . . .		M	T	T	T	M
Black Rhinoceros ( <i>Diceros bicornis</i> ) . . . . .	M	T	M	M	M	M
White Rhinoceros ( <i>Ceratotherium simum</i> ) . . . . .				S(R)		
Burchell's Zebra ( <i>Equus burchelli</i> ) . . . . .	T	T	T	M	M	M
Grevy's Zebra ( <i>E. grevyi</i> ) . . . . .	T(R)					M(R)
Elephant ( <i>Loxodonta africana</i> ) . . . . .	M	T	T	T	T	T
Lion ( <i>Panthera leo</i> ) . . . . .	M	T	T	T	M	T
Leopard ( <i>P. pardus</i> ) . . . . .	M	T	T	T	T	T
Cheetah ( <i>Acynonyx jubatus</i> ) . . . . .	M	T	T	T	T	T
Gorilla ( <i>Gorilla gorilla</i> ) . . . . .	T	T	M	M		M
Chimpanzee ( <i>Pan troglodytes</i> ) . . . . .			S(R)	S(R)	S(R)	S(R)
Ostrich ( <i>Struthio camelus</i> ) . . . . .	T	T				

Note : T denotes that the zone provides the typical habitat of the species described.

M that the zone is marginal for it.

S that the species occurs within the zone wherever its specialised ecological requirements are met.

(R) denotes a clear cut restriction of range within the zone indicated.

## VALUE OF THE TOURIST INDUSTRY

by

Professor Dr. B. GRZIMEK  
Direktor des Zoologischen Gartens  
Frankfurt/Main, Germany

People on holiday want to see things they cannot see at home. As their way of life changes, a change occurs in the purpose of their travels. Travellers through Europe, two hundred years ago, mainly described famous buildings, palaces and great cities; the scenery and the countryside were hardly mentioned. At that time one went to Italy to visit the ancient monuments, palaces and churches, not to sun oneself or bathe in the sea.

In 1870, 94.9 % of America's population lived in the country, in calm peaceful surroundings, and only 5.1 % in towns. By 1950 only 36 % lived in villages, but 64 % in urban communities. In the Germany of 1871, 62.6 % lived in the country and 37.4 % in towns; in 1950 the respective figures were 28.9 % and 71.1%. Thus in 80 years people's way of life has undergone a more radical transformation than previously in tens of thousands of years. Meanwhile the pace of urbanization has accelerated. It is an established fact that an increasing majority of holiday-makers are now in search of beautiful natural scenery; towns and famous buildings are usually visited only en route.

### *Urbanization leads to an exaggerated love of animals*

In former days the country-folk were in constant contact with horses, cattle, sheep, poultry, dogs and pigeons, and many wild animals were still to be seen daily in the vicinity of villages and small towns. The only animals now familiar to the city-dwellers are dogs and cats. Never before in the five hundred thousand year history of mankind has there been a time when the majority were completely cut off from nature and animals. Only in our own lifetime has such a complete transformation taken place in the human mode of life. One of the many consequences of this is an almost pathological attachment to animals. City newspapers announce with banner headlines the fate of a single animal, and exaggerated, often Utopian, demands are made for animal protection. Occasionally the press will devote more space to a cat stuck on a roof having to be rescued by the fire-brigade than to a road accident causing ten deaths. New zoos are springing up all over the world, not where the surroundings are most suitable for keeping wild animals, but in the densest of human conglomerations—in cities. The number of zoos in the world has already risen to five hundred, and individual zoos are each receiving more and more visitors. Between 1930 and 1940 the Frankfurt Zoo had an average of 330,000 visitors a year; at the time of writing the average is 1.6 million.

In the next few years more and more tourists will be searching for places where they can see animals in the wild. It must be realized, however, that the modern product of mass humanity wants to see as much as possible as rapidly and comfortably as possible, in order to describe it to others afterwards. Therefore one must not expect to persuade millions of tourists to walk observantly through the woods and watch small insignificant creatures. Just as the city-dweller wants to see in one day all the famous buildings of a town from a sight-seeing coach, he is also particularly keen to photograph while seated comfortably in a car, the large and well-known animals. Thank goodness there will always be other types of people, for we refer here only to modern tourists en masse.

*Africa's National Parks as modern holiday resorts*

The National Parks of Africa have a good chance of benefiting from tourist traffic since they can satisfy modern man's desire for contact with animals. Apart from this, tourist traffic itself is assuming ever-larger proportions, because the population is increasing by leaps and bounds, because the percentage of those who can afford pleasure trips is enlarging on account of the rising standard of living, and because their destinations are becoming more distant. In our grandparents' time only very wealthy Europeans could journey to the Riviera. It was never imagined then that today millions from the lower income classes would swarm into Italy every year. In the foreseeable future it will no longer take eleven hours to fly to East Africa but only five or three. During the last few years tourism in Europe has risen 10 % annually. Revenues from tourism between 1950 and 1959 have increased tenfold in Greece, and fourfold in Austria, Germany, Turkey and Portugal. In 1950, 302,000 Americans visited Europe and spent 358 million dollars; in 1959, 750,000 spent 931 million dollars. Italy had 365,000 beds for travellers in 1949 and 737,000 in 1959, representing an increase of 102 %. In Austria during the same period the number of beds increased by 103 %, in Germany by 94 %, and in Portugal by 134 %. Revenues from tourist trade in Greece amounted to 19 % of the total exports, in Italy 19 % and in Switzerland 16 %, but even in countries with a large trade in other exports the proportion was still very high : 12 % for France, 6 % for Denmark and 4 % for Germany.

Has Africa shared in this boom in tourism over the last decade ? In particular, could it increase its share on account of its psychological advantages as the goal of a journey ? East Africa could absorb some of this tourist traffic in Kenya, Uganda, Tanganyika and Zanzibar, of which the first three large countries have famous national parks. In 1959 tourist traffic in East Africa brought in 22 million dollars, placing it at the head of the exports of these countries and was exceeded only in Kenya by coffee exports. These East African countries had a total of 64,155 visitors in 1959, representing an increase of 10 % over 1958. The visitors spent an average of 21 days in East Africa and an average of six English pounds, i. e. 16.8 dollars, per day or altogether 22 million dollars during the year.

This shows that tourist traffic has increased only at the same rate as in other parts of the world. East Africa has therefore not succeeded in diverting the influx of tourists from the classical holiday resorts to its National Parks.

Compare the 64,000 visitors to East Africa with other countries : even Iceland has 12,000 visitors, Turkey 126,000, the Netherlands 1,294,000, Austria 4,240,000. The 6,853 Americans who came to East Africa in 1959 do not represent even 1 % of the 705,000 who visited European countries that year.

*Airfields are the critical factor*

How are the revenues from tourism divided among the various countries of East Africa ? Tanganyika is the country which has preserved the largest stock of wild animals and the Serengeti and the Ngorongoro crater are particularly well-known tourist destinations. Uganda possesses two famous and beautifully situated National Parks (Queen Elizabeth Park and Murchison Falls Park), while Kenya has only the Nairobi National Park which is conveniently near the capital but covers a tiny area, and the Tsavo National Park which is very dry and not scenically attractive. Revenues from tourist traffic in 1959 were split up as follows: Tanganyika £962,500; Kenya £5,197,500; Uganda £1,347,500; Zanzibar £192,000. Each visitor spent an average of £15 in Tanganyika, £81 in Kenya, £21 in Uganda and £3 in Zanzibar.

Thus the East African countries that maintain especially beautiful national parks surprisingly received only the smaller share of revenues from tourist traffic. This is due to the advantageous position of Nairobi, the capital of Kenya. It is true that in 1959 28 % of the visitors still arrived by boat, 60 % by air and 12 % by car. But the proportion of air and road traffic increases each year at the expense of those travelling by sea who in any case usually spend only a short time in the ports when the boats dock, and do not so often visit the National Parks of the interior. Nairobi Airport was served by 13 international airlines in 1959, whereas international traffic at the airports of Uganda (Entebbe) and Tanganyika (Dar es Salaam) was relatively insignificant. Moreover Dar es Salaam is a long way from Tanganyika's National Parks, whereas from Nairobi one can conveniently reach these very same National Parks by car. Since individual air-passengers on scheduled international airlines to East Africa have until now landed almost exclusively in Nairobi, they have necessarily stayed there first of all, and there bought their equipment, hired personnel for safaris, and chartered cars, coaches and small aircraft.

*Chartered aircraft must fly direct to the National Parks*

Africa will achieve a volume of tourist traffic comparable with that of other countries only if it succeeds in attracting the broad mass of tourists of moderate means. This can be done by cutting down costs. This main reduction must lie not so much in hotel costs in Africa, as in the air fares from Europe or America to Africa, since these represent the chief expense of the holiday. Following the example of other countries and continents such a reduction can be effected by party travel in chartered aircraft. Four-engined propeller aircraft are available for this purpose since they are now being discarded by the main airlines in favour of jets. The countries with the best chance of attracting the bulk of these parties of tourists will be those in which the four-engined planes from Europe and America can land near the National Parks. Otherwise costs will

rise steeply, because the overseas aircraft will have to wait or make empty return flights while the tourists will have to use hired cars, coaches or two-engined planes to cover large distances in the country itself.

Tanganyika may be taken as an example. If as soon as possible an airport for large overseas aircraft can be built near Arusha, organized parties will stay mainly in Tanganyika. If overseas aircraft continue to land in Nairobi, tourists will have to remain several days in Kenya and charter all further means of transport from there. It is in the interest of nature conservationists that the country which has preserved its fauna until now and will continue to do so also profits from tourism.

*Books on Africa mislead tourists*

One main reason why large-scale tourism has not yet reached Africa lies in the books and films by big-game hunters and explorers. These portray Africa as a dangerous land and give the impression that one must undergo great hardships and risks in order to see elephants, lions and giraffes. Europeans and Americans therefore believe they will be beset by poisonous snakes, beasts of prey and sleeping sickness; no mention is made of how comfortable and safe it has been for some time now to see these animals. Such books and films have delayed a mass influx of tourists by some ten to fifteen years.

But now that new African governments will be determining the fate of the National Parks, it is important to show that these are valuable touristic assets. This is why the writer, who for the last few years has been producing in German-speaking countries a very popular television programme on animals, got the first organized parties to Africa in 1960 by a kind of bluff. He announced several times on television that it was now possible to fly for three weeks to the National Parks of East Africa for 2,000 D-Marks (\$ 500), inclusive of the flight from Europe. Many Germans interested immediately made enquiries at the travel agencies, who of course knew nothing about such trips. Because of the heavy demand, several agencies were induced to organize such holidays at the stated price. The first parties flew to East Africa in chartered planes in December 1960. The favourable reports of those who went has led to subsequent trips for 1961 being fully booked and other travel agencies undertaking to arrange similar parties.

# THE SPECIAL PROBLEMS OF CONTROLLED REGIONS

by

G. GUIGONIS

Head of the Service des Eaux, Forêts et Chasses  
B.P. 830, Bangui, Central African Republic

The account which follows attempts to clarify the general lines of evolution of the principles and methods of management of what may be called " Natural wealth "—particularly of fauna—in countries where the basis of law and order is in fact the existence of such wealth.

We shall see how, starting with very general arrangements applying to vast regions, there has been a development towards arrangements peculiar to each country. These cannot avoid being diversified since the elements which influence their origin are themselves very different. Over and above the problems of flora and fauna peculiar to each country, many questions arise touching on such different fields as sociology, demography, economics and politics.

A comprehensive study of such questions in the immense and complex area of East, Central and West Africa would make it necessary to go into very involved explanations and to possess special knowledge, beyond the capacity of the present author. So I will not attempt to generalise but will confine my attention mainly to the Central African Republic (formerly Oubangui-Chari and the territory comprised in French Equatorial Africa).

The problem of Nature conservation is of very ancient origin. From the beginning of time man has become conscious of his spirituality through contact with the high places of Nature : the vast horizons, beautiful landscapes, deep forests and the wild life which animated them. These have inspired him with much that is good and, above all, he has quickly got to learn how to turn the religious awe which he experienced and his feeling of interest and respect for nature into an attitude of response to the rules and rites which have been handed down from generation to generation.

It is on such customary observances that the written law of the developed countries is founded. It is on the basis of " custom " that it is important to establish in Africa the rules of management in the field which concerns us here.

The customary attitude to wildlife which prevailed at the period when Africa began to be opened up by the first travellers was generally satisfactory : it was adapted to the prevailing conditions. Admittedly human populations were smaller and the means of destruction less powerful than today, but the fact remains that hunting was subject to many rules : seasons were carefully fixed; hunting grounds strictly apportioned; communal hunts were placed under the control of one man; the sharing of the spoils was regulated.

These attitudes underwent evolution as time passed and became adapted to the changed environment, but the fundamental conditions remained the same

and were not swept away by any sudden break, so that the first explorers could speak of Africa as a rediscovered Eden as regards animal life.

The first explorers, however, introduced the first factors of unbalance which the evolution of custom could not off-set: fire-arms, intensive trade, new needs, improved roads and means of communication. All these new factors were introduced at the same time as the social structure was in a state of upheaval. They opened the way for big monopolies and the commercialisation of hunting.

Gradually at first, the effects of all this on the wild life grew and grew. Realisation of the true state of affairs came slowly, so that when the London Conference of 1933 was called, wildlife had already suffered many catastrophes. This international conference and that at Bukavu which followed in 1953, had the merit of drawing the attention of the authorities to the situation and inducing them to take concrete and far-reaching measures both to restore the habitat and to provide adequate future regulation.

All over Africa total Wildlife Reserves, Parks and Game Reserves were established. The idea was to restrict the destruction of wild life, to a greater or lesser degree according to the category of the area concerned, first by preventing the extinction of species and, secondly, by building up "reservoirs" of species from which the surplus could spread to and stock the neighbouring countryside.

The first objective was successfully achieved and it is to this that we owe the survival of the rhinoceros in Central Africa. The second was much less successful, but nevertheless it still remains true that the lands so protected formed a bastion against subsequent development and in most cases have survived with their original boundaries to this day.

The policy adopted for the control of hunting consists essentially of:

- classification of animals into the completely protected, partly protected and non-protected, whose killing would be forbidden, limited to a quota or freely allowed;
- the control of trophies and of the animals cropped;
- various prohibitions, concerned with particularly cruel methods of hunting.

Laws brought into force in 1936 and 1947 in territories then under French control, strictly reflected the terms of the 1933 convention; but the value of any regulation, however good, depends on the way it is applied, and the results achieved by these laws were highly variable. They were good in the countries where the rules and regulations were supported by adequate means, materials and personnel; elsewhere they were only indifferent.

The rapid changes in economic, social and above all political conditions which took place since the end of the war in the countries with which this study is concerned, quickly rendered the regulations in force out of date, so that entirely new plans and policies had to be worked out. In French Equatorial Africa, this was facilitated by the fact that a serious effort was made to launch hunting-tourism, which involved much modification of the regulations.

A fundamental principle was adopted, namely the classification of Wildlife areas into those controlled areas where the interests of game conservation are

paramount and ordinary controlled hunting areas (zones d'intérêts cynégétiques ZIC and zones de chasse banale ZCB). The former were regions of small population with no future as regards agriculture or industry, where wild animals were more or less numerous (this last factor being the result of the first). In these areas game utilisation has precedence over other economic activities.

In the ordinary hunting areas (ZCB), on the other hand, although hunting is still controlled, the fauna has if necessary to give way in the face of demographic and economic advance.

The special feature of the ZIC is their management plans; their actual legislative basis is not very different than that of the ZCB though hunting is controlled a little more strictly as regards the sale of meat and some other points of secondary importance.

The post-war reorganization was completed by a re-grouping of Game Reserve areas. These, in the Central African Republic comprise considerable acreages of land, selected from the part of the country which has no villages and is generally more barren: hence they contain few places where there is any concentration of game. This means of course that a good number of areas of faunal interest, deserving of protection, remained outside the Reserves.

The department responsible (Service des Eaux, Forêts et Chasses) therefore presented to the National Assembly a comprehensive plan which commended itself by the very fact that it resulted in some decrease of the reserved areas. In fact it formed a coherent pattern which could be logically applied, and its adoption in 1960, brought to an end the era of fragmentary planning which had been doomed to failure. In the same year the Central African Republic, having by now attained independence, also revised all hunting regulations.

Since that date many new factors and new ideas have arisen. Thus the abandonment of the annual quota previously applied to the sale of arms, brought about a considerable influx of rifles and a proportionate increase in poaching. Fortunately the uninhabited ZIC did not suffer much as a consequence of this, but, on the other hand the opening up of tracks of access in these areas—theoretically for the sake of hunter-tourists, but in practice used by everyone—demonstrated only too clearly the vulnerability of non-migratory species, especially kob, the rapid "natural selection in reverse" effect where hunting is introduced in areas which were formerly protected. It also became clear that the idea that nearby Reserves would be capable of restocking the hunting areas and replacing animals destroyed, was illusory.

Nevertheless some favourable factors have emerged. The formation of a corps of Game Guards, brought about some years previously by transfer from the forest service and selection of suitable personnel from all branches of the police, has begun to bear fruit. Moreover the responsible authorities have begun to recognize the value of the country's wildlife resources. In short the present-day laws have confirmed and maintained the principles of earlier legislation which aimed at preserving the fauna. The classification of animals into protected, partially protected and unprotected species persists, as do the limits imposed on the number of animals killed, and the general control of the crop and trophies. On the other hand there is no longer any restriction on the sale of game meat by those holding customary rights (namely the citizens of the

Central African Republic) at any rate as far as the ZCB areas are concerned, though in the ZIC only members of local tribes are allowed this right.

Two other principles which have been preserved are worth noting : first the reassertion that, with due regard to the economic importance of hunting to the country, game is a national amenity; and secondly that, in addition to Reserves and Parks, there should be a category known as Hunting Controlled Areas. The basis of the latter is straightforward. They are the areas in which the regulations controlling hunting are the responsibility not of the National Assembly but of the branch of the Civil Service concerned—in this case—the Ministry of Agriculture through its Department of Water, Forests and Hunting.

The fact is that regulations made by the National Assembly tend in this context to be too rigid, take a long time to bring into effect and are affected by various other considerations which are often quite irrelevant. This is certainly the general experience.

But of course the control of hunting in a given locality requires constant adaptation and revision, and if the maximum utilisation of the fauna is to be achieved, and the maximum revenue obtained, it is most important that the off-take should be closely adjusted to the stock available. Unfortunately no inventory, however precise, no study, can fix with any accuracy what the state of affairs will be in a few years' time. It is therefore more logical to decide periodically—for example at the beginning of every hunting season—what number of animals can be taken, with due regard to the current state of affairs. This means in effect that we must apply to hunting the well-known " sustained-yield " principle of forestry management, keeping the rate of exploitation under constant revision in the light of the actual effect of such exploitation on the potential assessed in the original inventory.

This approach is subjective rather than objective; it is based on information derived from various sources, but also on " general impressions " to fill in the gaps which precise, but inevitably limited, observation is bound to leave. The aim of game management, to which the law must be adapted, is therefore to decide on when hunting should begin and end and what quota of animals may be taken, with such provision as may be appropriate for leasing (for the profit of the community or individual as the case may be) particular sectors of the hunting grounds.

It should be noted that it has been possible to organise hunting areas in this way, in the Central African Republic, without calling on additional personnel or material resources, simply because the selected areas have certain exceptional advantages : few tracks of access (seldom more than one per area), terrain well suited to hunting, inhabited by very few people and those not much addicted to hunting themselves.

This last point is important because, in these special hunting areas, the restrictions do not apply to holders of customary rights, namely the tribesmen within whose area the hunting grounds are situated. Conditions of lease may in fact have to provide for the buying out of customary rights by some system of handing over a portion of the game crop or its value, or providing an agreed quantity of meat, dressed or undressed. The lessor for his part would be permitted to carry out improvements, such as the construction of tracks and permanent camps, not to mention employing his own keepers. The lease

should be long term and renewable, so that there is an incentive to look after the holding like a good husbandman.

A system of this sort could well be applied to selected areas of Game Reserves which are at present unmanageably large. Complete protection ought to be confined to areas which are needed to safeguard rare species, outstanding concentrations of game or sites of special interest. It is perhaps still too soon to pass final judgment on the value of this approach, and its success or otherwise will of course depend greatly on how efficiently it is operated.

One final word about the ordinary hunting areas or ZCB. Due to the increase in poaching, game is becoming noticeably scarce in such areas, but the scarcity is more apparent than actual, for naturally hunted animals' reflexes for avoiding danger quickly become sharpened. They become more nocturnal in their habits and move away as far as possible from roads into the more remote areas which still exist. Nevertheless the apparent diminution of game must give some cause for concern.

A plan is therefore being studied for the creation under the title of *Forêts Rurales de Réserves Forestières et de Chasses* of hunting areas owned by rural cooperative societies (simple organizations informally recognized within the administrative framework of the Central African Republic). Such areas would not be more than a few thousand acres in extent, and would be run by the Service des Eaux, Forêts et Chasses for the sole benefit of the cooperative, only members of which would have the right to exploit the forest and animal resources in accordance with such terms and conditions as the Department laid down each year.

To sum up, the Central African Republic at present possesses one complete Wildlife Reserve (Vassako-Bolo) of about 580 sq. miles, three National Parks (Bamingui-Bangoran, 3860 sq. miles, Saint Floris, 390 sq. miles and Andre Felix, 660 sq. miles) and 8 Game Reserves totalling about 15,900 sq. miles. All these are constituted under the 1933 London Convention, and are areas in which all hunting is forbidden and the forest is also protected.

Finally there are eleven special Hunting Areas, in which the hunting season is fixed annually, quotas are laid down and leasing arrangements are available. All these are in the so-called ZIC zones, where hunting has priority over other economic activities. The rest of the country all falls within the ZCB or ordinary hunting zone.

It is worth noting that in the forest reserves of the Republic which are not included in the above special areas, totalling about 2,320 sq. miles, hunting is permitted except in a few limited areas undergoing re-afforestation.

It can, therefore, be claimed that the Central African Republic is well-off in wildlife areas, that they are generally well organised and that they form a very valuable economic asset.

# THE USE OF TRANSLOCATION AS A MEANS OF PRESERVING WILD ANIMALS AND AN INTEGRAL FACTOR IN THE SOLUTION TO CERTAIN PROBLEMS OF NATIONAL PARKS AND NATURE RESERVES

by

A. M. HARTHOORN  
Department of Veterinary Physiology  
Makerere College, Kampala, Uganda

## 1. INTRODUCTION

By translocation is meant the transfer of wild animals from one area to another. This may mean movement (i) to a safe area, (ii) away from a threatened one, or (iii) from one safe area to another. Sections (i) and (iii) may be considered as increasingly a function of nature reserves and national parks; section (ii) as a means of preserving animals in areas partly devoted to forestry, agriculture or ranching interests. Translocation may be used in a positive context of bringing animals into an area for a number of reasons such as to enhance a game reserve by re-introducing species of animals that have been exterminated in that area in the course of time, or else animals that should thrive in the particular area. In some instances new animals are brought in to try and re-establish a balance that has been disturbed, by occurrences such as the extermination of the larger carnivores. Or else animals transported in the negative sense of removing them from conflict with human interests in other ways than through their destruction.

The various headings set out above may be combined, and animals thinly distributed or exterminated in a reserve or national park may be reinforced by the addition of animals that have to be removed from other areas.

Animals may be caught in a number of different ways depending on their size and behaviour. Under the heading of wild animals in this context we are principally concerned with the larger ungulates and the carnivores. These animals, ranging in size from elephant downwards have been caught since very early times, often in ways that are still applicable for the purpose of moving them to other areas.

In its simpler form, translocation may consist of driving wild animals to another area which may be only a few miles away and keeping them from re-entering their old one. This method, usually accompanied by fencing is an important means of preventing damage to forestry or agricultural areas and will become increasingly important as a means of establishing and maintaining boundaries in areas of contiguity between a game reserve or park and agrarian or urban pursuits.

More complicated is the large scale transference of numbers of animals over long distances and over which they cannot be driven. This entails the catching, handling and transportation of the animals as well as a number of other factors such as climatological differences between the old and the new areas.

Whereas there is no specific reason why conventional methods of catching animals should not be employed to collect them for transportation, new methods of collecting them with the use of drug immobilising techniques are opening up new aspects. By the use of these new techniques the handling of wild animals for a number of purposes may become easier, more widespread and cheaper.

The development of a new technique will enable game rangers, park wardens and others associated with wild animal welfare to handle such animals, and brings this method into the province of park and reserve maintenance. A ready means of handling animals for moving or for a number of other reasons has an immediate bearing on the problems of these special areas. It is hoped and expected that the evolution of techniques of handling and moving animals may contribute to solving present and future problems of parks and nature reserves as well as contributing to the preservation and welfare of wild animals throughout Africa.

## 2. OBJECTIVES

The principal objectives in developing safe and readily useable methods of moving animals are as follows :

a) *Transfer of animals from one area to another as an alternative to destruction.* Many species of wild animals in Africa are now sufficiently rare to render their destruction wrong on scientific and ecological principles. Some of these animals exist only outside the game reserves and parks. Others are represented in these special areas but the numbers so existing are small and possibly not stable. Some animals, such as the black rhinoceros are not so much rare as belonging to a species that is dwindling rapidly. The time has come when these animals should not only receive complete protection from hunting, and as great a measure of protection as is possible from poaching, but should be protected in other ways as well, wherever they conflict with agrarian or social interests. In the last named instance the only remedy is to capture the animals and remove them to an area where they may exist without coming into conflict with their surroundings. In some cases this is a matter of returning them to the reserve which they have left. This is seldom a simple matter and a number of factors have to be taken into account. From the animal point of view we must consider the various ecological problems such as (i) Is the area far enough away from the former haunts or sufficiently separated by geographical boundaries to prevent a return ? (ii) Will the vegetation in the area stand the introduction of more individuals ? (iii) Did this type or animal exist in this area in former times, and is the vegetation, mineral content and so forth suitable for it ? (iv) Are there factors in the environment that will militate against the survival of the newcomers, such as a lower or higher altitude, different climate, or unaccustomed predators ? (v) Will the animals be able to adapt themselves to their new surroundings quickly enough to prevent them from falling an easy prey to its pejorative influences, including the time they take to throw

off the affects of the journey and the tranquillising drugs which may have been used ?

Other aspects must be taken into account, among which the financial consideration plays an important role, especially as this will differ extensively from one set of conditions to another. The following are some of the factors that must be taken into account. (i) Some animals are very much more difficult to catch than others and this possibly more than any other factor contributes to the expense. (ii) Their density on the ground will considerably influence the cost of capture. Normal density of black rhinoceros is only one per five square miles, and mileages of fifty or seventy miles may have to be run between sighting rhinoceros. On the basis of two bush vehicles being used (one for catching and one for transport of the beast) the cost immediately becomes apparent. (iii) The distance these animals have to travel to a release area greatly influences the cost of translocation. It does this in two ways : *a*) The immediate cost per mile of moving and *b*) the indirect cost of providing a holding ground where this is necessary. Animals may be moved a certain distance immediately on capture, this distance being different for the various species. Whereas this distance has been considerably extended through modern tranquillising techniques, the limits are nevertheless fairly rigid. Where they are likely to be exceeded, the animals to be moved must first be kept in a temporary holding ground so that they may be tamed before travel. This has the multiple function of ensuring : (i) that the animal suffers less apprehension from being handled and possibly crated, thus standing a better chance of survival; (ii) that he is properly hydrated and recovered from the trauma and exhaustion of being caught; (iii) that he has had a chance of being divested of some of the parasites that may jeopardise his survival under sub-optimal conditions, such as trypanosomes or worms; (iv) that he is able and willing to eat artificial food and to drink in a crate or other confinement so that he may be transported at leisure. It should be noted that most of the larger herbivores suffer from one form or another of shipping fever and that relatively minor disturbances to their normal way of life will precipitate a crisis in their normal endogenous bacterial and viral balances, or their internal metabolic environments.

*b) Decentralisation of small herds of rare animals.* Even where these small remnants are not in immediate danger, their decentralisation may be a desideratum in case disease or natural calamity wipe out the remaining nucleus. This may be especially true where the numbers of these animals are increasing so that a small take-off of the herd or herds may be contemplated—as in some areas the white (square-lipped) rhinoceros.

*c) The transfer of animals from one reserve to another.* Apart from purposes of decentralisation as set out above it may be necessary to move animals from one reserve to another for a number of other reasons. The most important foreseeable factor is the introduction of new blood to isolate herds. Game reserves under one name or another are decreasing in size. Where the strict reserve is decreased but the remains of the former area converted to a controlled hunting area the question of homozygosity should not arise. Other reserves, however, are either small areas from their inception or else have been forcibly contracted

as a result of pressure from land-hungry cultivators, or else a small reserve once in free exchange with the surrounding countryside, has been cut off by agriculture or actual fencing, from other groups of animals. The herds of animals isolated in this way may be small. When animals have been introduced into a reserve or park, the nucleus may be smaller still.

d) *Disease*. At present no control is exercised in the various enzootic and epizootic diseases that occur among wild animals in parks and reserves in East Africa. This lack of control is possible for a number of reasons. (i) Most of the reserves for animals are of sufficient size to allow endemic or epidemic diseases to "burn themselves out" and thus to rely on a natural immunity developing in the resident stock. (ii) No direct observable or foreseeable or preventable threat has yet been offered to rare groups of animals. (iii) The borders of the parks and reserves are mostly open to the passage of wild animals.

The individual catching and vaccination of adult stock is expensive and clearly useful only for small numbers of valuable breeding stock, or in an emergency. Other methods, as used for translocation might be employed, including the catching by various means such as driving and corralling of young stock, vaccination as they are driven through a chute or various other methods employed for cattle. A great deal of research is needed in this field which should not be put off until it becomes urgent. Undoubtedly the methods that are being evolved for direct handling of wild animals will be a tool for this purpose.

The vaccination of translocated stock should be a routine measure, especially where these animals are rare. Vaccination may be against: (i) normal enzootic diseases of the area with which the animals caught are likely to go down due to trauma, the exhaustion of capture, or the strain of change of diet or rigours of captivity actual or physiological. One example of this is haemorrhagic septicaemia of giraffe which may induce severe losses unless they are vaccinated on capture. Antibiotic treatment also has a place in this connection especially to guard against the localisation of organisms in traumatised areas; (ii) a disease affecting local livestock as this may be necessary to comply with local quarantine regulations; (iii) diseases which occur with greater or sufficient regularity in the receiving areas especially as the vitality of the animals in question may be lowered by captivity or may be lowered by the strange surroundings immediately on release. Animals such as rhinoceros which are resistant to disease such as trypanosomiasis will tend to succumb if debilitated by capture. In these cases treatment with trypanosomicidal drugs appears to have a salutary affect.

e) *Direct therapeutic interference* in individual animals follows directly on the last paragraph. This again may seem a far cry from the present policy of management. Direct interference of this nature, besides the instances enumerated under *d*) may be sub-divided for consideration as follows: (i) Assistance to animals that have been caught in natural hazards, (ii) assistance to animals that have been trapped or caught in snares, (iii) therapeutic and surgical interference in animals that have become damaged, or for the removal of foreign bodies. With regard to (i) and (ii) there are a number of cases reported in literature as well as recounted of help to animals that have been snared; by measures such as shooting through the snares; to large animals such as

rhinoceros which have been caught in pits, by breaking down the side of the pit or actual traction by a rope round the hind quarters, or even drawing a white rhinoceros out of a swamp by ropes placed round its head. Under item (iii) therapeutic interference was recently attempted, after immobilisation, on a lame elephant, who, however, proved to be suffering from a fracture due to a gun-shot wound. Treatment on veterinary principles has been reported as carried out successfully on black rhinoceros caught manually for translocation and found to be suffering from one or several arrows embedded in the flesh. These arrows, carrying a sub-lethal dose of cardiac glycoside appeared to create traumatised areas but no lasting systemic disturbance, and the animals in question are reported to respond well to conservative therapeutic treatment.

Where individuals of small communities of rare animals are affected by treatable surgical conditions, destruction is not necessarily the best therapeutic measure. The possibility of rendering assistance to animals in the semi-captivity of small parks and reserves by the use of modern methods of capture is a pleasing aesthetic concept, especially to the modern sightseer; and the reports on such cases a valuable means of inducing interest in the animals and their surroundings.

# WILD FAUNA AND FLORA OF AFRICA AS A CULTURAL AND ECONOMIC ASSET, AND THE WORLD INTEREST THEREIN

by

Sir Julian HUXLEY  
London

It is clearly impossible to cover all aspects of this subject in one short paper. I shall therefore only attempt to deal with Eastern Africa, roughly from the Kenya-Abyssinia and Uganda-Sudan frontiers to about the centre of the Union of South Africa, and from the east coast to the western side of the Western Rift, to the Northern Rhodesia-Angola border and to eastern Bechuanaland; and shall restrict myself to the ecology of its wild-life in natural and semi-natural terrestrial habitats, with special reference to the larger vertebrate fauna of the savannah and open bush country. Mountain uplands, forests and fresh waters will be briefly considered, but not marine habitats, beyond mentioning the fact that the littoral marine ecology of Eastern Africa is rich and interesting.

The Eastern African wild life on the great game plains and savannahs includes the only easily accessible and readily studied remaining portion of the world's prehuman climax community at its tropical richest. (The equatorial rain-forest provides another portion, but this is difficult of access and hard to study scientifically.) Its preservation for detailed ecological study is thus an urgent scientific task.

Furthermore, this open-country community is uniquely spectacular. It contains both the heaviest and the tallest land vertebrate (African elephant and giraffe), the largest land predator (lion) and heaviest bird (ostrich), two of the three large apes (chimpanzee and gorilla), other large Pleistocene survivals (hippos and rhinos), lemuroids, peculiar insectivores like manis, aardvark, and aardwolf, and an extraordinary assemblage of antelopes and other herbivores. It also possesses a great variety of striking and interesting birds, including cranes, herons, storks, pelicans, flamingoes, bustards, secretary birds, hornbills, touracos, eagles, hawks, vultures, kingfishers, parrots, glossy starlings, sunbirds and weaverbirds (including the largest vertebrate aggregation in the world, of some 11 million *Queleas* in the east of Southern Rhodesia). The sight of an abundance of large wild animals in freedom is an unforgettable experience, which must be preserved for the benefit of future generations of all peoples. It can also be a source of considerable financial profit for the territories of the region.

The scenery and geology of Eastern Africa is also very striking. It includes the main part of the largest Rift Valley system in the world, with its succession of lakes, large and small, its associated volcanoes and calderas, and the large

upthrust faultblock of Ruwenzori, whose peaks, with some of the larger volcanoes such as Mts. Kenya and Mikeno, provide good mountaineering opportunities.

As Leakey has shown at Olduvai, Eastern Africa contains an unrivalled ecological record of climatic and evolutionary change during the Pleistocene, including several important steps in human origins. Further work in this field and also in the Miocene paleontology of Africa is scientifically very desirable.

The freshwater fauna of Eastern Africa is of special scientific interest, as in several of the great lakes there has been an outburst of evolutionary differentiation.

Botanically, the upland zones above the forest line are of great interest, with their Tree Heaths, arborescent Senecios and giant Lobelias. Forests are among the important wild life assets of the region, especially for their functions in protecting water-sheds and preventing over-rapid run-off and erosion, as well as for timber-production.

Ecologically, a large part—probably over a third—of this huge area consists of marginal lands. These constitute an ecologically brittle habitat, which readily deteriorates and loses productivity under cultivation or the least degree of overgrazing. The natural animal community inhabiting these lands, however, is adapted to effect the optimum utilisation of their resources, as well as being immune to the major diseases affecting domestic stock.

In any given habitat there will be 15 or 20 different species of mammalian herbivores, ranging in size from dikdik to elephants, and with a great diversity of habit and food-plants—browsers, grazers, fruit—, seed- and bark-eaters, diggers; whereas cattle are restricted to a few species of plant for their food and are prone to various diseases, notably tsetse-born *nagana*.

Careful studies have shown that many habitats produce a considerable higher biomass and therefore greater weight of meat per acre in the form of wild game than they can in the form of domestic stock. Furthermore, some areas can yield a higher financial return if managed for cropping the surplus wild game than if ranched for cattle; and in still others the highest physiological and financial yield is obtained from a combination of cattle and wild game<sup>1</sup> (or domesticated game like eland).

In the Republic of South Africa, parts of various National Parks and Reserve systems are being used to breed large stocks of selected game species, for sale to farmers, who find that the resultant meat and hides provide a considerable extra source of revenue. Game-cropping schemes have already been started in Kenya and Uganda as well as on private ranches in the Rhodesias.

It is urgent that the governments of Eastern Africa should undertake comprehensive land-use surveys to determine which areas should be reserved as wild lands, either for eventual game management and cropping, or merely to prevent them being exposed to almost certain deterioration by being opened up for peasant pastoralism or cultivation. This is especially important in the huge tsetse-infected area (which is estimated to cover over half of Eastern

<sup>1</sup> There are of course considerable regions, like the Kenya Highlands, which can be most profitably used for intensive cultivation or stock raising; but these constitute only a small fraction of the total area of Eastern Africa.

Africa), for though modern methods can get rid of the tsetse, this is very costly, and the cost may not be offset by the resultant benefits, and indeed may lead to an ecological deficit in the shape of soil erosion and habitat-deterioration.

The survey programme should go hand-in-hand with extensive ecological research, pure and applied, on the habits, reproduction, migration and population dynamics of wild fauna and on all aspects of habitat management, including the regulation of burning and the prevention of dangerous fires. A great deal of research is also required on game-cropping—methods of culling, drying and preserving the meat, marketing, etc. Wild game is one of the major natural resources of Eastern Africa. Large-scale game-management and game-cropping could be of great importance, not only economically but physiologically, as the region is now markedly deficient in animal protein; and also agriculturally, as it could prevent wide spread habitat-deterioration.

Freshwater fish constitute a further important natural resource. A valuable method of increasing the supply of animal protein is by better freshwater fishery organisation in general, and by constructing large numbers of ponds for tilapia in particular.

A successful game-cropping and fish-farming programme would remove one of the major incentives to illegal game-slaughter (poaching), which is now largely undertaken to satisfy natural meat-hunger. The other major incentive is financial profit, from the sale of " trophies " and other animal products—skins, elephant tusks as ivory, rhino horn as an aphrodisiac, giraffe and wildebeest tails for fly-whisks, etc. The indiscriminate killing of wild animals for all such reasons is cruel and wasteful and endangers the proper operation of National Parks and Reserves, and the very existence of some interesting species. Both on ecological and financial grounds, Governments should be prepared to spend much more on suppressing this illegal and antisocial activity.

The cultural value of wild life as a source of enjoyment, interest and wonder is equally great and perhaps even more important. The sight of abundant wild animals in freedom is a unique source of enjoyment and interest. If the wild life of Africa is properly conserved in National Parks and similar Reserves, and adequate accommodation, access, and viewing facilities are provided, an increasing number of visitors from all parts of the world will undertake the modern equivalent of pilgrimage to enjoy the spectacle, and revenue from tourism could become one of the mainstays of the economy of all Eastern African countries.

In Africa, National Parks can also become an important element in national prestige. Furthermore, local or tribal Parks, especially if combined with game-cropping areas, can become sources of tribal prestige, as well as of profit to the local community through the local administration. A scheme of this sort has been set up in the Meru district of Kenya, and in Western Uganda the question of converting the Kisoro Gorilla Reserve into a Tribal Park is being considered. The subject is of especial importance in Masailand. If, for instance, the Mara River area and the Amboseli Reserve could be designated as the equivalents of Masai National Parks, this would be of unique value for African wild life conservation, while at the same time greatly strengthening the social, financial and political position of the Masai.

For these various values of Eastern African wild life to be realised, education in the broadest sense is essential. On the one hand there are what we may call general public relations—mobilising world opinion and making it aware of the enduring interest and enjoyment to be derived from African wild life and wild landscape. Even more urgent is the education of African opinion in the value of their own wild life. This can be promoted by organised visits to National Parks by chiefs, elders, professional men, students and school parties; by films and film strips, and through the medium of press and radio. However, it can only become fully effective if the central concept of conservation on an ecological basis is built into the general educational system. Perhaps the best way of ensuring this is to introduce the study of science by way of biology and the ecological approach. This not only leads on immediately to conservation, but can readily be linked up with human ecology and so with social affairs.

At advanced levels, teaching and especially research in the Universities and Colleges of the region should be largely concerned with its biology and ecology; and training courses of various types, dealing with conservation, should be provided both for specialists like game wardens and tsetse control officers, and for administrators and others for whose work some understanding of conservation principles and techniques is important.

Conservation is closely interlocked with demographic considerations, and indeed the population problem occupies a central position in human (social) ecology. Eastern Africa as a whole has now a relatively low population density; but with modern medical facilities, and with the better nutrition that will come with fuller utilisation of wild protein, the rate of increase, already fairly high, will itself increase, and the total population will shoot up, and could reach dangerous densities before the end of the present century. Accordingly it is essential that all the territories in the region should pay urgent attention to their demographic problem, should alert public opinion on the subject, and should frame and implement official population policies as soon as possible.

It is to the world's interest that the territories of Eastern Africa should be prosperous and economically stable. It is also to the world's interest that the unique large fauna of Eastern Africa should be safeguarded and conserved for scientific study and for the enjoyment of future generations. Thus the conservation of the wild life and natural habitats of the region must be not only of local but of international concern. The U.N. itself has already compiled a list of National Parks and equivalent areas : it is to be hoped that it will take over further responsibilities in the matter. U.N.E.S.C.O. is concerned on the scientific, cultural and educational side; F.A.O. from the standpoint of agricultural productivity in general and protein deficiency in particular, W.H.O. from the angle of nutrition and tropical disease.

Finally, since inadequacy of finance is one of the main reasons for the present inadequacy of conservation and preservation measures, it is much to be hoped that the various United Nations agencies concerned with the provision of finance to underdeveloped countries, like the World Bank, the International Development Association (I.D.A.), the Special Fund, and the Technical Assistance Board, will respond generously to all reasoned requests from governmental agencies directly or indirectly concerned with wild life conservation for financial assistance, whether for increased staff, better equipment,

improved access and accommodation for National Parks, education in the broadest sense, training, ecological (and demographic) surveys and studies, and research. Furthermore, that equally generous provision for similar African projects will be made by the great Foundations, through bilateral aid programmes such as those of the U.K., the U.S.S.R., France, Germany, and the U.S., and let us hope by private organisations. We have recently witnessed the, launching of a great international campaign to save the monuments of Nubia. It is even more important to save the unique wild life of Eastern Africa as one of the world's enduring resources.

# THE URGENT NEED FOR FORMALISED TRAINING FACILITIES FOR WILDLIFE MANAGEMENT PERSONNEL IN THE AFRICA OF TO-DAY

by

Major B. G. KINLOCH, M.C.  
(lately Game Warden, Uganda, currently Game Warden,  
Box 1994, Dar-es-Salaam, Tanganyika)

Who has not heard of the "wind of change"—the political "wind" of nationalism that has been blowing across Africa with increasing strength in recent years, reaching gale force in many areas? But more than one "wind" has been gusting across this great continent during the same period. A rising tide of world-wide interest and concern as to the future safety of the last great concentrations of the unique and varied fauna of Africa, has built up a high pressure belt of public feeling. From this belt of high pressure another "wind" has started, a wind of urgent enquiry and investigation; of intensive, though unfortunately still limited and localised scientific research; and of expressions of local public concern at the apparent lack of action and interest by the authorities concerned. This penetrating "wind" has done much to blow away the fog of misunderstanding and ignorance that has hitherto hidden the true value of Africa's great wildlife resources, and has lifted the mists of misconception to reveal the vital role that the great game animals can play in the development of this continent and the advancement of its peoples.

But the clearing of these clouds has also revealed on the near horizon, in stark reality, the dangers with which the survivors of Africa's previously apparently boundless herds of game are faced. The pessimists have already thrown up their hands in despair and described the present time as "the twilight of the great beasts", but the optimists, and those determined to fight to the last ditch, are convinced that there is still time to avert disaster—given adequate material and moral support for the battle.

You can be cynical and say these are merely melodramatic words wrapped up in flowery phrases, but we cannot afford to be cynical at the present critical time, and if this dramatic version of a technical document will bring home to those in a position to help and act, the urgency of the situation better than the clinical phraseology of cold-blooded officialdom, then the writer is willing to face the scorn of the unconverted!

"Granted, the situation is serious, but what has all this got to do with staff and staff training, and in what connection is help needed?"

This is a question you may well ask. What is the answer? Obviously everything finally turns on adequate funds, or appropriate help in kind, but funds for much needed transport and equipment and additional staff will be of

limited value unless both existing and extra staff can be properly trained. Such staff need to be taught up-to-date techniques of wildlife management, the degree varying with rank. At present full value is not being obtained from even the inadequate numbers of existing personnel because of the continuous lack of formalised training facilities.

We have no reason to decry the work done in the past by that rapidly vanishing race the sportsman-hunter-naturalist. Without their efforts at preservation there would now be little or no big game left to worry about. But they were working during less complicated times when there was little pressure on the land, the term "nationalism" had hardly been heard of, and the issues in regard to game were apparently straightforward. Game was regarded as an attractive sporting asset, and a convenient fresh meat supply on safari, where there could be no other possible use for the land it occupied, but it was uncompromisingly condemned as a direct obstacle to development in virtually all other areas. Thus the Game Wardens of the day had the straightforward problems of total preservation of game in certain areas from which humans were completely excluded; the supervision of licensed hunting regulated by laws based on a traditional code of sporting ethics; and the destruction of all species of game in areas where they came into conflict with man's use of the land. The tempo of life was slower, game was plentiful, and the consequence of mismanagement of the land and its resources had hardly started to become apparent. Under these conditions the Game Wardens and their senior officers had time and to spare to train their subordinate staff in their undoubtedly arduous but otherwise simple duties; and this they did with painstaking efficiency and thoroughness.

However, this golden age did not last. More and more land was cultivated or destroyed; wildlife was killed out to eradicate tsetse fly and encourage the keeping of rapidly increasing herds of useless scrub-cattle; game populations were decimated to provide meat for famine relief, meat for the war effort, and cheap meat for employers of labour; and the less resilient and adaptable species began to disappear with alarming rapidity along with the destruction of their essential habitat.

Now we have reached an era of involved issues and problems of extreme complexity, when our decisions and actions can have repercussions which are far reaching and often difficult to foresee. On the brighter side, wildlife is at last beginning to be officially regarded as a natural resource in its own right, and even more important as a natural resource of potentially great economic value capable of being utilised on a sustained yield basis in a variety of ways, if properly managed. Yet despite this complex modern picture we are still relying on largely inexperienced, virtually untrained, and often unreliable and untrustworthy junior staff. In fact, they are now in general less well disciplined, trained and supervised than they were in the past, for the present day Game Ranger no longer has the carefree, paper-free life of his predecessor; he is a harassed, frustrated individual with an impossible task and insufficient time to do it in!

It is clear that the time is long overdue for wildlife management to be regarded in Africa as a true branch of natural science comparable with forestry and agriculture. It has long been so treated on the North American continent;

why not here ? The foresters and agriculturalists have always considered it necessary to have a high percentage of both scientifically and technically qualified officers; why should we continue to consider that those responsible for managing our wildlife resources are in a different category ? Furthermore, it has long been regarded as important to require intermediate and junior staff of the departments of Forestry and Agriculture to undergo formalised training in a properly organised establishment; therefore, are we right in continuing with our present somewhat haphazard methods while in sight of us are impressive schools of forestry and of agriculture ?

Surely the answers to the above queries are obvious, but more recently a new factor has emerged which has injected an element of even greater urgency into the problem. I refer to one of the main and oft-declared aims of the architects of African nationalism—" rapid Africanisation of the civil services. " This means that not only are we faced with having to introduce the long overdue properly organised formal training facilities for intermediate and junior wildlife staff, but we now also have the problem of having to locate, attract, train and establish suitable African officers in the senior posts in the immediate future, instead of progressively and steadily as had hitherto been foreseen.

The problem is aggravated by three major factors. Firstly, there is no obvious or ready source of recruitment of suitably educated Africans with a leaning towards working with wildlife; secondly, the number of graduates in natural science which can be expected from African Universities such as Makerere during the next few years is very limited; and thirdly, at present a career in wildlife management in Africa does not offer the same attraction and material advantages as a career for a qualified officer in the forestry, agriculture or veterinary services, yet it is with these services that we must compete not merely for the best but, for some time to come, the only available candidates.

Our staff problems do not end there. We have yet another—an unbalanced hierarchy in the wildlife departments of both Game and National Parks, for the middle ranks, considered to be the vital backbone of all disciplined armed forces and civil services, are to all intents and purposes missing. At the top we have well educated, experienced and/or qualified Game Rangers. At the bottom we have the ranks of Game Scouts who form the bulk of the field staff; tough, usually loyal by their own lights, but poorly educated or illiterate and exposed to many forms of temptation, graft and corruption. In the middle there is a virtual vacuum, although in recent years some wildlife departments have introduced a few ranks of Game Assistant and Assistant Game Ranger. The difficulty has not only been financial; just as important has been the lack of training facilities required to produce men of the right calibre for these vital posts.

All this means that our recruitment and training problems fall into three groups as follows :

*a)* The attraction of Africans suitable for advanced technical and scientific training in wildlife management for the existing senior posts, and the organising of such training at suitable institutions;

*b)* The attraction of appropriately educated and physically and temperamentally suited Africans for training for the missing middle ranks, and again the organising of the requisite formal training;

c) The attraction of better educated, but still physically and temperamentally suited young Africans to the junior ranks, and yet again the establishment of formal basic training facilities.

We should now consider these groups separately in rather more detail:

a) *Senior Posts*

To attract the right material for this group we must offer the same terms of service as are enjoyed by qualified officers in other services which are responsible for the care and development of natural resources.

Training arrangements must be designed to cover the training of selected Africans with suitable academic qualifications, and mental and physical attributes for the more senior posts such as Game Ranger/Warden, and for that matter National Park Warden also. Such training could best be carried out in the U.S.A. and/or Canada where the Africans selected could do a four year degree course in " Wildlife Management, " or in some cases a shorter diploma course in the same subject, under suitable scholarships or grants managed by such institutions as the African-American Institute, or the African Wildlife Leadership Foundation. The former has expressed interest and willingness to co-operate in this matter, while the latter has already started on these lines—a most laudable and encouraging development.

The reasons for selecting the U.S.A. and Canada are, I think, obvious; they are the only countries who have really specialised in wildlife management and recognised it as a science of equal status to other branches of natural science; they have big populations of a variety of the larger mammals to conserve and manage in the face of human competition for other uses of the land involved; they have a hunter-pressure problem; and they have properly organised training facilities directed to both the theoretical and practical under-graduate and post-graduate training of students in the science of wildlife management.

Since the majority of the really critical wildlife problems in Africa to-day concern the preservation of the large mammals, particularly ungulates and carnivores, it is felt that some of the universities located west of the Mississippi River appear best suited to training these special students. These institutions are in areas of ungulates and range problems more closely allied to the problems in Africa than the eastern universities (Michigan State University being a probable exception to this general rule). It is also suggested that preference should be given to those universities, some of the members of whose staff have themselves had practical experience of wildlife management problems in Africa, e. g. those who have carried out wildlife research in Africa under Fulbright or similar arrangements.

It must be stressed again that we have little hope of getting more than a very few African University graduates with natural science degrees during the foreseeable future, and certainly not enough to meet all our present needs, let alone any possible future expansion. All this virtually rules out post-graduate training, and in consequence I suggest that we should adopt the following emergency procedure. First select a few chosen Africans who have a Higher School Certificate, or a good School Certificate pass, and who are in addition both physically and temperamentally suited to work with the departments of

Game and National Parks. This primary selection to be followed by a short "weeding-out" period with the departments concerned, the successful candidates then being sent to a suitable University in the U.S.A. or Canada for a four year degree course in "Wildlife Management." The final stage to be a period of post-graduate "on the job" experience with an established officer in the field in Africa.

To complete this Africanisation programme for existing senior posts, we would want to send at least six or seven African students to the U.S.A. or Canada per year for the next three years to meet the needs of the Tanganyika Game Department alone!

It has been suggested in some quarters that such training would be better carried out in Africa by arranging suitable facilities at say Makerere College. With this I cannot agree. Such facilities do not at present exist, wildlife management as a science is a very new idea in Africa, and time is too short to get it soundly established before the training must begin. Furthermore not only have the U.S.A. and Canada specialised in scientific and technical training in "wildlife management" as a natural science of equivalent status to forestry, agriculture, etc., but the broadening of outlook, and the realisation of the value placed on wildlife by advanced countries, which would certainly result from prolonged study outside Africa, would be of tremendous benefit to African students. They would return to Africa with greatly enhanced status in the eyes of their fellows; their views and teachings would be respected; and their personal contacts with visitors of all races would be made easier.

I would like to stress that I have not forgotten or ignored the fine work being done by the Nature Conservancy in the United Kingdom in this particular field, but at the moment they only cater for university graduates, and it is a drawback that practical work with large mammals in the United Kingdom must perforce be confined almost entirely to one species of ungulate—the red deer.

#### b) *Middle and Junior Ranks*

For the sake of simplicity, and much needed brevity, I think we can deal with these two groups together. First of all, we cannot hope to attract and retain the right material, and we must now go for men of better education, unless we can offer terms of service at least as attractive as those enjoyed by other departments, and in particular the uniformed, disciplined and sometimes armed forces whose primary work is connected with law enforcement. I refer to the Police, Prisons and Customs Services. It should not be forgotten that the work of the rank and file in wildlife departments is usually arduous, frequently dangerous and at present largely misunderstood and unappreciated. On top of this their pay and prospects are poor while their temptations are great. This is not a situation which should be allowed to continue.

Training for these two groups must be formalised, standardised, properly organised, largely centralised and soundly administered with adequate equipment and facilities. It is clear that what is needed to meet these requirements is the organisation of "Wildlife Management Training Schools," initially at least on a regional basis. Their primary task would be to train up the largely missing "middle ranks" of the Game Assistant/Assistant Game Ranger level,

but such schools could also cater for improving the standard of the more promising Game Scouts, etc., which in turn would both improve the efficiency of a service that has long been crippled by shortages of both staff and funds, and ensure that full value is obtained from such staff as exists. A plan for such a school to be based in the Arusha region of Tanganyika, and to serve the three East African Territories, has already been prepared in outline, but as always finance is the main stumbling block.

Space does not permit detailed description of the project here, but capital expenditure on buildings, vehicles and equipment would be not less than £70,000, plus the costs of common services depending on the site selected, and annual recurrent expenditure would amount to £12,000 or more, depending on the extent of external technical aid. Courses at this school would last for some 18 to 24 months and it would cater for 75 to 100 students at a time.

It has been suggested in some quarters that the whole idea is too grandiose, and that a start should be made by organising training in a small way in temporary tented or bush camps for short periods of two or three months. I would like to conclude this paper by countering that point of view, which I feel is dangerous since it over-simplifies the problem.

As I have stressed earlier in this paper, in the past game in Africa has generally been regarded mainly as an obstacle to development rather than as a valuable economic resource worthy of being conserved, developed and utilized. There has been a big official swing towards the latter view in recent years, but we (the wildlife departments) are severely handicapped by being the last to jump on the "financial band wagon!" We are still trying to catch up from the period when the finance allotted for game conservation was based almost entirely on the requirements for the protection of crops from wild animals, and the minimum effort needed to enable the territories to comply with their moral obligations under international agreements based on aesthetic interests. However, among the African territories Tanganyika in particular is a poor country and has a very shallow purse. Therefore to rob what the electorate regard as important essential services (such as education, health, agriculture, etc.) in order to boost game conservation would antagonise the majority of public opinion, and the long term future of wildlife depends on strong public support and co-operation. On the other hand, the world in general has, in recent years, brought considerable pressure to bear on the East African territories to take adequate measures to preserve their unique wildlife resources, which are valued highly by the outside world. The territories concerned now appreciate the value of this wildlife resource, and would like to be able to conserve it properly, but being relatively poor countries they just have not got the necessary money to do so. It would seem logical therefore to expect international aid if the world in general wishes to see the unique fauna of Africa preserved in Africa for the benefit of the world, as well as for the benefit of the people of Africa. Furthermore, I think it is fair to regard this world interest as not entirely altruistic, in view of the tremendous pleasure so many people obtain nowadays from visiting this continent to see, photograph, study and even hunt the great mammals of Africa in their beautiful natural surroundings.

My reason for stressing this all important financial aspect is that for too long the Game Departments and National Park Organisations in East Africa have

had to try and operate efficiently on a " shoe string. " Apart from the obvious consequences there are also less obvious, but equally important ones. For example, the indigenous peoples, seeing that wildlife conservation requirements are given low priority by those who are governing the country, are led to think that there can be little real value in conserving game, while the better educated ones are discouraged from choosing a career in a field which appears to be regarded as the " poor relation. " African and Asian peoples in particular are impressed by pomp and ceremony and signs of prosperity—in fact " window dressing " pays full dividends with them. Thus to run a wildlife management training " school " under temporary camp conditions, while almost next door is a flourishing forestry school and a large agricultural school both with good buildings, equipment, etc., is a bad start psychologically, for it must be remembered that we are not dealing with enthusiastic and dedicated European and American students, but African students with a very different background and outlook who have to be conditioned, steered and encouraged.

The short two or three months course proposal is very much in line with that we, in Tanganyika, already arrange from time to time on a " Range " basis for Game Scouts. It is useful but it is not enough since it does not even start to solve our main problem of building up a balanced hierarchy, with a solid central core of technically well-trained and disciplined " middle ranks, " and an " upper crust " of scientifically trained officers of good calibre. With the African such training takes time. It cannot be rushed, otherwise the requisite knowledge, sense of discipline and genuine interest in the work itself will not be properly absorbed or developed, and consequently will not be retained. We need adequate financial and technical help from international sources, and this is not asking for charity. The results will not only help the advancement of the countries of Africa, but will be to the indirect benefit of the world in general.

## THE ECONOMICS OF TOURISM IN NATIONAL PARKS AND NATURE RESERVES

by

Rocco KNOBEL

National Parks Board of Trustees, South Africa

Tourism is of immense value to any country. The best ambassadors a country can send to another country are those foreign visitors who return to their own countries and tell their countrymen what they have seen and experienced in the countries they have visited. Their reports are accepted as unbiased and reliable.

Tourism brings prosperity to a country. The whole country benefits from the tourist's spending power. Direct beneficiaries are the transport section, the hotels and other types of accommodation, the retailer, agriculture, industry, the building trade and a host of others. It is estimated that a tourist spends 45 % on accommodation, meals and drinks; 20 % on entertainment; 20 % on inland travel and 15 % on purchases. It is thus true to state that any country by encouraging tourists, invisibly exports her tourist attractions, because in this way she earns foreign currency. The advantage of this export is that it is never exhausted and it brings not only foreign currency but also a better understanding.

Africa has much to offer to a tourist from the New World, Europe or the Orient but undoubtedly most of what we have to offer in Africa, which cannot be equalled or surpassed in other continents, is linked with wild life and especially wild animal life. In saying this I do not want to belittle our beautiful coastline, our mountains, our forests, etc., but I am quite convinced that a person looking for mountain scenery will not in the first instance think of Africa. In night life we cannot compete with Paris, in opera with Vienna, etc. Visitors to Africa come here for an entirely different purpose, a fresh sensation which can only be satisfied by getting away from man made things and forms of modern civilization. As Mervyn Cowie once said :

" by heading off on safari into wild primitive places Africa can fulfil this want probably better than almost any other continent, but it should never be forgotten that most of the joy of being ' away from it all' is closely linked in most people's minds with the unforgettable experience of being in close contact with the creatures that inhabit these remote places, and the consequent element of danger and excitement. Without these wild and lovely beasts and birds the African landscape would be lifeless and uninteresting by comparison with many other countries. "

Our National Parks and Nature Reserves can and should offer these opportunities. It is therefore true that our wild life is an attraction of considerable

monetary value. This can best be proved by quoting actual figures which I shall do presently.

Before doing so I wish to state that the economic value of tourism to and in National Parks can be subdivided into *a)* the direct or tangible financial aspect, and *b)* the indirect or intangible financial aspect.

*a) The Direct or Tangible Aspect*

In this respect I wish to refer to the actual material benefit that a sanctuary can derive from visitors, i. e. money paid for admission, accommodation, sales of souvenirs, provisions, fuel, accessories, publications such as guide books, maps, post cards, films and photographs, etc. This is a direct benefit and can be expressed in an ordinary profit and loss account. I firmly believe that general statements will not suffice at a conference like this. I must therefore be pardoned for quoting exact figures from one such sanctuary to prove that a National Park can be a direct financial asset to the Government or Board controlling it. In this respect I wish to quote the exact figures for the Kruger National Park in the Republic of South Africa for the financial year ended March, 1960.

The actual income for the Kruger National Park from tourists alone amounted to £243,786, excluding the restaurants and shops which will be shown separately. The total expenditure including salaries, transport, depreciation, maintenance of roads, fighting veld fires and scientific research, amount to £219,967 leaving a surplus income over expenditure of £23,819. The total income derived from shops, restaurants and garages amounted to £298,363 while the total expenditure including purchases, salaries, and depreciation amounted to £263,022 leaving a net profit of £35,341.

The total income derived from tourist entrance fees, accommodation and sales thus amounted to £542,149 and the total expenditure for the same period was £482,987, thus leaving a favourable balance of £59,160.

When assessing the economic value of a National Park as a tourist attraction in Africa it must be borne in mind that visitors to National Parks have a special craving to return to nature and do not expect luxury accommodation. I can state as a fact that to house a visitor to a National Park in such a way that he will return to that Park and recommend his friends to such sanctuary requires only about one third of the capital outlay required for tourists to other parts of the country. From this point of view money spent on accommodation in a National Park is an excellent investment.

A difficulty experienced by any country is to find a market for its handicrafts. It has been the experience in the National Parks in South Africa that visitors to such sanctuaries are always very keen on acquiring something indigenous to that part of the world and a ready market is found for handicrafts and byproducts that of necessity becomes available in a game sanctuary such as articles made of horns or skins of wild animals.

In areas not large enough to be regarded as an ecological unit it soon becomes necessary to do a certain amount of harvesting of the main species protected in such an area. In this respect the governing body can also earn a certain amount of income should the harvesting be done on a scientific basis.

I hope that I have convinced you that the direct tangible financial possibilities of a well developed and well managed park are definitely worth while.

b) *The Indirect or Intangible Aspect*

i) In this respect I have in mind the money spent by visitors to the Parks in their home towns or on the way to the parks for such items as vehicle repairs, tyres, fuel, suitable clothing, cameras, films, food, refreshments, hotel accommodation, rails, etc. Those further afield—e. g. America or Europe; boat or plane fares, etc. The economy of a country as a whole is benefited by this invisible trade.

ii) Those who have interests in towns with shops, garages and hotels, on the way to the sanctuaries, consider this type of tourist trade as one of their main sources of income. In South Africa the Kruger National Park has definitely played a major part in the opening up of that part of the country, and many wayside shops and hotels owe their trade and growth to the Kruger Park. Even land values have risen in places near or adjacent to Parks.

iii) The Parks attract visitors from abroad and also from our own country. Park visitors are often well-to-do financiers or influential personalities—especially those from other parts of the world. If it had not been for the parks and for what they have to offer, overseas visitors would not readily be attracted to this continent. More often than not these silent sanctuaries influence visitors in respect of the scope of the country, and the security of its investments. Parks are in fact the show window of the country.

iv) The publication of books on wild life is fast becoming an economical proposition while films on wild life draw record crowds. We in Africa are in the favourable position to provide the facts for such sellers and bumper shows. Although this specific instance is considered as an example of the invisible aspect, I say without fear of contradiction, that it provides the park administrators a potential which could be considerably exploited.

During the previous century profits were made on animal products which could only be obtained after the animal had been killed. Now greater profits are gained by keeping the plants and animals alive in protected sanctuaries.

There is, however, a warning note with regard to the development of tourism and nature conservation.

Entry to a Park or Reserve should be a privilege and not a right. The administrators must have the power to limit the number of tourists to a Park or Reserve or to a certain area of a Park, must have the right to determine times of travel, and, if necessary, must have the power to prohibit travel altogether and at short notice. No public road should traverse a National Park or Reserve.

Park authorities should have jurisdiction over all visitors and should be able to enforce regulations with the least possible formalities. When a visitor enters a National Park or a Reserve he must be made to realise that he has to comply with all rules and regulations.

Tourism obviously leads to disturbances in the natural way of animal life. Such disturbances can, however, be mitigated or removed by a constructive policy of education and publicity, and strict measures of control.

Camps should be sited in areas that are not particularly liked by game. The tendency is to build camps in localities most frequented by game, but this

should be avoided. The continual interference arising from a tourist camp must of necessity upset the game, and a valuable area may in this way become completely lost to the fauna of a park. The camps should also be built where game need not be deprived of water in order to have an adequate supply for human beings.

The sands of time are running out. The protection of wild life, placed under our care, and not at our mercy, will, according to my mind, only be assured if we recognise it as an important economic asset to be utilised for the country as a whole.

Lothar Machura, the President of the Austrian Institute for the Protection of Nature, once said :

" Nature protection depends upon the knowledge and love of nature in contemporary mankind, and, finding this rather meagre, acknowledges in tourism a means of arousing it. "

# THE SURVEY AND ASSESSMENT OF WILD ANIMALS AND THEIR HABITAT IN TANGANYIKA

by

Hugh LAMPREY  
Game Division, Tanganyika

A very important preliminary to the introduction of wild life conservation and management in any form is a knowledge of what is there. On the face of it this simple statement is too obvious to deserve comment and yet the science of ecology which is involved is a young one in Africa. Ecological methods have been applied with success to the control of tsetse and other insects for over thirty years but the systematic use of ecological methods in the assessment of populations of the larger mammal species in which we, as conservationists in Africa, are so interested has only taken place on a significant scale in the last six or eight years.

The information which is required for a proper understanding of the factors involved in a policy of wise conservation and management can be described in very broad terms. We need to know many animals are present in the area with which we are concerned and what are their reproductive and survival rates. What species are present and in what numbers ? How do they make use of the country ? Do they remain in one area throughout the year or do they move over considerable distances ? How are they affected by the seasonal variations of the climate and the changing availability of water supplies ? What types of vegetation does each species select for its habitat and what is the significance to them of the different plants and plant associations ? Is the habitat stable or is it changing ? These and many other questions demand answers.

Perhaps the greatest practical ecological problem with which we are faced is the need to understand the nature of the impact of human activity on wild life. The survey and assessment of plant and animal communities becomes particularly important at a time when we hope to achieve an integration of wild life conservation with domestic animal husbandry or where wild animals come into contact with human settlement and agriculture. There is an urgent need for the study of means of practising wild life conservation in the presence of expanding human populations and current land use methods.

The ecologist has always before him the fundamental concept of the " ecosystem. " He is aware that the indigenous plant and animal communities are adapted to each other, having evolved together under the influence of natural selection and that they tend to be self-perpetuating. These inter-adapted communities or ecosystems are of the greatest interest to ecologists who derive from them much of the information upon which the principles of the sound use of land can be based. The concept of " carrying capacity " is

closely bound up with at least one such principle and the fact that any piece of land with its vegetation has a strictly limited capacity to support animal life without danger of deterioration is too often overlooked in East Africa.

As with other sciences, the success and reliability of the results obtained in ecological survey work will greatly depend on the soundness of the methods used. The purpose of this paper is to indicate briefly and in non-technical terms how the problem of assessing wild animal populations is being tackled by the Game Department in Tanganyika.

When the ecological study of wild animals and their habitat began four years ago, the first problem which presented itself was that of deciding how detailed or how extensive the work should aim to be. At that time Bernhard and Michael Grzimek planned and began their survey of the Serengeti Plains and the migrations of the great herds. Using an aircraft they were able to cover thousands of square miles of country. Their results and conclusions have been of the greatest value. Their methods were related closely to the resources and equipment available to them. Bearing in mind that we were entering a largely untouched field of research in East Africa and that any one of several lines of work might be pursued with equal profit, it was decided that an intensive study of the ecology of a small but representative area of country would be most suited to our very limited resources. The object of work was to obtain basic information on the animal ecology of a relatively undisturbed piece of the Acacia savannah bush country which extends over much of northern Tanganyika and southern Kenya. By limiting the study to a small area it was expected that the results obtained would be detailed. Nevertheless the intensive research programme has led on naturally to a far more extensive survey in much less detail of the adjoining 10,000 square miles of the Masai Steppe.

As the working area a small game sanctuary, the Tarangire Game Reserve of some 650 square miles was chosen. The particular significance of the area is that, in addition to having a considerable resident population of animals, it serves as the dry season refuge to some 15,000 migratory animals. The country is infested with tsetse and is uninhabited except by the Game Department staff. It is outside the scope of this paper to describe in detail the methods adopted for the study of the Tarangire Game Reserve and the surrounding savannah. It is sufficient to state that for a period of nearly four years systematic observations have been made daily by a team of fourteen trained African Game Scouts. The method involves the use of fixed transect lines through the bush along which the men walk daily making accurate observations of the animals they see. The observations are compiled as statistical data on animal density, the species composition of the population and the sex and age grouping within each species, numerical fluctuations from year to year and through the seasons, habitat preferences and food preferences. The scouts are trained to recognise and give the scientific names to the great majority of the plant species in the reserve and are skilled at making visual observations of the feeding habits of the animals.

Perhaps the most important part of the work is the manner in which it has been done. The team employed in the research are not highly educated and are drawn from the normal ranks of Game Department Scouts. Their particular qualifications are keen powers of sight and observation, a liking for the work,

the ability to read and write and a proven reliability. They are supervised by a Senior Game Scout when the biologist is not present.

Considerable doubt has been expressed in the past about the reliability of observations and results obtained by such a team of uneducated men. I am very much indebted to Mr. Archie Mossman, for pointing out to me that by establishing the accuracy and reliability of this work we should demonstrate the feasibility of a method which was hitherto untried on any comparable scale : that is, we would demonstrate the practicability of employing teams of scouts to obtain routine information and thereby enormously reduce the time taken by the lone qualified worker who depends on his own resources to complete a field study programme.

The possibility of unreliability in the observers has figured prominently in the design of the Tarangire research programme and in the analysis of the results. Cross checks have been made by several methods to test the reliability and, within the limits of error of the checks, few mistakes have been detected. Furthermore, the complexity of the analysis of the results, which it is not within their educational capacity to understand, coupled with the obvious soundness of the data obtained, point to an overall reliability which justifies the method. Here in Africa we have what may be a unique opportunity to obtain the services of relatively numerous but uneducated men who nevertheless have the invaluable ability to observe well when their interest is aroused.

It should be emphasised that the limitations of this method of obtaining ecological data are numerous and fully realised. The very nature of the observations which can be made in this way will greatly affect the design of the work and much of the value of the results will depend on the care with which the observers are trained. It is equally important that the scope of the work should be kept within the ability of the scouts. The Tarangire ecological work has produced certain data which could not have been obtained in any other way within the time available and with only one trained ecologist.

The more extensive survey of the Masai Steppe where the migratory animals move over several thousand square miles of country has been made with the use of vehicles and aircraft. Under these circumstances the ecologist has to take advantage of his own experience to assess what he sees. In open country animals can be counted from the air with considerable accuracy and surveys which are entirely adequate for many purposes can be achieved with the greatest possible economy and speed. The use of aircraft enables the observer to obtain in a very short time an accurate and wide knowledge of the country, the extent of the vegetation types and the extent of the numbers, range and movement of the larger mammal species. The Tanganyika Game Department are indebted to Mr. D. Zaphiro for putting his aircraft at their disposal for demonstrating so clearly the great advantages of using aircraft in conservation work in Africa. Zaphiro's survey flights have been followed by several others and the value obtained has been out of all proportion to the expense.

The survey and assessment of fauna and flora is work which demands specialised knowledge. As the need for the conservation of wild life becomes increasingly understood in African territories so will the need increase for

professional conservationists with ecological training. While in the first instance it may be necessary to obtain the help of ecologists from other countries, it is hoped that each African country will take steps to train its own specialists in this field, if necessary by sending them abroad to Universities and other institutions where wild life conservation is taught.

## THE IMPORTANCE OF STOCK SELECTION FOR INCREASING THE PRODUCTIVITY OF SEMI-ARID AREAS

by

H. P. LEDGER

Meat Research Unit, E.A.A.F.R.O.

Much of tropical Africa, because of its low or erratic rainfall, is marginal or sub-marginal for crops but eminently suitable for meat production. In East Africa this type of country accounts for about one third of the total land area.

The basis for utilising and improving animal productivity is primarily that of selecting the type or types of animals best able to thrive in a given environment. Subsequently endeavour is made to improve the husbandry by ameliorating the conditions and raising the plane of animal nutrition. As these aims are achieved a selection is made of those animals best able to respond to the improved conditions.

The rate of progress along the latter lines is inevitably governed by the price that a producer is paid for his produce which, in turn, is controlled by the standard of living and level of economy of a country as a whole.

Unfortunately the economies of African's emergent countries, as well as the vastness and ruggedness of much of their semi-arid terrain, preclude the possibility of raising the plane of animal nutrition to any appreciable extent. This does not mean however that such areas are unproductive or that such productivity cannot be materially increased—indeed it must be, for as the standard of living rises so will the demand for increased supplies of *cheap meat*.

What it does mean is that as major improvements cannot be attained by raising the level of nutrition they must largely result from the selection of those families, species or strains of animals best able to achieve either singly or in combination an efficient, sustained, conversion of the *existing fodder* into meat within this environment.

Faced with this problem of selection how envious is the animal husbandryman of his far more enterprising agrarian brother who, with arm-chair ease, can select from crops ranging from coconuts to pyrethrum or millet to tea, to match the vagaries of altitude, soil or rainfall.

To many people the suggestion that animals other than the known domesticated ones can seriously be considered as commercial meat producers is laughable. These same people however would consider it only right for a farmer in a predominantly grain producing area to keep pigs, the owner of moorland sheep and the dairyman Ayreshire or Jersey cattle according as to whether he lived in Scotland or the Channel Isles.

Indeed they would go even further and point out that certain breeds of sheep are essential for hill grazing whilst others do better in the lowlands. Clearly such people are keenly aware of the advantages to be gained by selecting stock

for even relatively small changes of environment, yet the conservatism of many is such that even now they will only tardily admit the possibility that zebu cattle (*Bos indicus*) may be better suited to meat production under semi-arid and unimprovable conditions than exotics (*Bos taurus*).

With regard to zebu cattle it must be remembered that they themselves are exotics having only arrived in East Africa some 250-300 years ago. During this time they have adapted themselves to the local environment but, with our present knowledge, it is surely illogical to preclude the possibility that some game animals, indigenous to the country, may be as well or better suited to produce meat in their own environment than domesticated stock or, alternatively, that they may profitably live in peaceful co-existence with them.

Fundamentally the problem is one of selection for efficiency in a given environment. Efficiency in meat production can mean many things such as the rate of growth, reproduction and maturity, resistance or susceptibility to disease, high conversion ratio in terms of pounds of stock feed eaten per pound of edible meat produced, variety of fodder plants consumed and the ability to withstand periods of extended drought.

In addition to these criteria there is the efficiency with which the animal deposits lean and fat within its body and the amount of wastage in the form of inedible products that occurs at slaughter.

It is when estimations of individual or species efficiency are being made that a knowledge of an animal's composition is so important. For example if one considers the production of 100 lbs of boneless meat from the carcasses of three animals of the same weight but which have a carcass fat percentage of 9, 28 and 36, it can be calculated, on the basis of the nutritive value of the "standing hay" usually available in these semi-arid areas, that the fattest animal may require 146 lbs more hay than the leaner and 72 lbs more than the medium fat one to produce the same amount of edible meat. In a country where feed is more often than not inferior or in short supply such differences may well be important.

It was to record the relative efficiency of animals in terms of their carcass composition that a standard system of carcass analysis has been developed at the E.A.A.F.R.O. headquarters at Muguga. Originally designed to investigate the production potential of "Boran" type zebu steers the work has now been extended to include sheep, goats and game animals.

Quality considerations excluded, two of the more important indices of carcass worth are those of killing-out percentage and carcass balance. The former is the weight of the dressed carcass expressed as a percentage of the live animal whilst the latter records the proportion of hindquarter to forequarter when the carcass is divided between the tenth and eleventh rib. A preponderance of hindquarter is advantageous, as is a high killing-out percentage.

The results of the preliminary investigations (Ledger et al. 1961) into the relative carcass composition of some game animals and domesticated stock showed that for side balance (Table I, Fig. 1) Thomson's gazelle were superior to the other animals tested averaging the surprisingly high figure of 58.4 % compared with 49.4 for Wildebeest, 50.0 for goats and 53.1 for cattle.

They were also superior for the killing out indices (Table I, Fig. 2) having an average percentage 56.8. This high killing out percentage is extremely interesting for it was obtained without the deposition of fat in the carcass. This is a completely different state of affairs to anything experienced with domesticated stock where the normal rule is for an increased killing-out percentage to be accompanied by a progressive increase in the amount of fatty tissue in the carcass (Callow 1944).

This startling difference in carcass composition is shown in Table II, Figure 3 where it can be seen that at a killing-out percentage of 51, game animals have a fat content of 1.8 % whilst cattle contain 14.1 %. At the top end of the scale, for a killing-out percentage of 60.0 cattle contain 28.4 % fat and game only 0.3 %. Such differences call for some explanation.

It might well have been assumed that game animals, living as they do for much of the year on coarse, inferior fodder, might well have a very high proportion of digestive tract in the body in order to retain large quantities of food for digestion. That this is not so is indicated by the high killing-out percentage attained and confirmation of this by analysis is shown in Table III, Figure 4. This table shows that at a killing-out percentage of 55 cattle and game have a full digestive tract amounting to 21.6 % and 17.6 % of the live animal respectively. This being the case the inference must be that the digestive tract in game animals is more efficient than that of domesticated stock.

Part of the answer lies in the composition of the game animals carcasses which contain the higher percentages of lean meat. As was shown earlier, it is much more economical in terms of food eaten to convert fodder into lean meat than into fat, though where or how these animals find sufficient plant protein is for the present, something of a mystery.

Such investigations would not be complete without some indication as to the relative amounts of human food likely to result from game and domesticated animal production. Such information is given in figures 5, 6 and 7 which show the relative yields of boneless meat per 100 lbs of live animal at given killing-out percentages (5) and the calorific values of such yield (6 and 7).

As game animals are found to kill out at up to 60 % under conditions where cattle running alongside them rarely achieve higher than 50 % a true estimation of yield is obtained if a comparison is made between cattle killing-out at 50 % with game having a 55 % carcass yield. As can be seen from Table VII this shows that game animals, under these specific conditions provide animal protein in excess of that obtained from cattle equivalent to 6,000 calories for every 100 lbs liveweight.

The conclusion arrived at from these studies is that some game animals are superior to domesticated stock for the purpose of converting rough fodder into *animal protein* (lean) but not for its conversion into *animal fat*.

The relative yields of hindquarters and carcasses.

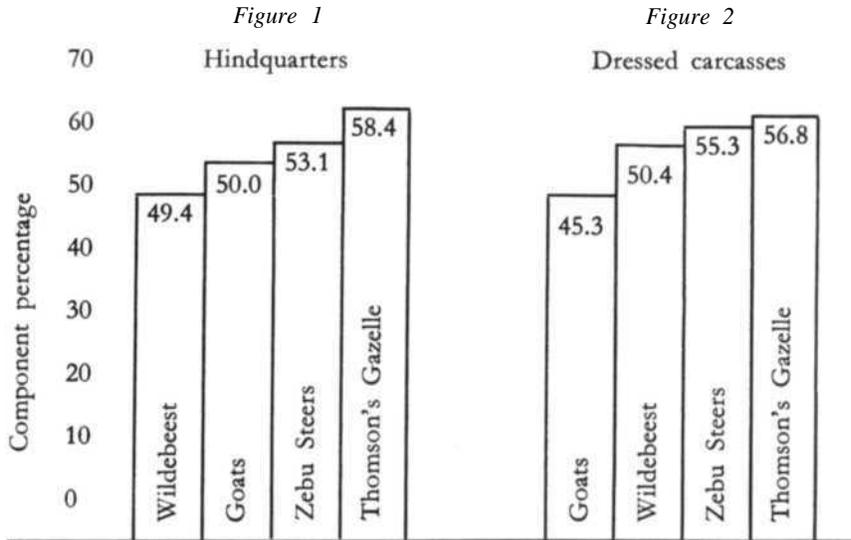


Table I and II (Fig. 1 and 2)

A comparison of the relative yield of hindquarters and carcasses in cattle, goats and game animals.

Species	Number	Soc Distribution	Description	Mean H. Q. %	Mean K. O. %
Wildebeest	9	5 M 4 F	5 Mature 4 Immature	49.4	50.4
Goats	12	4 M 4 F 4 Castrates	12 Mature	50.0	45.3
Zebu Steers	15	15 Castrates	9 Mature 6 Immature	53.1	55.3
Thomson's Gazelle	8	3 M 5 F	8 Mature	58.4	56.8

Figure 3

The relationship between the killing-out percentage and fat content of the dressed carcass in goat, cattle and game animals.

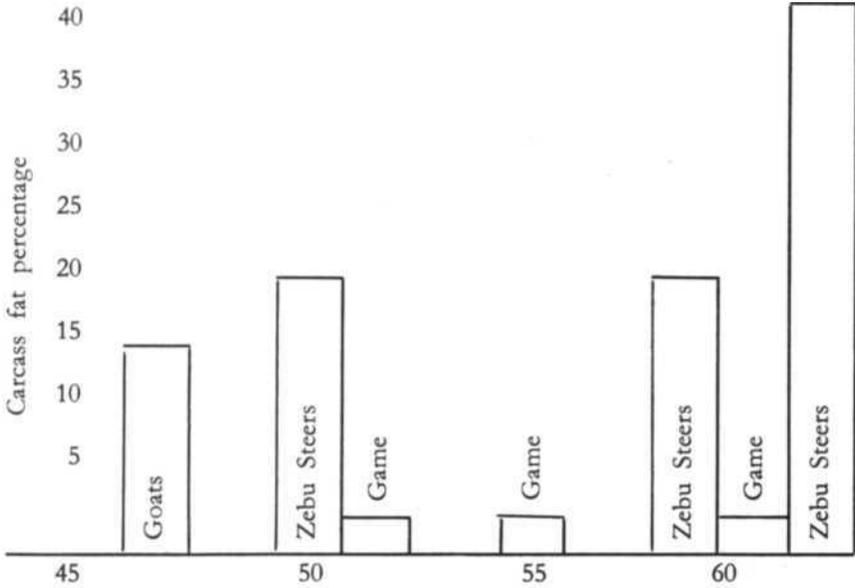


Table II (Fig. 3)

The relationship between carcass yields and the fat content of the carcasses of cattle, goats and game animals.

Species	Number	Sex Distribution	Description	Mean K. O. %	Mean Fat%
Goats	12	4 M 4 F 4 Castrates	12 Mature	45.3	14.2
Zebu Steers	20	20 Castrates	20 Immature	50.9	14.1
Wildebeest	3	2 M 1 F	3 Mature	51.0	1.8
Wildebeest	2 } 4	1 M 1 F	1 Mature	54.9	1.1
T. Gazelle		1 M 1 F	1 Immature		
Zebu Steers	18	18 Castrates	18 1st. Grade K.M.C. Steers	59.6	28.4
T. Gazelle	3	2 M 1 F	Mature	60.0	0.3
Zebu Steers	6	6 Castrates	6 " local " Grade Steers	61.5	34.9

Table III (Fig. 4)

The relationship between the dressed carcass and the full digestive tract expressed as a percentage of the liveweight in cattle and game animals at given killing-out percentages.

Species	Number	Sex Distribution	Description	Full KO %	Dig. Tract %
	Not stated	Castrates	McConnells Lean steer analysis	47.4	26.7
Wilbebeest	4	1 M 3 F	3 Mature 1 Immature	47.7	26.7
Kongoni	1	1 F	1 Mature		
Steers	calculated from regression line			51.0	25.2
Wilbebeest	5	3 M 2 F	4 Mature 1 Immature	51.0	22.0
Steers	Not stated	Castrates	McConnells ½ fat Steer analysis	55.7	21.6
Wilbebeest	2	2 M	1 Mature 1 Immature	55.1	17.6
T. Gaz.	6	1 M 5 F	5 Mature 1 Immature		
Kongoni	1	1 F	1 Immature		
Impala	1	1 M	1 Mature		
Hereford Steers	10	Castrates	Butters analysis	58.0	19.9
Eland	1	1 F	Mature	58.6	19.8
Oryx	1	1 F	Mature		
Hereford X Brahaman	10	Castrates	Butters analysis	61.5	16.3
Grant	2	2 M	1 Mature 1 Immature	62.6	17.9
Eland	1	1 M	1 Mature		
T. Gaz.	2	1 M 1 F	Mature		
Impala	1	1 F	Mature		

Figure 4

The composition of goats, cattle and game animals.

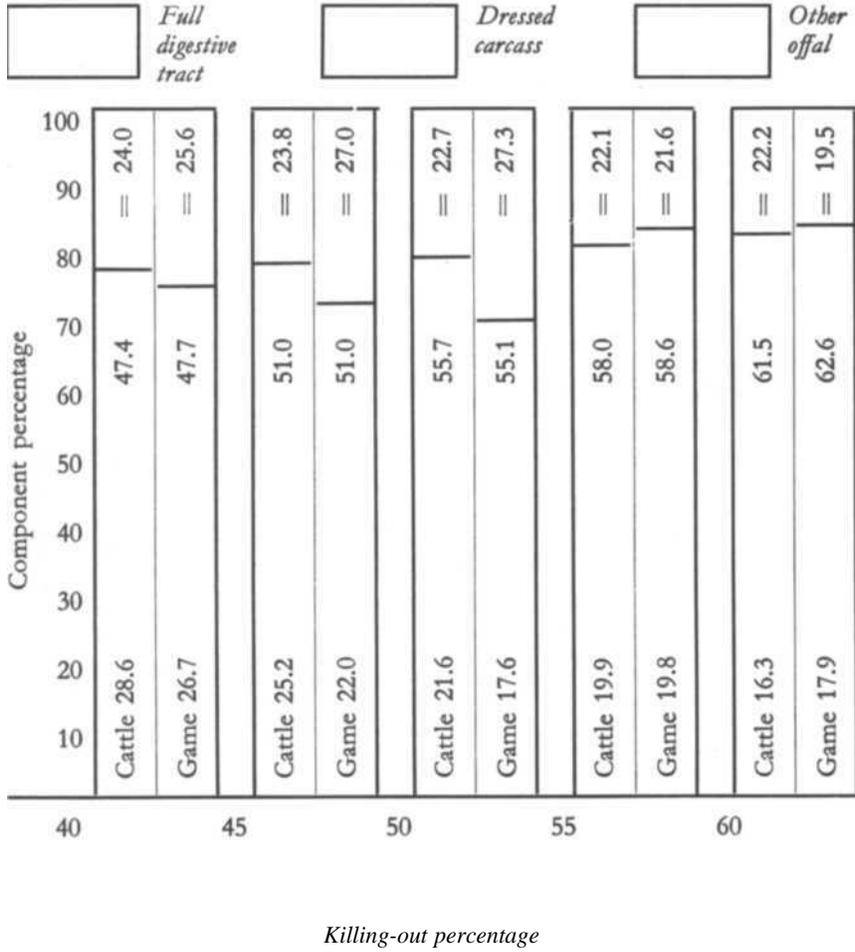


Figure 5

The yield and composition of the boneless meat in a dressed carcass per 100 pounds liveweight.

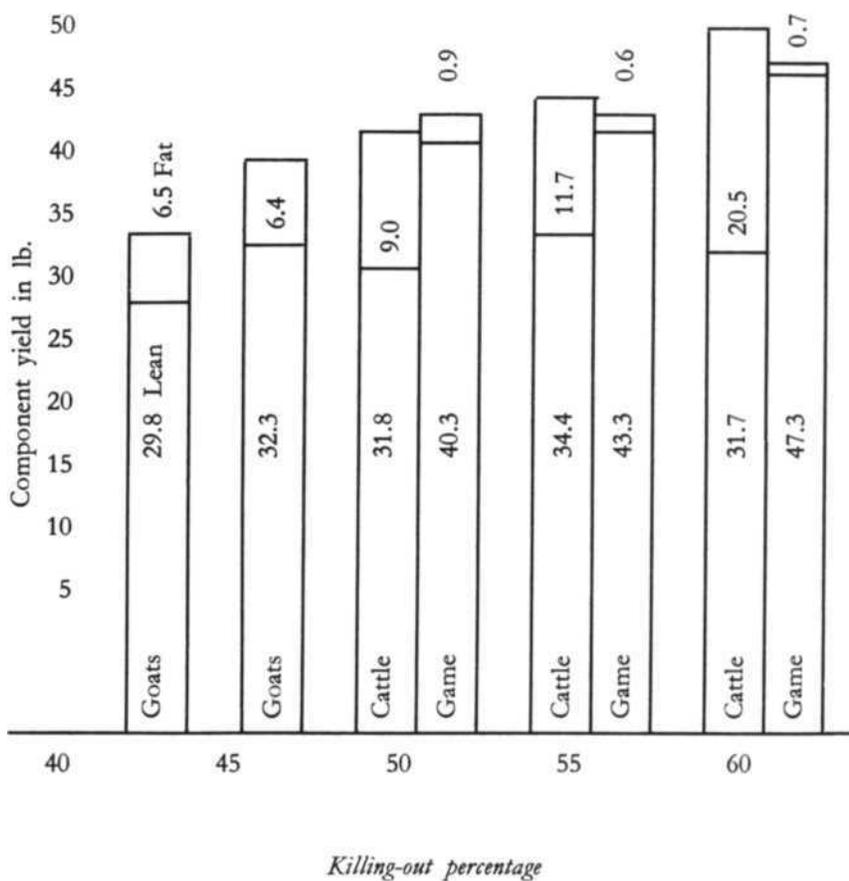


figure 6

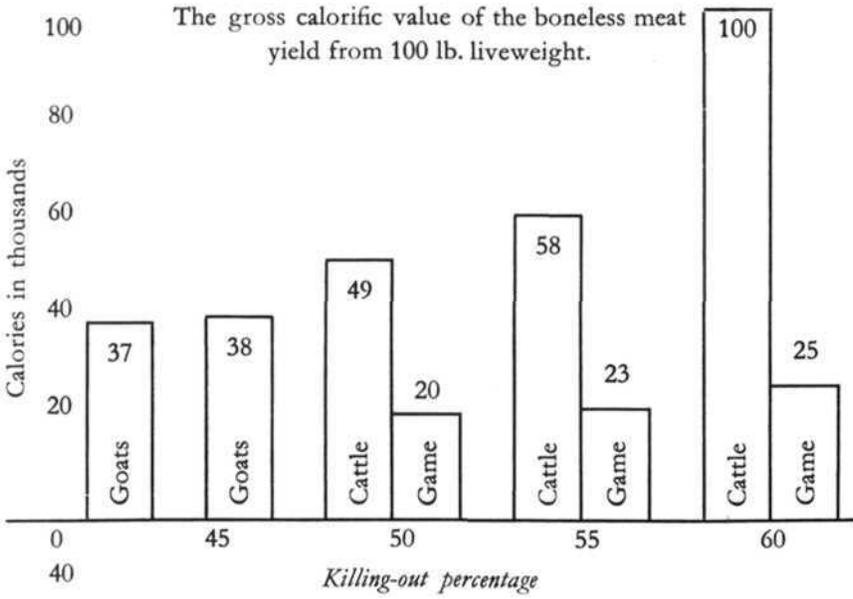
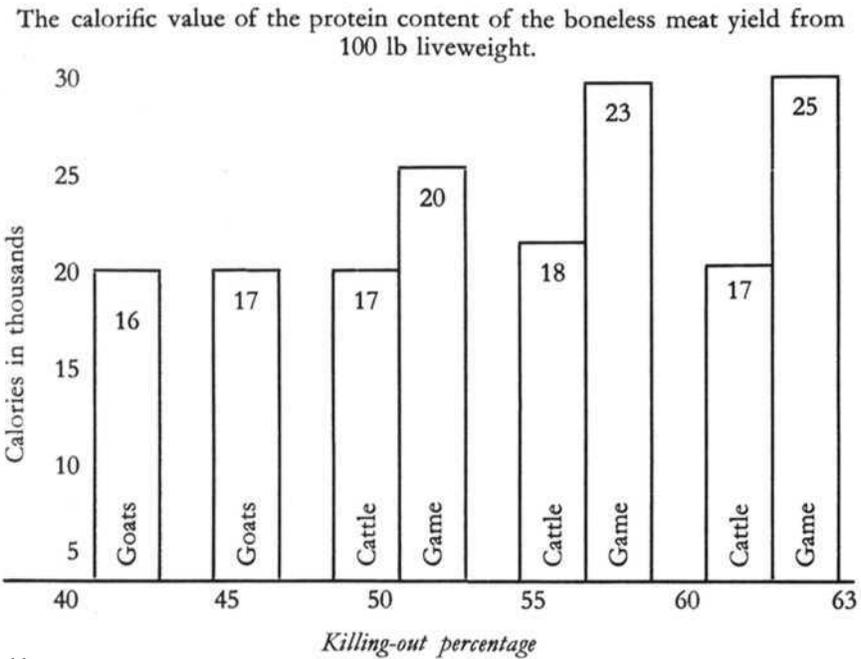


Figure 7



# THE EFFECTS OF ANTI TSETSE SHOOTING OPERATIONS ON THE GAME POPULATIONS AS OBSERVED IN THE SEBUNGWE DISTRICT, SOUTHERN RHODESIA

by

D. F. LOVEMORE

Tsetse and Trypanosomiasis Control Branch, Department of Veterinary Services, Causeway,  
Southern Rhodesia

Game destruction has been used successfully in Southern Rhodesia to reclaim 10,000 square miles of country from the tsetse *Glossina morsitans* Westw. and also to protect marginal country against advances by this species. It is pleasing however to record that this distasteful method has now been almost completely abandoned in favour of discriminative spraying with residual insecticides applied from the ground and some bush clearing. A small game destruction operation still continues in the Mtoko district on the north eastern border of the country and some very limited shooting is carried out along the game fences which are being maintained as barriers to prevent excessive game movement towards the reclaimed areas.

Arising out of the various game destruction operations which have been carried out in S. Rhodesia there are certain observations on game populations which are of considerable interest. The details on which these observations are based are in actual fact drawn from an operation recently carried out in the Sebungwe district since the author was involved in this but do also apply equally well to other operations which have been carried out elsewhere in the country.

The Sebungwe operation was in progress for the period June 1958 to October 1960.

The object of the operation was to create a game free—cattle free barrier between the dense tsetse areas of the Nagupande and Busi headwaters and the Lutope and Sengwa rivers in the north and the settled areas of the Kana and Shangani to the south. The operation was carried out between two east-west fences, namely a game fence to the north which limited immigration of game from the game areas of the river systems mentioned above as lying to the north, and a cattle fence to the south erected to prevent African owned cattle entering the area. The distance between these fences varied from 10 to almost 20 miles. The total area between the fences was about 1200 square miles—this was used as the shooting area.

All species of animals occurring in the area, other than lion, leopard and cheetah, the small nocturnal animals and the vervet monkey were shot; these were namely elephant, buffalo, eland, roan, sable, kudu, Waterbuck, tsessebe, zebra, impala, reedbuck, duiker, steenbok, Sharpe's grysbok, Warthog, bushpig, baboon, hyaena and wilddog.

To begin with the hunting (other than the hunting of elephant which was done by special control officers) was carried out by Africans armed with .303 rifles at a density of about 1 hunter per 10 square miles. After about five months hunters armed with shotguns and who hunted by night with bright lights were introduced to the area. The object of the shotgun hunters was to intensify the attack on the population of small game such as reedbuck, duiker, steenbok and Sharpe's grysbok. For the first seven months 5 shotgun hunters operated at random throughout the area, then for the next nine months the number was increased to 12, and these also hunted randomly. Finally, during the last eight months, there were 50 shotgun hunters operating throughout the area. It must be emphasised that control over the hunters was strict.

Half the meat from the animals killed was used as rations for the large government labour gangs employed in the area and the balance was utilized by the hunters and their families. Skins were sold for revenue.

The effect of the hunting on the general game population within the operations is described as follows (more than half the species listed above are not considered, either because of insignificant numbers or because of the obscurity of the effect of the hunting on the particular species):

1. Resident elephant were rapidly eliminated from the area and migratory elephant from the north soon learnt the significance of the game fence. Elephant proved no problem during the last twelve months of the operation.

2. The larger antelope, namely Waterbuck, sable, roan, eland and kudu are grouped together since these are animals which seem to move fairly long distances in the area under consideration. A comparison of the totals shot in June, July and August 1958 with those of the same months in 1960 indicate that hunters were still shooting just under half the number of these animals at the end of the operation as they were at the beginning. A possible explanation for this is that the animals which were being shot at the end represented the overflow from the untouched population north of the game fence since observation within the area led us to believe that there were very few, if any, resident animals remaining.

3. Warthog kills decreased markedly after the first year of hunting. The reduction was eventually in the order of 50 per cent of the total for the first year. In the last months of hunting, however, that is after the wet season of 1959/1960 the kills began to increase and it would seem that some form of balance had been achieved between the population and the hunting. The numbers are not likely to have been supplemented by immigration since these animals tend to be local in habit. A similar effect was noted with bushpig.

4. A total of 10,836 duiker were shot within the area during the twenty nine months of hunting and it is of particular interest to note that the record kills were achieved during the last two months of hunting. It would seem that even with the shotguns the crop taken off by the hunting effort had not begun to surpass the natural increase from the breeding population. Further evidence for this statement is that the rifle hunters were still shooting as many duiker at the end of the operation as they were at the beginning. Month to month results for the rifle hunters are more uniform than those for the shotgun

hunters. Duiker are local in habit and therefore, as for Warthog, immigration would play little or no part in maintaining their numbers.

It would seem reasonable from the foregoing to conclude that where a zone of country, adjacent to an extensive source of game is demarcated by fences and used as a killing ground, intensive cropping of the game can be carried out without noticeably depleting the general game population from beyond the killing zone. The larger antelope cease to be resident but maintain a steady immigration. The smaller game, notably duiker and Warthog remain, and perhaps relieved of the competition from the other animals as a result of the shooting, appear to flourish.

These observations are presented here in the hope that they will be of interest to the exponents of game management as a means of land utilisation for the wastelands of Africa.

# AN EXPERIMENT IN SPREADING PROPAGANDA AMONG INDIGENOUS PEOPLE AS TO THE VALUE OF WILD LIFE, AND THE NEED FOR ITS CONSERVATION

by

H. S. MAHINDA  
Game assistant, Tanganyika Game Division

In this paper I propose to say something about the important task to which I was assigned in January, 1960, after seventeen years' experience in the Game Department of Tanganyika, of expanding the publicity and educational side of the Department's activities. I will try to outline the main problems I have encountered, and the results which appear to have been achieved to date. It is my hope that it will help you to hear of both the successes and failures of this plan, and assist you to launch a similar project if you have not done so; for it is certain that the work has proved well worthwhile.

When I started this work I discovered that two things are misunderstood by many people—the difference between the words "disliking game" and "disinterested in game." By "disliking game," I mean the failure to understand the valuable protein and revenue potentialities of game, and regarding game purely from its nuisance or danger aspects. By "disinterested in game," I mean the idea of not taking any interest in the preservation of game, or in seeing or studying animals and their habits.

Regarding first "disliking game." There is no need to mention all parts of Africa, or other races who are settled there and who are hunting game. In Tanganyika there are about 120 tribes, and among them, there are only two, namely, the Masai and Watusi/Dahima who are well known to be the best livestock keepers and who depend entirely on cattle for both food and cash. They neither hunt game nor use their meat for food, nor intentionally disturb them except in defence of themselves or their cattle. The remaining tribes are nearly all hunting tribes which use game meat for food and make use of trophies for commercial and other purposes. In addition, there are about three tribes (Bahi, Ndorobo and Tindiga) who exist solely by hunting. They depend on wild animals in just the same way as the Masai and Watusi depend on their herds of cattle.

Regarding secondly "disinterested in game." This attitude is usually based on lack of knowledge. It is not surprising that an illiterate man does not understand what has only recently begun to be understood by specialists. It is quite wrong to say that those peoples which killed off all animals in their countries, did so because they did not like them, when, in fact, they did so through ignorance.

It is not difficult to convert Africans to recognise the value of a thing, provided, it is introduced to them in the right way. Almost every African is

interested in listening to good stories, therefore, if you want to get his interest, you must be careful how you explain to him how he is concerned with game. If one is so rash as to blame him, he will not accept what you say, even though it is true. Therefore, whenever I give talks or write pamphlets, I try to compose them with two objects—first, I give the story of game, how it has maintained us in the past; and what the present situation is; and secondly the reasons why Government is preserving game, and the way in which it is doing so, and trying to make my listeners or readers aware that game is of definite economic value to them and their country.

Although it is only a short time since I started the work of propaganda, the results have been encouraging all over the country. There are a good number of favourable comments about my work, and I have also received letters from many Africans who showed enthusiasm in the conservation of game, and it is very encouraging to see that not only men and schoolboys have interest, but women and schoolgirls as well.

#### CONSERVATION OF WILD LIFE

The situation at the present shows that, unless steps are taken, the problem of conserving wild animals in the future will be very difficult. The people of Tanganyika have already promised to fight poverty, ignorance and disease by working hard, to raise the standard of living by improved methods of farming. This means the old back-breaking method of cultivating small shambas with hand hoes will be rapidly replaced by tractors and ploughs. Thus many acres of land which are now available to wild animals will be soon taken away from them. This will also affect those routes which animals use during their migrations. Therefore, in many areas all animals will be compelled to remain in reserved areas such as national parks and game reserves. The result will be that, as the available areas dwindle the animals will be concentrated in small areas which will be unable to support them all. They will also be surrounded by shambas on all sides, so that they will be killed in defence of crops when they try to leave. Secondly, while it used to be possible to ensure that laws for the protection of game were followed because the people would accept an order from the Government whether they understood the reasons for it or not, people will not nowadays accept the imposition of regulations if they do not see that it is for their own good.

Therefore, if we want to save wild life, if we want it to remain in its natural state as it is now, and if we want it to carry on its migrations and remain as true African wild animals capable of being scientifically harvested instead of confined to one particular area of the country some urgent preparations must be taken beforehand:

- a) We have to understand game migration routes and habits and how they can be maintained.
- b) We have to discover effective methods of excluding game from shambas rather than using lethal weapons.
- c) We must find ways of increasing or extending National Parks and Game Reserve to include the full habitat of the animals concerned.

- d) We must extend propaganda work, especially in the various languages of the country.
- e) We must introduce biology of wild animals into the syllabus of all Institutions from primary schools to colleges.
- f) We have to investigate the possibilities of cropping schemes so that the wild life is used to the best economic advantage and that local people see the value of the animals in their area.

Not very long ago there were no schools in Africa, but special instruction was given to children by parents and others of the tribe. The girls were given lessons by their mothers and old ladies about all that concerned women, and the boys were taught by their fathers and other elder men about what concerned the men. The old people believed that, if you teach young children, when they are still young, they will grow up with full knowledge of everything. But unfortunately this good old system does not take into account new ideas and is beginning to lose its value. Something must now be done to replace it *adequately*, since the old type of instruction contained a great deal of natural lore which school instruction does not replace. Although some girls and boys at present may grow to be clever men and women, they will not compare with the boys and girls of the olden days as regards their knowledge of nature. It is very disappointing to see that some of them cannot even tell the names of different trees and wild animals in their own language. If one wants to know the vernacular names of different things, one has to ask the old men who did not go to school; not the young ones, because they do not know them. I regard this as a bad thing, for the future generation, for if one does not know about a thing one can hardly take interest in it. Therefore we must take immediate steps to encourage the teaching of the importance of the conservation of nature to the younger generation.

# THE VALUE OF THE TOURIST INDUSTRY

by

D. O. MATHEWS, O.B.E.  
East Africa Tourist Travel Association, Nairobi

## INTRODUCTION

During the past decade the growth of the Tourist Industry has been remarkable and it is now one of great importance, vying with the largest in the world. It was recently reported that in 1960 Wheat, which for years has been the world's largest single industry, was outstripped by Tourism.

Gone are the days when Tourism was limited to a few moneyed people travelling in leisurely luxury to favoured spots; for holidays with pay, more leisure, greater spending power and the urge to travel have opened the doors wide to the ordinary man. The wealthy still travel, but in addition we have a world on the move.

In 1960 nearly two million U.S. citizens went abroad for their holidays—whilst countries in Europe received over £600-millions in new money brought in by tourists from all over the world.

The luxury liner still makes world cruises and for those with time to spare there is no better way of seeing the world, but for those in a hurry the jet air-liner has made travel to Africa within 24-hours possible from the other side of the world. It is an almost incredible fact that one large jet air-liner can in a year carry as many people across the Atlantic as can the " Queen Mary. "

Many people have now made many trips to the traditional and interesting areas on the European Continent and many are now looking further afield for new areas of interest. High in this interest value is the Continent of Africa with its modern African States, its wild game, its vastness and its magnificent waterfalls, mountains and lakes, and its variety of climate. This is no guess for during a recent survey, undertaken by one of the largest travel firms in the world, it was found that apart from local travel and travel to Europe, the United States citizens' desire was to visit Africa.

I venture to prophesy that Tourism can become within the next ten years one of Africa's most important industries and as far as East Africa is concerned it could be its most valuable industry.

## THE VALUE OF TOURISM TO AFRICA

Apart from the very obvious benefit of bringing into a country new money which is spent in hotels, on transport to scenic or game areas, on amusements and shopping, Tourism has many other facets which are extremely important and from which Governments draw direct revenue in taxation. Before, however, considering these it is essential to emphasise that it is not merely those

firms directly engaged in tourism that derive benefit from a flourishing tourist industry. The hotelier must buy more meat, fruit, vegetables and flowers and he has to refurbish his hotel and its equipment. The transporter needs more petrol, oil and tyres, additional skilled driving staff and new vehicles. Tourism therefore starts a beneficent chain reaction and means more employment all round.

When we see how such highly industrialised countries as Britain, France, Italy, Germany, Switzerland and Japan develop and promote Tourism, it is obvious that it is a valuable industry. When we see what Tourism has meant to the Caribbean area in bringing prosperity to places without a great deal of industry other than agriculture, we all must appreciate how vitally necessary tourism is to most countries of Africa, where industrial and economic development have far less potential.

Tourism, however, never supplants another industry, it supplements all other industries. Its great advantage over all other industries is that its development does not destroy its natural assets, for the visitor comes, enjoys and photographs them and then leaves them for thousands of others to see and enjoy. Even the tourist who wishes to hunt or fish can be carefully controlled and allowed only to kill animals which whilst being good trophies are past breeding age and should be culled, or those which must be cleared from areas required for agricultural or industrial development.

Yet another valuable aspect is what is known as " domestic tourism " which is encouraging the citizens of a country or an area to travel on holiday within that area. This form of tourism not only keeps money earned within a country inside it, but also educates the citizens on the attractions of their own land.

Perhaps not so well appreciated as these economic advantages are the great benefits derived in public relations. The full value of a visitor is not measured merely by what he actually spends in a country—valuable though that may be—but is enhanced because he leaves as an informed ambassador. He has a wider knowledge not only of scenery and game but of standards, achievements and the problems which have to be faced.

Nothing can contribute more than tourism to help the nations and peoples of the world to appreciate and to understand one another. Nothing can do more to smash economic provincialism which for so many centuries has fragmented the world.

Tourism is therefore not only a great money-spinning industry, but also a benevolent force which can preserve international relations through better understanding.

#### A MAJOR INDUSTRY

What is absolutely vital in the development of a major tourist industry is a common and widespread awareness—a sense of appreciation of its value and the part it can play in developing countries. When that attitude permeates not merely the thinking but the action of all the Governments and all the peoples, then the industry can forge ahead.

Tourism is a highly competitive international business, and therefore must be tackled in a businesslike way. There can be no half measures or half-hearted approach. If a major industry is required, it is necessary to go all out for it.

The role of Governments is clear cut, for they must supply the basic essential services without which no tourist industry of importance can be developed. There must be adequate airport and harbour facilities, good roads, good water supplies, electricity, cable and telephone facilities and sanitation.

Having provided these basic utilities and requirements, the Governments have a further task of establishing a proper climate for the development of the industry. This climate is known as an " Investment Climate "; it consists of incentive legislation which provides tax relaxation and other concessions to encourage the investment of capital in Tourism. Freedom from income tax for a period and other capital inducements, such as freedom from Import Duty, are necessary to attract capital both local as well as overseas for building hotels and developing other tourist facilities and amenities. In addition, these incentives and concessions to capital investment must be widely publicised. It is not enough to have laws on the Statute Book—they must be made known to the world.

Governments must take all possible steps to reduce Customs and Immigration formalities for tourists and to keep them to a bare minimum. The Continent of Europe has increased its tourist traffic tremendously since all countries reduced their frontier formalities and the Continent of Africa should follow this wise example.

Government must also give every encouragement to their National Travel Organisations where founded or see to their establishment. These organisations must be given adequate grants to advertise, publicise and promote tourist facilities to the fullest extent. This is the task of specialists. Advertising, particularly in the U.S.A., costs money and only an organisation with ample funds can operate successfully in markets where a great tourist potential exists. To provide too little money for such a purpose is as bad as giving no money at all.

The establishment of National Parks for the conservation of flora and fauna is also an essential function of Government, but remembering always that their primary function is to preserve natural assets for the future citizens. Tourism can subscribe to and support these areas and can bring to the attention of the world their very great value. Here again adequate funds must be provided for research, game management and construction of roads, tracks and lodges.

Private enterprise also, like the Governments, has a clear and distinct role in the development of a major tourist industry. It too must demonstrate faith in the country and in its future as well as in its development potential by the investment of capital in the tourist industry. Local resources must provide the basic capital without which no major tourist industry can be developed; when local capital is invested in the tourist industry then, and then only, will overseas capital be attracted.

With both Government and private enterprise playing their respective roles the development of a major tourist industry becomes a relatively simple matter, and the only thing to be decided then is what aspects of the development should be undertaken first. This is a matter of prime importance since our visitors come from many areas and their needs are different. With all of them there is the joy of seeing a living landscape. Therefore the first necessity to the development of tourism in Africa is to develop our game areas, our

beaches and our scenic spots for these are our natural assets. We must at the same time see that they are readily accessible by road, by rail and by air and that they have accommodation for the visitor.

The next point is the type of accommodation to be provided. There should be large hotels of the luxury type in our bigger towns and cities, medium-sized hotels in the cities and outlying townships and small hotels of the cluster type which have proved to be extremely popular with visitors in our scenic and game areas.

#### CONCLUSION

Tourism is a great and keenly competitive international business. In addition to something to sell it demands comfortable and reasonably priced hotels, good communications, and a helpful welcoming attitude to the visitor which includes not only courteous reception but the reduction of formalities in Customs and Immigration to the bare essential.

The greatest strength of the Tourist Industry is that it brings in new money and new people. The businessman who comes as a tourist is a potential investor. Visitors gain a deeper understanding of the country, its problems and its needs.

There is no simple way of making money easily out of tourism any more than there is out of any other industry. Money must be invested in it, but its rewards are greater, more far-reaching, more rapid and more worthwhile than any other form of investment.

# MAN'S DEPENDENCE ON NATURE AND HER RESOURCES

by

Professor Th. MONOD, IFAN, Dakar

This paper will no doubt appear to some a little unusual, to say the least. I run the risk of inviting the courteous disapproval of those whose apparent realism prevents them from envisaging Man's relationship with Nature in terms other than utilitarian and efficacious or profitable. It appears impossible to me however to ignore the part played here by philosophy and ethics.

On reflection is it not essential to go beyond this preoccupation of the technical and " paying " aspect ? It may not be essential to possess a metaphysical or cosmological conception of existence in order to build a house (this applies to the Western world in the 20th century, or at least appears to do so...), but when speaking of Man's attitude to the Cosmos, there is no doubt that action will inevitably be coloured by ideas and that the mental climate of a given period, place or group, will be reflected in the behaviour of the Primate towards Nature, particularly the living world.

I am fully aware that certain aspects of the protection of Nature can and do present themselves not only as a regular duty but as good business, and these aspects are the most likely to appeal to some of those responsible for the future of the New Africa.

This had to be said, but is it not legitimate to wonder whether the effective and permanent protection of Nature can be based securely if it relies on, or even occasionally takes refuge behind the promise of material gain ? It is true that many have reached the point where they are unable to envisage humanity except in terms of " profit, " development, exploitation, " planning, " at every economic level. Should one not consider the risks involved in having recourse to nothing beyond utilitarian considerations, which may be only temporary and transient, true today, perhaps, but disproved tomorrow ?

In the attempt made to brake the damage inflicted or prevent the destruction of a habitat, utilitarian considerations have their justifiable uses, but can the notion of Man's responsibility towards Nature become truly effective unless based on a global conception of the World ? To explain it in a different way, if we wish to go beyond appearances, and get to the bottom of things, does this not require a great deal more than a bundle of practical recipes ?

Surely what is needed is the projection onto the World of a more fundamental attitude, justified by recourse—whether conscious or not—to a philosophy, a metaphysical conception perhaps, in any case of a specific type of relationship between Man and Nature ?

On reflection, it has seemed to me difficult to restrict this paper to the examination of the purely African attitude towards Nature and her resources. Firstly because even in traditional Africa, the question does not lie so much in a behaviour tied to geographically definable groups (racial for example) as in cultural "levels" shared with large sections of the human race. Secondly because in her present state of development, thanks to the juxtapositions of superimpositions of civilisations, Africa encloses a positive epitome of stages of mankind's evolution and behaviour.

Therefore, it seems necessary to define the three stages or main states that one seems to recognise in Man's evolution, and which I am tempted to describe as *biocoenosis*, *divorce* and *reconciliation*.

Needless to say these stages, which might be described as : *submission*, *aggression*, *responsibility*, cover a chronological sequence of events only in purely theoretical sense. None exist in isolation, in a pure state, the first because the stage seems to have been passed in the historic sense and remains only in residual forms which are becoming more and more "contaminated," the rest because they are intermingled in such a way that it is quite possible nowadays to see the more barbarous survivals of the Bronze Age side by side with the clearest indications of humanisation.

### 1. *Biocoenosis*

#### a) *Adaptation and resignation : a spontaneous equilibrium*

To begin with, Man is not and cannot be more than one element in the biocoenosis of which he forms a part. He is food-gathering and predatory, a Mammal amongst many others. In the regional ecological cycle, is the antelope-hunter, using a throwing stick and a bow, much more than a moderately improved carnivore ? Or, to be more exact, one which by evolving a small measure of technical skill compensates for his morphological disadvantages (musculature, teeth, nails, etc.) ? In a food-chain of the pattern : plant ; herbivore ; predator, Man, the panther, lion, cheetah or hunting dog occupy ecological niches more or less identical. In any case Nature's equilibrium under such a form of levy on food resources does not yet seem seriously threatened, or at least fluctuations which should be inscribed in the predator  $\square$  prey cycles cannot be attributed entirely to human agency.

Neither the hunter, fisherman, nor collector at this stage—and for as long as their numbers remain negligible and their technical advance archaic—can possibly be more than one element, *inter pares*, in biocoenosis, one of the wheels, amongst so many, of a cosmological reality of which Man will soon discover he forms a part.

No doubt the "biocoenosis" stage *sensu stricto*, dependant on the predominance of still mainly instinctive responses to the demands of environment, implying a capacity for direct adaptation to natural conditions with its variations, remains however a purely "fossil" stage, without any truly typical contemporary examples.

b) *Primitive technical developments : the equilibrium attained*

The process of perfecting tools, beginning with the axe, first of stone, later of metal, and followed by the bow and arrow, will give improved efficacy to mankind's activity. Agriculture will demand deforestation, henceforth made possible, and from that moment onwards the teeth of his herds were bound to prolong and intensify pressure on the Earth's vegetable cover.

The means, and consequently the damage inflicted, remain nevertheless strictly limited. Man has taken his place, producer no doubt, but of a type closely resembling his neolithic ancestors, and realising himself to be part of the Cosmos to which he belongs, and in which he has to function. Man and beast belong to the same organic whole in the centre of which mankind's interventions, usually traumatic, require a series of precautions and justifications, largely ritualistic, without which the cosmic order would cease to function : rain *must* fall, the seed take root, women conceive...

A French Africanist, H. Deschamps, referred to this mental climate when he said that: " It is impossible to escape from this sympathy felt by Man for natural things, this constant communion between Man and his environment constitutes one of the finest aspects of a black man's religion. It gives its people a wider expanse of vision, wider in that it is not constrained within the limits of humanity alone, in which so many philosophers have engaged us. It includes us in fellowship with the whole world, of which we lost even the understanding ... "

Does this " communion, " or " fellowship " of the type of " I-Thou, " as E. A. Gutkind expresses it, remain purely pragmatic, " operational, " to be classified as a recipe rather than an expression of feeling ? The appalling lack of sympathy for animal suffering, which is alas not restricted to mankind's pre-technical societies, is liable to prevent us from ignoring what these (like many others) lacked in ethical understanding.

Magical and symbolic links between Mankind and Nature are the promises and guarantees of efficacy : such a thing as what *we* call respect for life does not appear to exist. " Natural Resources " (if the terms were relevant in this context) could not be appropriated nor made use of without suitable ceremonial: the rules must be observed but without endangering the principle or at least its consequences.

Technical progress moreover which could only take root gradually confirmed Man's belief in his strength, his optimism, and his appetites. The wiser precautions of ritualism were on the point of bursting asunder.

## 2. *Divorce*

Having attained a certain degree of power, Man ceases to be a " taker " in the ecological pattern. He is about to leap out of the natural state to which he belonged only yesterday, bound by the magico-ritualistic past. From this moment he can act from without, along the lines expected, freed from any scruple and using material means progressively perfected : 4 guns, in a single campaign which was merely one of a series, accounted for 356 Addax Antelope...

A predatory rhythm on this scale is bound to be destructive, the *Raubwirtschaft*, the "economy of prey" can at last be released, the divorce between Mankind and his biocoenosis has been achieved, and he who has hitherto obeyed can henceforth give the orders; Nature appears to him as a prey to be eaten up rather than a capital to be used sparingly. The older relationship of the "I-Thou" type has given place to the pitiless "I-it" attitude if one may so describe the state expressed by E. A. Gutkind as "The only unity that still exists is a unity of disorder" (*loc. cit.*, p. 12).

Agressive tactics will take charge and become increasingly pervasive, quadrupled and intensified in the *technological sphere* by breathtaking extensions of power; in that of *thought* by the advent of the scientific spirit; in that of *monotheistic religions*, due to the extraordinary growth of the more dubious aspects of anthropocentrism : pride, lack of sympathy for other living creatures, the mystical aspects of Man, "King of Creation", etc.; and finally in that of the *socio-economic institutions*, with the transition from a subsistence economy consistent with the communal character of tradition African civilisation, an individualistic system founded on profit and ready to banish from its restricted view any consideration which will not prove immediately profitable.

Modern Africa is undoubtedly quite legitimately preoccupied with the welfare of its inhabitants, and must be tempted, in order to secure the basic resources needed to ensure the well-being of its inhabitants, to concentrate on the solution of the problem of its natural resources viewed in the light of economic necessities. This happens at the moment when elsewhere modern States have recognised, or are beginning to discover the multiplicity of reasons which render necessary an enlightened policy designed to protect Nature and to regulate wisely the exploitation of her resources.

### 3.Reconciliation

It seems as though Man is beginning to become conscious of his responsibilities towards Nature, aware that he is after all no more than the temporary tenant of Nature, answerable to his descendants for it. The problem is no longer one of passive submission to the injunctions of a Cosmos alternately hostile or beneficent, depending on the correct performance of rites designed to promote its munificence or avert its blows. The urge to give way to an enjoyable and intensified pillage which remains "permissible" as long as it "pays its way" is replaced by the need for comprehension, carefully thought out plans for improvement, pre-planned interventions, respect for Nature, condemnation of unnecessary destructiveness, systematic restoration of devastated sections of countryside, etc. On this condition, the dialogue could be picked up again, and the deplorable chaos of the "I-it" period replaced by new forms of equilibrium, harmonies within which *Homo sapiens* at last worthy of this appellation, placed in a world progressing with increasing speed towards unification, will acquire new means of developing an up-to-date philosophy, which has recently been described as the "bonheurs de croissance et de developpement," since only through these can Man emerge into "La zone des grandes joies stables."

The preceding remarks may seem to some to lack immediate value and to have little bearing on practical problems which seem to them the only ones worthy of our attention. I am convinced on the contrary, of Africa's need—since, through the force of circumstances she finds herself confronted with a whole series of decisions whose importance resides in the effect produced not only now but for very many years to come—is to consider a number of problems which are not valueless merely because they are different from those treated by economic experts. I am likewise certain that African tradition is both close enough and rich enough to supply those now responsible for taking decisions with all the information which *mutatis mutandis* will enable them to pass from the stage of factual equilibrium imposed from without, towards one of deliberately chosen and organised equilibrium, without tarrying too long in that of ill-planned and unwise exploitation.

# WILDLIFE RANCHING IN SOUTHERN RHODESIA

by

Archie S. MOSSMAN

Fulbright Research Scholar, National Museum of Southern Rhodesia, Bulawayo,  
Southern Rhodesia, 1959-1961

Studies directed toward the management of African wildlife have been carried out over the past two and a half years in Southern Rhodesia. Based upon this work and upon knowledge from other areas, the ranching of wildlife for economic return has begun. This paper will be concerned primarily with recent developments that immediately affect wildlife ranching in Southern Rhodesia and with the priorities related to wildlife ranching that are apparent at this time.

Raymond F. Dasmann and I undertook this work in the belief that the rapid extermination of African wildlife over large areas would continue unless its economic value could be established. The astonishing speed with which this extermination is being accomplished coupled with the extremely rapid deterioration of the veld that occurs through mismanagement when domestic stock are substituted for wildlife in much of Southern Rhodesia has served to lend great urgency to our work.

For our work we selected a ranch located in the brush covered south western low veld. After obtaining a conservative estimate of the game populations on the ranch and an estimate of their productivity, we recommended a game cropping program for the ranch. The harvest started in late July, 1960, and the first carcasses were marketed in early August.

From the animals harvested we obtained biological information. As the harvest progressed and with the considerable help of C. A. R. Savory of the Southern Rhodesia Department of Wild Life Conservation, we developed and refined cropping and handling techniques.

In the actual harvesting operation the only major difficulty encountered was spoilage which resulted from cropping during the hot months when no means for chilling the carcasses was at hand.

Marketing problems eventually slowed the operation almost to a standstill. These problems can probably be overcome by : 1. Selling game meat in Southern Rhodesia at less than the price of beef of the same quality; 2. Advertising extensively; 3. Presenting the carcasses with head and hooves attached so that the consumer can identify the species involved; 4. Exploring the overseas market for chilled, frozen, smoked, and canned meat products.

Over the past several months, foot and mouth disease has spread from Bechuanaland into Southern Rhodesia. Recently it has advanced into the southern low veld and the resulting quarantine areas now enclose the most important south western game areas. The disease usually follows a benign

course in southern Africa, but the virus becomes highly virulent in the United Kingdom and Europe. Because of this, stringent restrictions are imposed in the United Kingdom and elsewhere to avoid its introduction. As a result of these restrictions, the spread of foot and mouth in Southern Rhodesia could jeopardize her export of not only beef but also maize and tobacco. If such markets were lost the Rhodesian economy would suffer a severe set-back.

In the absence of adequate knowledge concerning the mechanisms of maintenance and spread of foot and mouth virus in Africa, strict controls on the movements of plant and animal products have been imposed in Southern Rhodesia. Strong pressure from cattle interests has resulted in special provision being made for the inspection and subsequent movement of cattle from areas placed under quarantine. These areas surround known foot and mouth regions and are thought to be free of the disease. Similar concessions could as logically or illogically be made for game.

The foot and mouth quarantine has stopped all game harvesting for the market in the south western low veld west of the Gwanda-Beit Bridge road. All ranches on which such harvesting has been carried out have been included within the quarantine areas. As a result of this new set-back, the Hendersons, on whose ranches we have worked, plan to temporarily discontinue their efforts to ranch game on a sustained yield basis.

An attempt to exterminate zebra and wildebeest on another low veld ranch lying east of the quarantine area is continuing. In the period 1955-59, the shooting contractors annually processed approximately 80,000 pounds of biltong. At 3 shillings per pound this had a gross annual value of £12,000. (First class game biltong is sold to butchers at 4/6d. per pound and resold at 6/- or more per pound. Biltong used for rationing at mines and so on brings 1/- per pound.) In 1960 the contractors produced 111,862 pounds of biltong worth well over £16,000. Their kill comes from a very large area, but probably represents a harvest somewhat in excess of sustained yield utilization. The owners of this ranch who have received virtually no monetary return from the extermination campaign are now becoming interested in the possibility of utilizing their game stocks for economic return on a sustained yield basis. They have asked for and received a preliminary survey of game production potential on a portion of their ranch and are exploring the possibility of exporting high quality venison canned for the overseas luxury market.

In the " Triangle " area of south eastern Southern Rhodesia a ranching enterprise that has been protecting its game is starting to utilize it. This ranch is ideally situated for such purposes having near its borders a population of about 3,000 wage-earning Africans. The owners operate their own retail store on the premises and expect to install butchery facilities. If successful, this operation should be important in encouraging the establishment of other such enterprises in that area. When ranchers start making money from their game and it is recognised that anyone could do likewise, there will be a great reduction in the pressure that some ranchers bring to bear on their neighbors to force them to exterminate game.

If the sustained yield economic utilization of wildlife is to have an assured future in Southern Rhodesia, certain priorities must be met. Private enterprise should be given every encouragement in setting up game ranching schemes.

Those people willing to gamble their funds in this new field should at least be given governmental assistance with marketing comparable to that given ranchers of domestic stock. The government must also be prepared to maintain legal control lest ranchers carry out game eradication in the guise of sustained yield utilization.

It is possible with our present knowledge to safely establish sustained yield utilization of game in Africa. This merely requires that the harvests taken be small enough to avoid dangerously depleting the game stocks yet large enough to be economically feasible. These requirements can be met with ease. Administrators tend to avoid such schemes in the fear that over-harvesting may occur. In doing this they face a far greater danger that by the time adequate research results are at hand to allay their fears, the animals will be lost. Research is badly needed to increase the efficiency of wildlife ranching operations so that more nearly optimum harvests can be taken without increasing the danger of over cropping. If funds are limited, however, game utilization must take precedence over game research at the present time. There is little point in doing game research only to find that by the time we have gained the knowledge, we've lost the animals. Consolation may be found in the certainty that as the economic value of game becomes recognized, public demand will result in research funds being made available.

Of utmost importance is the bringing of the African into active participation in wildlife ranching for his own benefit. From the overall conservation, socio-political, public health and economic aspects, no other facet of these schemes for wildlife utilization is now so critical. A start toward this goal was made when the New York Zoological Society provided the scholarship that has allowed Mr. Sidney Simpelwe of the Northern Rhodesian Game Department to work with the Fulbright big game research personnel in Southern Rhodesia. After his training, he will form the nucleus of an effort to achieve this end.

The feasibility of wildlife ranching in Africa has been proven beyond reasonable doubt. There are still problems to be solved, but they are relatively minor. It is now up to private enterprise supported by government to put wildlife ranching solidly into effect. As this progresses, the use of wildlife on public lands must begin. Projects that are designed to gain the active participation by Africans in game ranching for their own benefit are now of first priority and must be started at once.

NOTE  
ON THE PROBLEMS SURROUNDING  
THE IMPLEMENTATION OF A WILD LIFE UTILIZATION  
POLICY IN A DENSELY POPULATED COUNTRY

Prepared on behalf of the Government of Nyasaland by the Director, Game, Fish  
and Tsetse Control

INTRODUCTION

The majority of recent papers on the subject of wild life utilization policies have laid stress on the theoretical advantages of utilizing marginal lands for game cropping rather than cattle raising.

In Nyasaland, however, the main challenge to the continuance of wild life does not come from cattle but from ordinary subsistence agriculture and it seems probable that similar situations will arise in other East and Central African territories as human population levels rise. It may therefore be of service to the general discussion on wild life utilization policy to outline the problems which face Nyasaland in attempting to implement such a policy in present circumstances, even though no solution of those problems can, at present, be suggested.

OUTLINE OF CURRENT CONDITIONS

Nyasaland is a very densely populated country with an estimated total of some 2,860,000 people, increasing by 2.5 % per annum, a very small proportion of whom live an urban life. The average population density is some 78 per square mile and rises to more than 800 per square mile in some parts of the country.

With this large and rapidly expanding population most of the more fertile parts of the territory are already under close cultivation and the natural environment is already altered beyond the point where it will support a wild animal population of any significance.

Nevertheless there are areas where there is no cultivation or settlement, namely, the five Game Reserves and the numerous State Forest Reserves. The former, together with a particular area where hunting is prohibited and there is for various reasons no existing settlement, total about 2,500 square miles and the latter approximately 3,000 square miles.

There are also areas, some of which adjoin the Game Reserves and State Forest Reserves, which, though not completely uninhabited have population densities as low as 10 persons per square mile. The areas in this category adjoining the Reserves make up a total of approximately 1,500 square miles, the largest single area being about 700 square miles and the remainder varying from 400 to 100 square miles.

Most of these lightly populated areas consist of *Brachystegia* or *Combretum* woodland in varying degrees of openness, with numerous small streams or drainage lines but few large rivers since, in general, the areas tend to lie on the watershed between the Luangwa and Shire river systems. About two-thirds of the total is moderately flat but the rest is rather broken. The nature of the Game Reserves is very similar except for one area which consists of high rolling grassland with patches of relic forest.

In general the soil in both the Game Reserves and sparsely populated areas is of poor fertility and not suited to permanent agriculture, though there are pockets or strips of moderate soil here and there.

The fauna in the Game Reserves includes representatives of most of the Central African species of antelope, together with elephant, buffalo, pig and Warthog and by analogy the adjoining lightly populated areas must, in theory, be able to support a similar range.

#### DISCUSSION ON PRACTICABILITY OF A WILD LIFE UTILIZATION POLICY

It would appear that although a utilization policy is already impracticable for most of the territory, even in theory, it should be possible to apply it in these lightly populated areas, supported and supplemented by the actual Game Reserves.

Many of them are tsetse habitats and in any case not even superficially attractive to the cattle rancher and there has never been any suggestion of attempting to convert the natural bush to pasture or of directly expelling game to make room for cattle. Nor is the natural fertility of the land such as to give a worthwhile yield per acre in arable crops or stand cultivation for any length of time.

One might say therefore that there is no logical reason for occupying it, and it seems therefore that in such areas we have the primary requisite for a wild life utilization policy, namely, a reasonably stable environment.

Nevertheless the long term future for such policy is by no means clear, even in these marginal areas.

In the first place the wild life population currently existing is extremely low. Even in the Reserves the density is small by normal sanctuary standards. Thus the total number of edible mammals likely to be seen in the course of a six-hour patrol varies from a maximum of 34 head (Nyika) to as low as 5 (Majete). Outside the Reserves the incidence is, in general, even lower.

It is true that even the Game Reserves are but lightly protected against poaching at present. With a game staff of one man per 55 square miles one cannot expect much. No doubt wild animal populations could be built up, granted a really determined effort to protect them, but the fact remains that they would not yield a crop of much economic significance at present.

Nevertheless time and effort could, other things being equal, overcome this difficulty. The really fundamental problem is how to prevent, not merely hunting, but actual settlement and cultivation with consequent destruction of the environment in face of the enormous population pressures which are steadily building up.

The areas may be, and indeed are, unsuited to economic or long term agriculture, but unless steps are taken to prevent it they will undoubtedly be settled. Subsistence agriculture on them may yield a very poor livelihood but it will be a livelihood, at least for a short time. Arguments that using the land for agriculture will quickly destroy what little fertility it has will have very little force in the hearing of people who have no obvious alternative occupation. The fact that settlement of these marginal lands can at best be temporary will not prevent their being settled by the generation to whom settlement offers the only apparent solution of the employment problem in their lifetime.

The areas might be kept free of settlement and usable for wild life resources of various types by exceptionally rigid and determined Government action but a popularly elected Government will have great difficulty in sustaining such a policy unless the areas can be made to yield not merely a meat supply but an actual occupation for a considerable number of people. Even a supply of meat is scarcely a substitute for a livelihood.

Some way must be found by which at least the existing populations of these areas can be involved in the utilization schemes and given, not only a culinary interest, but an occupational interest in the success of wild life utilization schemes. Otherwise the task of halting the cultivation, and hence devastation, of the environment will be rendered superhuman. The simple conversion of erstwhile poachers into game cropping concessionaires would not absorb nearly large enough a percentage of the population to be decisive.

It seems very probable that other countries besides Nyasaland may be called upon to face this aspect of the problem in the not far distant future, and it is mentioned, not with the intention of suggesting that it is insoluble, but because earlier discussions have tended to overlook its existence. They have approached the question of wild life utilization from the standpoint of ordinary economics and principles of correct land usage. Rightly so, of course, since the biological desiderata of this decade foreshadow the economic and political facts of the next. Nevertheless it has to be recognised that democratic Governments have to deal not only with principles of correct land usage but human shortsightedness and improvidence as well.

Yet the problem must be solved, for the abandonment of the areas to short term subsistence agriculture offers no real alternative. Either the areas are left more or less in their natural state, in which case they can best be used for wild life cropping, or they will rapidly become virtual deserts. If the human population problem cannot be solved without occupying them then it cannot be solved at all.

NOTE  
ON THE RELATIONSHIP OF WILD ANIMALS TO ANIMAL  
HUSBANDRY AND DISEASE - NYASALAND PROTECTORATE

Prepared on behalf of the Government of Nyasaland by the Director of Veterinary Services

It is necessary to recognise that, classified according to methods of food procurement, there are three broad categories of mammalian and avian wild life which have an impact on the health and food requirements of human beings. They may be conveniently classified as stated below.

*Herbivores:* Those animals which exert their influence through direct competition with domestic animals for grazing and water and which since they exhibit similar zoological features to the domestic animals of their biological grouping they tend to suffer from the same diseases. Further it must be noted that some intermediate hosts of internal parasites of man are present in herbivorous game animals. Most of the larger species of game animals are herbivorous and may cause damage to man's installations, such as gardens and watering points, in their search for food and water.

*Omnivores:* Those animals which by the nature of their diet are likely to be direct competitors with man for his crops, and for purposes of clarity I include in this group animals which are not true omnivores, such as monkeys, as well as those which are, such as pigs.

*Carnivores:* For the purpose of this classification carrion eaters are included with the other flesh eaters. These animals not only make their presence felt by feeding on man's domestic animals and rarely on man himself, but by acting as a reservoir for zoonoses such as rabies.

It should be recognised that the density and variety of game animal population fluctuates according to the season of the year, the topography of the country, and the density of the human population. The influence that wild animals exert on rural life is in direct proportion to the chances available to them to obtain their food, and to survive in the presence of human beings and their dependent livestock.

IMPACT OF THE CATEGORIES OF ANIMALS DESCRIBED IN NYASALAND

*Herbivores:* The larger species of herbivores are confined to the more isolated parts of the country and to the tsetse belts, they have little effect on stock keeping, although they do assist in the maintenance of a tick and biting insect population. There is little evidence that trypanosome infection (Nagana) is maintained in wild game in this country, but it is evident that the presence of game must be a factor in the persistence of the vector, the *Glossina* fly. *Gondiosis*, the tick-borne disease of buffalo, which is transmissible to cattle, has

been diagnosed in one small area, but its importance is difficult to assess. Only two small outbreaks of Foot and Mouth disease have been diagnosed in this country and there was no involvement of game animals.

Smaller herbivores such as the Bushbuck and the Duikers are able to survive in quite densely populated country but although they may be a small factor in adding to the helminthological burden they cannot be an important influence. They tend to be more of a nuisance than a menace.

*Omnivores:* Monkeys are the most persistent of wild animals in heavily populated areas, and being very close to man, zoologically writing, they constitute the greatest hazard to his health. However, the danger probably only arises from very close association when they are kept as pets and it is improbable that they have any influence on outbreaks of epizootic disease in human beings. Animals of the family *Suidae* from their close relation to domestic pigs, and from their persistence in close proximity to cultivation, constitute a very great danger to successful pig keeping in village areas. The disease they transmit (African Swine fever) is one of the most invasive known and carries a high mortality. Both these types of animal are destructive of crops.

*Carnivores:* It is impossible to assess how many domestic animals are taken each year by the larger carnivores but it cannot be as large as is sometimes stated. It is apparent that these animals are a greater nuisance at those times of the year when their natural wild prey is difficult to come by. The smaller carnivores are however, a very real menace to man because of the prevalence of rabies, this country must be as heavily infected with this disease as any in Africa and in recent years a feature has been in existence of a game reservoir of the infection. One person has been killed by a rabid hyaena and two others are known to have been severely injured by another, and very many people have been bitten by rabid jackals and there are unconfirmed reports of people dying of rabies contracted in this way.

Birds appear to have little influence on disease dissemination, although it is difficult to find any firm evidence either way. It is probable that the effects of the sun reduces accidental transmission of viruses in comparison with more temperate climates. The larger carnivorous birds undoubtedly take a large number of chicks but there is nothing to indicate that wild birds have had any influence on the transmission of diseases of poultry.

*Consumption of Game Meat.* It is very evident that a number of intermediate hosts for parasites of man exist among wild animals. The most important being the muscle worm (*Trichinella spiralis*) and the cysts of the genuses of *Taenia* and *Echinococcus*, all of which can produce severe injury or even death. It is important to remember that the making of biltong (sun dried meat) does not reduce this danger. Tuberculosis and anthrax have not been diagnosed in game animals in this country.

#### SUMMARY OF THE IMPORTANCE OF WILD GAME IN NYASALAND

Generally writing game animals in this country cannot contribute anything to food supplies. Such suitable animals as are present are too remote from centres of population and are too few in numbers to be used in any practical manner to supplement the prevailing shortage of animal protein. Utilisation

might also be influenced by the unknown degree of incidence of intermediate forms of helminths parasitic in man.

Predation of domestic animals is at a low level except in very isolated areas, and tends to be exaggerated because of the Departmental requirement that blood smears must be supplied from cattle that have died and which are within a statutory dip tank area. The excuse for failure to supply such evidence often results in the attributing of a death to predation by wild animals.

The role of game in the survival of tsetse fly is not important in this country since it has been conclusively demonstrated that the trypanosomiasis is largely due to mechanical transmission of biting flies, and it can be controlled by the use of sanative drugs.

The most important impact is from the transmission of two virus diseases, those of rabies and African Swine fever, both of these diseases being transmitted by animals which are regarded as vermin. Further such animals are only of importance in transmission when they occur close to human habitation and their destruction in those localities could not affect the fauna balance of the game reserves.

#### CONCLUSION

The isolation of the game reserves, and their virtual confinement to unutilisable country, precludes any serious challenge by game to domestic animals. Any small inconvenience that the maintenance of game reserves might entail is more than compensated by the very great social and aesthetic advantages to the country of preserving the fauna they contain intact.

## HUMAN AND SOCIOLOGICAL FACTORS

by

Thomas R. ODHIAMBO  
Queens' College, Cambridge

The acceptance of the principle of nature conservation and the putting into practice of schemes embodying these ideas come face to face with several human factors which appear to act, separately or in concert, as barriers to progress in this direction.

### HUMAN FACTORS AS BARRIERS TO CONSERVATION

First of all, there is the natural conservation of a peasant and pastoral community, that had evolved (before the present century) a highly complex system of land use, which gave them a satisfactory yield in terms of crops, forest products, and stock, and at the same time maintained the natural fertility of the land. The cornerstones in this system were shifting cultivation and nomadism—practices which were based on sound ecological principles. But with the increasing population of both men and stock in the present century, there has built up a tremendous pressure on the land; and the traditional system of land use is no longer applicable. The great difficulty has been that of evolving a viable land-use system, which would succeed the traditional system and be acceptable to the peasant and pastoral peoples.

With this first barrier is correlated the need to demonstrate beyond any doubt that the conservation schemes being projected, and the underlying ecological principles, are sound and will pay. Although scientists appreciate and are anxious to preserve the magnificent collection of Pleistocene mammals so well preserved in Africa—such as the elephant, hippopotamus, and rhinoceros—and even that much maligned surviving archosaurian, the Nile Crocodile—these admirable sentiments cannot be expected to weigh much with a people fighting for their very existence. For it must be borne in mind that these communities have a long tradition of farming and animal husbandry, and that they have to work extremely hard for the meagre living they get; it will take an unusually convincing demonstration of tangible benefits accruing from the new land-use systems to induce them to modify their ways and practices.

The lack of appreciation by the general public of the ideas of conservation and its importance in land-use planning is a major obstacle. There is need to think not only in static terms—those of designating sanctuaries and national parks, and the protection of rare species of plants and animals—but also in more dynamic terms, for instance, the ecological survey of a whole region with its natural and human resources and the planning of how to exploit these

resources bearing in mind the ecological factors operating in that particular region.

The fourth barrier is the disastrous effect that shortsighted and unscientific projects, such as the groundnut scheme in Tanganyika and the slaughter of game in the name of eradicating the tsetse fly, have had on the attitude of the public towards conservation. I will illustrate this by the tsetse campaign, and by the Kariba Dam in relation to the game in the Zambesi Valley.

Dr. E. Hindle, of the Zoological Society of London, has reported results of surveys carried out in the Sudan, Uganda, Kenya, Tanganyika, Zanzibar, and Southern Rhodesia, which show unmistakably that the blood meal of tsetse flies is provided mainly by wart-hogs and bush-pigs : they supply about half the blood meal of *Glossina morsitans* and *G. swynnertoni* and over 85 % of *G. austeni*. On the other hand, the buffalo provides only 5 % of the blood supply; the eland, duiker, Waterbuck, baboon, monkey, and impala are rarely bitten; and the hartebeest, wildebeest, topi, and zebra are not bitten at all. A similar picture emerges from the Congo. Although these facts have been known for several years, it has been astonishing to note that in order to stem the tide of the southward advance of *G. pallidipes* in Uganda, it was decided as a matter of policy to eliminate *all* hoofed game animals (with the exception of giraffe, roan antelopes, and the Uganda kob) in addition to hunting and killing all bush-pigs. In 1958, over 8,000 buffalo were killed in the Katanga marshes alone. This unfortunate decision illustrates the prevailing dogma of tsetse control, by which the trypanosome-carrying tsetse flies are brought under control by starving them of their game food supply and at the same time eliminating game as a reservoir of these trypanosomes. The wholesale slaughter of game which went on for many years in Southern Rhodesia comes under this heading. The damage that this unproven dogma inflicts on the constructive principles of conservation is that it leaves the public bewildered as to the claim that both nature conservation and tsetse control (by means of game elimination) are based on biological tenets of unquestioned validity.

The story surrounding the inception of what has been called " Operation Noah " makes strange reading—and for this reason. It appears that although the authorities in direct charge of the Kariba hydroelectric scheme had made elaborate arrangements concerning the engineering operations, the safety of workers, and the movement of the resident human population to alternative areas, there was no clear idea as to the magnitude of the task of removing the rich fauna living in the forests of the Zambesi Valley and placing them on safer ground. Indeed, no thorough survey which would have revealed this fact was ever conducted; nor had far-reaching arrangements been made with universities and research institutions for intensive research in the Valley before, during, and after the flooding of this vast area of 2,500 square miles. The gross neglect of this phase of the work connected with the Kariba Dam can be gauged by the realisation that at the beginning of the flooding of the Valley only four game rangers were in charge of game rescue work on the Southern Rhodesian side, and none on the Northern Rhodesian. The financial commitments in this work were estimated not to be very large : for the Fauna Preservation Society in Britain launched an appeal in early 1959 for £10,000 to save the marooned animals, and the Northern Rhodesian government voted

£30,000 for the operation in mid-1959. It seems puzzling that, if the rich game fauna in this Valley is so valuable, official sources could have been so unaware of the predicament of the animals, and then to have been so slow in making available the small sum of money needed for the operation.

These two examples have damaged the case for nature conservation more than most people seem to realise.

#### TASKS FACING CONSERVATIONISTS

Keeping in mind these and the other barriers already mentioned, it is possible to suggest a number of tasks which face those who are concerned in nature conservation if the ideas and policies evolved as a result of ecological study are to penetrate into the planning and execution of land use projects :

- a) The clear demonstration that nature conservation pays.
- b) The planning of land use on ecological principles.
- c) Provision of alternative employment of people who have been deprived of their traditional way of living.
- d) The education of the public on nature conservation.
- e) The formulation and enforcement of intelligible game laws.

The whole project of nature conservation hinges on the first task—that of a clear and unequivocal demonstration that nature conservation pays handsome dividends, as compared with other systems. Earnings from tourism are not in a form that can easily be appreciated by a peasant or pastoralist, nor does the purely scientific value of the game appeal to the vast majority of the uninitiated public; what will convince are facts and figures, such as a few studies are now bringing out. Perhaps the best study of this kind so far is that carried out by Dr. Hugh B. Cott on the Nile Crocodile in Uganda, Northern Rhodesia, Barotseland, and Zululand—a study that occupied several years. Dr. Cott made a wide-ranging and intimate study of the biology and natural history of this crocodile, and the revelations will make a firm basis for the conservation and exploitation of this reptile. He found that, contrary to popular feeling, the crocodile feeds predominantly on *Protopterus*, *Barbus*, *Clarias*, *Aleste*, *Synodontis*, and *Auchenoglanis*—fishes that are not easily marketable, and which, moreover, prey on fish-eggs, fry, and fish (for example, on *Tilapia*) which are valuable to the fishery industry. But even so, the crocodile feeds on fish chiefly during the middle years of its life : during the early years it feeds on invertebrate predators, such as the freshwater crabs, Giant Waterbugs, dragonfly adults and nymphs, voracious waterbeetles, and aquatic spiders; these invertebrates, particularly the waterbugs and waterbeetles, are notorious as predators of fish fry. Crocodiles also feed on cormorants and darters who consume ten times more fish than the crocodiles themselves. What is most interesting is that where crocodiles have been exterminated (either through an official policy of treating the reptiles as vermin, or as a result of unrestricted hunting of the animals for their belly-skins) predatory fishes or crabs have increased to an alarming degree (e. g. *Heterobranchus* in the Congo; otters in

Lake Victoria; *Protopterus* around Mwanza; and crabs in Southern Rhodesia). In Mweru Wa Ntipa, on the other hand, where crocodiles have been protected, there is a large resident crocodile population and it is feeding almost exclusively on the predatory *Clarias mossambicus*, leaving alone *Tilapia*. There is no doubt, then, that crocodiles are worth protecting. It is feasible that, with a strict regime of cropping, the crocodiles can be elevated into a sizeable industry: official returns for 1954 show that 60,000 belly-skins were exported from East Africa netting an income of £230,000.

Controlled cropping of game in overpopulated areas, with provisions for collecting scientific data and for the proper utilisation of the meat, is also giving much needed information for demonstrating the effects of conservation. In the Queen Elizabeth National Park, the hippopotamus population was so dense in 1957 that they were beginning to cause overgrazing and soil erosion. With the help of several biologists, including two Fulbright scholars, a scheme involving the cropping of the hippo population and its maintenance at a certain level has evolved. It is thought that a cropping scheme for buffalo would bring in even better benefits: the value of meat in Uganda could be as much as £600,000 a year without depleting the herds. In Kenya, there is the Galana River Scheme, where elephants in a large buffer zone surrounding the Tsavo National Park are being cropped in a systematic way. All these schemes would have a more powerful influence if they were based on extensive comparative data taking into account the performance of domesticated animals and that of game under similar habitats and also under good husbandry management. We now know of the performance of goats under Uganda conditions from the work of Dr. Peter N. Wilson at Makerere. We need similarly comprehensive studies on the elephant, hippopotamus, buffalo, zebra, impala, and some of the other key animals among the whole spectrum of game animals.

Dr. F. Fraser Darling, Professor W. H. Pearsall, and many other ecologists, have stressed the peculiar nature of African soils—that it is old and senile, and that in vast areas there is a lack of those basic elements that would enrich the soil (sodium, potassium, and calcium). And, consequently, African habitats are not as permanently fertile as the lush undisturbed vegetation would lead one to believe. This sober thought makes it a matter of paramount importance that the planning of land use in any of the African countries should be viewed in its totality, and should be guided by intensive surveys of the whole region. Factors such as a soil survey (based on the lines of the recently completed soil survey of Africa south of the Sahara), ecologically meaningful studies of rainfall such as that of Mr. H. L. Manning in the case of Uganda, and the study of present-day land use as revealed by such studies as are now being carried out at Makerere for the lake districts of Kenya and Western Uganda—all these and other factors should impinge on the planning of land use.

The question of land use immediately raises the problem of what to do about those people whose livelihoods would be otherwise jeopardised by the operation of conservation schemes. Assuming that nature conservation convincingly demonstrates tangible benefits, there should be no insuperable difficulty in persuading such people in taking up more profitable pursuits. One way would be to offer them jobs as hunters and officials in the various cropping and management schemes; another would be to demonstrate to the

pastoralists the advantages of including some of the semi-domesticated game (the impala, the red lechwe, etc.) among their stock. For the great majority, however, there seems to be a need for organized hunting as a sport which would dissipate some of the hunting propensities.

The enforcement of game laws will depend largely on a vigorous campaign to educate the public on the needs of nature conservation. One innate characteristic of African children which has not been systematically exploited is the intense curiosity shown for birds and the large animals and the thirst to know their ways and habits. If mass media were to be used to better advantage, and if an attractive course on natural history and conservation were to be incorporated into school curricula, an informed awareness could replace the present apathy within a matter of a few years.

# AWAKENING PUBLIC OPINION TO THE VALUE OF THE TANGANYIKA NATIONAL PARKS

by

J. S. OWEN  
Director  
Tanganyika National Parks

It is proposed, in this paper, to deal with only a small section of the large field which is the subject of this item of the Agenda. The author is a very recent recruit to the ranks of conservationists and has little experience of the wider aspects of the problem of conserving natural resources in general or, even of conserving natural life outside the National Parks—though this is clearly of great concern to us. The scope of this paper is therefore strictly confined to the problems which face the Parks in Tanganyika. They may well not apply to National Parks elsewhere in Africa for countries in Africa differ very widely one from another and what is true for one is often false elsewhere.

Tanganyika has been fortunate in having an abundant and varied fauna and although, over large parts of the country, the animals have been decimated during the last half century, there still remain large tracts of country plentifully stocked with game. Much of this land is of little agricultural value, has no human settlement, and is infested with Tsetse. Already one large area (the Serengeti) and two smaller (Lake Manyara and Ngurdoto Crater), have been established as National Parks. More are needed if this large country is to have sufficient land set aside in perpetuity, not only to cater for the future needs of its own inhabitants and for the potential tourist market, but also to provide sanctuary for all the important species of its fauna. The essential bases—sufficient land and a wealth of animals—exist. It is now within Tanganyika's power to establish for ever, and without great difficulty, an incomparable system of National Parks for its future needs.

This is the first of Tanganyika's good fortunes. The second is that the present leaders of the country are well aware of the necessity for wild life conservation and are sympathetic to it. But in a democratic country, they cannot disregard public opinion and perhaps understandably the general public lags further behind them in this than in probably any other field.

This is not surprising. Those struggling to scrape a bare living from the soil seldom take a long term view. After all, it is only very recently that the more advanced nations have themselves woken up to the need for faunal conservation—and then only after they had destroyed all, or all but a fragment, of what they had to conserve.

There are also other special factors affecting African public opinion in Tanganyika:

- i) For centuries the African has depended on hunting for an important (and the most palatable) part of his diet. Before the coming of the white man and his destructive new methods of killing, man and the animals lived in balance and hunting was a legitimate and honoured activity. It still has the full support of tribal tradition behind it.
- ii) Since the white man came, the African has seen him exterminate the game over large areas, partly for food, partly for sport, partly for gain and partly to protect his farms from depredation and from competitive grazing. He does not see why he should be stopped by the white man from doing the same. For instance, he fails to understand the equity of a law which sentences him to a heavy term of imprisonment for killing an animal for food on his traditional tribal hunting grounds, while it allows a visiting white man to shoot a number of beasts on his land. For this and other reasons, African thinking on game is often coloured by the racial issue.
- iii) In the original Serengeti National Park, human interests co-existed and conflicted with those of the animals. As fervid protagonists of the latter, the National Parks came to be regarded by local opinion as being antagonistic to African interests. Because the Parks were used almost entirely by Europeans, they were regarded as being run exclusively in the interests of the white man.

Now there are, of course, perfectly understandable reasons for much, if not all, of what has happened. But, I for one, doubt the advisability, at this stage, of any sustained effort to argue the rights and wrongs of the past. As the Arabs say, *el fat mat*—the past is dead. Let us concentrate on the future recognising that what has gone before casts its shadow along the path ahead—that we have not only to awaken public opinion, but to change it.

Time is short and the means are limited. A campaign on a broad front is neither feasible nor likely to be effective. Those in daily contact with animals whether they are persons whose crops are raided by elephant or hunters hungry for meat, are stony soil for propaganda. But these are in the minority and their attitudes can be influenced only by action—adequate control of animals raiding crops and effective measures to limit poaching. It is to the others, particularly the leaders at all levels of society and the coming generation of leaders, that the main approach must be made.

In making this approach, there are five themes to be plugged—possession, pride, profit, pleasure and posterity (to bowdlerize Sir Julian Huxley)<sup>1</sup>

*possession*—the Parks belong to the people of Tanganyika and are run primarily for their benefit and not merely for the white man;

*pride*—in the national heritage of their Parks which are world famous;

*profit*—from the tourist trade, still with its potential barely assessed;

<sup>1</sup> The scientific value of National Parks is probably too remote a concept to be got across with much effect at present as is also the idea that Tanganyika owes it to the rest of mankind to preserve a world asset.

*pleasure*—in seeing the animals, which figure so largely in African folk-lore, in their natural state;

*posterity*—the desirability of preserving representatives of the many animals which are Africa's heritage for their children and their children's children to see.

We regard the inculcation of these ideas as the most important of our objectives. Not only is it vital to the survival and future development of the National Parks, but also, we believe, we have a very real duty to the people of this country to make them aware of the economic and cultural benefits to them of their Parks, so that they do not misuse nor waste this unique asset.

The intention is, therefore to tackle this problem as effectively and immediately as funds will permit. As the first step, we have made a film in Swahili directed to African audiences. In it we have tried to get across the purpose and value of National Parks. We hope that this will be the first of several and that we shall learn to make them progressively more effective. The cost is considerable, being some £3,000 for each film, lasting half-an-hour, with the necessary copies for showing locally.

Following the lead given us by the East African Wild Life Society, we are setting up an Information Unit to show these and other suitable films. It will be equipped with a Mobile Projector and will be in charge of a trained African who will tour schools, agricultural shows, community centres and other gatherings, giving lectures on the National Parks. The Unit will be equipped with a variety of visual aids and the Social Development Department have very kindly agreed to be responsible for training and supervision. This first unit has been financed by the generosity of the Munitalp Foundation. To cover the country adequately several of these units are required, but the capital cost of the vehicle and equipment is approximately £3,500 and the recurrent annual cost of running is about £1,500 per annum.

Thanks to the generosity of the Frankfurt, Germany, Zoological Society, we have been able to publish an eye-catching poster in Swahili carrying the words " Our National Parks are the envy of the world—be proud of them. " The second is in the course of preparation with the slogan " Our National Parks bring good money into Tanganyika—preserve them ". More are needed.

The vast majority of visitors to National Parks in the past have been Europeans and visitors from abroad. Mr. R. M. Bere, till recently director of the Uganda National Park, to whose thinking on this subject we owe so much, has long stressed the importance of getting the local people into the Parks so as to dispel any feeling they may have that the latter are run only for white men. Visits of parties from all levels of society, from school children to Chiefs, have therefore been arranged to all the National Parks and only finance prevents us from extending invitations to cover all senior schools in the area. Prizes have also been awarded for essays in the schools on subjects connected with National Parks.

Other media of influencing public opinion, including the press, are being used and provided we get enough money to do all that we would like to do, we are confident that the overall result will be a very marked awakening of

interest in the National Parks, an effective measure of support for our objectives, and a real chance of making the Africans themselves anxious to save the wild life of Tanganyika from extinction.

It is easy to be cynical about the effectiveness of propaganda. It is also easy to underestimate the powers of the right approach in this country.

Great emphasis has been placed in the world outside on the fact that the Parks are a world asset. We feel very strongly, therefore, that we are justified in looking to the rest of the world to help us in our task. This can be done in two ways. Firstly, by providing us with the financial means for propaganda which are essential to success. And, secondly, by helping us to build up a thriving tourist industry, on which both the future of the Parks and the validity of our propaganda so largely depend. Without this help the long term survival of the National Parks cannot be assured.

THE PLACE OF NATURE CONSERVATION  
IN LAND-USE PLANNING WITH PARTICULAR REFERENCE  
TO THE MODERN AFRICAN STATE

by

W. H. PEARSALL

Professor Emeritus, 6 Pemberton Drive, Morecombe, Lancs., U. K.

a) *Factors of Habitat*

A major problem in the development of any modern state is that of conserving and extending the energy resources available. The chief energy resource in most parts of Africa is sunlight. Fossil fuels like coal and oil are generally absent and the water resources are, with some exceptions, small or at too low an altitude. The energy derived from hydro-electric installations will thus perform on a limited scale. The long-term and very expensive possibility of using atomic power will hardly be lost sight of—but the size of the very cheap sunlight resource is generally overlooked. If a hydrogen bomb were to devastate part of Africa, it would still dissipate less energy than would fall as sunlight on the same area in a single day. One problem of African land-use is thus how to make use of this major energy resource.

The obvious and simplest method of utilising the sun's energy is by maintaining a continuous plant-cover in order to absorb as much light as possible. This must then form the basis for developments in agriculture, forestry or wild-life management. The potential of production by a vegetation cover in Africa is extremely high, but it is only realised where soils and climate in conjunction are favourable.

Over very wide areas in Africa soils are too infertile to permit high and continuous production. They are often extremely old and have been impoverished by rain-washing through the ages, or else they have developed such a texture as to be subject to seasonal waterlogging. They are very generally too unstable under cultivation to permit intensive cultivation unless the products, either plant or animal, will also pay for heavy replacements of the minerals removed in the crops. A second major problem is thus how to maintain the less fertile soils in productive use at a lower or at no additional cost.

The high temperatures that prevail in Africa not only permit rapid plant production where conditions are favourable, but also enhance the instability of many of the soils under cultivation because they lead to very rapid decay of organic matter in the soil. It is thus hard to build up soil reserves of substances of biological importance like nitrogen and phosphorus either in pastoral use or by cultivation and even to maintain a good soil structure. The widespread use of fire accentuates this instability by destroying organic litter. The traditional method of the forest fallow used throughout Africa is completely

justifiable as a method of soil conservation, though it reduces the productive period of arable use to only about two years out of twenty. A parallel system of pasturable woodlands used in India (on the poorer soils liable to severe erosion under monsoon rains) also allows of pastoral use only for some two years in twenty.

These soil problems are complicated by climatic ones. High evaporation rates are almost universal in Africa except at high altitudes and thus the rainfall is often too low to replace evaporation losses. At least half of Africa has too small a rainfall or one too uncertain from year to year to support permanent cultivation, the areas of uncertain rain being *famine zones*, in that crop failure would ensue on an average once in three to five years. In both arid and famine areas, forms of land-use other than arable cultivation must be envisaged.

Where the rainfall is low, widespread precautions are necessary to conserve the limited water supplies. This means that the vital catchments must be maintained primarily as *water conservation areas* and other uses to which they might be put must be secondary to this main function. Water conservation areas are usually maintained under woodland (conservation woodlands) as the shade reduces the soil temperature and lessens evaporation from it, while the effect of trees is to help the penetration of rain into the underground stores from which springs and streams are fed and the surrounding country watered. In the famine zones, where probability of rain is inadequate, pastoral occupation is usually attempted. It seems that the units of land-use must be large enough to allow of the migration of human and animal populations to meet the shifting pattern of rainfall. Almost always it will be necessary to envisage also adequate reserves of dry-season grazing usually on areas that are flooded or too cold in the wet season. The proposed arrangements in the Serengeti (Northern Tanganyika) show how this type of country can be exploited for either human pastoral populations, or for wild-life management. In this instance, the better soils, the good drinking waters and the shorter migration route is to be reserved for human pastoralists and their domestic animals—while a long migration path consisting very largely of tsetse-infested "bush" and also of areas flooded in the wet season is to be devoted to wild-life management. In either case the danger of over-population by grazing animals is the most serious threat to maintaining production.

In the infertile and arid parts of Africa there is much open woodland and "bush," and one of the main land-use problems is how this type of country should be managed. A great deal of it is "fire-climax" owing much of its present unproductive condition to the frequency of fire. According to Shantz and Marbut there is not less than four million acres of this type of vegetation in Africa south of the Sahara, perhaps twice as much. Most of it is capable of improvement but the technique probably involves not only fire control but also the linking of the bush areas with others of different and higher water status, to supply alternative grazing in the dry season or water for irrigation. It should be recognised that the removal of the bush is very often harmful both to local water relations and to soil conditions.

The range of African habitats thus falls into three main groups presenting different land-use possibilities, in which sites available for conservation of the native flora and fauna can be recognised as follows :

1. Areas suitable for intensive arable cultivation require woodland for local timber (building) and for fuel. The proportion of a territory required for this purpose is estimated at not less than one-tenth in a productive African area (e. g. Kigezi), but is more usually considered to be one-sixth of the area, in Indian and European examples. These woodlands can be used to maintain native plants and animals also.

2. More arid and/or infertile areas, still moderately productive, may be in part suitable for local seasonal cultivation or pastoral use. They are also likely to include considerable areas under

- a) water-conservation forests,
- b) protection forests designed to prevent soil erosion,
- c) pasturable woodlands in which seasonal or periodic cropping by grazing animals is the most practicable form of land-use.

These three types can, of course, be combined and in many cases they can also suitably be used for wild-life conservation.

3. Famine areas may be mainly used in conjunction with areas of excessive water supply, for developing migratory pastoral or wild-life management.

In the difficult habitats (2) and (3), so widespread in Africa there is much opportunity for the development of productive systems of land-use from the native plants and animals. In these difficult sites the choice is generally between a low level of production and a rapid site deterioration if a higher rate of production is attempted. The scale of production possible rarely justifies a large capital expenditure to overcome difficulties.

Scientific assessments suggest that the most productive forms of land-use in these difficult habitats are the natural plant and animal communities which live there, and it is likely to be most rewarding if they or something closely resembling them can be maintained. The purely biological argument is that the plants and animals living there have become adapted over millions of years to life in the rather difficult conditions, and if they are replaced by others chosen simply because they produce something useful to man, e. g. domestic animals, it will usually be at the cost of serious losses in total production and of damage to the habitat and its resources.

PRECIS OF THE PAPERS PRESENTED AT THE CONFERENCE  
ON LAND MANAGEMENT PROBLEMS IN AREAS  
CONTAINING GAME : LAKE MANYARA, TANGANYIKA  
20-22 February 1961

by

Dr. H. C. PEREIRA  
Director A.R.C.R.N., Salisbury  
Rhodesia and Nyasaland

INTRODUCTION

Some 50 officers, whose work includes detailed technical studies of scientific aspects of this group of problems, met for three days to exchange information under the chairmanship of Dr. E. W. Russell, C.M.G., Director of the East African Agriculture and Forestry Research Organisation, Muguga. Agricultural, Veterinary, Game and National Parks Departments from the three East African territories were well represented. Both Northern and Southern Rhodesia sent specialists while others attended from the two High Commission Research Organisations at Muguga and from the Makerere Veterinary School. Wild Life Specialists from the U.S.A. working in East and Central Africa played a key part in the discussions.

The Conference was opened by Chief Fundikira, then Tanganyika's Minister for Lands. He assured the meeting that the Tanganyika Government was extremely concerned to make the best use of its natural resources of land of wild life and was determined to encourage this scientific study.

This brief account is intended to include the major points in both papers and discussion. Much valuable discussion and information has perforce to be omitted in order to keep within an acceptable length. A bibliography of all references quoted in the papers is available from the E.A.A.F.R.O. Librarian, P.O. Kikuyu.

*Section I*

*The Fodder Preferences of the Principal Species of Game  
compared with those of Domestic Stock*

Paper No. 1. *Preliminary Results on Determination of Foods Eaten by some East African Wild Ungulates*, by Lee M. Talbot and Martha H. Talbot, Wildlife Research Project.

Mr. and Mrs. Talbot who are conducting a Wild Life Research Project financed by the U.S. National Academy of Sciences, the National Research Council of the U.S.A. and the New York Zoological Society and supported by the Kenya Government, have been carrying out field studies in the Mara

and Serengeti Plains areas for over two years, using Muguga as a base for operations. Mr. Talbot outlined in this paper the methods available for collection of data and explained why under the circumstances of their study the best method had proved to be the shooting of animals, after observed eating, followed by the immediate collection of swallowed food before it had been altered by digestion. Data had so far been analysed from 248 animals of some 15 species. A study of the recognisable food fragments showed that 22 forms of food each accounted for more than 2 % of the total. Competition with cattle was direct only for the main three or four grass species of which *Cynodon dactylon* is most important, e. g. among Wildebeest, Thomson's Gazelle and Topi. A wide variety of plant species are utilised by other game.

In the following discussion, Mr. Lamprey, Game Biologist of the Tanganyika Game Department, described the results of some 10,000 observations of individual animals browsing and grazing in circumstances where the species of vegetation is easily identifiable. He also found Star Grass to be by far the most important preferred food. He agreed that the observation method was not reliable when short grasses were being heavily grazed by groups of animals of different species as in the Plains study of the Talbots.

Mr. Stewart, Game Biologist of the Kenya Game Department, described his initial calibration study of faecal residues. Although this needs much preliminary work and suffers as a method from selective digestion of soft leaf as compared with the roughage components of animal diet, there are advantages which make the method worth while pursuing.

The fistula technique by which samples are automatically collected from the oesophagus or from the rumen had given definitive information about selective grazing by domestic stock in the U.S.A. This was already under trial at Muguga in co-operative work between E.A.A.F.R.O. and E.A.V.R.O. and might eventually be applied to fully tamed game animals. It was agreed that the game harvesting schemes now beginning on a pilot scale in East Africa might provide much material for stomach contents studies.

All observers agreed on the very decided preference shown by many species of game for young grass. Wildebeest herds persistently followed rainfall. A very wide range of grass species are eaten when newly sprouted but there are marked differences between game species in the extent to which grazing continues as the grass matures. Wildebeest lose interest when the grass reaches 6" or more high while Topi continue to eat grass in the dry stage.

The degree of fouling does not appear to have a major influence on selection of grazing areas although it might well become important if game were confined within restricted boundaries.

## Section II

### *Progress in Capture Techniques for the Study of Wild Animals*

Paper No. 2. *Advances in the use of muscle relaxing drugs for immobilisation and handling of the larger land mammals*, by A. M. Harthoorn and J. A. Lock, Makerere Department of Animal Physiology.

Dr. Harthoorn described the capture-drug technique as having reached the stage of an efficient tool for studies of elephant and hippo. This permitted individual marking for study of movement of these species, both of which were the subject of experimental pilot scale cropping schemes for meat supplies to the Uganda population.

There was no likelihood of the general application of one drug to all species. Careful physiological study was required. The relaxation of muscles could not be confined to those of locomotion only; respiratory muscles were also affected. In the rhino, for instance, antidotes must be given within minutes. The Uganda cob, being similar in structure to the goat, was easily matched, but very high or very low blood pressures in other species made careful selection of drugs and calculation of dosing of drugs essential. Even then, far greater mortality must be accepted than in veterinary practice. The opportunities for study of parasites and blood stream pathogens in temporarily immobilised animals was most valuable.

Paper No. 3. *A Review of the Current Position of field Immobilization in East Africa*, by Lee M. Talbot and Martha H. Talbot, Wildlife Research Project.

After paying tribute to the development work by Drs. Buechner, Harthoorn and Lock in Uganda, Mr. Talbot described joint work with Mr. Lamprey on capture and marking of game species in Tanganyika and mentioned Mr. Carter's work in capture and transfer of rhinoceros in Kenya. The Wildlife Project on which he and Mrs. Talbot were engaged made intensive use of capture drugs. The syringe-darts could be propelled by guns or by crossbows. Crossbows were favoured in Uganda and Kenya, while in Tanganyika the " Cap-Chur " gun or pistol powered by carbon dioxide capsules, was preferred. Mr. Talbot personally preferred the pistol for ranges up to 45 yards, within which 90 % accuracy could be achieved on the larger animals from a moving vehicle.

The object of the Wildlife Project was both to improve the capture techniques and to use them for the study of plains game. About 200 animals of 14 species have been drugged to determine dosages, and the results have been published.

Drugs used in medical and veterinary anaesthesia are delivered straight into the bloodstream of a patient whose age, weight and condition are known. In field capture work by dart-syringe the injection is intramuscular, subcutaneous or even intraperitoneal requiring up to several times the intravenous dose, while the age, weight and condition of the animal must be judged from a distance. Since the heavy doses necessary in these conditions may also paralyse the respiratory muscles the requirements are for a drug with a high margin of safety and a high speed of action. No single drug yet tried in East Africa satisfies all these criteria over many species. In order to establish the pattern of reaction to changing dosage rates, preliminary experiments have been made on domestic cattle where other variables can be better controlled.

Most of the work described had been done on the Wildebeest for which the drug, Gallamine, now provides an efficient means of capture.

Throughout East Africa the capture techniques have made possible the transference of many game animals as an alternative to their destruction.

### *Discussion*

No drug yet known could be given irrespective of dosage, so that treatment of water holes was not practicable. The game is paralysed, not anaesthetised, by muscle relaxant drugs, and the animals are aware of their subsequent handling. Prompt administration of tranquilizers is useful for transport and these also improve breathing by minimising the effects of overdosing with muscle relaxing drugs. Blindfolding is a routine precaution. When released after capture and marking, animals are not subsequently found to be more wary or difficult to approach.

### *Section III*

#### *Use of Light Aircraft*

Paper No. 20. *The Use of Light Aircraft in East African Wildlife Research and Game Movement*, by D. R. P. Zaphiro and Lee M. Talbot.

Paper No. 21. *Aerial Analysis of Wildlife Population Structures*, by Lee M. Talbot and D. R. P. Zaphiro.

A convincing exposition of the advantages of the use of a slow-flying high wing monoplane in game study and management was given by Mr. Zaphiro of the Kenya Game Department. The need to acquire thorough mastery of the handling of the aircraft before distracting 90 % of the pilot's attention to game observation was readily appreciated by the meeting.

Sampling estimates from air and ground had given excellent agreement in open country, and, for elephant and rhino in bush country. In thicket vegetation Impala counts were much higher from the ground. With Mr. Talbot, a method of estimating the sex ratio of Wildebeest groups was described. When disturbed the bulls took up defensive positions on the perimeter while the cows and calves went to the centre. Control of poaching, cattle trespassing and other management problems were greatly simplified. The Tanganyika National Parks had newly acquired an aircraft for this work.

### *Section IV*

#### *Possibilities of Using Game Species for Protein Production on Marginal Land*

Paper No. 4. *The Possibility of Using Wild Animals for Animal Production on East African Rangeland based on a Comparison of Ecological Requirements and efficiency of Range Utilization by Domestic Livestock and Wild Animals*, by Lee M. Talbot, H. P. Ledger and W. J. A. Payne (E.A.A.F.R.O. Animal Husbandry Division), based on a paper to the 8th Int. Congress of Animal Production (in the press).

In East Africa the main deficiency in human diet is animal protein. Very large areas of undeveloped semi-arid country have shown poor returns from domestic cattle. Difficulties of management in the marginal areas are acute. Extreme fluctuation in rainfall distribution, combined with high temperatures and sparse watering points, render this type of country extremely vulnerable to denudation, erosion and desiccation. Tsetse fly has denied large areas to cattle and these areas have thus escaped severe deterioration from overgrazing.

Even *Bos indicus* is a comparative newcomer to East Africa and the animals adapted by nature to this environment may provide a more efficient source of animal protein. In comparison with cattle many game species utilize a wider range of the vegetation flora and can make use of range at greater distances from water points; they are tolerant to trypanosomiasis and can therefore make use of tsetse-infested country. Species potentially useful for meat production include Wildebeest, Zebra, Eland, Grant's and Thomson's Gazelle, Kongoni, Buffalo, Impala, Topi, Oryx, and, in certain regions, Giraffe, Elephant and Hippopotamus. Because of widely different food preferences many species can thrive in the same habitat.

Most game species have a higher yield of edible meat, as a proportion of live weight, than is found in cattle; the killing-out percentages of both Grant's and Thomson's Gazelles, Impala and Eland all being about 60 %, while cattle of the African pastoral tribes rarely exceed 50 %. There is some evidence that Eland, which are readily domesticated and have received some study, have a higher rate of live-weight gain and an earlier maturity than have cattle in similar circumstances. Estimates of carrying capacity of acacia savannah were quoted by Mr. Talbot to show that very much heavier standing crops of game thrive without damage to the habitat, while smaller standing crops of cattle, in Masailand, cause severe land deterioration. Improvement of cattle ranching needs capital and skilled organisation; the game is already there.

The greatest need at present is for work on harvesting, distribution and marketing of game as a continuing crop.

Paper No. 5. *The use of carcass analysis techniques for investigating the meat production potential of game and domesticated animals in semi-arid areas*, by H. P. Ledger and W. J. A. Payne (E.A.A.F.R.O.), Lee M. Talbot (E. A. Wildlife Project) and D. Zaphiro, Kenya Game Department.

Mr. Ledger presented this paper and emphasised that domestic livestock producers are highly selective in both the species and strains of animals for contrasting environments. Species, selected from pigs, cattle, sheep and goats were highly adapted by specialised breeding for different forms of intensive or extensive farming. The semi-arid areas need capital expenditure on water, roads, fencing, etc., to permit domestic stock to make use of their very low intrinsic productivity. The level of animal nutrition in these areas can not be raised economically. It is therefore logical to seek other species better adapted to conversion of the existing fodder to meat.

Fat is the most uneconomical of animal products, and is more efficiently extracted as vegetable fats and oils than after conversion in the animal. The essential contribution of the animal to human diet lies in its high quality protein. Even lean cattle, giving dressed carcass weights only 45 % of live-weights, average about 18 % fat while a finished steer, killing out at 50 %, averages 28 % fat. An over-fat steer can carry 35 % of fat. The game animal carcasses which he had analysed in the Meat Research Unit at Muguga had killing out percentages of about 60 % but only 4 % of the dressed carcass was fat.

The proportion of hind-quarter (aft of the 10th rib) in the dressed carcass was higher in the small game (Gazelle and Impala 58 %) than in Zebu cattle (53 %) but lower in the Wildebeest (49 %).

The proportion of lean meat in the carcass which, according to Professor Callow is approximately 33 % and varies little among breeds of cattle, is 32 % in the Zebu at Muguga and 32 % in the goat at Mpwapwa, Tanganyika. At Muguga, however, Wildebeest carcasses averaged 42 % lean meat while Thomson's Gazelle averaged 46 %. Several pages of detailed data were presented as an appendix to this paper. The game species were thus shown to produce more lean meat and less fat and bone than do domestic cattle.

Dr. A. S. Mossman, Fulbright Scholar in Wildlife Management, gave an account of similar findings as a result of an experimental game-cropping scheme near Bulawayo. The average killing-out percentage of the Impala was 61 %. This was the main species cropped; 300 had already been marketed through the Cold Storage Commission.

Paper No. 6. *Some Aspects of Game Cropping*, by Dr. A. M. Harthoorn, Department of Animal Physiology.

Dr. Harthoorn surveyed the present experience of game-cropping in East and Central Africa and elsewhere. He discussed briefly the difficulties due to diseases such as anthrax, and food hygiene aspects of field slaughter and butchering. The use of capture drugs, followed by slaughter and correct bleeding procedures, may improve the efficiency and safety with which large animals may be harvested. In addition to poaching, licensed hunting in Uganda supplies a great deal of the meat for local populations. Crude but effective distribution and marketing arrangements already handle large quantities of meat annually.

In the discussion, work at the Kabete Veterinary Laboratories was quoted as finding both Zebra and Wildebeest carcasses to yield 50 % of liveweight as meatmeal and bonemeal, as compared to 31 %-32 % for scrub cattle.

The presence of measles in game meat was discussed at some length. The symptoms were common, but the species of tapeworm were associated with jackal and hyena rather than with the domestic dog, so that transmission to man was improbable. None of the several hundred game carcasses submitted for inspection in Southern Rhodesia had been condemned. Many present had lived on game meat for substantial periods without ill-effect. Incidence of measles in Masai cattle was, however, reported as very high. No laws at present cover inspection of venison in East Africa. This subject was further discussed, with other disease problems, later in the meeting.

Paper No. 7. *Metabolic Stress and Nitrogen Excretion*, by H. G. Livingston, E.A.A.F.R.O., Animal Husbandry Division.

In the absence of Dr. Livingston, his paper was presented by Mr. Ledger. As detailed nutritional studies are extended into semi-arid areas an outstanding anomaly is evident. Indigenous cattle gain weight on pastures whose chemical assessment indicates less than a maintenance ration. The Animal Husbandry Division of E.A.A.F.R.O. is following the two alternative hypotheses. Either the cattle are selecting high-value herbage or they possess ability to extract more nutrients from poor herbage, and to waste less of those extracted, than has been hitherto understood. On the latter hypothesis, the digestion of proteins in the temperate zone ruminant is fairly well understood. Most of the carbohydrate and protein is used in the rumen to grow micro-organisms, which

themselves yield all of the ten essential amino-acids, together with some of the B vitamins. Digestion of these bacteria in the true stomach renders the ruminant far less sensitive to diet. An endproduct of the digestion of proteins in the rumen is ammonia and some, but not all, of this ammoniacal nitrogen is wasted. Some is used by bacteria in the rumen, while some is known to be absorbed via the portal vein for conversion in the liver to urea. It is physically possible that this process may be reversible and that some non-protein nitrogen could diffuse from the bloodstream back into the rumen during periods of starvation. McDonald (1948) has shown that some of the urea also passes to the saliva for re-use in the rumen, while the excess is excreted in the urine.

For the tropical ruminant the work of Schmidt-Nielsen (1959) has shown that the camel can re-process waste urea. There is some evidence that Merino sheep have a similar ability. The reduction in urea excretion gives important economy in the use of water as urine. Zebu cattle and game animals, adapted to periodic low protein diets, may have this mechanism and its investigation is important. Comparison of nitrogen levels in blood, saliva and urea of exotic and indigenous cattle on high and low protein diets, using identical twin sets, is in progress at Muguga. In collaboration with the Game Departments of East Africa, similar studies are commencing for game species.

In the discussion, the conclusion that animals adapted to use of low-protein forage would also show the least need for water was confirmed from the experience of the game specialists present. The advantages of the mobility of game in exploiting their habitat and the destructiveness of cattle whose corresponding mobility involved return to fixed bomas and water points was described by several speakers.

A number of speakers challenged the accuracy of the means of age determination in game animals, since cattle were known to show very wide variations in the timing of their teeth-eruption.

The Game Biologists described the body-dimensions, horn diameters, degree of wear on teeth and other supplementary factors which were taken into account by full-time research workers. They were satisfied that the determinations were of sufficient accuracy to determine growth curves over large numbers of animals.

Paper No. 8. *A Method for Determining Weight of Wild Animals from External Body Measurements*, by Lee M. Talbot and J. S. G. McCulloch, Wildlife Research Project, E.A.A.F.R.O.

Mr. Talbot described the external body measurements taken on immobilized animals. These, and the method of weighing, were subsequently demonstrated in the field. Dr. McCulloch of E.A.A.F.R.O. had analysed the data statistically and had suggested that while useful results could be obtained using a polynomial form of regression, the equation had no physical meaning. Use of the product of length and girth to give the dimensions of volume held more promise. The external measurements for the 100 beasts examined, were capable of predicting live weight with a standard error of only 5 %. Elimination of the weights of viscera and of stomach fill on a subsample of 16 ounces did not show any improvement in accuracy.

Mr. Leslie Brown, Chief Agriculturist, Kenya Department of Agriculture, gave a brief talk on range-management. He commented on the lack of men and money allotted to research on land-use in ranching areas of East Africa. Much use of marginal land for cultivation, developed at public expense, was following the earlier mistakes of the U.S.A. Even where commercial ranching is in skilful hands, there is evidence of slow deterioration of rangeland and invasion of bush species. In some African areas, less skilfully used, this process had reached the final stage of continuous dense bush cover with grasses excluded. It was doubtful whether man would ever be able to manage marginal ranch-land efficiently with the present narrow range of species of domestic stock. Game species, adapted to make use of a wider range of forage, may well prove essential. Research was needed as a matter of urgency before further public money is spent in developing marginal areas with the inadequate knowledge at present available.

In the following discussion, there was strong support for the thesis that beef should be produced at higher efficiencies under intensive development; there was no economic excuse for the severe deterioration of very large areas of semi-arid land in order to produce cattle at very low efficiency. The manner of herding in concentrated groups while driven long distances to water and to bomas caused severe damage, compared with which the heavy grazing was of lesser importance. There was large scale evidence of deterioration of open grasslands to bush and rock wilderness. Game specialists reported significant changes in the occurrence of game species as the natural fauna adjusted to the changing environment. A heavy concentration of game in acacia-savannah country could be followed by fire to limit bush development; there could be no fire after heavy grazing by cattle.

In the Western U.S.A. large areas of range-land were now showing steady improvement as simple rules of management were applied, although complete non-use had produced deterioration. Intensification of water development rendered more urgent the need for better management. U.S. experience in National Parks had shown that wild species could also lose adjustment to their environment, and the population, e. g. of elk, needed management to avoid destruction of habitat. An East African example is provided by the populations of elephant in Uganda—settlement has reduced their habitat to one-sixth of their original range but the population numbers had not accordingly changed. Forest reserves, game parks and sanctuaries are becoming over-stocked. Traditional migration routes have been blocked by settlement. Since 1927, 45,000 elephant have been shot on control operations; 8,500 of these have been killed by licenced hunters who sell the meat to the local population. More control is needed each year since the elephant are rapidly destroying their habitat. Similar observations were reported from the Mara where fire made spectacular inroads into riverine forest and thicket after damage by large concentrations of elephant (a single herd of about 400 has been seen).

The problems of grazing rotation and resting of pastures with mixed populations of game and cattle were raised. Where large populations of wild game were present, pastures rested from cattle were heavily grazed by game; no solution to this difficulty was suggested. Experience in South Rhodesian ranches with very large paddocks had so far been more promising. Game populations tended to stay in the same pastures and to respect fences.

Paper No. 9. *Preliminary Findings on the Population Dynamics of the Wildebeest in Narok District, Kenya*, by Lee M. Talbot, Wildlife Research Project.

Mr. Talbot pointed out that for management of either game or cattle knowledge is needed of rates of reproduction, rates and causes of mortality, ratios of males to females, etc. His paper presented a summary of the population dynamics of Wildebeest in the Narok district. This is the key species for any game cropping scheme and for study of interaction with cattle populations. Detailed prolonged observations from fixed posts, combined with strip sample counts and surveys by both vehicle and aircraft, were supplemented by long cross-country journeys, keeping individual groups under continuous observation. Collections throughout the year have been made in co-operation with the Kenya Game Departments, Kenya Veterinary Department, E.A.A.F.R.O. and E.A.V.R.O. to secure the maximum information from each animal shot.

Reproduction rates are high, 95 % of all females of over one year of age produce a calf each year. Mortality rates are even higher. The primary cause of adult mortality is predation. Between 200 and 300 lion and a very large population of hyena, together with leopard, cheetah and hunting dogs, account for some 4,000 wildebeest a year. Predation is particularly severe in young calves, and in the past two years in the Narok District has amounted to about 45 % of the total calf crop. There is additional loss of calves separated from their mothers when large herds are disturbed. A disease, believed to be rinderpest, also takes a heavy toll of calves 6 to 10 months old. During the past two years the total mortality in the annual calf crop during the first year of life amounts to 85 %. All known factors lead to an estimated fall in population of 17 % per year. The total population of Wildebeest has, however, dropped sharply by about 55 % in two years in the area studied. These losses cannot be accounted for in full by observed predation and disease.

In the ensuing discussion the meeting was startled to learn that Game Department officials believe that poaching losses near to the Tanganyika-Kenya border amount to "hundreds per month" so that a substantial part of this big fall in population may be due to poaching.

Mr. Talbot recommended that the region of the Serengeti National Park and the Narok District of Kenya should be treated as a single ecological unit. By the planned use of fire, game should be led to use the northern extension of the Serengeti Park. At the present rate of mortality the population of Wildebeest in the Loita-Plains, Narok-Mara area is too small to maintain itself. Before game-cropping is attempted, steps must be taken to reduce this mortality rate. In the Serengeti, however, the population is of the order of 100,000 Wildebeest, which can maintain itself even against an 85 % calf mortality.

#### *Section V*

##### *The Disease Problems of Wild Animals in relation to Domestic Stock*

Papers 10-16. *The Role of Wild Animals in the Maintenance and Transmission of Disease*, by East African Veterinary Research Organisation.

This group of admirably short and factual papers by members of the East African Veterinary Research Organisation was introduced by Mr. Brocklesby, who began by stating firmly that the veterinary profession were not prejudiced

against game : they did not believe that elimination of all game would eradicate any of the main cattle diseases from East Africa.

Paper No. 10. *Rinderpest and Game*, by G. R. Scott.

Dr. Scott tabulated the six wild species in which natural infections have been proven. These are buffalo, kudu and eland, wildebeest, impala and Warthog together with a further list of 11 species which have proved susceptible to infection by direct inoculation.

Paper No. 11. *Serological Evidence for Enzootic Rinderpest in Wildebeest of the Serengeti: Mara: Loita Plains Area*, by W. Plowright and R. D. Ferris.

Messrs. Plowright and Ferris reported tests on sera from 73 Wildebeest for neutralising antibody against Rinderpest virus. While only a small proportion of adult animals from the Amboseli-Kajiado-Kapiti area are immune to Rinderpest, all of the adults tested from the Serengeti-Mara-Loita Plains area showed past infection with the virus. Kongoni, Topi, Impala and Gazelle sera, examined in small numbers only, show no evidence of past infection. It is not yet known whether the relatively mild virus strain found in Wildebeest would be of high virulence for cattle.

Paper No. 12. *Some Observations on Caprinised Rinderpest Virus in Buffaloes*, by R. D. Brown.

Dr. Brown described some direct experiments with cattle and tame buffalo, which showed no transmission of Rinderpest virus to buffalo penned with cattle reacting from K.A.G. vaccine.

Paper No. 13. *Blue Wildebeest and Malignant Catarrhal Fever of Cattle*, by W. Plowright and R. D. Ferris.

Messrs. Plowright and Ferris reported isolation of malignant catarrh virus from 16 % of 50 apparently normal Wildebeest. Uninfected wildebeest calves, never infected by inoculation, suffered only a mild transient fever, while transmitting the disease in malignant form to bovine calves penned with them.

Paper No. 14. *The Role of Wild Swine in the Epizootiology of African Swine Fever*, by D. E. DeTray.

Dr. DeTray reported that African Swine Fever, which causes an almost 100 % mortality in domestic swine, is carried by apparently healthy warthogs in areas where no domestic swine have been introduced. In Kenya strict paddocking of domestic swine, enforced by law, has successfully prevented their infection.

Paper No. 15. *Wild Animals as Reservoirs of Theilerial Parasites Pathogenic for Cattle*, by D. W. Brocklesby.

Mr. Brocklesby, describing present knowledge of the Theilerial parasites carried by game, associated Dr. Barnett with the studies reported. In cattle *T. parva* causes East Coast Fever while *T. mutans* is ubiquitous and usually harmless. Similar organisms have been found in blood samples from 50 out of 58 Wildebeest. Work in South Africa showed buffalo to carry a similar infection. Following up this work on strains collected from buffalo in Kenya suggests that after several passages through cattle the buffalo parasite can

produce East Coast Fever. Muguga studies had recently isolated a parasite, not transmissible to cattle, which caused death of eland, with symptoms similar to those of East Coast Fever.

Paper No. 16. *Tick Records from Game Animals*, by Miss J. B. Walker.

Miss Jane B. Walker described the wide range of tick species, some of which are specific to hosts such as python, hyrax and elephant. The Brown Ear Tick which is the most important vector of East Coast Fever in cattle, has been found on buffalo and on many species of antelopes. Occurring mainly in areas having over 25 inches of annual rainfall it is often associated with the tropical bont tick, which is the principal vector of heartwater of ruminants. The bont tick has been collected from carnivores as well as from many antelope species. In the drier areas, Miss Walker described ticks with a wide choice of hosts, but without incrimination as disease vectors. *Amblyomma gemma*, which feeds on both wild and domestic ruminants, has been proved in the laboratory to be a vector of heartwater. The Blue Tick, which transmits both redwater and anaplasmosis to cattle, is rarely found on game animals.

In the discussion, the most effective method of control of parasitic diseases was, by dipping and careful management, to clean a fenced and limited area, and by preventing the ingress of infected cattle, to keep it clean. Helminth diseases depend similarly on dosing and management. Neither can be carried out so effectively in the presence of migrant populations of infected game. While exotic stock are unlikely to succeed without protection, Zebu stock have been known to thrive in game areas.

Paper No. 17. *A Note on the Game Animal Hosts of Tsetse Flies and the incidence of Trypanosomiasis in them*, by W. P. Langridge, Kenya Veterinary Dept.

Mr. Langridge described the wide range of the eight known species of tsetse fly in East Africa. Other species of biting flies can also spread trypanosomiasis. A wide range of game species showed from 10 % to 50 % incidence of trypanosomiasis. The technique devised by Weitz, to identify from a blood-smear the animal species on which a tsetse fly has fed has been most valuable in study of the feeding habits of different tsetse species. Elephant, buffalo, rhino, bushpig, Warthog and forest duiker are preferred hosts of four important species of tsetse, although large numbers of plains game were available. The high proportion of plains game infected with trypanosomiasis suggests that mechanical transmission by biting flies may be of considerable importance.

Paper No. 18. *Parasites of Game in relation to Domestic Stock*, by Dr. S. F. Barnett (Kenya Veterinary Department).

Dr. Barnett presented a formidable list of parasites of game recorded by the Veterinary Department of Kenya.

### Discussion

From a wide-ranging discussion on the role of wild game in the maintenance of endemic disease and the spread of epidemic disease there is space here to record only a few salient points.

Although rarely providing the main source of infection wild game do undoubtedly afford some hazard to cattle production. Rinderpest, Foot and

Mouth Disease, anthrax and rabies could all become very serious hazards if veterinary defences were relaxed.

When living in an environment free of trypanosomiasis there is some evidence that game species usually tolerant to this disease lose much of their immunity.

Rinderpest causes severe losses in wild game and seems to progress from one species to another. The 1960 epidemic among Kenya game in the N.F.D. almost exterminated the Greater Kudu, took about 60 % of buffalo and elephant, then laid waste the Impala herds, subsequently killed 60 Giraffe in six weeks, but did not touch Oryx, Grant's or Thomson's Gazelles. The epidemic appeared to die out on reaching the European farming area but unfortunately it has since broken through to the Mount Kenya forests, where 84 buffalo and elephant died in three weeks. It may now spread around the mountain and it is feared that the Bongo may also be decimated.

In Kenya, fly barriers are cleared to a width of two miles by bulldozer and chain and are kept bush free by burning every 2 or 3 years. Game destruction is regarded as wasteful and ineffective.

In Uganda, after bushclearing and spraying had failed (E.A.T.R.O. tried all methods in a £150,000 scheme) many thousands of cattle and many villages were evacuated while re-invasion of *G. morsitans* in a typical environment threatened W. Uganda. Game slaughter policy began and 30,000 animals have been shot in the last three years in Ankole and Bunyoro. All species are still being shot to a clearing limit line. Beyond this line 1,000 sq. miles need clearing to the lake line, which can be held. An appeal has been made to the World Bank and to I.C.A. for funds to apply insecticides.

In Northern Rhodesia, where two-fifths of the total land area is still infested with *G. morsitans* two very large fly-barrier clearings are maintained. In addition, there are 200 miles of game fence 2 meters high. The official policy is to separate game from cattle as completely as possible. Fog-spraying of insecticides at night, under a temperature inversion, had proved successful.

Many speakers expressed doubt as to future means of control of Masai cattle numbers as disease was progressively eliminated.

## Section VI

### *Marketing and Related Problems*

Mr. Leslie Brown gave a prepared assessment of the relative economic importance of extensive ranching as compared with intensive livestock industry in Kenya. Summarizing the published data for 1957-58-59, from European agricultural enterprises the average gross farm revenue from livestock was £7.9 million for these three years, of which £6 million came from intensive farming, including dairy, pigs, poultry, etc. and £1.9 million from ranching. Approximately £1.1 million came from African pastoral areas, giving a total gross revenue from the extensive livestock industry of £9 million per annum. Against this figure the estimated annual tourist revenue of £5.5 million is impressive.

In all three East African territories the land inhabited by African pastoralists was deteriorating; over many large areas the pasture resources were virtually destroyed as a result of overstocking through lack of off-take. Yet of Kenya's 6 ½ million people the majority live on a low-protein diet. If every African ate only *1 lb. of meat per week*, this would consume 600,000 stock units killing out at 500 lbs. per annum, representing a 10 % annual cull of the cattle population of six million. The purchasing power of the African community, as the result of the sale of cash crops, had increased to over £2 million per annum in recent years. This must be the fate of the excess scrub cattle from the pasture areas.

Several speakers quoted evidence that African farmers with cash crop incomes bought large amounts of meat, but were very selective purchasers; fat cattle were always chosen in spite of price, and much of the stock purchased came from European producers.

Lean stunted animals from overstocked areas of the pastoral tribes are very difficult to market. In the Karamoja District the Local Native Council field abattoir lost £10,000 in one year on scrub stock purchased at Shs. 35/- per head. They would, in fact, have lost money if the beasts had cost nothing at all since the internal market in East Africa for meat and bone meal has recently dwindled while costs of transport to overseas markets are very heavy. At present there appears to be real doubt, should a " sociological break-through " to the Masai be achieved by which they were persuaded to sell some 15 % of their cattle, whether there would be enough market demand for the off-take. Boneless meat for canning appears to be one of the possible outlets, although this needs expensive refrigerated transport.

The biggest difficulty in exporting meat is the inability of East Africa to declare freedom from Rinderpest and from Foot and Mouth disease. Complete separation of cattle from migrant game would assist in establishing control. This has already been achieved in the case of African Swine Fever. Canning is the most promising means of export but much of the Masai stock is too poor even for canning. The Kenya Meat Commission factory at Athi River cans a great deal of medium grade stock, but the East African pastoral tribes have an exaggerated idea of the value of their cattle. As a result 2,000 head per month are bought from Somali traders. Although trekked down from Somalia their cattle are sold at a realistic price at Mombasa.

On the marketing of game meat, successful reports were made by several members. Since 1958, some 1,600 hippo have been cropped in West Uganda, the carcasses being sold on the spot to contractors at about Shs. 200/- each. The meat retails readily at Shs. 1/- per lb. in African villages. Uganda Kob, also cropped systematically, has found ready sale. It is proposed to crop 1,000 elephant a year for 3 years on a similar basis. In Kenya a cropping scheme for 200 elephant a year is beginning in the Galana region. Small Veterinary Department samples showed Wildebeest to be worth about Shs. 54/- each for meat-meal plus hides while Zebra, whose hides are valuable, total Shs. 147/- each. A major problem is the distance of the game-producing areas from the main consumer areas.

In Southern Rhodesia a pilot cropping and marketing scheme has established the following values on the Bulawayo butchers' meat market.

Impala . . . . .	£ 4 each	Buffalo . . . . .	£24 each
Zebra . . . . .	£ 8 each	Duiker . . . . .	£ 1 each
Kudu . . . . .	£12 each	Warthog . . . . .	£ 4 each
Wildebeest ..	£14 each		

These prices could, with advantage, be lowered to increase the volume of trade and to make the different meats better known. At present beef prices and ranch costs, 15,000 to 20,000 acres are necessary to break even; yet there are many ranches of 10,000 acres or less. The marketing of game meat could substantially increase productivity. Government support is urgently required for the better organising of the meat-handling and marketing facilities and for the enactment of the necessary legal provisions.

The Uganda Government has already applied to F.A.O. for the assistance of a specialist in the economics of meat marketing.

It was agreed that the same of game meat must not be allowed to impede the off-take of cattle from the pastoral tribes.

Two further papers :

Paper No. 19. *The Use of Check Sheets to facilitate field recording and subsequent analysis of data*, by Lee M. Talbot;

Paper No. 23. *A proposal that a small reference book be prepared for the use of field workers associated with game husbandry problems*, by H. P. Ledger, were distributed, but time did not permit their discussion.

## *Section VII*

### *Tour of the Ngorongoro Conservation Area*

Paper No. 24. *East African Background to the Special Problems of Ngorongoro*, by A. J. Mence, Game Ranger, Member of the Ngorongoro Conservation Authority.

Mr. Mence described briefly the setting up of the Conservation area. The objectives of the C.D. and W. scheme by which it is initially financed are :

- a) Reclamation of unpalatable grasslands and the development of good grazing with greatly enhanced carrying capacity.
- b) The prevention of trampling and erosion around water supply points.
- c) The provision of additional reasonably distributed water points to permit of good range managements.
- d) Additional forest protection and improvement to protect water catchments.
- e) Special protection of the wild life in the area to the fullest extent compatible with the reasonable interests to the pastoralists.

The Nuffield Trust has granted £20,000 to provide for research work on a) under the scientific direction of Dr. Russell. The unique status of the area as an internationally known tourist attraction has to be balanced against the

agreement with the Masai under which they withdrew from the Moru Kopjes.

Progress has up to the present, been slight, because any of the improvements listed postulate the acceptance of some degree of restriction and control by the Masai. The latter have a social structure and traditional grazing habits which have as yet made no visible progress in adaptation to the changing conditions of East Africa. Removal of the biological controls of cattle disease and tribal warfare has led to gross overstocking and the virtual destruction of the grazing potential of much of Masailand. The Conservation Area therefore suffers from infiltration of stock from areas already devastated, and where the only effective biological control on cattle population is now death from starvation.

The 130 sq. miles of Crater floor support all through the year a population of some 10,000 Wildebeest and Zebra and some 3,000 to 4,000 Gazelle with a few hundred together of Eland, Waterbuck, Reedbuck and Kongoni. In addition there are 2,000 resident Masai cattle and 2,000 sheep and goats. There is thus a permanent population of about one stock-unit per 6 acres. In addition, an extra 5,000 Masai stock units enter the Crater during the dry season, to raise the grazing density to a beast per 4 acres. Well distributed permanent water and a high water table enable the Crater floor to sustain this astonishing carrying capacity.

This water supply, however, is dependent on the hydrological regime of the catchment areas. Uncontrolled burning and severe overgrazing with destructive trampling are reducing the ability of these catchments to supply a steady dry-season flow. As a result the marshes and reedbank areas on the Crater floor, favourite habitat of lion, hippo and wildfowl are drying up. There is considerable recession of the forest cover on the catchments with burning and overgrazing of the tussock grasses which replace the trees. Dr. Pereira had inspected these catchments and had reported on the hydrological effects, which justify careful catchment protection. He had commented that the destructive and undisciplined manner of the burning and grazing rendered impossible the application of a multiple land-use policy as operated in many forest reservations in the U.S.A.

The excessive pressure on the highland grazing, intensified by overstocking from areas outside the Conservation Unit, had resulted in the widespread dominance of the rather unpalatable tussock-grass *Eleusine jaegeri*. Dr. Glover and Mr. Newbould are working on this problem on behalf of the Nuffield Trust. By a combination of grazing management and controlled burning it may prove possible to reduce the tussock-grass to a palatable state and eventually to eliminate it. Until a system of grazing management can be guaranteed however, the success of such a scheme would be of questionable value, since the tussock-grass is at least a valuable protection against soil erosion. There is little plains game on the uplands and negligible competition with stock.

In the rains, however, both stock and game concentrate in very large numbers on the Serengeti Plains. With loose volcanic ash soil, high temperatures and sparse rainfall these pastures are very easily damaged. They are being damaged extensively, the most visible damage being from heavy concentrations of herded stock.

With the onset of the dry season this damage is greatly increased as the animals converge on the permanent water supplies. Development of additional water supplies has been a major task of the Conservation Authority. The sites are strictly limited by the nature of the geological structure. Two large dams, one large hafir, and several boreholes and pipelines have been newly constructed. Allocations to Masai bomas, made with the object of dispersal of grazing, have been completely ignored and heavy stock concentrations overgraze the areas in succession.

The diversion of water from the Olmoti Crater into pipelines to supply stock on the uplands grazing is believed to be at least a partial cause of the drying up of the hippo pool and marsh on the Crater floor.

The use of large grassland areas in the Eastern Plains, at present denied to the Masai by East Coast Fever, could be used if they would accept and use a dipping scheme. This they refuse to do.

# ECOLOGICAL RESEARCH AS A BASIS FOR WILDLIFE MANAGEMENT IN AFRICA

by

George A. PETRIDES<sup>1</sup>  
Michigan State University  
East Lansing, U.S.A.

Africa's wildlife is unique. Nothing like it exists anywhere else. There may be thirty or more species of hoofed animals in one small country, as there is in Uganda. They range in size from tiny dik-diks and duikers to large buffaloes and tall giraffes. Huge rhinoceri, hippopotami, and elephants are still abundant in a few areas. There is a similar variety and appeal among other animal groups.

For centuries, Africa's wildlife resource was harvested regularly, albeit by primitive methods, and supported many people. Increasing human populations and their use of the land, however, now are drastically limiting land for wildlife throughout much of the continent. Especially because of the damage they cause to crops and tree plantations, big game in Africa must be maintained mostly on wild lands if it is to be preserved for the future.

Most of the remaining wild lands have been preserved until the present by the tsetse fly. Some areas have been closed to entry because of human sleeping sickness carried by the fly, but most of these insects carry livestock trypanosomes which effectively limit settlement. Tsetse-infested areas and other wild lands still are extensive but they are becoming increasingly isolated from each other by strip-settlements along the roads. Control of tsetse flies, moreover, is being accomplished by bush clearing, game destruction, and veterinary preventatives. By whichever method tsetse control is achieved, the eventual result is occupation of the land by man and his livestock with consequent displacement of wildlife. The tsetse fly in Africa can be thanked for saving many game areas until now, but its power in the face of modern control procedures seems to be nearly at an end.

This paper proposes to discuss the problems that presently beset the preservation of all wildlife in Africa but especially it is the large grazing mammals and, to a lesser extent, their predators which are considered. While the field experience on which this paper is based was derived principally in East Africa, the comments offered are believed to have general application throughout Africa.

<sup>1</sup> The author was the first Fulbright scholar to undertake ecological research on the large mammals in Africa. He worked under the Royal National Parks of Kenya in 1953-1954 and, with Dr. Wendell G. Swank of Arizona, assisted the Uganda National Parks and Uganda Game Department in 1956-1957.

*Some Principles of Ecology*

It is becoming widely recognised that proper wildlife management procedures depend on the recognition of principles of ecology.

Put simply, ecology is the study of the interrelations between organisms and their environments. It is the analysis of environmental factors which affect the distribution and abundance of organisms. The effects of geologic history, of climate and weather, of soils and topography, of micro-organisms and other plants and animals, and indeed of everything external to the individuals or populations of organisms under study and which might affect them are appraised.

Probably, the most fundamental concept of ecologists is that *it is the characteristics of the habitat which control the abundance of an organism living in that habitat*. This should be an obvious truth, since even man's abundance is related to the availability of suitable food and shelter and to the scarcity of predators, competitors, diseases, and parasites. Yet a great many people, especially those living in cities, seem to feel that the welfare of a species somehow is a matter which is up to the species itself to ordain. The true situation must become known more widely if a real public appreciation of problems in wildlife management is to be achieved.

That environmental effects do occur is evident from field studies. For example, on Nairobi National Park grasslands in Kenya in 1953-1954 (Petrides, 1956), red-laterite soils were utilized by about four times the number of animals carried on black-cotton chernozems (Table 1). The food plants on the black soils were little eaten, perhaps being less nutritious, while those on red earths were heavily grazed.

*Table 1*

Effects of major soils on average daily density of grazing animals per square mile, Nairobi National Park, Kenya, January-July 1954 (after G. A. Petrides and W. G. Swank, 1956)

Herbivore Species	Red-laterite	Black-chernozem
Wildebeest	35.2	3.7
Thomson's gazelle	27.1	2.3
Zebra	16.6	6.0
Kongoni (Coke's hartebeest)	16.2	10.0
Impala	14.1	3.7
Grant's gazelle	10.6	4.6
Giraffe	0.8	0.04
Eland	0.2	0.02
Waterbuck	0	3.5
Cattle	10.6	0
Sheep	3.0	0
Total	134.4	33.9

Table 2  
Composition and numbers of large grazing mammals per square mile in Queen Elizabeth National Park, Uganda (from G. A. Petrides and W. G. Swank, unpublished).

	Undergrazed area	Moderately overgrazed area	Severely overgrazed area	Animal Population-response to overgrazing of <i>Themeda</i> grasslands Short-grass stage	Shrub-invasion stage
(Square miles in area)	(11.8)	(5.6)	(9.0) <sup>2</sup>		
Elephant	3.8	3.7	8.7	Decreases	Increases
Hippopotamus	2.9	1.8 <sup>2</sup>	38.5	Increases	Decreases
Buffalo	32.0	47.2	10.4	Increases	Decreases
Waterbuck	0.6	1.6	8.7	Increases	Increases
Kob	0.3	47.8	1.2	Increases	Decreases
Bushbuck	0	Q.II <sup>1</sup>	1.4	Increases	Increases
Reedbuck	0.1 <sup>1</sup>	0.3	0	Increases	Decreases
Wart Hog	0.1 <sup>1</sup>	2.2	6.9	Increases	Increases <sup>3</sup>
Duiker	0	0.1 <sup>1</sup>	0.1 <sup>1</sup>	Increases	Increases <sup>3</sup>
Total Numbers	39.8	104.8	75.9		
Number in terms of 1000-lb. animals	63.7	76.6 <sup>2</sup>	177.9		

<sup>1</sup> Densities computed from monthly censuses during the period November 1956-May 1957.

<sup>2</sup> Nocturnal use of this area by hippos could not be calculated and is omitted; total biomass supported doubtless is somewhat higher than indicated.

<sup>3</sup> Probably decreases and is replaced by the bush-pig as bush becomes close, since the wart hog is a grass-eater.

In Queen Elizabeth National Park, Uganda, in 1956-1957 (Petrides and Swank, 1958), differences in the composition and density of the vegetative habitat evidently caused marked variation in the numbers and kinds of ungulates present (Table 2).

Another important idea in ecology which follows directly from the above, is that each unit of habitat has an ability to support continuously only a certain number of each kind of animal. If a higher number of animals are allowed to occur there, they will damage their food supplies. Too many herbivores will destroy their forage; too many carnivores will diminish their prey. *There is a maximum number of each species of animal which can be supported by a habitat without damage to that habitat.* This number is known as the carrying capacity of that habitat for the species concerned. One area of habitat thus may have a series of different carrying capacities, one for each species of organism which it supports.

Usually, the carrying capacity is expressed in terms of the maximum numbers of a species which a unit of habitat can support without damage to the habitat either throughout the year or during the period when the species is present. In Queen Elizabeth National Park, the carrying capacity of the grasslands for hippopotami from November 1956 to June 1957 was about 27 animals per square mile in the areas studied. This was determined by carefully counting at intervals all herbivores present (Table 2) and then comparing their numbers and weights with the condition of the grasslands over which they grazed at night (Tables 3 and 4).

Table 3

Condition of grassland range in Queen Elizabeth National Park, Uganda, as compared with average daily biomass of grazing animals, November, 1956-May, 1957 (from G. A. Petrides and W. G. Swank, unpublished)

General range condition	Undergrazed	Moderately overgrazed	Severely overgrazed
Percentage of plots protected by vegetation or litter	96.2	47.4	34.6
Percentage of plots showing developed erosion pavement	0	6.1	50.8
Total number of plots (March 20-June 3)	158	600	710
Total herbivore biomass, in terms of 1000-pound animals	63.7	76.6 <sup>1</sup>	180.3

<sup>1</sup> Estimated average range carrying capacity is about 80,000 pounds of herbivore biomass per square mile per day. The carrying capacity for 3000-pound hippos is estimated as 80,000÷3000 = about 27 animals.

It also follows that *the condition of the vegetative range indicates the relative abundance of herbivores foraging on it.* In Queen Elizabeth National Park, for example, not only did the density of the vegetation and consequent soil

coverage differ according to the abundance of (mainly) hippos feeding on the area (Table 3) but the species of plants growing on the study areas varied markedly according to the degree of forage utilization as did the weights of total vegetation present (Table 4). It is evident that to fully interpret the effects of grazing on the development of vegetation it is necessary to study the order of plant succession in the area under conditions of light to heavy grazing pressure and to compare the observed vegetative conditions with the expected stage of plant succession.

*Table 4*

Condition of the grassland range in Queen Elizabeth National Park, Uganda, as determined from species percentage composition and forage weights, March 20-June 1, 1957 (from G. A. Petrides and W. G. Swank, unpublished)

General range condition	Undergrazed	Moderately overgrazed	Severely overgrazed
Selected plants :			
Themeda triandra	42.3	7.2	0.4
Heteropogon contortus	4.7	16.0	
Sporobolus stapfianus	2.0	18.6	7.8
Brachiaria decumbens	0.5	10.0	3.2
Tragus berteronianus			6.6
Eragrostis racemosa			4.3
Woody plants	trace	4.7	1.33
Forbs	2.5	3.0	32.0
Pounds of forage per acre	578	1090	4295

A still further useful concept is that *both animal and plant populations normally produce surpluses which can be harvested with no damage to the basic breeding stock*. Predators and disease organisms, of course, normally harvest the surplus of animals and contribute to the establishment of the habitat's carrying capacity. But it is true that in the absence of such restraining mortality factors, such as may well occur in national parks and other areas where predator populations are difficult to maintain at original levels (Petrides and Swank, 1958; Simon and Treichel, 1959), the reproductive rate of prey species normally is higher than required for population replacement. Regular harvests of such populations take advantage of surplus production, thereby maintaining the basic stock within the carrying capacity of the area and simultaneously profiting from the meat yield and sometimes also from fees charged for sport hunting (see beyond).

When this principle is compared with the previous ones; it becomes apparent that *unless* the surpluses of herbivorous animals are prevented, either by diseases, parasites, predators, or by man's harvest, over-populations of those animals will occur which deplete vegetative food supplies and possibly expose

the soil to erosion. Similar overpopulations can occur among carnivores, although fighting, diseases, and food scarcity tend to prevent it. If it does occur, reduced prey populations result, causing eventual food shortages and a reduction in carnivore numbers. From the standpoint of area management, overpopulations of herbivores are much more likely to occur than overpopulations of carnivores and are potentially more damaging to the management area.

Although only the barest essentials of ecological principles have been reviewed here, it can be seen that (1) the habitat is all-important in regulating wildlife abundance, (2) each unit of habitat has a limit to the number of each animal species that it can support without habitat damage, (3) the degree of vegetative utilization by animals indicates wildlife abundance in relation to the area's carrying capacity, and (4) animal populations normally produce surpluses which can be harvested regularly with no harm to those populations and with probably benefits to the habitat.

Ecological knowledge, it is evident, is essential to the management of wildlife and its habitat. It is necessary to understand the ecological relationships between the several elements of the natural community: (1) The animal species : methods must be devised for censusing important animals, for telling their sexes and ages, for discerning their reproductive and growth rates, for discovering the effects of their competitors, predators and diseases, for judging their habitat requirements and the limiting factors, and for learning their movements and social habits. (2) The plant habitat: the classification of plant species and communities, their places in succession, their relations to soil types and reactions to burning, their rates of production and resistance to grazing, must be established. (3) The land use potential: the relations of wildlife lands and the national parks to human population pressures and to other economic uses of the land should be determined.

Without adequate ecological research and knowledge, the wildlife resource is subject to improper and wasteful management.

#### Land Use Categories and Wildlife Management

The Swahili word *nyama* means either meat or animal. There are no separate names for these things either in many other African languages. This traditional African outlook toward game reflects centuries of constant watchfulness and battle to thwart the killing of livestock and sometimes humans by lions and other predators. Destruction of essential crops by elephants, hippos, rhinos, and various large herbivores also has had to be guarded against.

Most of the present game departments in African nations had their beginnings as game control units, assisting in crop protection. Despite this primary function, however, most such departments attempted controlled hunting on most lands and also undertook to preserve the wild game completely in certain areas of their jurisdictions, designated as :

A. *Game Reserves*. So far as can be determined, the only proposed benefit to wildlife on these areas is legal protection from hunting. Unless the animals concerned in fact were once being harvested faster than they were being replaced through reproduction, the game reserve offers the population no

advantage. Furthermore, there are several disadvantages (Petrides and Swank, 1958; 1960);

1. *Game reserves are not closed to settlement.* Although a non-resident often may not even legally camp in Uganda game reserves without a permit, local people may graze livestock, cut wood, cultivate crops, or utilize the area in any other way they wish, except through hunting. Thus, land uses which may be inimical to the preservation of game habitats are quite legal. It is true that adverse land use activities in game reserves are normally discouraged by district officials, but no certain permanent protection against habitat destruction is provided. Whether reserves are viewed primarily as areas on which to maintain game or as places to raise game for harvest across reserve borders, the loss of the land for other purposes would be fatal.

2. *They are not game areas for the legal hunter.* Game reserves are entirely closed to hunting. If game becomes abundant therein, this may be taken as proof of the effectiveness of the refuge. If it fails to increase then the need for the reserve seems to be all the greater. In either case, these lands, usually the best game lands, are withdrawn from legal hunting.

3. *They may lead to overgrazing and depleted food supplies.* If protected grazing animals should increase to numbers beyond the carrying capacity of the range, damage to the vegetation could well occur.

4. *They give the appearance of preserving game when they may not provide for its future.* Most national maps show these reserves and most educated residents and visitors believe that these areas provide definitely for the future of the game they contain. Since the reserves are not permanent the interested public may be misled.

B. *Game Sanctuaries.* These are areas in which either selected species (for example the white rhinoceros and mountain gorilla in Uganda) are designated as being especially protected from legal hunting, or all game species are temporarily so protected. Game sanctuaries have all the weakness of game reserves plus those inherent in their limited objectives. They are even more misleading when displayed, as is frequent, on maps of the country.

C. *National Parks.* Most nations throughout the world have established, or are establishing, national park systems for the enjoyment and education of the public. In these areas, important natural populations of animals and their vegetative habitats are set aside as *permanent* and *unspoiled* displays of natural conditions (Petrides, 1955, 1958). They serve to protect representative and scenic landscapes and associated native plant and animal communities against all encroachments. They function as living national museums, preserving samples of the original countryside and its plants and animals for the enjoyment of everyone. Local residents and those from other countries are considered and the effort is made to provide for peoples of future generations. Furthermore, national parks preserve for scientific study and for possible use in agriculture, forestry, and veld management those wild plant and animal species which might one day be needed for the improvement of man's crops, forages, domestic animals, medicines, and other biologic needs. National parks

also are very valuable in attracting tourists, since they differ from nation to nation and present natural conditions peculiar to the various parts of the world. Thus, in their several unique ways, national parks are important sources of national income. Often, they yield greater per-acre returns than any other use to which these lands could be put.

The viewpoint is occasionally expressed, however, that some wilderness areas should be set aside as strict reserves purely for scientific use. But as time goes on, pressure for other uses of land so designated would seem to prevent the application of this policy in Africa. It is believed that it would be better to provide for reasonable public use of a wilderness so as to stimulate a demand for its maintenance. Access to some portions of such an area, however, may be controlled. This could be done unobtrusively through the limitations of facilities, but, if necessary, could be accomplished through entry permit requirements.

Land use planning problems do exist in providing for national parks. One involves the desirability of bringing into a national park system adequate samples of unspoiled country in all the major biotic regions which a nation possesses. Another concerns settlers interested in cultivation, grazing, fishing, woodcutting, mining, or hunting. Provisions to plan for an adequate park system and to foresee and thwart park invasions must be made.

A major problem exists, however, where overpopulations of large herbivores are not anticipated. Such overpopulations with consequent severe damage to vegetation have occurred in Nairobi (Petrides, 1956), Murchison Falls (Petrides and Swank, 1958; Buss, 1961; Buechner, verbal)—and Queen Elizabeth (Petrides and Swank, 1958) National Parks in East Africa and in many North American and some European national parks.

When an overpopulation does occur efforts may have to be made to overcome suggestions for additional waterholes, salt stations, pasture seeding, and fencing *unless* such procedures are associated with simultaneous herbivore reductions. Otherwise, even aside from the cost involved, additional problem areas will be created by still-expanding populations of grazing animals.

Many people feel, and properly so, that there should be some forests somewhere that do not show the marks of an axe, saw or panga. Somewhere stands of trees of representative types should be allowed to grow, mature, and die, without concern that lumber is being wasted. These areas substitute cultural, scientific, recreational, and other economic values for their timber assets. There are many people who feel that nature similarly should be allowed an unmanaged course for some animal populations. If animals destroy their food supplies and die, they say, let them do so. The cycle eventually will repeat itself and habitat and animal life will recover.

But the overgrazing problem does not parallel the forest situation. Dying trees enrich the soil and tend to perpetuate at least the climax vegetation. In contrast, over-abundant herbivores may destroy the vegetation and often important soil conditions. Perhaps through the centuries such a completely-affected area would recover slowly, but even assuming that some animal life survived there to see that day, such recovery would be exceedingly slow. Much would depend upon the severity of the inflicted damage and on the availability of additional lands. But, in general, can we afford, in a crowded world, the

destruction of limited wild lands ? Will land so destroyed be saved for a comeback perhaps a hundred years or more in the future, or will it be taken during that time for other purposes ?

Looked at in another way, national parks nowadays often exist as islands in a sea of land used or planned for other purposes. Like all island biotas, those of such natural areas are more susceptible to destruction than are the biotas of extensive lands. Some national parks may contain organisms which can maintain themselves without interference by man. But the plant and animal community organization of many others will change with time. As a result of natural forces, management may be necessary in such areas to preserve certain organisms. Such management might involve the control fire, or the use of fire. Or it might involve any one of a number of possible procedures to alter an undesirable condition or trend. The prevention of severe overgrazing and overbrowsing by game animals is one such management measure. Contradictory as it may seem, it is believed that *wildlands today will often require management in order to preserve their wilderness character.*

*Hunting Reserves:* While it sometimes may be necessary to open national park lands to hunting in order to limit the increase of some animals, other suitable areas could well be designated especially for sport hunting. These would provide for recreation, with release for energies and tensions. These lands could also serve for a sport-hunting industry. On them, fees could be collected especially from non-citizen hunters, and meat could be harvested. They would also provide for the managed preservation of native fauna and flora and perhaps of local beauty spots. They could serve to preserve public lands for future recreational needs and, where located adjacent to national parks, permit the possible harvest of over-abundant national park animals.

The proposed hunting areas would somewhat resemble the controlled shooting areas in Kenya and possibly some other countries but would differ in several important respects :

1. The lands would be legally designated as being dedicated to game production.
2. The game herds would be under constant careful management.
3. Hunting by local residents would be given priority over, but should not eliminate, safari parties.

Recreational opportunities for rural Africans are relatively few. Hunting has an important place in the tradition of most tribes. Adequate and suitable lands dedicated to hunting and game production could well be set aside in each important tribal area. Either with modern weapons or with primitive individual or tribal methods, hunting could be undertaken on designated areas with no harm to the game population. Such hunting must be regulated, of course, under the guidance of trained game ecologists. When hunting is so regulated, however, preservation of both game and habitat may be as permanent as on a non-hunted area.

*Game-Ranching Areas.* Of special importance in Africa, large wild herbivores can be managed primarily for meat production on lands devoted to that purpose (Petrides, 1955; Petrides and Swank, 1958; Dasmann and Mossman, 1961;

Riney, 1960). The evidence to date indicates that such wild meat animals make more efficient use of the pasturage, have fewer disease problems, and require less range development and labor than do domestic livestock. Sporthunting may also be undertaken on these areas. Such areas under proper management could well provide for permanent game preservation.

*Non-wildlife Lands.* On lands devoted primarily to cultivation, forestry, livestock pasturage, or other purposes, it should be possible also to grow some wild animals which do not seriously compete with agricultural production. These animals would provide an additional return from the land, serve as a supplementary meat source, permit recreational hunting, and possibly enable some sport-hunting on a fee basis. Particularly the smaller and less crop-destructive wild animals might well be very useful in such situations. In Africa, much attention necessarily is given to reserving lands especially for big game preservation but the use of non-wildlife lands for secondary crops of game should not be neglected.

# DEVELOPING AN APPRECIATION FOR THE NEED OF CONSERVATION OF NATURE AND NATURAL RESOURCES

by

John A. PILE  
Public Relations Officer  
Natural Resources Board of Southern Rhodesia

## THE NEED

It requires but a brief glance back into the past to realise that it is an historical fact that whole civilizations have been completely destroyed by the wasteful use of natural resources. Today there is ample evidence that resources are still being squandered. For instance, in the United States a conservation survey estimated that nearly one third of the country's top soil has already been lost. In China the Yellow River annually carries away some 2 ½ thousand million tons of top soil. In the Republic of South Africa enough soil to cover tens of thousands of acres to a depth of some twelve inches is washed every year into the Orange River. In Southern Rhodesia 50 million tons of soil, or the equivalent of a three thousand acre farm mixes each year with the flood waters of the Sabi River. To the south again, the Kalahari Desert is reported to be moving at the rate of two miles a year towards the Indian Ocean.

While natural resources are being squandered the fact must be faced that even with the present world population there is only about 1 ½ acres of arable land from which to feed each person. Furthermore, the net daily increase is assessed by the experts to be in the region of 120 thousand. The question may well be asked " What future without conservation ? "

## THE PROBLEM

Conservationists throughout the world are, of course, fully alive to the danger that exists : the problem is to create this awareness in every member of the community. In Africa this problem is perhaps of a more complex nature due to the different races, their customs and standard of education.

In Rhodesia development has followed the same general pattern of other countries. The European brought knowledge of science, agriculture, medicine and the money and " know how " necessary for resource development. For the indigenous population this meant more stable conditions, a lowering of the natural death rate and the stopping of tribal wars. No longer was there the need for shifting cultivation, a practice which, although primitive, did little to upset the balance of nature.

Every country in the world has in some form or another experienced this agricultural, economic and social revolution. The increase in the population necessitated the opening up of more land, exploitation of mineral deposits, and the development of communications. As far as land use is concerned, ignorance on the one hand and greed on the other started the inevitable erosion of the country's basic natural resource—the soil. It is interesting to note that the number of ploughs used by the indigenous African population rose to 91 thousand between 1902 and 1939.

The immediate problem therefore which confronted the country was two-fold :

- a) the education of the more advanced sections of the farming community to the need and methods of soil conservation, and
- b) the education of the more backward indigenous population in more advanced agricultural methods adaptable to their educational, economic and environmental circumstances.

On the long term basis the need was to create an awareness of the importance of the conservation or wise utilization of all natural resources among all sections of the community, irrespective of race or creed, and whether or not their occupation was directly concerned with the natural resource wealth of the country.

#### THE APPROACH

In Southern Rhodesia the passing of the Natural Resources Act and the formation of an independent Natural Resources Board, charged among other things with " stimulating by propaganda and such other means as it may deem expedient, a public interest in the conservation and improvement of natural resources, " have resulted in the building up of a steady and comprehensive conservation education programme covering all its many and varied aspects.

On the farming side the programme is directed at educating both European and African farmers to the importance and benefits to be gained by contour ridging, grass strips and waterways in arable land, the use of organic and inorganic fertilizer, crop rotations, correct stocking rates, the advantages of fire as a servant against bush encroachment and the danger of fire that becomes the master, the hazards of stream bank cultivation and the importance of vlei and sponge protection. In fact, in this sphere of its publicity and propaganda campaign the Board covers all aspects of good farming right up to individual farm and whole catchment protection planning.

To achieve these aims a wide and varied use is made of all modern publicity and educational methods. Each week the Board presents a radio programme entitled " Our Natural Resources, " and special scripts are written for the African services, ensuring a regular flow of material. In addition, arrangements are being made for television programmes as soon as this new service has extended its present limited range. A wide variety of posters, booklets, leaflets, farming diaries and calendars are produced in runs of 30 thousand to 40 thousand. The national press and radio news service is kept well supplied with new items, special articles are written for all the various magazine publications,

and a well designed advertising campaign is conducted in all types of literature produced in the country.

With regard to visual aids, the Board has its own library of 16 mm. sound films and 35 mm. slides, each set with a special script adaptable to different audiences. Coupled with this there is close liaison with the Ministry of Education's Audio Visual Aids Service, the film libraries of Consuls, High Commissioners and Trade Commissioners, as well as those of large commercial concerns.

An integral part of any publicity campaign is the combined co-operation of Research, Conservation and Extension services, field officers of the Department of African Agriculture, and the Intensive Conservation Area Committees. The success of any conservation education campaign is completely dependent on being given the support and co-operation of all these interests, whether it be publicity supporting research and extension, or vice versa. Provided all are working together not only individual but public opinion can be swayed to cry out against the transgressor and, if necessary, sway the views of Government on the desirability of specific conservation legislation.

It will be appreciated that many of these publicity and propaganda methods, such as radio, news items, articles, films and slides, also form an integral part of an overall conservation education campaign even though they have been designed for a specific objective. However, the creation of a conservation consciousness in the public generally must obviously start with the country's youth who must be brought up with a clear understanding of responsibility towards the conservation and wise utilization of the country's natural resources that they will eventually have to shoulder.

In Southern Rhodesia it is first necessary to educate and convince the teachers, many of whom come from overseas, of the need for conservation education and the resource problems facing the country. Over the years, therefore, the Board has organized conservation courses for teachers during the vacations which last about a week and include lectures, film and slide shows and, more important, visits to the neighbouring countryside to see for themselves what is happening and what measures are being undertaken to put matters right. In addition, day, morning or afternoon outings are arranged during the year for the teachers in centres throughout the country. Only in this way has it been found possible to obtain a sympathetic approach towards conservation education in the schools.

For the children themselves a "conservation day" was originally organized each year when children planted trees in the school grounds or in the towns and villages, and conservationists visited as many schools as possible to talk to the children on some simple aspect of conservation. From this small beginning, the "day" was extended into a "conservation week," but now in Southern Rhodesia the Board, on the advice of its Conservation Education Committee, adopts one of the natural resources as the main theme for the year. Supported by the Educational Ministries and the teachers, this theme flows through the year's curriculum, with Conservation Week highlighting the year's activities. In addition, publicity and propaganda is designed to emphasize the year's theme not only in the schools but throughout all sections of the community, the Sunday of Conservation Week being observed by nearly all the ecclesiastical bodies as Conservation Sunday,

This year the theme is Wild Life Conservation. At the beginning of the year a national poster and slogan competition was organized, the winning entry forming the basis of the national campaign poster and embodying the slogan " Conserve Wild Life—Don't Destroy—Let's Enjoy. " The posters are displayed in shops, garages, halls, offices and schools throughout the country.

In order to gain wide support for the campaign and to ensure overall distribution of material all Chambers of Commerce, Publicity Associations, Town Management Boards, Wild Life and Hunters Associations and Travel Agents were advised of the campaign details and all gave the Board assurance of their support. The co-operation of these bodies does much to ensure the success of any campaign. For instance, this year a leading oil company is sponsoring the production by the Board of 40,000 wild life colouring-in books giving 24 outline illustrations of different animals with a short, simple write-up on each, for distribution to primary schools. A large tea concern is running its sales campaign on the wild life theme and is distributing coloured wall charts giving 50 illustrations of different animals with a write-up on each, and picture cards of these animals are given away with packets of tea, plus an album which may be purchased for a few pence at the stores. They have also offered a special prize in a national Wild Life Photographic Competition being run in conjunction with the campaign. This prize will enable at least four senior school children, African and European, to spend one week in the Kafue National Park. Then again, a leading soft drinks concern are using the top of the national campaign poster plus the slogan in their advertising and are giving away models of wild life for a specified number of their product's bottle tops.

A special advertising programme has been implemented which both appeals for support of the campaign and highlights pernicious practices such as snaring. This is supported by special articles in the press and magazines not only emanating from the Board but from conservationists, both Government and otherwise.

For African children 30,000 copies of the game Snakes and Ladders have been produced based on a wild life theme, the players going up the ladders for good conservation and down the snakes for bad. This game is proving extremely popular in Southern Rhodesia and the approach has attracted widespread interest from other countries.

On the radio, " Our Natural Resources " programme is regularly stressing all aspects of wild life conservation, and during Conservation Week in July a special talk was given to schools, and a quiz held in the " Young Rhodesia " programme. To capture the interest of adult listeners, a competition was held each day of Conservation Week on the Commercial Service of the Federal Broadcasting Corporation with attractive prizes being donated by commercial firms.

It is true to say that this year's campaign has aroused the interest of the whole country and from a pure publicity and propaganda point of view has been an unqualified success. It will be noted, however, the one, and probably the main essential has not been mentioned, and that is the follow-up and personal approach by Research, Conservation and Extension services and the Intensive Conservation Area organization. The success of this campaign must, therefore, be limited compared with those devoted to other resources such as soil and

water, where the follow-up proved that resource conservation paid off in cash. Nevertheless, the campaign has been a tremendous success in so far as public interest has been gained in our wild life resources, so that with general public opinion roused in sympathy we can now look forward to a greater impetus being given to research and extension services, those all important ingredients in the endeavour to create a conservation consciousness in all sections of the population irrespective of occupation, race or creed.

# ECOLOGICAL RESEARCH AS A BASIS FOR MANAGEMENT

by

H. J. van RENSBURG  
Department of Agriculture  
Tanganyika

## 1. INTRODUCTION

Regional planning on an ecological basis is a first essential step in production procedure. Soils, vegetation types, climate and environment are the main factors which influence any production plan. Rainfall seems to be the most important single factor influencing plant growth. Soil types play a very distinct role though in the absence of sufficient moisture they seem to be of minor importance. There is no doubt that the maintenance, improvement and correct use of the vegetation cover is a most important aspect of the solution.

## 2. REQUIREMENTS OF GAME ANIMALS

The main requirements for game animals are (a) Food, (b) Water, (c) a suitable Environment.

### a) *Food*

Food is required in the way of grazing, browsing and prey. There is tremendous variation in food requirement from species to species, even in respect to herbivorous animals alone, where some species are almost exclusively plains animals living largely on grassland vegetation with a small amount of browse; for example, Grant's Gazelle, Thompson's Gazelle, Wildebeest and Zebra. A second group consist of dominantly browsing animals such as the Impala, Gerenuk, Kudu and Giraffe, while the Elephant and the Rhinoceros exhibit rather extraordinary browsing habits particularly the latter which seems to have a most perverse appetite in eating what normally would seem to be most unpalatable plants such as *Euphorbia turicalli*, *Euphorbia ingens*, *Sansevieria zeylanica*, *Commiphora stuhlmannii* and a number of other succulent and latex-bearing plants. The Buffalo on the other hand prefers to live in forest or dense riverine bush but grazes mainly on grass within the forest glades and along the forest margins.

Different animals have different browsing heights depending upon their size and reach but the Giraffe is the most remarkable as he towers over the tops of trees to eat the young shoots of species such as *Balanites aegyptica* and *Boscia spp.* of which they seem to be particularly fond.

The grazing conditions are largely dependent upon the rainy season and in northern Tanganyika, an area where game concentrate, the rainfall is restricted to two rainy seasons between November and May while the rest of the year is generally dry. This long dry season between May and November, however, is often accentuated by partial or sometimes complete failure of rains during the normal rainy seasons resulting in shortage of grazing.

b) *Water*

Water requirements for different animals also vary to a very large extent. Some species such as the Buffalo require a frequent and regular supply while other species such as the Grant's Gazelle and the Giraffe can go for long periods without water.

Similarly to the grazing, the water supplies also largely depend upon the rains and when they fail it generally results in water being limited to relatively few permanent supplies due to the rapid drying up of rain ponds which usually support the animals on temporary grazing areas for considerable periods. In the case of animals such as Wildebeest and Zebra which walk backwards and forwards to restricted water supplies there is the danger of destruction of vegetation by trampling and subsequent erosion, reminiscent of the devastation which so frequently occurs around large cattle watering points where large cattle herds converge from the grazing areas and villages.

Such damage can largely be obviated with adequate numbers of well-distributed water supplies where the animals can spread out more evenly and where there is not the consistent trampling between the grazing areas and the watering points.

Furthermore the fact that certain game species do not require water at frequent intervals assist in the even dispersal of such animals thus obviating damage by trampling.

c) *Environment*

Suitable environments for different species of game animals also vary to a large extent, some being primarily bush thicket, woodland or forest species while others are plains species and are generally confined to open grassland plains. Some animals are much more confined to a specific environment than others, for example, the Waterbuck which lives in riverine bush. The Buffalo also generally remain in forest or riverine areas where there is an abundance of green succulent grass. The Rhinoceros can be found in rain forest or swamps as well as in deciduous thicket vegetation in semi-arid areas and it seems to like swampy grassland plains with tall grass, particularly if there are mud holes for wallowing in. Impala are generally confined to deciduous thicket and bush country where there is plenty of palatable browse but in areas where they are protected and fairly tame they do appear in relatively open country.

The Elephant also likes cover and is rarely seen out in the open during daylight. Some game animals will, however, leave their usual day-time habitats and cover at night and do traverse open country in search of food and water or on migration. Hippopotami, for example, will wander considerable distances at night in search of suitable grazing.

## 3. FACTORS AFFECTING ENVIRONMENT

a) *Irregular Rainfall Pattern*

Irregular rainfall can very largely effect game movements and the occurrence of unseasonal drought, particularly, can bring about many complications. During periods of widespread rain the game generally disperse and make use of rain ponds and small pools in areas where grazing is plentiful. As these dry up, however, with the advance of the dry season, the game congregate in larger numbers around the more permanent water supplies or follow customary migration routes to more distant parts. During excessive drought years with limited and restricted water supplies and acute shortages of grazing in the vicinity of permanent water supplies the situation becomes desperate and hardship amongst the animals invariably follows. Furthermore, this situation becomes increasingly difficult where grazing and water supplies are shared by game and domestic stock, for example, at Ngorongoro and in the Serengeti plains in northern Tanganyika.

The utmost necessity to control grazing animals, both game and cattle so that their numbers do not exceed the food supply during dry seasons and drought periods cannot be over-emphasised and the terrible conditions which prevail during such times should provide sufficient warning that unless necessary steps are taken to rectify the situation further periods of such disastrous hardship must inevitably follow.

Grazing control with game animals is rather a difficult task unless it can be based on controllable watering points but it is also true that due to the "scattering" habits of game and their migratory movements damage caused by wild animals is in no way comparable to the devastation caused by domestic stock in the vicinity of widely dispersed permanent water supplies. Furthermore, some game animals use extremely little water and seldom go to drink.

b) *Fire*

Over vast areas, fire has for a long period played an important part in moulding the vegetation pattern and has been the dominant factor in maintaining open grassland with scattered trees. When the grass is plentiful and dry on some of the extensive plains in semi-arid areas, fire often sweeps over many miles of plains. Sometimes it is only broken by rocky mountain ranges, roads, recently burnt areas or riverine, swamp and thicket vegetation.

Such periodic burning combined with intensive browsing by various game species maintains an open grassland vegetation pattern in which bush thickets, where the vegetation might consistently escape fire, only occur in limited local areas. Grass growth is then more or less entirely eliminated due to competition from excessive shade, lack of moisture and relatively close grazing around foothill areas and in the vicinity of permanent water.

c) *Changing Animal Populations*

Changing animal populations is another factor which effects the environment in various ways and it can largely be attributed to the following factors :

i. *Due to drought.* The effect is not always simple but can be diverse and complicated in pattern. Firstly, areas denuded from grass cover might revert

to weeds and bush and, secondly, grassland areas which in subsequent years receive lighter grazing due to reduced animal numbers might then be subjected to a period of more intense burning with greater damaging effect on woody plants.

ii. *Due to epidemics.* Occasionally widespread epidemics such as Rinderpest can reduce animal populations very drastically over large areas which can also result in increased grass growth and increasingly severe fires.

iii. *Due to settlement.* Settlement has the effect of controlling and restricting game movement and it is generally experienced that farming and game keeping do not go smoothly together unless the strictest control can be exercised and a suitable farming system can be adopted. There is generally the nightmare of damage by game animals to farm crops and the transmission of diseases to livestock where game areas are situated adjacent to developed farming enterprise.

# UTILIZATION OF WILDLIFE IN THE TRANSVAAL

by

Thane RINEY

Utilization of wildlife in the Transvaal is a well established but growing concept. First, animals were distributed throughout the province as a means of saving the species, then, as populations increased, numbers were reduced to prevent overstocking. It was soon clear that the surplus animals had real economic value and herds have increased in number to the extent that from 1955 to 1960 between two to three thousand private farms and ranches were developing wildlife as an increasing contribution to the total individual ranch income.

In 1959 alone at least 3,593 tons (over 7 million pounds) of meat was taken from private ranches in the Transvaal and this does not include meat or live animals sold from government owned and managed wildlife ranches and reserves. The final column in Table 1 was based on somewhat less than average values for carcasses of the various species sold in 1959. With the inclusion of over £8,700 income from guinea fowl this brought the total 1959 Transvaal private revenue from wildlife to over £200,000.

*Table 1*

Value of Large Mammals Shot and Sold from Transvaal Private Ranches in 1959

Species	£ Carcass Value	No. Animals Shot	£ Total Value
Impala	4	12,676	50,704
Blue Wildebeest	9	2,612	23,508
Zebra	8	1,540	12,320
Kudu	12	6,960	83,520
Springbuck	2	1,665	3,330
Blesbuck	4	1,750	17,000
Duiker	.15	1,066	799
Bushbuck	3	708	2,300
Warthog	2.10	456	1,049
		<u>31,993</u>	<u>£ 194,530</u>

Most of the Transvaal herds are increasing and it is still early to quote and generalize about total production figures for comparison with those available from other parts of Africa. However, many examples are already in hand and provide favourable indications. For example, in one 3,000 acre area live weights

of blesbuck and cattle total 52,366 pounds per square mile of live weight. Here blesbuck already contribute somewhat over one third of the total ranch income, while the land is improving from a seriously depleted condition due to years of overstocking by cattle. This summary figure does not include springbuck, impala and other wild species which are increasing in number but which are not being harvested.

In another area a rancher working severely depleted land has discovered that while 8,800 pounds of cattle per square mile degrade his land (while producing a profit of £600 on a 3,000 annual investment), 17,600 pounds of springbuck and blesbuck on the same area not only produce more profit per year (£700) but allow the land to recover, while the annual cost of maintenance and harvesting is negligible.

A shooting contractor on one large ranch has averaged about £10,000 per year (gross income) for the last several years, without apparent sign of depleting wild populations over about one half million acres. Several ranches are already realizing over £1,000 per year, net profit, and a few over £2,000 from what originally was a few animals encouraged to build up as food for labour and for aesthetic purposes. Already some ranches are gradually reducing domestic stock (both cattle and sheep) while increasing their populations of harvestable wild animals. Based on several sets of records it is clear that parts of the Transvaal can produce over 50,000 pounds live weight of inexpensively harvestable wildlife while allowing previously depleted country to improve in condition. In this southern part of Africa the total potential production on a stable basis has probably not been achieved in recent years. Although total weights of wildlife in Wankie Game Reserve in Southern Rhodesia are similar to figures presented by Talbot (see page 329) these weights apparently cannot be maintained for they are consistently associated with deterioration of the conservation values of the land. However, even in this early stage of development on marginal lands sensitive to abuse it is clear that greater production with stability can be maintained through use of wild populations than by the use of either cattle or sheep, or combinations of cattle, sheep or goats.

As one would expect from the gradual development of wildlife utilization especially over the previous 15 year period, management procedures have developed in several ways. Live animals are sold to other ranchers and the demand for live animals for restocking purposes is greater than the supply, although hundreds of wild animals are shifted annually. Some ranches have areas set aside for utilization of eight to ten species of wildlife, while others utilize but two or three species and still others combine cattle ranching with utilization of one or more species of wild mammal. One ranch successfully combines maize farming with the harvesting of blesbuck.

Marketing procedures have also developed in different ways. Meat is either sold fresh, or dried and sold as biltong. Sales take place by arrangement between ranchers and neighbouring licensed butchers, from roadside stands, or carcasses are sent to the open markets in large urban centres where they are bid for by specially licensed retail butchers in the same way as bids are made for beef and mutton. As would be expected, prices are more standardized in large urban areas.

## CONCLUSIONS

Although Transvaal workers consider wildlife utilization in its early stages, it is clear that populations of large mammals have been gradually increasing the annual income of between two and three thousand Transvaal ranches over the past decade. Much of this development is on previously depleted land now improving in condition while sustaining economic use of wildlife. It may be important for other parts of Africa—even in earlier stages of development—to recognize that the steady growth of various types of utilization of large wild mammals has already been successfully integrated with and is expanding under several different forms of land use outside National Parks.

# SURVEY AND ASSESSMENT OF RESOURCES IN WILD AREAS

by

Thane RINEY

In this discussion I am thinking of wild areas as those lands which have no stable form of land use, having been abandoned following some previous form of use, marginal lands principally occupied by large wild mammals and influenced only in a minor way by human activities, or land set aside for reserves and National Parks.

It is important as a background for planning surveys and assessments to realise that many of these wild areas in Africa are in various stages of adjustment with increasingly concentrated human populations, so that unallocated wild lands are becoming increasingly hard to find. This adds urgency to, and places priority on, the need for surveys and assessments whose ultimate purpose may lead to the most effective use of wild areas on a permanent basis.

We have observed the tendency for forms of land use adjacent to unused lands to spread into and through the unused land, and it is usual to find observers assessing wild lands in terms of potential agricultural development, pastoral expansion, water development, afforestation projects, watershed protection, tourism, and many other potential ways in which humans can make use of land.

The major issues of wild life conservationists may be the large mammal populations in Africa; the major issue for conservationists in general may be the deterioration of the land through present forms of land use; but the major issues of the governments of the various countries lie not directly with animals, vegetation or soil, but with people, and it is to be hoped, with developing some sort of stability for their economy under which all their human populations can thrive. If we, as soil, vegetation and water conservationists, or wildlife conservationists, have a case that is worth making (and I believe we have) it must be made in terms of the renewable natural resources of the country we deal with and in terms of the greatest long term benefit to the people of the country, and our investigations should be planned with this in mind.

There are two types of priority needs that seem to be worth emphasizing : the need to integrate closely the information gathered on animal surveys with the way in which the soil and vegetation is maintaining itself in the presence of our study populations, and, secondly, the need to make maximum use of the few workers now present in Africa by developing rapid survey techniques.

The close integration of information on animal populations with the present status and trend of soil and vegetation should help us present our case for wildlife in a clearer way to those individuals or organisations who are indifferent or neutral towards large mammal populations or wildlife research. No

land user, or any person concerned with the spread of desert areas in Africa, can afford to ignore the principle that whatever is done with land, unless conservation values are maintained, the soil-vegetation complex will decline in productivity. If we want to keep steady, healthy populations of animals we must consistently maintain a suitable habitat to support them. It is hard, then, to over-estimate the importance of surveys which show us how habitats are maintaining themselves in the presence of a variety of animals, and how the animals are maintaining themselves within their habitats. Survey techniques are available for detecting trouble soon after it starts to develop : trouble in the form of increasing bare ground, a decreasing cover of perennial grasses and increase in shrub or forest encroachment. Other techniques, such as classification techniques and condition indices, help detect trouble with animal populations and when these and habitat assessment techniques are combined, it is often a simple matter to demonstrate under or overstocking for large mammal species.

The second suggested priority is the development of rapid survey techniques designed to produce information that is useful to administrators who must make decisions relating to wild areas and wildlife and insofar as possible through the use of existing personnel.

A rapid survey technique has recently been developed in Rhodesia for comparing conservation status under different kinds of land use and under different densities and combinations of animals. It records easily recognised and easily measured types of observations that reflect varying degrees of trouble from the standpoint of maintaining conservation values. Through its use various management programmes were demonstrated as causing serious interference with the soils and vegetation of the land on which the animals depend. Many of the areas downgrading in condition were wild areas. They included parts of National Parks, tsetse control areas and unallocated lands, yet the marked changes taking place in the habitats of the wild animals indicated that even in wild lands, some form of management to sustain at least the basic conservation values is necessary. In this study trouble on wild lands was caused by artificial permanent water points, too frequent burning and overstocking by wild animals. Satisfactory conditions were revealed as well as unsatisfactory ones and it is hoped that this information will be of help to administrators who are interested in adjusting their own programmes of action to keep their wild areas healthy.

One Rhodesian survey of two study areas has shown that the land in one of these was in healthier condition than the other which had half the number of animals but included cattle, and which was extensively depleted. In another survey land was clearly overgrazed by wild animals alone, indicating that these lands must be watched with as much care as cattle grazing lands. On still another rapid survey it was discovered that land can continue to downgrade over 75 years after the initial cause of the trouble (overgrazing by domestic stock in this case) had stopped. These are but a few examples of results of rapid surveys to discover how the soil and vegetation 'was enduring different kinds of use.

The importance of the conservation aspect for Rhodesian wild lands is that no matter how valuable the wild land survey is today, it will be of no lasting

help if lands alongside wild lands are going out of production, for sooner or later many wild lands containing large mammals will be desired for development as the only good pieces of country left. This potential danger should help fasten our interest on lands adjacent to wild lands as well as the wild lands themselves, and to emphasise the value of full co-operation and if possible active collaboration with technicians interested in surveying and assessing renewable natural resources other than wildlife. Even from these studies it is clear that from the standpoint of simple watershed conservation, there is a need to manage even wild lands, and that surveys and assessments can be useful by uncovering problems and suggesting solutions.

Other examples of desirable types of rapid surveys suitable for Africa are : mapping of major types of land use to define and locate wild lands as well as land under different forms of use; within the wild lands, mapping of major habitat types using air photographs; under certain conditions the censusing of game animals and migrations by air, and under other more heavily forested conditions the use of indices to populations instead of actual counts; the use of spot classifications and condition indices to quickly assess differences in suitability of two different environments; the use of questioning of local human populations followed by brief field checks to determine the distribution of certain rare but well known species, like the gorilla, and the questionnaire has been used to good advantage in some parts of South Africa to determine the distribution of large mammals; the use of simplified stomach analysis by men unable to identify species, but perfectly capable of telling trees and shrubs from grass. Some of these short cut techniques have already been developed and applied on a small scale in Northern and Southern Rhodesia and South Africa, but it is urgently important to develop and publish more rapid field techniques especially suitable for field workers interested in the collecting data, but with little time for, or experience with analysis of the data.

An emphasis on increased voluntary contributions by interested existing field staff should in no way detract from the present trend of gradually working more and more professionally trained men into National Park and game departments. The most effective use of staff in conducting some types of rapid surveys and assessments will probably involve close co-operation of biologists and various types of field staff from several different departments. Especially when co-operative types of investigations are conducted it is important to emphasise the use of field forms and lists of pertinent field information required and so on.

A final suggestion is that serious consideration be given to arranging for the preparation of a handbook of various survey and assessment techniques especially designed for use in Africa by biologists and the field staffs of National Park and game departments. This would greatly facilitate comparison of evidence taken on surveys and assessments in different parts of Africa.

## CONSERVATION IN THE IVORY COAST

by

G. ROURE,

Conservator of Water and Forests, and Secretary-general of the National Committee  
for Nature Protection, Abidjan, Ivory Coast

Two major faunal Reserves, recorded in the annex to the London Convention of 1933, have been established in the Ivory Coast: the so-called " Reserve of Sassandra, " officially entitled the Reserve totale de Faune de Tai, about 1640 square miles in the west of the country, between the Sassandra and Cavally rivers; and the " Reserve in the North " or Reserve totale de Faune de Bouna, 3474 square miles. Only the latter is effectively demarcated, preserved and organized, both from the point of view of protecting the animals and affording tourists the opportunity of viewing them. It has in fact the status of a National Park. Development of the Tai reserve is dependant on the provision of roads of access, and generally the opening up of the south western region of the Ivory Coast.

The Ivory Coast can also claim a number of small faunal Reserves, rising from 75 to 110 square miles in area, some designed for protection purposes and some for controlled hunting.

There are some 250 forest reserves, making up a total of nearly 11,600 square miles, which are mainly intended for the protection of forest vegetation but are also in effect faunal reserves, although in some cases hunting rights are retained.

Finally, in the category of areas earmarked for the conservation of complete habitat and its wildlife, are :

*a)* the National Park of the Banco, a remnant of high forest about 11 ½ square miles in area, near the entrance to Abidjan, run for the benefit of the public which visit it freely and for educational purposes (it is the study area of the Ivory Coast Forestry School);

*b)* the southern part, amounting to nearly 20 square miles of the Integral Reserve of the Nimba Mountains. This Reserve was created in 1944, the greater part of it, some 56 square miles, which is also the most accessible part and includes the Research Station, lying within the Republic of Guinea.

In dealing with the problems of faunal resources, which are or could be rationally exploited, we have paid particular, in fact almost exclusive, attention to the conception of " Controlled Areas " or multi-purpose reserves. Furthermore the emphasis has always been on standardising management practice, because, in the Ivory Coast, coordination of such Reserves seems to offer the

principal means, and the one best fitted to current conditions and the immediate future to

- a) ensure the protection of the country's fauna potential; and
- b) emphasise the importance wherever possible of developing these areas for tourism and hunting, first on a regional, then on a national and finally on an international basis.

While it is true that the control of hunting and protection of the fauna introduced by the French, has not been abrogated or modified, nor indeed questioned, and remain in force *de facto*, these principles have not yet really become widely understood and deeply implanted, and too often are reduced to mere rules and regulations (usually referring only to the larger and better known species) and, moreover, are only effectively applied in the strictly controlled and fully developed game areas.

Again, while the development of tourism both for hunting and for viewing nature has only really made a beginning with the Reserve of Bouna, which had 1,000 visitors in 1960, and with the appointment of one hunting control officer, whose activities are shared by the Ivory Coast and Upper Volta, the possibility of more widespread developments depends to a great extent on social progress, the organization of holidays and leisure activities, and a general advance in the standard of living.

With regard to the utilisation of game meat for improving the diet of the people, the present position is what little use is made of animal resources is made largely (too largely) by poachers, with no reference to any rational exploitation, no real profit for the public as a whole and in such a way as seriously to endanger the future existence of the fauna. In any case the stage of rational exploitation of the fauna on a big scale for food purposes in areas characterised by very vulnerable soils and much endemic disease, ought to be preceded by a period of very careful planning of the proper protection of the fauna against individual greed and in the interests and for the advantage of the people as a whole.

Future development may well take the form of establishing local, regional, departmental or national hunting associations which, when sufficient progress along these lines has been made, will provide a secure foundation for protection and at the same time provide the necessary authority for obtaining special hunting permits, much on the lines which have been gradually and successfully developed in France over the last 50 years.

# THE NATURAL RESOURCES OF MADAGASCAR

by

Pierre SABOUREAU  
Keeper of Nature Reserves

## *Part I*

### THE PRESENT STATUS OF NATURAL RESOURCES IN MADAGASCAR

#### *A. The Environment*

The conservation and utilisation of Natural Resources are controlled by two factors, climate and population.

##### *1. Climate*

Fauna, flora, the flow of springs and rivers, the stability of soil on slopes, all depend on climate. It influences the agricultural potential, both directly through precipitation and temperature, and indirectly by the action of water on soils and their general evolution.

Three climatic regimes occur in Madagascar : a Guinea-type forest climate on the eastern slopes, what Inspector-General Aubreville has called the " East Madagascar climate " (there is a similar climate in the Sambirano district, which could be called the " Sambirano/Nossi-bé climate "); secondly, the western half of the island falls within the tropical regime of alternating dry and rainy seasons, with a 6 or 7 months dry season, and the climatic zones could be entitled " Diego-Suarez, " " West Madagascar " and " South-West Madagascar, " in the coastal belt, and " High Plateaux " in the interior; thirdly, the south of the Island only enjoys a low and irregular rainfall, and typifies the " South Madagascar " climatic zone, which has Sahelo-Soudanian affinities.

##### *2. Population*

The average density is small: 23 inhabitants to the square mile. There is much variation, from 100-130 per sq. mile on the plateaux and in the east to a very sparse population in the west; in an island distinguished by its broken hilly terrain, the highest population per unit of cultivable land is in fact to be found on the eastern slopes and the plateaux.

The population is increasing rapidly and has doubled in less than thirty years. 52 % of the people are under 18 years of age. Demographic pressure will greatly increase in the course of the next few years. This pressure is all the more acute because yield from cultivation is poor. More intensive methods of agriculture are essential, but come into conflict with the traditions of the people, who do not understand what purpose they serve.

### B. *Fauna*

The fauna of Madagascar is very peculiar. It has a very great scientific interest, and is also a tourist attraction. In backwoods areas it is a source of protein.

The fauna is endangered by various factors : some are the results of " progress " and are to be met with in all developing countries : they stem the destruction of wilderness, population increase and democratisation of hunting. Commercial exploitation is often an additional factor. Others are the survival of customs which are no longer suited to modern conditions (e. g. trapping, the use of fire), and the abandonment of taboos which formerly served to protect species ill-adapted in the struggle for existence (e. g. tortoises and lemurs).

Man has not been by any means blameless for the disappearance of certain species (e. g. Aepyornis, giant lemur, hippo). There has been a general diminution of fauna everywhere and only total protection can save some species from rapid extinction.

### C. *Flora*

The Madagascar flora is equally varied and rich in species. The original vegetation has disappeared over nine tenths of the island. Secondary vegetation now supplies building materials, but is of little value for industrial purposes. The original flora includes several ornamental species of interest to plant collectors; few species offer easily worked timber, but any forest which is at all easily accessible is intensively exploited for local needs.

### D. *Soils*

Leaching, annual fires and defective cultivation have all contributed to the impoverishment of the soil. Owing to the high population, however, much marginal land is brought under cultivation. The Agricultural Department does its best to encourage soil conservation. Due to the hilly nature of the country there is much variation of landscape.

### E. *Water*

Water is always plentiful in the eastern sector of the island, is valuable in the west and extremely precious in the south. In both west and south the life of the people and their stock, and the irrigation of crops depends absolutely on the conservation of supplies, achieved by improvement of springs and the construction of dams, wells and other water works.

## Part II

### PLANS FOR THE DEVELOPMENT AND USE OF NATURAL RESOURCES

#### A. *Fauna and Flora*

The last 2,000 years have seen a great diminution of the original habitat, which now survives in only about a sixth of the country. In developing countries, however, some destruction of primitive vegetation, to open the way for

cultivation, is inevitable, but it ought to be carried out in a properly planned way.

The Madagascar Government is anxious to preserve a sample of all the original type habitats and wildlife species. For this purpose 12 total reserves have been created since 1927, comprising about 1,900 square miles including examples of all the main biotopes. In addition there is a National Park and 17 Special Reserves for the protection of flora and fauna, covering a further 1,050 square miles. The conservation of biotopes and the species they contain is thus fairly well assured, and offers opportunity for further scientific study.

All forests protecting water catchments or steep slopes or capable of exploitation have been registered in the national Forest Estate, which it is intended to demarcate and protect against encroachment.

Under the hunting regulations all animals are classified as vermin, game or protected. The first category can be hunted all the year round; the hunting of game species is restricted to the non-breeding season; protected animals can only be killed or captured for scientific purposes.

#### B. *Soil*

Madagascar is composed of plains, of no special importance from the point of view of " nature conservation, " and mountainous zones. The soil conservation service is doing its best to check erosion in the populated parts of the latter and the Department of Agriculture is trying hard to increase the productivity of cultivable land.

#### C. *Water*

Water conservation is the responsibility of experts of the WHO organisation, who have planned a system of control, but its implementation has been put off because of the complexity of the problem. Meanwhile the Government is doing what it can, especially by protecting the vegetation cover and improving cultivation methods, a policy which in practice can only be applied progressively sector by sector.

#### D. *Value of the Tourist Industry*

Madagascar is an undeniable tourist attraction because of its landscape, its fauna and flora, and, not least, the friendliness of its people. Despite its potential, however, the value of the industry remains small, but the Government is making every effort to publicise the country and improve hotels and roads. Improvement of National Parks and other sites of special interest should also contribute to this effort.

### *Part III*

#### RESEARCH, CONSERVATION AND EVALUATION OF NATURAL RESOURCES

##### A. *Inventory and Evaluation*

Inventories have been prepared of the different habitats, examples of which have been registered as Total Reserves, while some additional reserves designed for educational purposes have recently been established. Scientific study of these areas should be facilitated as the work of demarcation progresses.

The Service des Eaux et Forêts keeps inventories of the main forest types, for protective purposes. A 1 : 1,000,000 map has been prepared, and 1 : 100,000 sheets are issued as soon as completed by the Surveys.

The Commission for Historic Monuments and Sites keeps a list of protected sites of special biological interest; the Department of Tourism is responsible for compiling lists of natural curiosities and other places worth visiting.

### *B. Ecological Research*

Madagascar has a quite extensive meteorological network. Observations are maintained in or near each Total Reserve.

Ecological research is necessary in order to elucidate the character of each of the type habitats, determine its micro-climate and the conditions of life which apply to its animals and plants. This will require much detailed observation, little of which has yet been accomplished.

### *C. Planning of Rational Exploitation*

The vital problem is to keep the balance between population and cultivation on the one hand and forests and reserves on the other. Where this balance has been disturbed, it needs to be restored. This is an integral part of the general development of the country, being closely related to the control of water, rivers and soil erosion, quite apart from the scientific, educational and even the tourist importance of the actual Reserves.

Nature Reserves have been selected purposefully in uninhabited and wild places, to represent a variety of habitats and a good sample of unmodified vegetation. Their remoteness makes conservation easier and also safeguards them from economic pressure. Being situated in areas which are hydrographically important, they also serve a protective role and therefore in themselves can be said to serve the purpose of rational utilisation.

Conservation of Natural Resources is in fact a specialised but complementary activity to those of the Department of Water and Forests which deal more with economic aspects. Hence a Nature Reserve organisation can properly be constituted as section of the Department of Water and Forests, for the sake of both efficiency and economy, but should nevertheless be accorded a certain degree of independence. It could with advantage undertake responsibility for negotiations with people living near the borders of the Reserves.

### *D. Control over Game-Cropping*

Properly speaking there is no game-cropping in Madagascar. The fauna does not include any of the larger wild animals found in the African Continent. Nevertheless some of the species, which do occur, are in demand for zoos, etc. There are no restrictions on the taking of animals not on the protected list, but trapping of protected species is controlled. Their capture can only be authorised when it is impossible to get hold of captive-bred animals. The use of the latter ensures that animals exported are in good conditions and accustomed to captivity, and does not have the disadvantage of disturbing wild life. Only

Nature Reserve staff is normally permitted to trap animals, since the ordinary forest-officers have neither the time nor the necessary special knowledge. Trapping is generally done in the neighbourhood of the Reserves and the whole operation is supervised and carried out in the best possible conditions.

#### *E. Types of Reserve*

Madagascar has three types of reserve for the protection of Nature; the total Nature Reserves, National Parks and Special Reserves for the Protection of fauna and flora. The constitution of the two first is based on the requirements of the London Convention. The network of conservation is completed by the Special Reserves, designed to protect a particular habitat, species or nesting place. They are provided for in a law, which also has appropriate power for making subsidiary regulations. Most of the Nature Reserves are surrounded by protected zones. In addition to the three categories of protected area specified, there are also a number of forest reserves and hunting reserves for which the Commission of Historic Monuments and Sites is responsible.

#### *F. Conservation Staff and their Training*

The activities of the staff of the Reserves differ from those of the forester. Their primary—though not their only—function is to be guardians. Obviously the staff of Nature Reserves must be interested in Nature; they must be observant; they must be able to recognise not only the trees and the game but also the shrubs, plants and other animals. They must know how to prepare specimens and how to capture animals.

The staff is recruited from among the foresters. This offers a double advantage : they have a good foundation for their work in their previous experience of supervision, control of expenditure and contacts with the people, and secondly they are well known to the forest staff and can keep up their old friendships, which is a great advantage in such an isolated job. It is important, in view of the specialised nature of their work, that they should be prepared to serve for a fairly long term. They get their initial training by attachment to existing staff, but, as this is not enough, they are given additional courses of instruction after posting.

### *Part IV*

#### THE PLACE OF NATURE IN LAND-USE PLANNING

##### *A. Factors of Environment*

The policy in Madagascar is to site Nature Reserves, except in special cases, away from thickly populated or development areas, in places where they can play a useful part in the general conservation of the environment. Where Reserves are desirable in populated areas, they have to be kept to a small size and are limited to the absolute minimum necessary for conserving a sufficient sample of the habitat and the species it contains : probably about 2,500 to 4,000 acres is the minimum necessary to maintain favourable conditions (the Lokobe reserve and its effect on the climate of Nossi-Bé may be quoted as an example).

*B. Economic Considerations**1. Exploitation of Forest Products*

Nature Reserves are essentially protective bulwarks and cannot readily be adapted for productive uses. Productive forestry should really be associated with land-clearing even though land-clearing is generally undertaken in the interests of agriculture. The fact is that exploitation of forest produce in a Reserve changes the environment and disturbs animal life, even if it does so to a much less extent than if the forest is being completely cleared or the animals in it are being trapped without any sort of control. However if exploitation is very carefully managed and not conducted like a mining operation, there is no very great objection to it.

*2. Agriculture*

Areas which border on the Reserves, where agriculture can be practised are not very extensive, and, since they offer a poor return, they tend to be left alone. Nevertheless where agriculture abuts on reserved land, proper agricultural practices would help to combat soil erosion and would certainly support the protective function of the Reserves, while at the same time ensuring more productivity. There would be fewer envious glances cast in the direction of the Reserves by the peasant farmers. Such improvement in the standards of agriculture would also compensate for the restrictions which must, inevitably, accompany the creation of a Reserve. In this process the human element is important: the staff responsible for the Reserves ought to remain in the same area for as long as possible and win the friendship and confidence of the neighbouring people. Then, provided agricultural improvement programmes are easily understood and the staff of the Reserves has the necessary equipment and knowledge for the job, they can be trusted to get on with it at minimum expense. In thus lending a hand with the improvement of surrounding areas the staff must not of course be diverted too much from their main objective of guarding the Reserve : it is a question of observing the proper priorities.

*3. Animal Industry and Animal Diseases*

Prohibition on the depasturing of cattle in Reserves always causes some difficulty with stock-owners, who look with envy on the more luxuriant vegetation in the Reserve, and tend to think that grazing would do it no harm. However, in relation to the size of the Reserves, the area available for pasture is vast. There is no good reason to suppose that the wild animals which find shelter in the Reserves are a reservoir for disease or any menace for that reason. This view is supported by the fact that they are generally well-isolated and can be seen to be in good health.

*4. Relation to Human Food Supply*

The Reserves, constituted as described above, have no direct bearing on human food supplies. What is necessary is to ensure that the farmers in neighbouring areas should be assisted in every way to improve their production, and to recognize the fact that the protective role of hill-top Reserves benefits cultivation and food-supplies in the land below.

### *5. Sociological and Human Factors*

Various prohibitions have been imposed in times past to protect forest, trees and animals. The people as a whole still treat Nature Reserves with a surprising degree of respect, and the notion of reservation is not foreign to their mentality. The Malagasy people are alive to the value of preserving samples of their ancestral landscape. It is chiefly the possibility of losing land which frightens them, but, if compensating benefits can be offered, they can often be persuaded into agreement.

National Parks provide a place of relaxation for town-dwellers who feel the need to get back to natural surroundings. The Malagasy love to visit places, and the Parks can meet a real need as well as helping to inspire a greater love of nature.

## SOME GENERAL POINTS

### *I. Cultural and Economic Value of Fauna and Flora*

Fauna and flora are of considerable scientific interest; they add to the richness and variety of life, of which full use can be made as long as such assets are not squandered. Within the means at her disposal, Madagascar is trying hard to preserve these assets.

### *II. Integration of the Conservation and Use of Natural Resources in Economic Development Programmes*

The conservation of natural resources, particularly of soil and water, is of primary interest to those African states, which draw their essential well-being from Agriculture. Such conservation needs :

1. *A properly protected Forest Estate.*
2. *Rational Exploitation of Land and Water.*

Every effort should be made to fix forest boundaries in perpetuity and combat soil erosion. The achievement of such aims needs a continuing effort and material resources, which may be beyond the capacity of the present generation and the period of current development programmes, but the aims should nevertheless be kept constantly in view.

Nature Reserves are a national heritage. It must be everyone's responsibility to conserve them. Responsibility for fixing the objective lies with the Government, but it needs the support and agreement of every citizen, and only in this way can major aims be achieved. Community effort in constructing roads and buildings or establishing major crops has often been successful, and in the field of nature conservation it is vital. But it must be guided by an over-all plan, which will fix the goals to be achieved, and which can be applied in successive instalments. The introduction of such a plan could well be timed to coincide with the signing of an African Charter for the Conservation of Nature. It would be a real demonstration of the sincerity of such a Charter.

### III. *Human Attitudes to Problems affecting the Use of Natural Resources*

Attitudes differ according to whether we are dealing with country or town dwellers, inhabitants of the coast or of the plateaux. Attitudes to the principal factors involved, forests, burning, animals, Reserves, can be outlined as follows :

#### a) *Forests*

The peasant always hates to abandon his claim on land : in his eyes the forest constitutes a reserve of good soil, which he can use if he feels the need of it. He does not understand its wider influence. At the most he admits that mature forest is useful for providing timber : areas which have been returned to forest many years ago still, in his eyes, remain part of the agricultural zone. This attitude of mind gives rise to much friction, and unless the Forest Estate is very carefully preserved and demarcated, it is far from safe and will continually be under pressure.

Coastal people have much the same outlook and regard the forest as inexhaustible. Only the people of the plateaux, who have plenty of land, are inclined to admit the usefulness of forest and the protection it affords.

#### b) *Burning*

On the subject of bush-fires the views of urban and rural populations are usually opposed. Cattle-owners regard bush as a nuisance, the destruction of which will improve the grass and benefit his animals; the cultivator uses the fire to clear his land or get rid of weeds : so both cattle-owner and cultivator consider that bush-burning is of value.

Town-dwellers, on the other hand dislike having the surrounding plateaux denuded by fire and the risk of damage to property. People living along the coast or on the high plateaux themselves, incline to one or other of these opposite views, according to their occupation.

#### c) *Wild Animals*

The countryman's attitude to animals is that they are only useful if they can be eaten, and that he can do as he likes about them, ignoring or destroying those which are inedible or cannot even be used to make soup. Town-dwellers do not depend on wild game for food, but like to have some of them available for recreation, though usually ready enough to accept regulations controlling the taking of game or rarer species.

#### d) *Reserves*

The Malagasy has no particular objection to the creation of Reserves, which he regards as part and parcel of traditional governmental control. In rural areas there is always a tendency to resist any extension of Reserves and the people, while not actively against them, are less enthusiastic than town-dwellers.

One absolute essential is that all Reserves must be properly demarcated, with boundaries carefully selected and adequately marked on the ground. People must be left in no doubt as to what is allowed and what is forbidden.

#### *IV. Popular Education in the Protection of Natural Resources*

This is an aspect of the conservation problem, which has not yet received sufficient attention in Madagascar. It is not enough to give occasional lectures on the subject, however carefully they are designed. The authorities responsible for Nature Reserves have done something in the way of arranging "Nature Weeks" to interest people in their work and show that there is another side to it than merely carrying out "police" duties. On the whole reactions were favourable and there is much to be said for repeating these experiments in other areas in order to build up satisfactory public relations and a more attractive "public image" of the work of the Department.

The popular attitude to anything really starts, however, with what is learned at school, so it is just as important to have nature teaching in the curriculum as it is to have school gardens. Lecture courses for adults, though useful enough, will not by themselves do much to help the situation. This does not mean that teaching of better agricultural methods is not also useful and needs to be stepped up, but teachers, training-staff, and even primary school teachers, should all be encouraged to take a real interest in the conservation of Natural Resources. A programme needs to be thought out and launched.

For the rural peasant population this educational approach may of course be too theoretical to win support for conservation and it is important to do as much as possible by practical demonstration. The cinema which has been too much neglected up to now can render great service here. Educational films should be shown whenever people can be gathered together. There is an adequate supply of projectors and other apparatus, but what needs to be organised is enough mobile cinema vans to enable visits to be made to villages throughout the country.

#### *V. International Aspects*

##### *a) The London Convention*

The Convention of 1933 was signed by colonial powers. The Government of Madagascar at present considers itself bound by it, but the situation needs to be regularized if support is to continue. Two solutions suggest themselves : either the new African States can adhere to the Convention or they can collaborate in drafting a new one, the latter a much better alternative.

In fact the Convention needs to be thoroughly revised and brought up to date, for there is no doubt that States will feel much more bound by something which they have helped to promulgate than if they merely endorse something which is still regarded as coming from abroad.

##### *b) International Activity in the Field of Nature Conservation*

There are four organisations concerned, which is really too many. FAO and UNESCO are well known in Madagascar, as is CCTA/CSA, but IUCN is still almost unknown. This is a pity because IUCN is a specialised organisation, well fitted to deal with African problems. I would suggest that IUCN in collaboration with UNESCO should concentrate on a really big propaganda

drive to popularise the idea of the Conservation of Natural Resources—particularly fauna and flora. This should be brought down to the local level and made as practical as possible, if IUCN is to exert a proper influence. CCTA/CSA and its International Soils Bureau can best be left to deal with soil conservation problems, the struggle against erosion, land use and water conservation, and have indeed done useful work in this field.

c) *The United Nations' list of Parks and Reserves*

The protection of Reserves is a matter of interest to the world at large. It is highly desirable that Reserves should not be modified, far less abolished, without reference to international opinion. Only the United Nations organisation has the necessary authority, and should take the responsibility. The UN should, therefore maintain a list of National Parks and Reserves, be notified of any changes which are proposed and have the right to give or withhold approval. Such an arrangement, which would be in tune with what was envisaged in the London Convention but of a more universal character, deserves the support of all States.

Young countries find the upkeep of Reserves a heavy charge on their expenditure, when their resources are extremely limited and first priority has to be given to equipping themselves to meet the needs of the modern world. International aid is, therefore, essential for countries which have insufficient resources to maintain their Reserves, if these are to be built on a solid foundation commensurate with their global interest, and not allowed to deteriorate from lack of funds.

d) *Proposed African Charter for the Protection and the Conservation of Nature*

A solemn declaration by all States of adherence to the principles of protection and conservation of Nature would be an excellent step forward. There is no doubt that an obligation solemnly undertaken would be more carefully observed, and cooperation in dealing with the difficult problems involved would be ensured.

However, the practical results of such a Charter will largely depend on whether the States that subscribe to it have sufficient resources to implement it and take the necessary measures, so the degree of effective application of the Charter will no doubt vary. None the less it would serve the purpose of emphasising, in popular estimation, the importance of conservation, even if its inception cannot, as would be desirable, be in all cases coordinated with firm and concerted action and intention to safeguard national heritages.

### *Conclusion*

I hope that this review of what has been done in Madagascar and what we feel are the most important aims, based on a frank statement of our point of view, will help to lead this Conference towards a solemn declaration of the principles of the Conservation of Natural Resources and towards effective and coordinated action in saving what is left of the African fauna and flora. Madagascar can be relied upon to give her full support to all steps taken towards that objective.

# INTEGRATION OF THE CONSERVATION AND DEVELOPMENT OF WILD RESOURCES WITH PROGRAMMES OF ECONOMIC DEVELOPMENT IN MODERN STATES

by

M. K. SHAWKI  
Director of Forests, Khartoum  
Republic of the Sudan

Natural resources are comparatively more fundamental to the economic development of under-developed countries than they are to more highly developed states. Renewable natural resources of flora and fauna are particularly vulnerable to misuse and depletion in fast developing modern states. This is due to their own characteristics as basic factors in production and the intrinsic characters of the economic and social set up in under-developed countries. Their importance and their vulnerability in modern states make a double call in such states for careful and rational use, which is what we mean by conservation.

If we quickly survey the main features of economic programming in modern African states we will see that although natural resources are paramount, yet the integration of their rational use, conservation and development in such programmes is by no means easy.

The greater dependence of our development programmes is on natural resources because our production is basically of primary nature needing less capital or modern skill and depending mainly on natural resources. It is highly probable that the development rate in relation to the available capital and skill in under-developed countries, comparatively, supersedes rates of development in older states higher up, or even at the top of the scale of development devised by Roscoe in his theory of development. This means we are using a greater slice of natural and human resources. This very fast rate of development increases the need for and complicates conservation work. From the subsistence economy and living conditions of underdeveloped countries stems shortage of capital, a further reason to fall back more heavily on natural resources. Psychologically citizens and statesmen of emerging modern states tend to covet industrialisation and favour it. The very basis of primary production i. e. proper Agriculture, Forestry and Animal husbandry command less enthusiasm, when voting money for development.

Shortage of technicians and low standard of technology are serious shortcomings in the field of economic planning.

In developing countries modes of land use tend to be backward and land tenure and other tribal customs and practices deleterious.

Most of the modern African states are freshly and actively acceding to political independence and are going through great social and economic

experiments. Drafting of different democratic systems, the world over, has too often resulted in chaos. In many a modern state there is a tendency to subordinate public interest to political exigencies. Proper long term economic development projects are harder to support and push against cheap immediate Governmental convenience.

All these factors render natural resources vulnerable to over exploitation, misuse and depletion.

The main characteristics of conservation and development of renewable natural resources include their need for long term investment which does not attract capital. Renewable natural resources of forests and wild animals, as opposed to mines, need good management to provide a sustained yield in perpetuity. However it is not often realised how essential such management is, particularly to fast developing countries. Hence, often it suffers from shortage of funds and the even more serious shortage of technicians.

Foreign aids are particularly prone to lack of consideration of the conservation aspect and badly need a special effort for coordination and active observation of the long term view of rational use of resources i. e. conservation of nature and natural resources. Unfortunately also the indirect benefits accruing from such conservation and development, which form a considerable proportion of their total benefits, cannot often be appreciated by the populace nor fully evaluated by naturalists and expressed in figures and introduced in the famous formulae of economists.

It is perhaps relevant to refer to a specific example of the position of conservation and development of wild life in a modern African state i. e. the Republic of the Sudan. This is a country of vast clay plains and sand dunes with some areas of rolling and lateritic country and a few widely separated groups of hills and mountains having a total area of about one million square miles. It lies between latitudes  $21^{\circ} 55'$  and  $3^{\circ} 53'$  North and longitude  $21^{\circ} 48'$  and  $38^{\circ} 30'$  East. The rainfall varies from nothing in the northern desert region to over sixty inches in the southern tropical mixed deciduous forests. In consequence the various types of vegetation tend to lie in broad bands running very roughly east and west parallel to isohyets. It has a population of about 11 millions. The demographic trend is 3 % upwards; one of the highest in the world. The standard of living is also climbing fast. The country has acceded to independence about 6 years ago.

Development programmes were first introduced about 15 years ago. During this period a total of 157 million pounds of the Sudan's own funds were spent on development but, of that, only less than one million was devoted to conservation i. e. forest conservation and rational utilization and incidental game preservation and soil and water conservation. In the said 15 years the rate of development as gauged by new funds approved for it has increased by more than 10 times while the funds devoted to conservation have dwindled, by the end of the 15 years, to  $\frac{1}{3}$  of their original proportionate level at the beginning of the period. Almost all this development was agricultural in nature.

The area under irrigated Agriculture in the Sudan has now reached a total of about three million feddans. This is about double what it was in 1950. The area under mechanized (tractor) rain agricultural crop production has now also reached a figure of about one million feddans. The total area under mechanized

agriculture in 1950 was about one thirtieth of what it is now. Extensions of railway lines since 1952 total 880 kilometres in comparison to a total of 3,247 kilometres of older lines. Work on new extensions is progressing rapidly. This is creating big new settlement centres and making more and more forest areas accessible. These rapid developments are all on natural forest land. Future progress is anticipated to be as rapid as it was during the last 10 years or even more.

Our efforts for integration of conservation in development programmes began in 1942 i. e. before our development plans, when a Soil Conservation Committee was set up to report and make recommendations on the situation in the Sudan with regard to soil erosion and desiccation and the availability of rural water supplies for the human and animal population. A Soil Conservation Board was set up to advise Government on the expenditure of funds allocated for soil conservation. It consisted of Director of Agriculture as Chairman and included a representative from the Financial, Civil, Geology, Veterinary and Forests Government Authorities, as well as two distinguished rural minded citizens. Other citizens could be co-opted when necessary. The work of this committee consisted largely of providing rural water supplies and constructing works to prevent soil erosion and impairment.

In 1955 a Land Use and Rural Water Supplies Development Board was set up to advise the Council of Ministers on all aspects of Land Use and Rural Water Development. It was given power to control policy and approval of all plans and programmes for the new Land Use and Rural Water Development Department. The Director of the Department acts according to decisions of the Board, unless the Minister of Agriculture disagrees in which case the matter is referred to the Council of Ministers. The Department became responsible for scrutinising and submitting to the Board all proposals for Land Use and Rural Water Development (including well-drilling programmes). It appears that the development envisaged in all these cases was development of water supplies, and not actual land-use. Later a sub-committee, under the terms of reference of the board recommended the following definition of land use:

" LAND USE - Means the proper use of the land for the purpose of cultivation of crops, utilization and establishment of pasture lands or forests, according to the capacity and suitability of such land, in priorities demanded by national needs and economy and in such a manner as to maintain such utilised land in good heart and perpetual productivity. "

In January 1961, the Council of Ministers established a new organisation to deal with development questions. This consists of: *a*) an Economic Council under the Prime Minister to draw up the Government Policy on development, and approve plans and budgets before submission to the Council of Ministers; *b*) a Ministerial Board for Economics and Development under the Minister of Finance to consider the annual development budget, and other sources of funds, after submission by the Ministry of Finance, and before forwarding it to the Economic Council, and to consider reports on projects and difficulties in development matters; *c*) a National Technical Board for Development under the Permanent Under Secretary, Ministry of Finance, with 17 official members (Directors of Departments, etc.) and 5 non-official members appointed by the Council of Ministers. Its responsibilities are to assess the human, material and financial resources of the country, and research into developing

them to meet the country's needs. It drafts development plans financed from local and foreign resources and supervises execution, and reports on them.

However, it cannot be claimed that the general rapid economic and social development in the Sudan is yet accompanied by sufficient forest, water and soil conservation and game preservation measures. It is regrettable to observe that progress on forests, water and soil conservation has not made enough headway. Land is still being cleared of trees and game i. e. sources of essential cellulose and protein, to produce rice and sorghum i. e. lower value carbohydrates. Development programmes in which conservation is not sufficiently integrated threaten to lead to the destruction of our main assets : natural resources. Effects of large scale deforestation are bound to be disastrous on water supplies and soil fertility, particularly as no proper rotation is yet worked out for the mechanically farmed areas. More and more productive and potential gum areas are being cleared for settlement and cultivation. The abundance of wood fuel that has so far been taken for granted can no longer continue to be assumed. Wild animals need much more active protection than they ever needed before.

It will be seen from the preceding broad survey of the characteristics of modern states and their development and the features of conservation and development of natural resources and from the short account on the relevant aspect of development in the Republic of the Sudan, as an example of such modern states, that there is a great need for proper integration of the conservation development of natural resources in economic plans particularly in developing countries. This may be achieved through strong representation at top level for the conservation point of view. A Supra-Ministerial Committee or a good representation in the country's development machinery is a primary requirement for proper integration of conservation and development. This may insure the adoption of proper land use measures including creation of forest and game reserves for the present and future. It may also ensure provision of necessary funds and a sufficient number and standard of technicians for conservation work.

There is also need for enhancing our research efforts in the field of ecology, economics and management of natural resources including game cropping and Forest utilization. We need to know more about the best means of conservation of the natural habitat.

Finally there is great need for an intensive campaign of information and mass education on principles of proper land use and conservation of nature and natural resources to counteract adverse factors of depredations; such an education and information campaign should cover the whole spectrum of society. We need to reach the common man and instruct him on the rules and ethics of forest utilization and game hunting and shooting. We need to advance to high executives who decide on development schemes and whose job it is to manipulate diverse and integrate heterogenous foreign aids and technical assistance.

By pursuing these means actively I feel certain that we should fairly well satisfy the eminent need for the integration of the conservation and development of wild resources with programmes of economic development in our modern African states. On this will depend the future prosperity of Africa.

## THE GALANA RIVER GAME MANAGEMENT SCHEME

by

N. M. SIMON

Chairman, East African Wildlife Society

Africa has long possessed a more abundant and more varied fauna than any other continent. So prolific were the assemblages of certain East African species that, until relatively recently, the great herds were considered well able to maintain themselves, and little thought was given to the question of scientific management or efficient utilization. The loss of a few hundred or a few thousand wild animals made little difference to the overall picture because casualties were soon made good through natural increase. Even as recently as the immediate post war period the nearest approach to management was a somewhat erratic and haphazard system of "control" employed by the Game Department to reduce or eliminate troublesome wild animals which were found to be in conflict with agriculture or other forms of development. In short, until the end of World War II, the wild animals in East Africa were generally considered capable of managing themselves.

From 1940 onwards the surge of development resulted in an unprecedented reduction of wild populations. At the same time the attitude of the African towards wild animals underwent a significant change. No longer was he content to limit hunting to his personal requirements. A new factor—the commercial incentive—was introduced and led to constantly mounting pressure being exerted on the diminishing wild herds. To start with the principal commodities involved were ivory, rhino horn and leopard skins, but it was not long before meat was also in demand. Illicit hunting for meat now takes place on a very large scale.

The Waliangulu, a numerically small but highly proficient hunting tribe, inhabiting the arid coastal hinterland of Kenya, were among those who were encouraged to commercialise their hunting propensities by extending their activities beyond the range of customary subsistence hunting. So successful were they that a small number of Waliangulu hunters was responsible for an estimated average annual bag of about a thousand elephants, as well as appreciable numbers of rhinos, leopards, giraffes and other species. The situation became so serious that in 1956 fears were expressed concerning the ability of the wild herds in and around the Tsavo National Park and the Coast Province to withstand such relentless, large scale slaughter. It was also recognised, by all but the Waliangulu, that the indiscriminate methods employed would, if unchecked, eventually lead to the tribe virtually poaching itself out of existence.

The Kenya Government therefore authorized the mounting of a drive against the gangs of poachers inhabiting the region. This highly successful operation, under the command of David Sheldrick, Warden of the Tsavo

National Park (East), resulted in the arrest and conviction of more than 400 Waliangulu—a substantial percentage of the total able-bodied males of that tribe.

Because the Waliangulu lived almost exclusively by hunting—the majority knowing no other vocation—it was at once apparent that a serious administrative problem would arise as soon as their prison sentences had expired. Unless alternative opportunities were offered them, the majority would have little option but to revert to their former nefarious poaching activities. The nature of the country in which they lived, and their own inclinations, precluded any possibility of interesting them in agriculture or any other conventional employment. The problem, then, was to offer the Waliangulu a legal occupation which would be acceptable to them and which would not be entirely alien to their traditional mode of life.

The problem was resolved by devising a pilot game management project, the first of its kind in East Africa, in which ex-poachers and their families were invited to participate. The area selected embraced a large part of the traditional Waliangulu hunting ground, situated roughly between the Tana and Galana Rivers, adjoining the Eastern boundary of the Tsavo National Park, and extending to more than 2,000 square miles. A generous grant from the Nuffield Foundation enabled the scheme to commence on April 1st, 1960 with the following declared objectives :

- a) to demonstrate that wild life management in arid and sub-marginal regions is a wiser form of land use, economically as well as ecologically, than conventional husbandry or pastoralism;
- b) to give legal and profitable employment to local tribesmen who had previously lived by poaching;
- c) to provide a source of cheap protein food for African consumption in a country notably deficient in protein;
- d) to establish a method of controlling excess elephant populations in the Tsavo-Park and adjacent areas;
- e) to act as a pilot game management project for the benefit of the local people which, if successful, could be extended to other tribes in East Africa.

There is no doubt that game management projects on these lines, designed for the specific benefit of the local people would, if successful, lead to gaining the support and co-operation of the African people in the conservation of wild life and wild lands. It is generally recognised that without that support the future of the African fauna is bleak indeed. For these reasons it is hardly an exaggeration to suggest that the success or failure of the Galana River Game Management Scheme is likely to have a marked influence, for better or for worse, on the future of wild life conservation in East Africa and perhaps farther afield.

The experience gained to date has indicated that, fully staffed and properly administered, the scheme could prove profitable, financially and conservation-wise. Unfortunately it has fallen short of its objectives in the first year of

operations and is unlikely to succeed unless the frustrations that have bedevilled it since its inception can be overcome.

The target for the first year envisaged the cropping of 200 elephants, but neither adequate personnel, equipment nor transport were provided for many months after the commencement of the scheme, although funds appear to have been available for the purpose. Because the minimum staff and transport requirements were not met, the scheme got away to a bad start and there is little possibility of fulfilling the first year's programme.

The Galana River Scheme is essentially a pilot project. It is therefore self-evident that the acquisition and collation of data is of the first importance. Only a qualified man can be expected to tackle this aspect of the design, and then only after protracted study. Apart from sporadic aerial counts, no work of scientific value has yet been done, neither is any contemplated in the foreseeable future. Little or nothing is known of the reproductive patterns and social structure of elephant populations and the absence of such knowledge necessarily results in a very speculative method of game management. It seems essential for an experienced ecologist or wild life biologist to be seconded to the project.

Another important aspect of the scheme that urgently requires investigation is the question of marketing. The production of large quantities of game meat is bound to conflict to some extent with the wholly admirable work at present being undertaken by the Veterinary Department in their current destocking programme. An inflated price has to be offered to the pastoralists in order to induce them to sell their cattle and this leads to an unavoidably high price being paid for poor quality beef. The marketing of cheap game meat will inevitably lead to a reduction of beef sales in some areas and clash with present attempts to destock pastoral lands—a policy which is of the utmost importance to the conservation of pastoral regions. Unless and until the marketing problem can be resolved the scheme will have small chance of success.

One of the greatest difficulties concerns the attitude of the Waliangulu participants. Although the scheme has been designed for their benefit, it is disheartening to have to record that they have little faith in what is being done. Their attitude is that if 200 elephants a year have to be shot, they should be permitted to shoot them themselves and market the meat and by-products in their own way. They cannot understand why it should be necessary to establish a headquarters, employ Game Wardens, purchase transport, etc., when they can work, as they always have, without such modern refinements. Unless the Waliangulu can come to believe in the project there is small hope that it will succeed.

One method by which this could be achieved would be to modify the present fiscal structure to enable the scheme to become truly financially self-supporting. Government has steadfastly refused to agree to this suggestion and, although one can appreciate official reluctance to allow hypothecation of revenue, the fact remains that the present financial arrangements are beyond the comprehension of the Waliangulu and they are naturally suspicious of something they cannot understand. Proceeds from the sale of ivory, etc., are at present paid into General Revenue and Government allocates an approximately equivalent sum to the scheme. This arrangement may seem straightforward enough but,

in practice, it suffices to prevent the Waliangulu from having confidence in the project. The difficulty can only be overcome by allowing the scheme to become fully self-financing, even though this involves a departure from accepted administrative practice. Regular sales of ivory and other products should be held on the spot. The accredited representatives of the Waliangulu would then be able to haggle over the price in the customary manner and come to their own terms with the dealers. The money should then be paid over in hard cash so that the participants could see the fruits of their labours instead of, as at present, having to wait for ivory to be sold at one of the twice yearly Mombasa auctions with the proceeds disappearing into General Revenue.

This may seem an insignificant point, but it is of the greatest importance when dealing with the Waliangulu. Because of their lack of faith one of the cardinal objectives of the scheme will not be met and, without the complete confidence of the participants, game management in East Africa will never become generally acceptable. A realistic, imaginative and forceful approach to the Galana River pilot project could set the pattern for future conservation trends in East Africa but, if the present opportunity is neglected, there may not be another chance to convince the local people of the advantages of controlled cropping. There is far more at stake than the scheme itself. The broader concept of obtaining the co-operation of the people through active participation in proper management of the wild life resource is in the balance.

# COMPARISON OF THE EFFICIENCY OF WILD ANIMALS AND DOMESTIC LIVESTOCK IN UTILIZATION OF EAST AFRICAN RANGELANDS

by

Lee M. TALBOT

Wildlife Research Project jointly sponsored by United States National Academy of Sciences  
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For several years ecologists with a knowledge of East African conditions have maintained that wild animals appeared to make more efficient use of East African rangeland than domestic livestock. However, lacking detailed, long-term studies, it has been difficult to back up this observation with evidence. In the past few months evidence has become available in the form of preliminary results from research projects concerned with the survey and assessment of resources in wild areas. The major part of these preliminary data come from the Wildlife Research Project and from a co-operative research program between the Project and Dr. W. J. A. Payne and Mr. H. P. Ledger of the Animal Husbandry Division of the East African Agricultural and Forestry Research Organization.

This paper summarizes the available data and briefly compares the ecological requirements and efficiency of range utilization by domestic livestock and wild animals in East Africa.

East African rangeland is characterized by low precipitation, high temperatures and high evaporation. In terms of rainfall this rangeland is in areas which have a high probability of receiving less than 20 inches a year, i. e. roughly one third of the total land area of East Africa. Although the average annual rainfall in this area may be as much as thirty five inches, the irregularity and uneven distribution of that rainfall, combined with high probability of low rainfall, high temperatures and evaporation, produce vegetation and pasture conditions usually associated with much lower annual rainfall. These lands are particularly vulnerable to overgrazing induced desiccation with consequent lowered production, and even with the best of existing economical management the production obtained from domestic livestock is quite low compared with European or American standards, yielding at the maximum a gross return of about ten shillings per acre (Ledger *et. al.*, 1961).

The forage produced on these rangelands is in the form of herbs, grasses, and woody plants which range from low bushes to tall trees. Grasses are the preferred forage and most efficient source of nutrition for the domestic cattle and sheep, and often of goats. However, except under intensive range management the grasses only form a part of the total available plant food. Of the two to three dozen grass species usually present in this range area, less than

ten percent provide the bulk of the preferred, economic livestock feed (Heady, 1959). Thus, only a small portion of the total available vegetation supports the domestic livestock crop.

Further limitations on domestic livestock production come from water needs and disease. Dry season water points are often so few and far apart that much of the range is denied to animals requiring water once each one or two days, while the pasture areas near the water points receive disproportionately heavy and destructive usage. At the same time cash yields per acre expected even from intensive management are so low that provision of sufficient improved water points is often economically unfeasible (Ledger, *et. al.*, 1961). Disease is another important livestock limiting factor. For example, large areas of East Africa are still denied to most domestic livestock due to the presence of tsetse fly. As a consequence, these are among the very few areas of East African rangeland which do not show moderate to very severe damage from overgrazing.

Attempts to increase animal production from this rangeland must fall into two categories; improvement of the range for the presently used forms of domestic livestock, and utilization of animals better adapted to the existing range conditions. Improvement and management of the existing range usually involves bush clearance, disease control, provision of water, stringent grazing control, fencing, and occasionally, reseeding. All of these operations are expensive. In many of the East African rangelands, the necessary capital for such improvements is not available, and even if it were available, the low yield per acre expected from these lands often does not justify such expenditure.

One therefore looks toward animal species better adapted to animal production under the existing conditions. The indigenous or native breeds of cattle, goats and sheep are better adapted to the existing conditions than the exotic or improved breeds (Williamson and Payne, 1959). However, even the local breeds in East Africa were imported in relatively recent times and the limitations mentioned above apply to them as well as to the more recent imports. The truly indigenous livestock are the wild animals which presumably have evolved along with or within the environment, and which therefore should be best adapted to living in it. The present studies have shown that this is indeed the case, and that the yield of meat and other animal products per acre may be potentially much greater from wild animals than from domestic livestock. The evidence supporting this conclusion comes from comparisons between domestic livestock and wild animals' diets, apparent digestive efficiency, growth rates, liveweight gains, water requirements, disease relationships, and standing crops and carrying capacities. These are discussed in turn below :

*Diet:* In East African rangelands it is not unusual to find some twenty species of wild herbivores living and feeding in the same area. These animals range in size from the twelve pound dik-dik to the three to five ton elephant. Where a variety of species are found in the same area the present study has shown that the food preferences of the various species are strikingly different and complementary (Talbot, 1961). As an example, wildebeest, zebra, and topi are basically grass eaters, yet there is relatively little overlap between each with regard to grass species and stage of growth eaten. Impala, Grant's and

Thomson's gazelle are mixed feeders, utilizing grass, herbs, and woody plants depending on the season and stage of growth. Their grass preferences are complementary to those of wildebeest, zebra and topi. Buffalo are mixed feeders, yet their grass preferences are entirely different from the antelope and zebra. Rhinoceros and giraffe rely mainly on woody shrubs and trees for their feed, and their preferences do not conflict with each other or the antelope. Thus, where such a mixed population of East African wild ungulates exists, virtually all the vegetation growth of an area provides nutrition for the animal mass living on it. Where cattle, goats and sheep graze a similar area, only a very small part of the total vegetation growth provides preferred and efficient nutrition to the animals involved.

*Digestive efficiency based on killing-out percentage and visceral weight:* The efficiency of nutrition of a mixed population of wild ungulates apparently is matched by the nutritional efficiency of the individual species involved. The killing-out percent (butcher's carcass weight expressed as a percent of liveweight) of Thomson's gazelle averages 56.8 %; Grant's gazelle averages 63.2 %; topi 53.6 %; kongoni 52.5 %; impala 59.5 %; wildebeest 50.4 %; eland 58.6 %.

In comparison, the killing-out percent of the majority of African owned cattle seldom exceeds 50 %; the long-legged tropical meat goats average about 45 %; and the indigenous sheep about 44 % (Williamson and Payne, 1959). This differential killing-out percentage on this rangeland between domestic livestock and wild animals is not a matter of fat, in fact, the wild animals have far less fat than the domestic livestock (Ledger, *et. al.*, 1961). Rather, it is due to the weight of the viscera and digestive tract fill. Most wild animals require a substantially smaller total digestive tract per unit of liveweight than the domestic livestock on the same range, indicating that their digestive systems are more efficient in utilizing the available nutrients than those of domestic livestock.

*Water requirements:* In general, cattle in East Africa are watered at least once every one or two days, but at the height of the dry season they may be watered only once every three days. Although the water in forage satisfies some of the body water requirements all domestic livestock require additional water at more or less regular intervals. The wild animals, on the other hand, have quite flexible water requirements. Oryx, Grant's gazelle and gerenuk can live for months in areas totally devoid of surface water. Thomson's gazelle, and impala can also exist for long periods with no free water. Kongoni, topi, wildebeest, eland and buffalo all drink frequently where water is available, but they are able to go waterless for several days, and to travel dozens of miles to find water if necessary, with no apparent adverse effects on maintenance of life or growth rate. A large and vigorous wild ungulate population, therefore, can be supported year-long on a range where short water supply renders only a limited population of domestic livestock possible.

*Growth rates and liveweight gains:* The average liveweight gain of cattle on East African rangeland is 0.3 lbs. per day (Ledger, *et. al.*, 1961), and that of sheep in Tanganyika over an 18 month period is 0.115 lbs. per day (Williamson and Payne, 1959). The liveweight gains of some of the principal species of wild animals (c. f. Table I) range from 0.13 lbs. a day for ten months for the

Thomson's gazelle to 0.54 lbs. a day for four years for the eland. The liveweight gain per day increases with the size of the animal involved, but with a given poundage of domestic livestock and mixed wild animals there is substantially greater liveweight gain per day from the latter. As a consequence the wild animals reach marketable or economically harvestable size at an earlier age than domestic livestock, Masai cattle, under Masai management in East Africa reach marketable size in five to seven years. Under more efficient management this stage may be brought down to about four years. Sheep and goats require one and a half to two and a half years. Thomson's gazelle require roughly fifteen months, Grant's gazelle and impala about eighteen months, topi and kongoni about two years, wildebeest two and a half years, and eland three to four years.

*Age of reproduction:* The average range cow in East Africa will breed when about three and a half years old, and improved ranching management may bring this down to two and a half years. Sheep and goats may breed first when just under a year old (Williamson and Payne, 1959). The gazelles and impala will breed when under a year old; topi, kongoni and wildebeest when just over one year old. Eland and buffalo probably breed first when two to three years old. The birth rate of most wild animals is very high. In the wildebeest herds of the Serengeti-Mara region, for example, over 95 % of all adult females in the population produce a calf each year.

*Disease Relationships:* Disease is one of the most important factors adversely affecting domestic livestock production in East Africa. While relatively little is known yet regarding the disease picture within wild animal populations, many diseases appear to affect game to a lesser extent than they affect domestic livestock. This situation is particularly true with regard to trypanosomiasis.

*Standing crops and carrying capacity:* Carrying capacity of a given rangeland is extremely difficult to state with accuracy. It varies from year depending on the climate and condition of forage vegetation. The most suitable index is the actual condition of the range (Heady, 1959). When the range is deteriorating the carrying capacity has been exceeded by the standing crop, and this is true throughout much of East African rangeland. The standing crop of domestic cattle on moderately well managed grasslands is about the equivalent of one thousand pound animal per 20 to 30 acres, or 31,000 to 32,000 pounds per square mile (Henderson, 1950; Ledger, *et. al.*, 1961; Petrides, 1956). In Masai-land acacia-savannah land outside of grazing schemes, the stocking rates of domestic livestock determined by this study range from 11,200 to 16,000 pounds per square mile, i. e. the equivalent of one animal per 20 acres, where the animal averages from 350 to 500 lbs. In bush country denied access to cattle because of tsetse fly, the standing crop of goats and sheep ranges from 2,100 to about 8,000 pounds per square mile. In contrast, identical acacia-savannah land grazed by wild animals and a few sheep and goats supports a standing crop of 90,000 pounds per square mile, and the bush country grazed by wild animals exclusively supports a standing crop of 30,000 pounds per square mile (c. f. table II). In all cases the high standing crops of wildlife appear well within the carrying capacity of the rangeland while in virtually every case

the standing crops of livestock under existing management conditions exceed the rangeland's carrying capacity, judging by vegetation deterioration.

*Magnitude of the potential wildlife harvest:* As seen from Table II, the standing crop of wild animals on acacia-savannah land may be two to eight times that of domestic livestock, and the crop of wildlife on bushland may be from four to fifteen times that of goats and sheep. Since the wild animals breed earlier, reach maximum growth quicker, achieve higher liveweight gains and higher killing out percentages than the domestic livestock on comparable land, it can be assumed that other things being equal, the potential harvest of meat and other animal products from wild animals should be several times that possible from domestic livestock alone on much East African rangeland.

At least equally important, the higher yields achieved from wild animals need not be accompanied by the pronounced land degradation that accompanies most domestic livestock raising in East Africa at present. However, careful management of wildlife is just as important as management of domestic livestock, as mismanaged wildlife can overgraze rangeland just as mismanaged domestic livestock.

*Distribution and Marketing:* From the above the use of wild animals as a source of animal products appears biologically and ecologically practical and desirable. Probably the most difficult problems to be overcome will be connected with distribution and marketing. It is suggested, therefore, that the aspect of wildlife harvest at present most in need of investigation is distribution and marketing.

*Conclusions:* From an ecological standpoint, exploration of the indigenous fauna as a source of animal production seems only logical. Presumably the basic reasons that it has not been done previously to any large extent have been lack of an urgent need to make more efficient use of African rangeland, combined with a conservatism of outlook regarding wild animals and land use. With changing conditions, the expanding need and market for animal products, and the increasing need to achieve maximum production from Africa's lands, it appears most desirable at this time to further explore the possibilities of increasing animal production through utilization of the mixed wild ungulate fauna of East Africa.

Table 1  
*Uveweight gains per day, domestic livestock and wild ungulates  
 on East African rangeland*

Species	Liveweight gain per day (lb.)	Period (mths)	Average adult weights (lb.)	Approx. age when adult weight reached (mths)
Thomson's gazelle	0.13 (0.06)	10	41- (18.6-24.0)	18
Impala	0.08 (0.04) 0.26 (0.12)	15 10	53 (45.8-59.4)	24
Grant's gazelle	0.20 (0.09) 0.26 (0.12) 0.22 (0.10) 0.44 (0.20) 0.34 (0.15) 0.50 (0.23) 0.39 (0.18) 0.52 (0.24) 0.44 (0.20) 0.41 (0.19) 0.54 (0.24)	18 10 18 12 24 12 24 12 24 12 24 12 24 30 48	101- (45.8-66.2) 146 (114.3-132.4) 252- (122.5-150.6) 292 270- 332  360- (163.3-208.7) 460 625- (283.5-376.5) 830 44- (20.0-45.4) 100 350- (158.8-453.6) 1000	24 24 30 30  45 ? 18 60
Domestic sheep <sup>1</sup>	0.12 (0.05)	18		
Domestic cattle <sup>2</sup>	0.30 (0.14)			

<sup>1</sup> Williamson and Payne (1960)

<sup>2</sup> Ledger *et. al.* (1961)

Table II  
*Yearlong standing crops of domestic livestock and wild ungulates*

Type of Range	Location	Animals	Yearlong standing crop lb./sq. mile kg./hectare	Reference
Acacia-savannah	Kenya Masailand	Cattle, goats, sheep	11,200-16,000 (19.6 to 28.0)	This study
"	"	Wild ungulates	90,000 (157.6)	"
"	Tanganyika Masailand	" "	37,400-70,300 (65.5 to 123.1)	Lamprey (1959)
Moderately managed red oat grassland	Kenya	Cattle	21,300-32,000 (37.3 to 56.0)	Henderson (1950) Petrides (1956) Ledger <i>et. al.</i> (1961)
Acacia-commiphora bushland	Kenya-Tanganyika Masailand	Sheep, goats	2,100-8,000 (3.7 to 13.5)	This study
Acacia-commiphora bushland	Kenya-Tanganyika Masailand	Wild ungulates	30,000 (52.5)	" "

# THE VALUE OF THE TOURIST INDUSTRY IN THE CONSERVATION OF NATURAL RESOURCES IN TANGANYIKA

by

T. S. TEWA

Minister of Lands and Surveys, Tanganyika

As in many other countries in Africa, we in Tanganyika need a great deal of money if we are to raise the standard of living of our people to a reasonable level. We are a poor country. The things we can produce are not likely to bring in the income we need to fulfil our hopes for the future. We are faced with having to spend large sums of money on education, health, communications and a number of other basic services, none of which will directly increase the income of the country. One of our most urgent needs, therefore, is an industry which can bring in large sums of money from outside while making the minimum demands on our slender resources for capital expenditure and for foreign exchange.

2. This need, although more stringent in Tanganyika, is experienced also of course by more advanced nations in varying degrees. It is instructive to note that these countries, including the richest among them, have recognised that one particular industry can make a special contribution towards easing their shortage of foreign exchange. That industry is tourism. Germany, Italy, Britain and France—to name but a few—have each concentrated on building up a tourist industry. Even the United States, faced with the fall in her gold balance, has recently started a drive to attract tourists to America. To these can be added a number of largely agricultural countries, e. g. Spain, Switzerland, Greece and the West Indies, where tourism has grown to become a vital factor in their national economies, enabling them to support a higher standard of living than they could otherwise do. We believe that in this matter Tanganyika can be guided by experience elsewhere and that we also should build up a tourist industry which will help substantially to make a better life for our own people.

3. To attract tourists one must have tourist attractions. Do these exist in this country? Have we something which people will travel thousands of miles to see? I think the answer is clear. The wildlife of Africa is unique. For centuries it has stirred the imagination of men in other lands with its promise of adventure. And perhaps nowhere else in Africa can one see such an abundance and variety of animals in their natural setting as in Tanganyika. In addition, we have a good climate, beautiful scenery, snow-capped mountains, the attractions of the coast and many picturesque scenes of African life. These

latter are important, particularly for tourists from other African countries—but it is the lion, the elephant, the rhino and the herds of other game which in my personal view together form the attraction to the tourists from countries outside Africa. It is these that we can set against the cathedrals and art galleries of other countries as our special tourist attraction.

4. It must, however, be said that the almost mystical and romantic regard for wild animals which some people have, has often puzzled the peoples of Africa. To many Africans, the elephant is a dangerous agricultural pest, the lion a savage killer of men and stock, and the wildebeest an unwelcome competitor for scarce grazing. Residents in Africa expect protection from damage by game and they expect to see that where human interests and those of animals conflict, the interests of animals are allowed to prevail only in carefully chosen and restricted areas. But if the mass of my countrymen are to be enlisted in the ranks of conservationists, they will need to be convinced not only that the animals in these restricted areas, that is the Parks and Reserves, can be more use to them alive than dead, but that the money necessary to preserve them would not be better spent on more schools and doctors. In other words, they will expect us to see that what they are told is "their heritage", however valuable it may be as a cultural asset, can still be made to earn its keep. Can this be done? I believe it can—through tourism.

5. There is already available a firm basis of practical experience on which to judge the tourist potential of this country. The East Africa Tourist Travel Association has estimated that in 1959 the overall value of the tourist industry to Tanganyika was just over £\ million. In 1961/1962 the Government proposes to spend directly on tourism nearly £53,000 which is about 5 % of the revenue. This money is being spent on putting in tourist roads (one is the new access road to the Ngurdoto National Park), rest camps and other amenities and on publicity both by the Tanganyika Government and through the East African Tourist Travel Association. The Dar es Salaam hotel is a tourist asset and money is being put into that. The Lake Manyara hotel is developing into an important tourist attraction and money has already been put into that. We hope to obtain the services of an expert to advise us on the realistic approach to the problem of developing tourism. When we have had this survey my colleague, the Minister for Commerce and Industry, hopes to be able to announce a co-ordinated plan for the development of tourism. I am confident that this plan will take account of the way in which our wildlife has shown itself able to attract tourists. This will be the opportunity then for "wildlife" to earn its keep.

6. In assessing the potential of the tourist industry, it is necessary to examine the factors which are likely to affect its growth. There are a number of these, all positive and well defined. Many of our visitors have come from the industrial nations of the west. The individual men and women in these countries are living in highly competitive, materialistic and complex societies whose pressures are increasing every year. More and more are they being forced to live in urban communities. They need to get away periodically from the artificiality of modern life and to refresh themselves in simpler and more natural

surroundings. And yet every year it is getting more difficult to do this. Their roads and holiday resorts are becoming increasingly cluttered up and offer less and less scope for relaxation and peaceful enjoyment. So they are turning for their holidays to places which are further and further afield from their own countries. This trend is most marked and is increasing in strength very rapidly. The time has gone when the traditional holiday resorts of the middle classes in Europe can satisfy the growing number of people seeking for freshness and something new.

7. Another factor of importance is the growing prosperity of the middle classes in these nations. No longer is foreign travel a prerogative of the rich; the main tourist market now lies in the middle and lower middle strata of society whose members spend a surprising proportion of their personal budgets in their annual holidays. If we are to develop a large tourist industry in Tanganyika, we should pay special attention to this market where big financial returns are likely to be found.

8. Lastly, the cost of travel over long distances is coming down. Air fares, and more particularly charter fares, have now reached a level which makes it possible to visit East Africa comparatively cheaply and very quickly.

9. These factors have already started to operate to East Africa's advantage and this year a number of European travel agents have launched a series of package tours from Germany and Switzerland, largely as a result of Professor Grzimek's campaign in Germany to encourage people to visit the Serengeti and other National Parks in East Africa. These tours provide a fortnight's visit to East Africa by air at an all-in cost of some £200, of which the cost of the air passage is approximately £85. Holidays at this price are already within the compass of what many people in Europe are prepared to spend on their annual holiday; and the cost will undoubtedly come down. These first package tours have proved most successful and present indications are that the numbers will at least double during the forthcoming year.

10. In view of these developments it is clear that great opportunities await any country in Africa which has an abundance of wildlife, is prepared to welcome and look after visitors from other lands and to see that reasonable sums of money are invested in hotels, roads and other tourist facilities. For although it will be our wildlife which will attract tourists to this part of the world, just as the art galleries of Florence and the waterways of Venice serve as primary inducements to visit these towns, many visitors will want to do other things as well as watch wild animals. Their holidays must be given variety. All this will require careful planning if we are to make the most of what we have to sell. But it can be done—of that I am convinced.

11. The main theme of this Conference is Conservation. My purpose in writing this paper is to bring out the close connection between tourism and the conservation of our wildlife. We cannot afford expensive measures of protection unless these result in income to the country. The more we can develop tourism the better we shall be able to justify and promote the well-being and perpetuation of our National Parks and game sanctuaries and the

more we shall enable the rest of mankind to share in our heritage. We are conscious of our responsibilities and are determined to play our part in preventing the extermination of our fauna. We are told that we hold it in trust for mankind and this we accept. For our part, however, we feel justified in calling on others to help. And one of the ways in which they can do this is to come and enjoy what we hold in trust for them.

12. Finally, let me say that we should like to see many more visitors to Tanganyika for other reasons, quite unconnected with any money that they may bring. As a newcomer among the independent nations, we need informed and sympathetic friends among the other countries of the world. We hope that those who have visited Tanganyika as tourists will go home with some insight into our problems, some sympathy with our aims and some liking for our people. This will be not the least of the benefits the wild animals can bring to our country.

# THE PROTECTION AND CONSERVATION OF NATURE IN THE REPUBLIC OF SENEGAL

by

P. TOUSSAINT-MORLET

Conservator of Water and Forests and Director of the Service des Eaux, Forêts et Chasses,  
Senegal

Professor Aubreville, retired Inspector General of Eaux et Forêts of France Overseas, has written:

" The protection of Nature as a whole is the protection of the environment in which African humanity lives—that is of the soil which it cultivates, the waters which are indispensable to its life (those which come from the sky in the form of rains and those from the soil and from the rivers) and, lastly, in general terms, the natural vegetative cover of the soils, which is the chief protection both of the soils and of water supplies. This last includes all the forests and bush, reserved and unreserved, all types of vegetation which do not amount to forest but, occurring even in desert country, have a protective role towards the soil or are useful to man. "

Questions relating to the protection of Nature in Africa have been—in recent years—the subject of much study and attention. The African Conference on Soils held at Goma, in the then Belgian Congo, in October 1949, dealt with all the problems of the rational use of the soil. The Abidjan Conference, of December 1952, examined African forestry problems. The Conference at Ibadan in November 1960, was the first meeting in Africa of the so-called Forestry Commission to be held at the international level where the problems were again reviewed: it reached the conclusion that African states must quickly establish a rational plan for land-use, in the light of the increase in population and economic expansion, if they wanted to make the best use of the still vast and widespread areas of bush which occur in the Continent. This is absolutely essential to keep climatic conditions favourable to cultivation, guard against erosion floods and drought and, finally, maintain and protect water supplies and the fertility of the soil.

As to wildlife, the Commission meeting at Ibadan agreed that it constituted a particularly valuable element of the renewable natural resources of the continent and that, here again, only adequate planning and management could ensure that it would not be thrown uselessly away.

## 1. *The Present Role of Natural Resources in the Senegalese Economy*

A. *The Environment.* Situated between latitudes 12° 18' and 16° 41', the territory of the Republic of Senegal stretches from East to West between longitudes 11° 22' and 17° 32' W., and is 76,000 square miles in area.

There are many different climatic zones in Senegal:

*a)* The Sahelo-Senegalese climate of the coastal belt from opposite the Cape Verde Islands to the northern Senegal frontier. This is characterised by the prevailing trade winds, which make conditions temperate and not unlike those of the Canary Islands;

*b)* The true Sahelo-Senegalese climate which covers the Groundnut Belt, the pastoral bush-country, the Petite Cote and the Sine-Saloum estuaries;

*c)* The Sahelo-Saharan climate of the Delta of the Senegal River and all the middle reaches of the river-mouth area;

*d)* The Sahelo-Soudanian climate of the country lying east of the longitude of Podor;

*e)* The Guinean climate of the Casamance country west of the longitude of Podor and south of a line from Koungeul to Fathala. This is a variant of the Sahelo-Soudanian climate.

In each of these different climatic zones, different soils are met with: e. g. sandy soils, found for example in the Groundnut belt in a triangle Thiès-Louga-Diourbel; wind-blown sandy soils on the sea-coast; humiferous soils; black soils characteristic of the depressions such as occur at Niayes; alluvial soils like those of Oualo and Fonde in the river valley, or those of Basse Casamance; beige-coloured soils of Sine-Saloum; and, lastly, the laterites which cover the greater part of eastern Senegal.

*B. Flora and Fauna.* Trees are a feature of the whole Senegalese landscape.

Tree cover may be very thin—*euphorbia* bushes on the dunes, tamarisk on saline soil, *Acacia Vereck* (gum trees) in the thorn steppe; it is rather thicker (about 125 to 500 trees per acre of such species as *Acacia Senegal*, *Acacia steno-carpa*, etc.) in the Sahelian sector; and, where the conditions are particularly favourable (as at Oualo and Fonde du Fleuve), in thick stands, of such species as *Acacia nilotica* or the mangroves of Basse Casamance or bamboo thicket (*Oxytenanthera abyssinica*).

Passing gradually from the open acacia steppe of the pastoral zone, characterised by the nomadic herds of domestic stock, we meet heavy Soudanian forest of eastern Senegal and the Guinean type of Basse Casamance, forests which are still little exploited.

These eastern Senegal forests have all the usual Soudanian species: Mahoganies, Kapoks, Dimb, various Combretums, often an undergrowth of *Oxytenanthera*. They are a ready source of supply of the materials needed for making mortars, axe-handles, carpentry wood and fuel. They provide, too, an invaluable refuge for wild animals, many kinds of antelope, small and large, including the last herds of Derby eland, and elephant. The forests of Casamance, stretching eastward from the sea, include mangrove of many different species, very impenetrable and comparable to what is found on the Ivory Coast (for example the Reserve of Santhiaba Mandjak near Oussouye); also dense Guinean forest of Basse and Moyen Casamance at Daniella (*Parinarium*

and other species) : and the Soudanian forest which grows less dense as one travels eastward.

The fauna, mainly winged and aquatic, of the mangrove sectors of the Guinean forest, includes : bush-buck, hippopotamus along the river banks, monkeys (Mangabey, vervet, Patas, baboon), leopards, francolins (commonly called " partridges "), hares (mistakenly called rabbits) and, where the forest is more open, herds of large antelopes (hartebeest, Waterbuck, duiker, eland) and predators (lion, jackal, hyena).

The Acacia steppe of the great bend of the Senegal River up to 100 years ago contained herds of elephant, as noted by the botanist Perrotet on Lake Guiers in 1841. Only 20 years ago lions and ostriches were still numerous; people still spoke of the last giraffes. In 1960 migratory birds, such as quail, snipe, duck and stork, were common, and resident species included francolin, guineafowl, bustard, hare, Dorcas gazelle, a few lion, the last Dugongs and crocodile (hippopotamus have disappeared from the River Senegal from the mouth as far as Bakel).

*C. Plans for Development and Utilisation.* With regard to forests, the Service des Eaux et Forêts is concentrating on preserving all the forest which is left and which has escaped destruction at the hands of agriculturalists. The idea is to constitute a National " Forest Estate " amounting to some 12,540 square miles or 19.5 % of the total area of the country. Of this 12,500 sq. miles only a portion is true forest. There are more than 5,000 sq. miles of reserved " bush " (scattered-tree grasslands)—chiefly scattered acacia, which forms a valuable refuge for the animals chased out of other areas by advancing cultivation.

Some forests are under proper management and are being exploited for charcoal (like those of Thiès, Pout and Bandia) or timber (such as the forests of Bignona district). In others plantations have been established which should lead to increased revenue (Teak, Cassia, Neem, Anacardium). But the greater part of the afforested areas is made up of reserves, whose sole purpose is to assure the protection and conservation of soils and the protection and conservation of the wild fauna which normally finds a shelter and refuge in them.

Out of the total of 12,500 sq. miles of protected forest, 7,140 sq. miles have been constituted as hunting reserve (including in particular the 1,920 sq. miles of the Niokolo-Koba National Park and its extension areas).

There is no doubt that the Forest Estate will tend gradually to decrease as a result of new zones being brought under cultivation by the Centres for Rural Expansion established by the Department of Agriculture. Industrial expansion, foreshadowed in the four year plan for the territory, will also result in many important areas being cleared. We can only hope that rational agriculture will enable the fertility of the soil to be maintained.

The Department of Forestry is supported by a Decree of May 1961, setting up Regional Commissions for Reservation and de-Reservation, together with a Central Commission at Dakar. The principal Departments interested in Conservation are represented on these Commissions (Lands, Forests, Animal Husbandry) and are in the position to put some curb on the demands for opening up new land which are often out of all proportion to the capacity of the people concerned for making proper use of it.

Wherever possible the Forest Department intends to speed up the enhancement of the economic value of forests by a programme of planting species of high economic yield and quick growth (such as Teak, Gmelina, Cassia and Neem). This should make it more easy to safeguard the interests of the forest estate and to maintain a satisfactory level of afforestation for the country as a whole.

As for the protection and rational development of the fauna, the system of hunting permits in Senegal aims at the reasonable exploitation of game, while forbidding the shooting and hunting of such larger species as survive (hippo, giraffe, elephant and Derby eland).

D. *Value of the Tourist Industry.* Since 1953 a small flow of tourists has been attracted to the National Park of Niokolo-Koba, situated in the South of the Tambacounda district, 312 miles, as the crow flies, from Dakar.

Thanks to the provision of facilities, which are adequate enough as a start (a hotel at Simenti with 30 beds, a Forest Camp for 20 at Niokolo, a small hunters' camp outside the Park at Badi and a 1,200 yard airstrip, able to take D. C. 3 and Heron aircraft in the dry season), we have been able during each of the last five years to reckon on about some 600 visitors, among whom were many Austrians, Belgians, Swiss, English and French, together with a few Senegalese administrative personnel or University Students. It is, therefore difficult to speak of a Tourist Industry, rightly so called, in Senegal, when the most that one could properly call it is " hunter-tourism " in its infancy.

## *2. Research, Conservation and Evaluation*

A. *Inventory and Evaluation of the Natural Resources of Undeveloped Areas.* As mentioned above, over 7,000 sq. miles of protected forest are still undeveloped. The people of the riverbanks only gather what they need in way of fuel and timber for kitchen and dwelling-houses. These forests still sustain a wildlife population, and there are some additional forested areas, not included in the Forest Estate, where this applies, notably in the Kedougou district of eastern Senegal.

Most of the latter, whether of the Soudanian or Guinean gallery forest type, can still play a useful protective role. Not incorporated in the Forest Estate, they only exist because the population is sparse or even totally excluded by such hazards as the sleeping-sickness carrying tsetsefly, or the Simulium fly, which can cause blindness. It is indeed difficult to make any reliable assessment of their present value. But their value for the future is considerable; they protect the slopes, maintain and protect the supply of water for the country and the fertility of its soil, and keep the productive potential intact for future generations. They should in fact be taken into full account and properly indicated in pedological and topographical maps, so as to ensure that any future exploitation of such areas is properly planned.

The assessment and evaluation of wildlife resources is equally difficult. Most hunting is purely of the traditional pattern, for everyday food; no record is kept of the animals killed and it would be very difficult to make an assessment with the means at our disposal. Game taken in this way does not seem to be over-exploited, at least as far as the antelopes of medium size are concerned

(kob, hartebeeste, Waterbuck and roan), because the number of hunters is small and the arms they use often very primitive. But the danger is increasing. Modern weapons are smuggled over the riverine boundaries of the country and some hunters are beginning to try to make a steady living by selling game—meat, rather than just using it to feed their own families.

B. and C. *The Basis of Ecological Research and Planning of Rational Utilisation.*

Rational land-use planning is essential for Senegal because of the population increase; and proper ecological evaluation is equally essential in the light of proposals to bring new land under cultivation. The first necessity is, of course, soil maps and a proper investigation to decide, in the case of soils left under forest cover, what quick growing exotic species are most suitable and best calculated to increase the forest's value. This work has been carried out in Senegal by various commissions which, under the direction of Father Leuret, have established a provisional schedule and have enabled a four-year plan to be set on foot.

For the purpose of Research, Conservation and Evaluation of forest, fish and hunting resources, two research stations have been planned, one to specialise in river and sea fisheries and one for silviculture. A programme of re-forestation with timber and fruit-bearing species (such as *Anacardium occidentale*) has been worked out for the next four years.

D. *Reserves for Fauna, National Parks, Forestry Reserves containing Big Game.*

The Senegal Service des Eaux, Forêts et Chasse has been in contact with experts in other organisation (such as Mr. Morel of ORSTOM and Mr. Roux of the Natural History Museum) in order to establish a group of specialists to draw up a programme for the efficient protection for migratory birds. This would conform with the objectives set out by the Committee on Game Birds (of migratory species) at Baden-Baden in May, 1961, during a meeting of the International Hunting Council—an organisation whose Administrator-General also happens to be French Ambassador in Senegal, Mr. Hettier de Boislandier.

This Study-group will decide on the suitability of creating a second National Park in Senegal, in the great bend and delta of the Senegal River, for the purpose of assuring protection of migratory species such as flamingo, snipe, godwit, ruff and the various duck, which are to be found wintering and even occasionally nesting in this area. The work, in which Mr. Roux of the Paris Natural History Museum, Mr. Morel of ORSTOM and Mr. Cremoux, a forest expert, are participating, is planned to be carried out in the period August 1961-March 1962. The International Hunting Council and other scientific organisations concerned will be kept informed of the results of the survey and of any administrative measures taken to implement it.

Hitherto Senegal has had only one National Park—that of Niokolo-Koba—, created by Act 4032 SE/F of the 18th July 1950, and constituted originally as an absolute Game Reserve. It became a Park in 1954. By joining to it the Reserves of Niokolo-West, Niokolo-East and Niokolo-South West, it now (1961) totals an area of 1920 sq. miles. Situated in the Sahelo-Soudanian climate zone, and composed of lateritic plateaux with Soudanian vegetation, intersected by creeks with Guinean vegetation, this Park gives shelter to a

particularly large quantity of game, at least by Senegalese standards. Herds of buffalo of up to 40 head have been counted, a herd of about 60 elephant, the last Derby eland (a herd of 20 head) and about 20 Hippopotami in the Gambia river. In fact it is quite a remarkable remnant of the major species of the past. In addition there are now several thousand of the larger antelopes (notably Buffon's kob, also Waterbuck, roan and hartebeest) and numerous smaller species (duiker, oribi, bush-buck), wart-hog, some bush-pig, several kinds of monkey, a few prides of lion, leopards, hyenas of two species, civets, mongoose, etc.; and many birds (duck, spurwing-geese, herons, guineafowl and both the small and large species of hornbill).

All this fauna, which was undoubtedly on its way to extinction in 1948/1949 when Niokolo was first planned, has built up again in quite spectacular fashion during the last ten years. First the herds of antelopes bred up very rapidly; the bigger animals followed, including the buffalo herd and the elephants (the presence of a few calves has been spotted from the air in the elephant herd which periodically moves out of the Park and often takes refuge in the vegetation along the meandering River Koulountou). As for the Derby eland herd, which has been seen only three times in five years and not at all in 1961, it remains uncertain whether it has increased or not. Despite the Park staff (1 Game Ranger and 6 guards) and the creation in 1961 of a motorised force, serious poaching has been discovered and has increased during the last two years because of the ease with which poachers can escape across the borders of neighbouring countries. The first indication, in 1959, was the discovery of the remains of several elephants. In 1961, several poachers' camps, with racks for drying the meat and bones of butchered animals, were found : the camps were destroyed and some poachers were arrested.

E. *Qualified personnel: the Fauna and Flora Protection Service.* As far as the protection of flora is concerned, responsibility lies with the staff of Eaux et Forêts, stationed in the seven Administrative Regions of the territory and composed of Senegalese Controllers, Overseers and Guards, with European Inspectors. Unfortunately Senegal still has too few Guards, less than 200 for a country of over 77,000 square miles, Nor indeed are there sufficient police. Nevertheless the number of offences brought to court by staff of the Reserves rose to 761 in 1960, made up as follows :

Grazing cattle in protected forests or other areas. . . . .	16
Damage to forests by felling or lopping trees. . . . .	21
Damage to forests by felling or mutilating protected species. . . . .	187
Cultivation in the forest. . . . .	88
Exploitation or sale of forest products without permit . . . . .	395
Bush fires . . . . .	17

In the total of 761 cases those referable to fauna protection numbered 37, as follows :

Hunting without a permit . . . . .	16
Hunting at night . . . . .	2
Hunting in a Reserve . . . . .	5
Killing protected animals . . . . .	10
Sale of game meat . . . . .	4

The National Park of Niokolo-Koba is under separate management and has its own police (consisting of an Inspector, a European Game ranger on duty all the year round, and 6 Forest Guards). As mentioned above, a motorised force covers the southern track along the Gambia River, which is much used by poachers. To be frank, this staff is insufficient both in number and quality. The Guards fear the poachers more than the poachers fear them. The Game Ranger, despite his devotion, cannot be everywhere at once.

### 3. *The Place of Nature and its Conservation in Land-use Planning*

#### A. *Factors of the Environment.*

B. *Relation of Undeveloped Regions to Forest, Agricultural and Animal Industry development.* The approach to conservation varies a great deal according to whether it is being considered in the context of a purely pastoral area or one devoted to groundnuts or the cultivation of food crops. It is also much affected by the density or otherwise of the human population. In pastoral areas, such as the Lower Senegal, Podor, Matam or Linguere districts, the forest rules forbid the felling or mutilation of species of importance to man or beast (*Acacia Senegal*, *Faidherbia albida* etc.) and only permit careful pruning or lopping. In fact Forest Reserves are essentially "sylvo-pastoral" in character

In the Groundnut zone (Diourbel, Louga and Thiès districts and Kaolack), on the other hand, there is one climatic and sylvo-pastoral aim in Forest Reserve policy: the Rules attempt to secure the protection of certain valuable components in the flora of which one, a species of juniper *Faidherbia albida*, is particularly useful because of its beneficial effect on fertility and the protection of the soil, and also the nutritious seed-pods, much used by animals as fodder.

In the food-crop areas, the purposes of forest reservation are essentially to ameliorate the climate and also to provide reserves of cultivable land which have not lost fertility and which, when brought under cultivation, can be properly controlled within the framework of some collective organisation, such as the "Rural Expansion Centres," through which the State can enforce rational practices like the use of manure, succession of crops and other rotational methods.

The whole of eastern Senegal with its very small population is yet another separate case. Here there is no immediate conservation problem so far as the bush is concerned, but it is much the most important faunal area, especially since 1900 square miles have been established as a National Park. The chief features of the Four-year Plan for this area, are the opening up of new tracks of access to facilitate supervision and protection and the construction of hides and observation posts near water-holes to help in the task of keeping a proper count of the animals and acquiring knowledge of their habits.

C. *The utilisation of wildlife for food.* The eastern Senegal population depends on game for part of its meat supply. Without this source of protein, the people would certainly be undernourished, since stock-raising is much hampered by the presence of tsetse. Hence the authorities in charge of reservation concentrate on trying to secure protection for species of big game threatened by

extinction. It is difficult to make even a rough estimate of the number of wild animals killed and eaten either as fresh or dried meat. However, an approximate estimate of the amount of game meat consumed can be guessed at by the following calculations. During the seven months of the dry season, when hunting is relatively easy, at least 14 Oz. of meat are eaten per person per day, which makes about 176 lbs. per adult per year : Kedougou district has 40,000 inhabitants : if 20,000 of these can be assumed to be adult, one arrives at the impressive total of 1600 metric tons of meat, the equivalent of 10,000 head of cattle (on the basis of 350 lbs. of meat per head).

In other parts of Senegal guineafowl, bustards and duck contribute an appreciable amount of protein in the rural diet. But the problem here is of secondary importance, since there are plenty of domestic animals and in some places fish is also available.

In conclusion, one must hope that as the people progress and become more educated in matters of nature conservation, we will be able to look forward to an era of truly rational utilisation of wildlife, based on making good and regular use of the income from this source without jeopardising the existence of any of the species concerned. Unhappily we have not yet reached that stage, and at present the biggest problem facing the Senegal authorities is to save the larger animals from a very real threat of extinction.

## DEVELOPING AN APPRECIATION OF THE NEED FOR CONSERVATION OF NATURE AND NATURAL RESOURCES

by

Jacques VERSCHUREN, D. Sc.  
Congo National Parks Institute

The protection of nature and natural resources is of cardinal importance, especially in the case of Africa. The expression " the dying land of Africa " is justified; urgent measures are essential if rapid degradation of the biological habitats is to be prevented.

This brief note deals essentially with the African continent; it is addressed above all to the elite in the newly independent countries or those shortly to become independent. This elite is responsible for the future of their several countries. In this connection, it is encouraging to note the attitude of the Congolese authorities; despite the innumerable difficulties encountered by that country in recent months, the authorities have not lost sight of the imperative dictates of nature protection and have taken effective steps, especially in the case of the National Parks.

There can be no doubt but that, while the protection of nature has its scientific aspect, it is above all the direct economic aspect that has to be stressed. The natural habitat is not inexhaustible and must be husbanded with care if speedy degeneration is to be avoided. When we say " natural habitat " we have in mind all its constituents—fauna, flora, as well as man himself who is, in the final resort, the main beneficiary from nature protection. The rash destruction of forest cover will entail rapid degradation of the thin layer of living soil, swift erosion and even, in many cases, climatic change.

Observers unanimously agree that Africa is gradually drying up and that the desert is encroaching year by year. The phenomenon, perceptible in marginal Zones and savannah areas where the dry season can be extremely severe, is less apparent in forest country where nature appears inexhaustible. It is of utmost importance that the elite from essentially forest countries should have an opportunity of visiting pre-desert regions. Nothing could be more vividly impressive—rain seems such a natural phenomenon in forest regions! It is a primary necessity to bring attention to bear on the desiccation of the African continent unless prudence is exercised.

Thus careful husbanding of the forest capital is essential. It is necessary, too, in the mountainous regions which constitute reservoirs—thought of as inexhaustible—for the surrounding country both in respect of ligneous matter and of water. In a very dry season, when everything is burnt up, when the springs have run dry, nothing more impresses the human masses living at the

foot of the mountains than to watch the clouds that crown their summits and survey the wooded slopes which conserve moisture and water.

Caution is equally necessary in draining swamps. The comparison with a sponge which retains a minimum of water when everything is dry and absorbs the overflow in periods of excessive rainfall and danger of flooding, is an eloquent one. The regulatory function of stretches of swamp should not be lost sight of.

Equally with the flora, the fauna demands constant attention. For thousands of years there was equilibrium between man and the animal resources. Today that equilibrium has been upset and, without protective measures, the fauna is doomed. Outside certain reserve areas, the larger animals have entirely disappeared. Game was for a long time the sole basis of the meat diet of African Peoples. In many cases there has been gross negligence in the management of this resource in recent years. Wise management of the game capital can aid considerably in supplementing the diet of populations in the marginal zones which have no other natural economic vocation, as frequently happens in Africa. But people have to be shown that not all the animals can be killed indiscriminately; if they want a herd of large ungulates to survive into the future, only certain individuals must be killed. Why not explain to the huntsman that he should act like the peasant who keeps fowls, who will never kill the young chickens but waits till they have grown, and will not touch the mother hen ? Regard must be had for the suckling females; the young antelope, the new-born buffalo and the elephant calf must not be killed.

The situation is comparable as regards management of ichthyological resources. Care is imperative. A peasant population, if its attention is not drawn to the matter, will tend, through lack of knowledge, to fish in spawning grounds where the fish are much easier to catch. They must be taught not to " kill the goose that lays the golden eggs. "

What arguments are to be presented by the elite of the new countries to the less educated masses to justify the existence, the maintenance or the creation of National Parks, nature reserves or zones of protection ? To what arguments are highly educated people especially sensitive ?

### 1. *Direct economic value*

In many African countries, tourism is now a basic resource and will be even more so within a few years. But the overseas tourist visiting Africa comes chiefly to see something he can find nowhere else, namely great herds of animals. Tourism thus signifies National Parks. The latter will be a source of direct wealth (entry fees, licences) and indirect wealth (contribution to the general economy). Well managed, tourism presents a potential value that is incalculable. Besides the " international tourism " for foreign visitors, let us also bear in mind local tourism.

The National Parks also have a direct economic function as a *game reserve* and repopulation zone for surrounding regions. We will only mention here,

in passing, the possibilities of "game management" in certain sectors of nature reserves and protected lands which are marginal from the standpoint of cultivation and stock-raising.

### *2. Scientific value*

The elite are far more concerned with this consideration than is generally supposed. Attention should be drawn to the possibility of scientific studies of indirect or less immediate value (respectively animal husbandry and medicine, or pure research) in the nature reserves.

### *3. Educational and cultural value*

While this aspect will mean nothing to people in the bush, it will sometimes be a determining factor for town-dwellers, the young elite, the students. I have been amazed at the interest shown by certain non-rural populations in the Congo who had never seen a wild animal and hoped one day to observe for themselves these animals of which they had heard at school. The younger generations must be persuaded that their country possesses a wealth which is the envy of the world and can be found nowhere else. Europe has its cathedrals, preserved through the ages; Africa is proud to show the prodigious natural spectacles which she has helped to save.

### *4. Indirect economic value*

A National Park protects the environment; especially in the case of strict reserves, it plays a positive part in conservation of the forest biotope, in the battle against desiccation, against natural erosion, in stabilisation of climate. The Albert National Park is a particularly striking example in this respect.

### *5. Political and prestige value*

This argument is fundamental. The elite must be shown that to protect nature is a sign of a highly advanced civilisation, that the countries in the forefront of economic progress are also leaders from the standpoint of protection. It must be made clear to the new countries that, in this domain, their prestige is at stake. For the leader of a newly independent country to wipe out a nature reserve, by a stroke of the pen, would be to diminish his country's status in the world. The possession of well-run nature reserves confers on a country a higher place among nations. In my view, this aspect of the problem can never be sufficiently stressed: every national of a newly independent country must take pride in its National Parks, must realise that they are part of his heritage, owned and enjoyed in full liberty and in no way subject to external intervention. The example of the Congo is particularly noteworthy in this respect. The Congolese authorities attach considerable importance to conserving their nature reserves and are aware that the whole world admires their attitude, despite the recent difficult circumstances.

# WILD FAUNA AND FLORA OF AFRICA AS A CULTURAL AND ECONOMIC ASSET AND THE WORLD INTEREST THEREIN

by

David P. S. WASAWO  
Makerere University College, Kampala, Uganda, East Africa

## 1. *Introduction*

The fauna and flora of Africa today is in many ways unique. Tropical grasslands attain their greatest development in Africa and in them one finds a fauna that is unrivalled in any other part of the world, not only in its numbers, but in its great variety, and in the number of species that are not found anywhere else. Examples of such numbers, such variety and such uniqueness abound. For instance, the number of Topis in the Southern part of the Queen Elizabeth Park in Uganda; the great spectrum of Antelopes and other animals in the Serengeti Plains; and such unique types as the Giraffe. There are also animals in these plains whose numbers have dwindled so much that they are in danger of extinction unless actively protected; such for instance are the White Rhinoceroses remaining only in various small pockets.

The forests of Africa compare very well with some of the great forests of Tropical America. They are particularly well developed in the Congo basin, and in some parts of West Africa. They harbour animals, some of which are of considerable interest, not only because they are little known, but also because they are not found anywhere else in the world. Such for instance are the Gorillas, the Chimpanzees, the Okapis of the Congo, and the little Pygmy Hippopotamus of the Liberian forests. Some of these animals, for instance, the mountain gorilla, could easily become extinct if their habitats and themselves were not protected.

## 2. *Wild fauna and flora as a cultural asset*

There is, perhaps, a tendency in the world today to overstress the economic aspects of any natural resource. While this is understandable, it must never be forgotten that " man does not live by bread alone, " that there are other aspects of his nature that require not only satisfaction but also development. Man appreciates beauty for its own sake—and the appreciation of beauty can be developed and improved. He is a curious being, whose thirst for knowledge can be insatiable—and this curiosity can be improved upon by education and by a better presentation of the challenges of his environment. He has an ear for music, an eye for colour, an appreciation of the vastness of his environment, an urge to meet and exchange views with people of other lands and climes. The

cultural development of a people is not only judged by what they produce but also by the way their spirit and minds are developed to appreciate what is around them and in them. In Africa we have a unique flora and fauna which can play a great part in this development.

One day in late February this year I stood for the first time on the edge of the Ngorongoro Crater. The scenery in front of me engendered such a feeling of the greatness and sublimity of nature that I had only once before had in my life, and that is when I beheld the face of the Matterhorn, in the moonlight, from a hotel window in that delightful town of Zermatt in Switzerland. It is an undefinable feeling—akin to the feeling that one has when one listens to great music, looks at a superb work of art, or even gazes at a historical ruin such as the Coliseum in Rome. Such feelings, I believe, elevate the human spirit. To provide opportunity for our youth, and even our older men and women to have such experiences should be one of the aims of the New Africa. It will never be possible if our flora and fauna and our physical environment are wantonly destroyed.

The elevation of the human spirit, the cultural development of man, is not only catered for by a mere looking or listening or doing. It can be furthered much more by intelligent observation, by trained listening and by informed doing. The youth of Africa have a superb heritage in their fauna and flora which they can use for intelligent observation, for trained listening and for informed utilisation. This is a challenge for education in its broadest sense. The opportunity for our youth to travel in the plains, or pick their way through the forests listening to the sound of birds, the call of various animals, or watching the myriads of antelopes grazing, is an opportunity for which they would be justifiably envied by the youth of other lands. One need add here, the opportunities for research that this fauna and flora presents us with. Nor must one forget the recreational value of this flora and fauna for the people of Africa, if they are properly managed. Some of the National Parks, for instance, the Queen Elizabeth Park in Uganda, have already provided the kind of accommodation for the modest pocket which can enable most Africans to have some recreation in the Park.

One last point in which the fauna and flora of Africa can be considered as a cultural asset. Most of the tourists that come to Africa today come largely because of the prospect of seeing game in its natural surroundings of savannah, forests and mountains. In the process of seeing the country and its game, they meet and exchange ideas with our people, they learn more about our way of life, our difficulties, our ideas. They go back to their countries better informed about us, and are thus in a position to discount some of the wild ideas that overseas people normally have about Africa. This aspect of the contribution of tourism to cultural exchange is becoming even more important as more and more of the African countries become independent.

### *3. Wild fauna and flora as an economic asset*

The wild fauna and flora of Africa have evolved on the continent for a much longer time than the domestic ones. The former therefore are capable of utilizing the natural environment much more effectively than the latter. In the marginal areas domestic stock can only be kept after a considerable capital

outlay whereas the wild game seem to thrive quite well in these same areas. It is therefore possible, after suitable study, to crop the game in these areas and obtain a much higher yield of meat than would be possible if domestic stock had been kept in the same areas with the same capital outlay.

It is important to stress that these marginal areas should be carefully studied and demarcated. Game cropping is already being carried out in the Rhodesias, and in some parts of Kenya and Uganda. The hippopotamus cropping in the Western Province of Uganda is not only yielding valuable proteins for the people, but is also putting some much needed cash into local government coffers. There is even the possibility of farming game in these marginal areas as some of the experiments in South and Central Africa have indicated.

It has been pointed out above, that most of the tourists that come, at least to East Africa, come because of the possibility of seeing game. In 1959, these people brought into East Africa something of the order of £8 million, a figure which made the tourist industry rank fourth in the economy of East Africa. Of this £8 million figure, Kenya received about £6 million, which came second only to the £10 million received from exporting coffee. It is agreed, by experts in this field, that the development of tourism in East Africa is still in its early stages, that many more tourists could be attracted to these territories as a result of the development of better communications, more and better hotel accommodation and the existence of peaceful and stabilized conditions. Much more money, than the above figures indicate, could be earned for these territories.

The wild flora is important in many ways. It provides the basic food for the wild animals, in that the herbivores depend on it and utilize it to build up a body which can in turn be utilized not only by the carnivores, but by man in the ways that have been indicated above. The plants provide cover and without them there would be rapid erosion and the destruction of the physical environment both for animals and for man. The presence or absence of forests affects the climate, particularly rainfall, and finally forests provide timber, and as such can be a continuous resource if properly utilized.

#### *4. The world interest on African flora and fauna*

Wild life preservation is one of the most urgent problems facing Africa today. The reason for this is because the great majority of the people do not know of the cultural and economic benefits that can accrue from game. In some of the marginal areas people live side by side with game and regard game as usurping their grazing lands. People set fires to whole areas of forests in order to occupy a small area at the edge. The main problem, therefore, is that of educating the people to appreciate the many varied benefits of wild life.

Africa does not have anything like the trained personnel with experience in wild life to carry out not only the job of educating the people, but that of finding out the best ways of utilizing the flora and fauna to the best advantage. Nor does Africa have sufficient funds to employ these people even if they were available, and to pay for the carrying out of some of the pilot schemes. The countries of Africa, therefore, look to the rest of the world for help and guidance.

The rest of the world has an interest in the wild fauna and flora of Africa because of its uniqueness; because it provides for them an opportunity for having experiences which they cannot have in any other part of the world; and because of that urge to preserve for posterity something which in many ways is of immense value. The banding together of the people of Africa with those of the rest of the world for the preservation of this resource should therefore be a natural and a happy common effort.

The rest of the world, however, should always remember that new nations are very jealous of their newly acquired independence—and that they have to be very careful as to how their advice or help is given. This is why the conference at Arusha is particularly welcome, because experts from various parts of the world are sitting together with Africans to see what can be done as a joint effort.

# PLANNING THE MANAGEMENT OF WILD AREAS

by

E. B. WORTHINGTON  
The Nature Conservancy  
London

All who have had much to do with the practical conservation of nature or natural resources know that every habitat is subject to change. Of the living communities animals obviously change most rapidly, being mobile; plant communities generally change rather less rapidly, except for the annual herbs; the soils change but little if the land is kept in a natural state, but they can be very unstable if the protective covering of vegetation is removed. The climate changes from hour to hour, but other physical attributes of the habitat—its geology and the gross features of its topography (as opposed to the lesser features such as the shape of a river bed)—are usually permanent for most practical purposes.

There follows from this concept of perpetual change two major considerations : (1) In order to conserve an area or a natural resource in a condition something near the *status quo* it is no use merely " preserving " it by excluding outside interference. It is nearly always necessary to apply active management in order to stop changes taking place or to guide them in a way which is beneficial. (2) Before management can be defined one must be completely clear about the objectives, and also one must have a fairly good idea of what, in each set of circumstances, the natural changes are likely to be.

In those areas which are given over to the tourist industry, the main object is to produce the best possible spectacle of wild life in a natural setting—maximum numbers and variety of conspicuous species. In those areas where the object is to produce crops of animal and plant products, such as food, skins, ivory, wood, gums and beeswax, one wants a maximum sustained yield. The population density of animals required is generally much higher in the former case than the latter.

Taking the savannah lands of Eastern Africa as an example, one can visualise an idealised pattern of wild land use in three categories as follows :

1. There would be one or more " strict natural reserves " (in the sense of the International Convention for the Preservation of the Flora and Fauna of Africa of 1933) maintained for scientific study, especially the study of natural changes, under conditions of no interference. These natural reserves, not necessarily very large in area, would be situated within these.
2. A National Park which would be managed to provide a maximum carrying capacity for wild animals and maximum attraction to tourists.

3. A buffer zone surrounding the National Park would likewise be managed but with the object of a maximum sustained yield of wild products some of which would come from the overflow of the National Park.

The buffer zone would itself normally abut on settled areas of agriculture or intensive animal industry in which those kinds of animals which cause damage would be strongly discouraged. But there are many borderland cases; for instance, the object may be to produce a crop of wild animals as well as of domestic animals.

Whatever the size of the conservation area,—a few hundred acres of a "strict natural reserve", a few hundred square miles of a National Park, or thousands of square miles of wild lands used as cropping area—and whatever the particular objects may be, it is of great value to have a carefully worked out plan, based on the survey and assessment of all relevant factors. Detailed planning for the management of wild areas is a somewhat specialised job in which the Nature Conservancy in Great Britain can fairly claim to have progressed a considerable way. Of the eighty five National Nature Reserves in Britain today considerably more than half are now under approved Management Plans, each of which is a document of from twenty to a hundred pages prepared according to a standardised pattern. A particular advantage of having plans of this sort becomes obvious when changes of staff occur and a new man finds a ready means in the plan of learning something about his area and his functions in looking after and developing it.

It is not suggested that the experience derived mainly from the United Kingdom is directly applicable to conditions in Africa. The areas concerned and their complexity are much larger in Africa than in Great Britain and the staff available for looking after them and studying them is nearly always less. Nevertheless, while Game Departments and National Park authorities have few specialist officers, some of those in other technical departments are deeply interested in the wild areas and would doubtless be ready to assist from time to time, e. g. in drafting particular sections of management plans. By such means considerable progress could be made in preparing management plans for many of the conservation areas in Africa. In the hope of assisting in the initial stages of such work a *pro forma* showing the subject headings which would normally be covered in a management plan and notes on its preparation is set out below.

*Pro forma for management plans for National Parks, Game Reserves, Nature Reserves, Controlled Areas, etc.*

## INTRODUCTION

### 1. Name and general information

Give such basic data as location, legal status, area, altitude, references to available maps and to air photographs with dates. There may be references also to ground photographs or films which provide material for subsequent comparison.

## *2. Reason for establishment and history*

Summarise what has happened to the area both before and after it became used for conservation and the circumstances which lead to its present state.

## *3. Surveys and scientific information*

Divide into a dozen sub-headings (according to the area more or less may be needed). They are arranged in a logical order dealing first with the physical factors of the environment, then the soils and vegetation which are dependent thereon. And so, via the fauna, to the human activities. This section should be a summary of everything that is known about the area and it should include if possible complete references to publications.

- a) Topography
- b) Geology
- c) Climate
- d) Water regime
- e) Soils
- f) Vegetation and flora
- g) Fauna
- h) Land Use history
- i) Archaeology and ancient monuments
- j) Communications
- k) Public interest

## *4. Objects of management*

This is generally much the shortest section of the plan, but the most difficult to write. It comes here rather than at the beginning because the objects need to be thought out against the background of everything that is known about the area. The fewer and shorter the sentences used in defining the objects the better, but it may sometimes be helpful to classify the objects into such categories as economic, scientific, conservation, public access.

## *5. Management Programme*

This provides the real body of the plan arranged in a programme covering a period of say five years. It is convenient to break this down into sub-sections such as :

- a) Scientific management of water, soils, vegetation and fauna;
- b) Estate management, such as improving and maintaining communications, buildings, fences etc.;
- c) Subdivisions, e. g. a part open to the public and another part closed, or special areas ear-marked for testing the effect of management operations such as controlled burning or cropping surplus animals.

6. *Public access*

This has special importance in the case of National Parks where the visiting public have to be provided for an controlled in various ways.

- a) Permits to visit, collect, photograph etc.
- b) Rights of way and byelaws
- c) Special problems such as safari lodges, camping sites, hazards, public education.

7. *Time schedule, finance and priorities*

This is in some measure a summary of sections 5 and 6 but rearranged in a clear schedule and where possible costed.

8. *Staff and division of responsibilities*

- a) Headquarters staff
- b) Specialist Officers
- c) Wardens
- d) Delegation of functions to juniors

9. *Progress reports and routine observations*

This section is important as a reminder to the staff in charge.

10. *Bibliography*

Arrange as for a scientific paper.

## APPENDIX

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