IUCN Publications new series Nº 19

IUCN

Eleventh Technical Meeting
Onzième Réunion Technique

Papers and Proceedings

Rapports et Procès-verbaux

NEW DELHI, INDIA

25-28 November 1969

VOLUME III

A. Fourth Session: International Commission on National Parks

THE NATIONAL PARK SITUATION IN SOUTHERN ASIA, WITH SPECIAL REFERENCE TO THE ROLE, MANAGEMENT AND ECONOMIC AND SOCIAL FUNCTIONS OF NATIONAL PARKS IN DENSELY POPULATED NON-INDUSTRIAL REGIONS

B. Pre-Conference Study-Tours to National Parks and other areas of conservation importance situated in India

REPORTS AND DISCUSSIONS

Published with the assistance of UNESCO

Union Internationale pour la Conservation de la Nature et de ses Ressources

International Union for Conservation of Nature and Natural Resources

Morges, Switzerland, 1971

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 organizations. 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 worldwide basis, not only for their intrinsic cultural or scientific values but also for the long-term economic and social welfare of mankind.

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

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

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

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

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

IUCN Publications new series **No. 19**

eleventh technical meeting onzième réunion technique

Papers and Proceedings
Rapports et Procès-verbaux

New Delhi, India
25 to 28 November 1969

Volume III

A. Fourth Session: International Commission on National Parks

The National Park situation in Southern Asia, with special reference to the role, management and economic and social functions of National Parks in densely populated non-industrial regions.

B. Pre-Conference Study-tours to National Parks and other areas of conservation importance situated in India.

Reports and discussions.

Edited by
Fred M. Packard
Hugh F. I. Elliott

Published with the assistance of UNESCO
International Union
for Conservation of Nature and Natural Resources
Morges, Switzerland, 1971.


PRINTED BY Unwin Brothers Limited
THE GRESHAM PRESS OLD WOKING SURREY ENGLAND

Produced by 'Uneoprint'

A member of the Staples Prining Group (UO9908)

Preface

The Ninth and Tenth Technical Meetings of IUCN held at Nairobi (1963) and Lucerne (1966), were concerned with identifying and assessing some of the more important ecological considerations affecting conservation of nature and natural resources in tropical and temperate regions, respectively. The Eleventh Technical Meeting, held at New Delhi on 25-28th November 1969, adopted a somewhat different approach. Although much of the material presented was appropriately drawn from experience of conservation problems and scientific research in southern Asia, the aim was to use this material, supplemented by a limited number of comparable studies from other parts of the world, to illustrate the activities and interests of each of the five Commissions on which IUCN relies for technical advice, the formulation of its policies and the promotion of its projects.

Thus, with the exception of the Commission on Legislation, whose specialized field of work does not lend itself to this kind of approach, each Commission undertook the organization and supervision of a Session of the Technical Meeting. In addition, reflecting the close community of interests between IUCN and the International Biological Programme, a full Session of the Meeting was devoted to IBP activities and this was also organised by the Commission on Ecology by virtue of its special liaison responsibilities.

The Papers and Proceedings of the Eleventh Technical Meeting are, therefore, being published in five parts. Volume I contains those pertaining to the Commission on Ecology, including the IBP Session material; Volume II has been prepared by the Survival Service Commission; Volume III by the International Commission on National Parks; Volume IV by the Commission on Education and Volume V by the Commission on Landscape Planning.

Two points concerning the arrangement of material in the five volumes call for comment. First, certain of the topics dealt with in Volume I, under the heading of wildlife utilisation and management (e.g. 'the role of zoos') and also the problems concerned with the identification and conservation of undisturbed islands, are very much the concern of the Survival Service Commission and of its specialist groups. That they were nevertheless dealt with at the first two Sessions of the Technical Meeting, under the auspices of the Commission on Ecology, was mainly due to the large number of papers on endangered species presented for discussion at the Survival Service Commission's Session (see Vol. II). It is, however, also an indication of the interdependence of conservation of habitat and species survival, which closely links the work of the two Commissions.

Secondly, a novel feature of the Eleventh Technical Meeting was the presentation and discussion of the reports on what came to be known as the 'pre-Conference Study Tours'. These were in effect six short-term research projects, designed to provide an up to date assessment of a variety of conservation problems of current importance in the host country of India, but typifying problems which frequently come to IUCN's attention. The projects were made possible by the generous financial support of the Smithsonian Institution and were carried out during the week immediately preceding the General Assembly by small groups of experts, representing the appropriate Commissions, working in collaboration with their Indian counterparts, appointed by the Inspector-General of Forests, who were responsible for all the local arrange-

ments. Two of the studies were mainly concerned with endangered species, two with National Park development and management, and one each with problems of general ecological and landscape planning significance. The resulting reports were dealt with accordingly at various Sessions of the Technical Meeting, but for ease of reference and because, with one exception, the studies were sited in existing National Parks or equivalent reserves, it has been deemed convenient to include all the reports and summaries of the discussion on them in the present volume, Vol. III of the Proceedings.

Contents

Introduction

In view of his long and close association, as member and chairman, with the International Commission on National Parks, the President of IUCN, Harold J. Coolidge, opened the Fourth Session of the XIth Technical Meeting on the afternoon of 27 November 1969. He welcomed the large attendance and the important and varied programme planned for the Session under ICNP's direction, and also took the opportunity of tabling a first page-proof copy of the new and revised English version of the United Nations List of National Parks and Equivalent Reserves (Second Edition): he congratulated all concerned with the production of this volume, which could be considered as one of the most valuable documents relating to the world-wide conservation of natural areas.

Professor Jean-Paul Harroy, Chairman of ICNP, then took the chair for the session and explained the order in which the material presented for consideration in the session would be dealt with. Time was very short, so that in order to have as much as possible for discussion those items on which comments and questions seemed likely to be most numerous would be taken first, leaving other items to be presented briefly towards the close of the session, although they would of course be included in the Proceedings.

In the record which follows, however, it has been decided to revert to the more logical order, beginning with the contributions specially prepared for the session, including the nine reports on the national parks and conservation situation in southern Asia, country by country, and then, in the final section of the Proceedings, placing on record the Reports and discussions of all six Pre-Conference Study-Tours. As explained in the Preface four of these were in fact presented and discussed at other sessions of the Technical Meeting, but all of them are of particular interest in the context of National Parks and Park Systems planning.

SECTION A (i): Country situation-reports; Paper 1.

National Parks of India

K. S. SANKHALA
Director, Delhi Zoological Park, New Delhi, India.

INTRODUCTION

The National Park movement in India is as old as the Indian history. The *Rishi Ashrams—Abannyas,* where every form of life was protected, were our earlier National Parks. Kalidas, in his famous work 'Shakuntala', describes the touching farewell given to the heroine by the plants and animals of her father's 'Ashram', which is described as the highest form of human understanding, where man communes with Nature, and is certainly the outstanding example of a National Park in Indian literature.

In recorded history, King Ashoka the Great (300 B.C.), gave protection to animals and plants. But the passion for preservation was lost during the more recent turbulent period of Indian history. During the last two centuries, the whole country was the happy hunting ground of the employees of the East India Company (during the Company days till 1857) and the British soldiers, Rajas, Nawabs, Jagirdars and the Civil Servants. The trigger-happy movement destroyed most of the magnificent wild life of India.

At the beginning of the present century, a few dedicated naturalists realized the danger of vanishing species and raised their voice. With their efforts, the famous Banjar Valley (1900) of Central Provinces (the present Kanha National Park of Madhya Pradesh) was established as the first Wild Life Preserve in India. Kaziranga (1908) and Orang (1914-15) were the other sanctuaries formed in the first fifteen years of the present century. Probably, the idea of keeping such wild life preserves did not appeal to the 'Shikar' — oriented rulers, because everything then was in plenty. Still, five more sanctuaries were added after the First World War. Then in 1935, the first National Park was established in India in the foothills of the Himalayas. It was named the Hailey National Park, after the then Governor of the United Provinces, later renamed Ramganga National Park, and finally Corbett N.P., after the famous hunter Jim Corbett. At the same time the idea of National Parks spread to other parts of the country, e.g. Orissa (1931), Bihar (1932) and Maharashtra (1935). By the Second World War 18 sanctuaries had been established and during the War years Mathodi and Madumalai in Madras (1940), Bandipur in Mysore, Pabha in Assam, Lothian Island and Jaldapara in Bengal (1941) were also constituted as Game Sanctuaries.

Immediately after World War II, and during transfer of power and partition of the country, unscrupulous poachers took advantage of the transition and started a massacre of wild life and their habitat. Large tracts of forests were cleared for 'grow more food campaigns' and wild animals were killed for 'protection of crops'. Even the sanctuaries and parks were not safe. The death cries of innocent denizens reached the late Prime Minister, Jawaharlal Nehru, who ordered an immediate enquiry. On the advice of the experts, the Indian Board for Wild Life Preservation was constituted in 1952. This was the beginning of

the present era for Indian wild life. Within five years of the setting up of the Board, 66 sanctuaries and national parks have been constituted.

By the time of the First World Conference on National Parks in 1962, we had 103 sanctuaries, five national parks. But still they were not popular. The jet age and mass travel have focused attention on these wild life areas and the list has shown another rise by 22 sanctuaries. There are now 125 sanctuaries, including 5 legally constituted national parks in India. There are proposals to declare six more national parks. All are accessible during November to June, but the best time to visit them is from December to April. Most have accommodation either inside or at a little distance from the boundaries in the form of Forest Rest Houses or Dak Bungalows, which are reasonably comfortable.

DISTRIBUTION OF PARKS IN INDIA

India can be divided into four main geographical zones: the Himalayas, the Indo-Gangetic-Brahmaputra plains, the Thar Desert and the Peninsula. These zones have clear demarcations and each has characteristic geology, topography, climate, flora and fauna.

The Himalayan mountains are in the North ranging from 200 m (656') to over 9,000 m (29, 528'). They are geologically recent in origin. The Himalayan rock is soft, composed of shells, schist, gneiss and limestone. The Central Himalayas are composed of granite. The lower slopes have good growth of forests from Kashmir to Bhutan. The forest zone is further sub-divided into sub-tropical sub-montane foothills rising up to 1, 524 m (5,000') and the temperate region from 1, 524 m (5, 000') to 3, 353 m (11, 000'). Sal *Shorea robusta,* in a continuous belt from Assam to the banks of the Jumna, is the main feature of the natural forests. There are also open savannas where elephant grass *Saccharum spontaneum* grows in great profusion. There are scattered trees of Simal *Salmalia malabaricum,* Khair *Acacia catechu* and Amaltas *Cassia fistula.* On the higher elevation in the temperate zone, Sal is replaced by Chir pine *Pinus roxburghii, sometimes* forming pure stands. Vegetation in the temperate zone consists of Conifers—Chir, blue pine *Pinus wallichiana* and deodar *Cedrus deodara,* in the Central and Western Himalaya, and *Pinus khasia, Cupressus torulosa* and *Taxus baccata* in the Eastern region. Moist depressions and cooler aspects support broad leaved Oaks *Quercus incana, Quercus semicarpifolia,* maples, walnuts *Juglans regia,* thick growths of rose-bush *Rosa muscata* and fern brakes, while rhododendrons *Rhododendron arboreum* and birch *Betula ulnoides* form the tree line. *Bambusa arundinacea* and *Bambusa falcata* occur in exposed soils.

On still higher elevations, there are Juniper bushes and finally the Alpine pastures merging into the perpetual snow-covered peaks. The sub-zone of the Western Himalaya—Kashmir to Ladakh—a landscape of *Anemone, Primula, Geranium* and *Pinguicula* in the fore-ground of the snow-covered peaks, is most spectacular and unparalleled in the world.

The lower regions were the home of tiger *Panthera tigris,* leopard *Panthera pardus,* elephant *Elephas maximus,* sambhar *Cervus unicolor,* chital *Axis axis,* barking deer *Muntiacus muntjak,* hog deer *Axis porcinus,* and wild boar *Sus scrofa.* With the change of vegetation at higher elevations, Himalayan black bear *Selenarctos thibetanus,* marten *Martes flavigula,* musk deer *Moschus moschiferus,* chir pheasant *Catreus wallichii,* kaleej pheasant *Lophura leucomelana,* monal pheasant *Lophophorus impejanus,* snow leopard *Panthera uncia,*

goral *Nemorhaedus goral,* blue sheep *Pseudois nayaur,* Kashmir stag *Cervus elaphus hanglu,* in the west, and lesser panda *Ailurus fulgens* and tragopan *Tragopan satyra* in the east, appear. Brown bear *Ursus arctos,* black bear, snow leopard and monal are found at still higher elevations. The arid plateaux in eastern Ladakh and above the tree-line are the home of ibex *Capra ibex,* Himalayan tahr *Hemitragus jemlahicus,* Himalayan marmot *Marmota bobak,* snow leopard and Tibetan wild ass *Equus hemionus kiang.*

There are 32 wild life sanctuaries and one national park in the Himalayan region. Motechur (1938),Rajaji (1948), Sonaripur (1950), Jaulasal (1953) and Corbett are situated in the sub-montane tracts of the Himalayas. Corbett National Park, originally constituted in 1935 as Hailey National Park, extended over 324 sq. km (125 sq. miles). Since it was losing 46.6 sq. km (18 sq. miles) by submergence in the Ramganga Dam, 202 sq. km (73 sq. miles) were added in 1966 to compensate. The park is known for its wild elephant, tiger, deer, and the sub-montane beauty of lofty Sal trees, backed by row after row of the Himalaya ranges. Movement inside the park is mostly on elephant-back because the grasses are tall and visibility from ground level is poor. Sonaripur and Jaulasal sanctuaries are the habitat of herds of swamp deer *Cervus duvauceli* in addition to tigers and other wild animals.

Corbett is not free from forestry operations and grazing by domestic stock. It is managed by exclusive staff. There is an entry fee of Rs. 2/- per head, plus a fee for each camera taken into it. Accommodation is available to house 50 people, plus 10 more bedrooms scattered in other nearby Forest Rest Houses. The park is open from November to June. The nearest airport is Delhi—320 km (200 miles) away. The road is good except the last 64 km (40 miles) of fair weather road which opens only in November to June.

Kugti (1957), Simla, Simbalpara, Kalatop and Khajiar (1958), Daranghti, Taria, Majhalhal, Rakchum-chitkul, Lippa Asrang, Sri Naina Devi, Govind Sagar, Nargu, Bandli, Shikari Devi, Tunda (1962), Renuka, Darla Ghat, Shilli (1964), Gamugul and Sechutun Nela (1967), all in Himachal Pradesh; Shankaracharya, Rajparin or Dassu (1945), Chumnai (1946), Dachigam (1951) and Ajjas Jheel, in Jammu and Kashmir; Nanda Devi (1939) and Govind Pashu Vihar (1955), in Uttar Pradesh; and Senchal (1963) in West Bengal, are the sanctuaries situated in the temperate region. All these sanctuaries are wild life oriented. Except for Dachigam, they are not very well known. Dachigam is 23 km (14 miles) from Srinagar and 11 km (7 miles) from the Civil Airport, Srinagar. It extends over 142 sq. km (55 sq. miles) of temperate forest, with rolling pastures. The sanctuary is known for Kashmir stag. It is managed by exclusive staff—a Block Officer under the guidance of the Game Warden. Grazing of sheep of the Government Sheep Breeding Farm is permitted. The watch-dogs and watch-men of the Farm disturb the wild animals. There is no direct financial return as no fee is charged. Only 500 people (more foreigners than Indian citizens) have visited the sanctuary, mainly to enjoy its natural beauty, especially the Kolahoi Glaciers and Tassar Massal Lakes, and to look for the Kashmir stag.

There are extemely few sanctuaries in the arid lands of the Himalayas for the protection of high altitude wild life. There is no national park in this region of outstanding scenery and of beautiful plants and flowers, particularly in the Alpine region.

The Great Gangetic Plains extend from the foothills of the Himalayas in Punjab, Haryana, Rajasthan, Uttar Pradesh, Bihar, Bengal and Assam. The tract is mostly flat and networked with tributaries of the Sindh, Ganges and Brahma-putra rivers. It is bounded by the Himalayas in the north, Vindhyan mountains

in the south, the whole of West Bengal, extending into East Pakistan, in the east, and the Thar desert, of recent origin, in the west.

The eastern region of the Great Plains receives a heavy rainfall of over 200 cm M.A. (47. 9"), which gradually falls to 25 cm(6. 0") as we proceed to the west. Bright sun, almost the year round, alluvium soil and good rainfall support luxuriant forests of Sal and *Terminalia tomentosa* in Bengal, Assam, Bihar and Uttar Pradesh. As we travel from east to west, the vegetation changes from the tropical ever-green through moist deciduous to dry deciduous in drier parts of Punjab, Haryana and Rajasthan. We get scattered stunted growth of trees and savannah-type vegetation, consisting of *Acacia leucophloea, A. Senegal, A. arabica, Zizyphus* spp., *Anogeissus pendula, Boswellia serrata* and *Dichrostachys cinerea.* There are many macro- and micro-climatic climaxes depending on ecological factors, i.e. the Ganges delta swamps of the Sunderbans in Bengal support the mangrove forests of *Heritiera forma, Avicennia officinalis* and *Rhizophora macronata,* etc. The unstable banks of rivers are colonized by Khair and Sissoo *Dalbergia latifolia* forests in drier areas, by cane and elephant grass in wet areas, and by thorn forests in the deep ravines of the Jumna and the Chambal.

The high rainfall zones of 406 cm (160") and over, of North Bengal and Assam, develop tropical evergreen multi-tier and moist-deciduous vegetation of *Trewia nudiflora, Ficus* species, *Eugenia jambolana, Bischofia javanica, Dillenia indica,* bananas and *Pandanus, Gmelina arborea, Chukrasia tabularis, Alstonia scholaris,* bamboos and cane brakes *Calamus tenuis;* elsewhere *Schima wallichii, Stereospermum chelonoides, Albizia lebbeck,Hymenodictyon excelsa, Sapium haceata,* with middle storey of *Diospyros* spp., ground cover of *Eupatorium* spp., and in open areas bamboos and in waterlogged patches canes, are dominant.

There are seven sanctuaries—Kaziranga (1908), Orang and Laokhawa (1914-15), Manas (1928), Sonai Rupa (1934), Pabha (1941), Garampani (1952)-in Assam, five sanctuaries—Jaldapara and Gorumara (1941), Lothian Island (1943), Mahanadi (1953) and Chapramari (1963)—in West Bengal, and Keibul in Manipur, situated in this eastern region. The sanctuaries are wild life oriented and afford protection to rhinoceros *Rhinoceros unicornis,* tiger, leopard, wild buffalo *Bubalus bubalis,* swamp deer, hog deer, barking deer, elephant, wild boar, sambhar and many interesting small mammals; birds, including tragopan species and hornbills, and reptiles, including pythons and monitor lizards. Kaziranga and Manas of Assam and Jaldapara of West Bengal are among the oldest sanctuaries. They have become popular in the past few years.

Kaziranga extends over 430 sq. km (166 sq. miles) on flat land, mainly supporting tall (5 m) so-called elephant grasses, such as Ekra *Erianthus* spp. Khagra *Phragmites karka,* Tora *Alpinia allughas,* Nal *Arundo donax* and *Saccharum spontaneum,* and scattered trees of *Albizia procera, Careya arborea, Lagerstroemia parviflora, L. flosreginae, Ficus* and that all too common weed, the water hyacinth *Eichhornia.* The sanctuary is famous for its 500 rhinoceros, 375 elephant, 100 barking deer, 250 swamp deer, 500 hog deer, 350 wild buffalo, 20 gaur *Bos gaurus,* 500 wild boar, 200-300 otters *Lutra lutra* and 20 tigers (Spillett, 1966). The area has been recently declared as a national park. A buffer zone of 111. 4 sq. km (43 sq. miles) to cover the southern aspect of the Miker hills with a corridor of 5. 22 sq. km (2. 0 sq. miles) to enable it to be a self-contained eco-unit, has been added to the sanctuary. The animals migrate during floods to these higher grounds to safety.

The nearest civil airports are at Jorhat, 88. 5 km (55 miles), and Gauhati, 225. 3 km (140 miles) from the park headquarters. Cars are available at the airports

for hire and there is also a public bus service. Two tourists rest houses cater for 22 people at a time. The interior of the park is approachable only on elephant back. There are 15 elephants available most of the time for visitors at a nominal charge of Rs. 5/- per head. This is inclusive of the entry fee. The park is managed by a young and enthusiastic staff of Game Wardens and Game Watchers.

Assam's other sanctuary is Manas, situated in the Kamrup or the Valley of Love and, as the name suggests, is still more enchanting in natural beauty and landscape. The famous Golden Langur *Presbylis geei* is found in this sanctuary. The only ape of India, the Hoolock or White-browed gibbon *Hylobates hoolock,* is found in Garampani sanctuary. Similarly, the only home of about 100 surviving Brow-antlered or Thamin deer *Cervus eldi* is Keibul sanctuary of Manipur.

There is no sanctuary in Chirapunji, one of the areas of highest rainfall, 1168. 4 cm M.A. (400"), in the world, nor in the swamps of the Sunderbans, which were once considered to be an inexhaustible source of tigers.

Jaldapara sanctuary extends over 93. 24 sq. km (35. 8 sq. miles) of alluvium plains of 406. 5 cm (160") M. A. rainfall in the north of W. Bengal. Vegetation consists of *Albizia procera* and *Dalbergia sissoo,* pure or mixed with *Lagerstroemia parviflora, Cedrela toona, Gmelina arborea* and *Anthocephalus cadamba.* The most common weed is *Eupatorium.* There are 50-60 rhino, 40-50 sambhar, 400-500 hog deer, 125-140 barking deer, 125-140 wild boar and other animals like elephant, tiger, swamp deer and leopard with less than 10 each (Spillett, 1966). There is accommodation for six people in three suites at the forest rest house and 16 beds in youth hostels.

The easiest way to get to this sanctuary is to go by air (twice a week service from Calcutta) to Hasimara airport, which is 5 km (3 miles) from Baradabri rest house, or by train (Assam Mail) to Madarihat railway station, which is 11 km (7 miles) away. Visitors are taken round on elephant-back. Activities of the military camp create some disturbance in the sanctuary.

As we move westwards, we enter the lower rainfall zone (about 203. 2 cm or 80") of Bihar, characterized by moist or dry deciduous Sal forest, with which the common associates are *Terminalia* spp. and bamboos. There are two wild life sanctuaries—Madanpur and Gauouli (1959), in the Gangetic plain in Bihar.

Travelling through Sal forest country, we then enter the legendary State of Uttar Pradesh, famous hunting area of the Mughals, Nawabs, British officers and Civil Servants, and Jim Corbett. Here they shot tiger, elephant, leopard, swamp deer, sambhar, hog deer, chital, barking deer, wild boar, sloth bear *Melursus ursinus,* nilgai *Boselaphus tragocamelus,* jungle fowl *Gallus gallus,* etc. The wild life in Uttar Pradesh probably suffered more than anywhere else. Maldhan (1953), Malan (1957), Tanda (1958) and Bankatwa (1960) have now been established as sanctuaries to preserve what remains.

The extreme western limit of the Great Plains is dry and supports only stunted and scattered tree growth. There are very few natural forests. Most of the land area has been converted into either agricultural fields or over-grazed pastures. Still some patches of natural vegetation have been protected as range lands. Bhupinder Sagar Bird Sanctuary (1959), Kohli Kheri, Barasson, Theh, Majobulloch, Shihnasgarh, Bir in Kalesar and Dharpur (all in 1964), in Haryana, Bir Bhunriher (1959), Motibagh (1959) and Gogiana (1964), in Punjab, have been declared sanctuaries for protection of fauna of the arid zone—the black buck *Antilope cervicapra,* chinkara *Gazella gazella bennetti,* nilgai, wild boar, hog deer, francolins and other game birds.

The bird sanctuary of Bharatpur has attained world fame both for its nesting resident birds and its congregation of migratory waterfowl and Siberian cranes, and also for a few mammals like the chital, nilgai, wild boar, sambhar and hyaena *Hyaena hyaena.* It is only 53 km (33 miles) from the Taj Mahal, the marvel of man's creative art.

THE THAR DESERT

The greater part of Haryana and Rajasthan form the western limit of the Great Plains and the extreme eastern limit of the world desert belt. Geographically, it is of most recent origin, where instability still continues. Vegetation is poor consisting of scattered trees of *Prosopis specigera, Acacia Senegal, Acacia leucophloea* and bushes of Phag *Calligonum pollinoides, Leptadenia spartium* and *Calotropis procera* and the landscape is characterized by rolling sand dunes both fixed and mobile. Agriculture is mostly dry farming and vast tracts are used for uncontrolled grazing. Black buck, chinkara, desert hare *Lepus nigricollis dayanus,* nilgai, desert cat *Felis libyca,* desert fox *Vulpes vulpes* and occasionally wild boar are found. Only three small areas-Bir Hissar and Rowari, in Haryana, and Tal Chhaper (1962) in Rajasthan, have been notified as sanctuaries. Tal Chhaper is especially known for black buck. Gajner, a private reserve of His Highness Bikaner, known mostly for the Imperial sand grouse shoot, is equally important for black buck, chinkara, nilgai and the wild boar. Unfortunately, the recent repeated droughts have forced these animals to migrate out of the preserve in search of water, when they are all too likely to be killed.

MAIN PENINSULA

South of the Gangetic Plains, the Peninsula takes the form of a triangular table-land 300 m (984') to 900 m (2, 953') in altitude and dissected by rivers. The northern part of this table-land rests on the confused Vindhyan hill ranges. They extend to southern Rajasthan, northern Madhya Pradesh, Jhansi and the Mirsapur and Chakya forests of southern Uttar Pradesh. Southwards the Peninsula is walled by the western and eastern ghats, culminating, towards the tip of the triangle, in the Nilgiri, Anaimalai and Palni hills. The forests differ considerably in their composition.

The north-western Peninsular mountain region receives poor rainfall (less than 100 cm or 40") and supports tropical dry deciduous forests, pure and mixed, of teak *Tectona grandis,* especially in the Gir forests of Gujarat, and of *Anogeissus pendula, Acacia latifolia,* Salai *Boswellia serrata, Lannea coromandelica, Acacia arabica, Acacia catechu,* Dhak *Butea monosperma, Diospyros melanoxylon,* Jamun *Eugenia jambolana* and *Ficus glumerata* in the cooler parts in the Gujarat forests. This is the home of Asiatic lion *Panthera leo.* Though the lions have been given complete protection since 1954, yet their habitat of 1250 sq. km (483 sq. miles) was given the status of a wild life sanctuary only in 1965. A small area of 62. 2 sq. km (24 sq. miles) inside the present sanctuary is likely to be declared as a National Park. The site of this area, which will be more of a *sanctum sanctorum* than a national park, is being selected for final notification.

The headquarters of Gir sanctuary are at Sassan, a place connected by rail (overnight journey) from Ahmedabad and also by air from Bombay to the nearest airport, 56. 3 km (35 miles) away at Keshod. There are comfortable

rest houses to accommodate 22 people at a time. Additional accommodation of ten beds is being provided. There is no entry fee, but 'lion shows' (feeding of lions on buffalo bait) are charged for. A departmental jeep is provided for visitors to go round the sanctuary. A network of roads carries people close to the lions. The best time to visit the sanctuary is January—March, when lions provide better chance of photography. The present population of lions is 177 and there are a few sambhar, chital, leopard, hyaena and jackal *Canis aureus.* The forests are worked for timber. Cattle grazing by 'Maldharis' (graziers) is a big problem, as they graze their cattle all over the sanctuary except in felled areas. Both activities disturb the animals and destroy the range land and, worse still, the Maldharis sometimes resort to poisoning of carcasses to kill lions.

Elsewhere in the north-western region, there is one bird sanctuary—Nalsarovar (1969)—for water birds, and two more sanctuaries—Puma Valavadar (1969) sanctuary in Bhavnagar district for protection of black buck and Purna (1969) sanctuary in the Dang forest area on the borders of Maharashtra.

The parts of Gujarat and Maharashtra which have a poor rainfall (less than 100 cm or 40"), due to their position in the rain shadow of the western ghats, support stunted dry vegetation consisting mainly of *Acacia leucophloea, Zizyphus* species, small trees and shrubs. Stunted teak *Tectona grandis, Sterculia urens,* bamboo and Dhak also grow, wherever there is a little more rainfall.

This was the home of antelopes and gazelles (black buck, chinkara, nilgai, four-homed antelope *Tetraceros quadricornis)* and the hunting cheetah *Acinonyx jubatus.* The first two have become rare and the last one has been posted in the Red Book as an extinct species. The Indian wolf *Canis lupus,* jungle cat *Felis chaus,* common fox *Vulpes bengalensis* and an occasional leopard also occur. Tigers are rare.

The Vindhyan ranges extend to Southern Rajasthan, which is also an area of low rainfall (less than 100 cm or 40") around Kota, Sawai Madhopur and Dholpur. The characteristic vegetation is dry deciduous forest of poor quality stunted teak, mixed with miscellaneous species—*Anogeissus latifolia, Lannea coromandelica, Terminalia tomentosa, T. arjuna, Acacia catechu, A. leucophloea, Diospyros melanoxylon* and bushes of *Grewia pilosa* and *Zizyphus* spp. Where the Aravalli ranges have intermingled with the Vindhyan system, the tree crop changes to pure *Anogeissus pendula.*

Due to strict protection given to wild life by the erstwhile princely State, the fauna used to be rich. It was the home of the Indian tiger, leopard, sambhar, chital, hog deer, barking deer, wild boar and all the four antelopes—black buck, chinkara, nilgai and four-horned antelope—as well as of jungle cat, desert cat, caracal *Felis caracal,* porcupine *Hystrix indica* and ratel *Mellivora capensis.* The population of peafowl *Pavo cristatus* and other birds is high even today and the State is known as the Peacock State of India. Among other game birds, there are the francolins *F. pictus* and *F. pondicerianus,* jungle fowl, the spur-fowl *Galloper dix lunulata,* bush quail *Perdicula asiatica,* common quail C. *coturnix* and migratory mountain quail *Ophrysia superciliosa.*

Wild life is being strictly preserved in the Darrah, Sawai Madhopur, Van Vihar, Jaisamand, Sariska (1955) and Mount Abu (1960) sanctuaries of the State.

Sariska is situated on the Delhi-Jaipur tourist route and is the nearest wild life area (200 km—122 miles) to Delhi, the capital of India. It was established in 1955. The sanctuary was extended in 1958 and a few more forest blocks—Ajabgarh and Bhangarh—are proposed for inclusion, to make a self-contained

eco-unit of 492 sq. km (190 sq. miles). There is first class accommodation with 22 beds and a jeep is available for tourists. The staff is working exclusively for the sanctuary under a game warden who is available on telephone No. 5 (Sariska). The sanctuary is famous for tiger, sambhar, nilgai and wild boar viewing during night drives. The old forts and ancient temples are other attractions of the sanctuary. Forestry operations, like removal of grass, cutting of bamboo and 'Katha' or the heart-wood of *Acacia catechu,* together with overgrazing by domestic cattle are the disturbing factors in the sanctuary. Even copper prospecting is likely to be undertaken there.

The limit of the north-eastern Peninsula is situated in parts of Southern Uttar Pradesh, Jhansi, Mirzapur and Banda forest divisions, where Chandra Prabha Sanctuary has been created to protect the wild life. This was the place where Asiatic lions were introduced in 1958. Unfortunately, the experiment was not a success.

The Indian tiger is still found in the greater part of Madhya Pradesh. The forests are typical dry deciduous consisting of *Anogeissus latifolia* and teak, as described for southern Rajasthan. The wild life is also similar, except that the tiger population is better. Panna Siri, Dubri (1953), Kheoni, Shikarganj, Maujhar Shikarganj, Shikarganj B, Shikarganj C (Naurhiya Sanctuary, Block II) and Shikarganj C (Naurhiya Sanctuary, Block III) (all in 1955) are the sanctuaries in Madhya Pradesh, while Kanha (1955), Shivpuri (1958) and Bando Garh (1968) are the national parks. This is the only State which has three national parks properly notified.

With better rainfall (152 cm), teak is replaced by sal and Kanha is the most outstanding national park in India. The Banjar Valley, where it is situated, when first reserved for shooting (1900), was comparable to any of the national parks of East Africa. An area of 251 sq. km (97 sq. miles) was declared a national park in 1955. The rolling meadows are interspersed with beautiful stands of sal, whose leaves turn yellow and all intermediate shades from season to season. There are good roads and elephants are also used to take visitors close to chital, gaur, tiger and sometimes sambhar. This is the only area in the Peninsula where a small herd of swamp deer is found. The park is approachable by air to Nagpur and thence by land 320 km (200 miles). There are two sets of 18 beds in comfortable rest houses and two cabins of 8 beds. The park is looked after by a separate staff consisting of an Assistant Conservator of Forests, under the Divisional Forest Officer, Mandla South. It is proposed to extend the park.

Bandogarh is a recently created national park and is in the stage of development. It is likely to be developed as a park for propagation and protection of white tigers.

Nine sanctuaries—Dibrigarh (1931), Chandaka and Balukhand (1935), Raigoda (1938), Simalpal (1956), Khalasuri, Padmatala, Ushakathi and Mahanadi (all in 1962)—are situated in Orissa. The topography changes from the formal flat Gangetic plains to undulating hills of the eastern ghats. The forests are dry deciduous sal, sometimes changing to moist deciduous. Luxuriant bamboos grow in all the forests. They give protection to elephant, gaur, sambhar, chital, barking deer, hog deer, nilgai, tiger, leopard, sloth bear and small mammals like porcupine, ratel and caracal, jackal, hyaena, jungle cat, civet and a variety of birds.

Establishment of 'Nandankanan', a biological park, is being contemplated. This will consist of an open zoo in the Whipsnade style and a natural forest. A beginning has been made by establishing a small zoo. Simalpal sanctuary is

being proposed as a national park. It is a place of natural beauty and rich wild life. There are waterfalls and tropical rain forests and extensive bamboo forests, grassy valleys and tribal villages.

Another Peninsula area comprises the Ranchi hills in Bihar, where there are two important parks—Betla (Palamalu) (1959) and Hazaribagh. Both, though called national parks, are still sanctuaries in legal status. Hazaribagh National Park extends over 183. 9 sq. km (71 sq. miles) and is situated on the National Highway No. 39, Delhi-Calcutta, 12 miles from Hazaribagh. The nearest airport is Ranchi at a distance of 112. 6 km (70 miles). There is accommodation for 28 people in different rest-houses. The park is under a Game Warden with the status of Forest Ranger, under the control of a Divisional Forest Officer who looks after the area 'in addition to his other duties'. There are another eight sanctuaries in this region of Bihar: Tabo (1932), Bamiabura (1934), Barasand and Dumka Damin (1938), Lat, Karh and Kederma (1946), Kaimur and Rajgir (1959). The vegetation and wild life are similar to what is found in Orissa.

There are four sanctuaries—Pakhal, Eturnagaram, Pocharam and Qawal—all created in 1952, in Andhra Pradesh. Qawal with its scenic beauty and developing wild life is attracting attention. There are good rest-houses for visitors' comfort. The largest known breeding colony of the Grey Pelican *Pelecanus philippensis*,at Kolleru, has been declared a Bird Sanctuary.

Of the four sanctuaries—Bandipur and Muthodi (1941),Dandeli (1949) and Nagarhole (1955)—in Mysore, Bandipur is well known for the gaur, sambhar and elephant of its dry deciduous forests. There is also a bird sanctuary established in 1936. Bandipur sanctuary is situated on the Bangalore-Ooty road, 160 km (100 miles) from Bangalore airport. Regular excellent coaches take visitors to the sanctuary. It extends over 57 sq. km (22 sq. miles) and forms part of the Venugopala Wild Life Park. The area was declared a sanctuary in 1941 and is being notified as a national park. It is managed by an exclusive staff of wild life officer and game rangers, in addition to the territorial forest staff. There is sufficient accommodation to house 28 people in five different bungalows. In addition, three tents with 8 beds are provided. Extra accommodation for another 12 beds in cottages and 30 to 40 beds in a dormitory is under construction. There is a well-planned network of roads and 'Machan' (observation posts) for viewing wild life.

In some forested blocks of Maharashtra, antelopes give place to deer, chital, sambhar, barking deer, mouse deer *Tragulus meminna,* leopard, gaur, four-horned antelope, hyaena and wild dog *Quon alpinus.* Radhanagari (1958) and Singhad are the sanctuaries and Tadoba (1935) a national park in the State. Tadoba is situated in the Chanda Forest Division—175 km (109 miles) from Nagpur airport and extends over 116 sq. km (41 sq. miles). It was first declared as a sanctuary in 1935 and subsequently up-graded as a national park in 1956. It is expected that it may be enlarged to 754 sq. km (291 sq. miles) to make it a self-contained eco-unit. Accommodation in the park consists of 8 beds in four suites. There is no regular forestry operation in the park but the rights of grazing, taking of forest produce and transit are arresting the progress of the park, which is known for landscape features and population of chital and leopard. It is managed by an exclusive staff under a Game Warden.

There are three wild life sanctuaries in Goa-Collem (1967),Canocona (1968) and Bondla (1969). They are in the formation stage. Wild life is very much depleted.

The Malabar coasts receive a heavy monsoon rain (300 cm M.A.) from June to September and the western ghats support lofty trees, big bamboos and thick undergrowth. The whole vegetation complex of tropical moist evergreens is very luxuriant. It consists of *Bischofia javanica, Cullenia excelsa, Dysoxylum malabaricum, Artocarpus intergrifolia, Mesua ferrea, Calophyllum tomentosum, Hopea wightiana, Vetiveria indica,* mzny Myristicaceae and Lauraceae and tall elephant grasses like *Saccharum spontaneum* on the eastern aspects. Teak, rose wood *Dalbergia latifolia* and *Terminalia* spp. appear in less moist areas, the rainfall decreasing from west to east. The wild animals in these forests are elephant, gaur, wild boar, sloth bear, barking deer, mouse deer, sambhar, Malabar squirrel and a very few tiger and leopard. But due to thick forests and heavy undergrowth they are hard to see. There are five sanctuaries in Kerala: Periyar (1950), Noyyar, Vazhani-cum-Peechi and Peechi, all established in 1958, and Prambikulan (1962), of which Periyar is specially noted for elephants. It is situated on the western slopes of the western ghats and was the hunting reserve of the erstwhile princely State of Travancore. It was constituted as a sanctuary in 1933 and renotified in 1950, when enlarged to over 780 sq. km (300 sq. miles). The area is a self-contained eco-unit. The easiest way to reach it is by air to Cochin and thence by road. Most of the wild life viewing is done from a boat cruising along the shore of the Periyar Lake. There is a good 9-room hotel, 'Arya Niwas', in the sanctuary. The main problem of the park is the eucalyptus planting on the grassy ridges of the sanctuary, which might reduce wild life habitat. The sanctuary has its own staff.

In the adjoining forests of Tamil Nadu are situated Madumalai (1940), Tiger sanctuary (1962) and the proposed sanctuaries of Top Slip and Mathukuzivayal. The vegetation is so luxuriant that wild life viewing is difficult except in the dry season. Other proposed sanctuaries are at Manjampatti, Kodai Kanal and Mundandurai. Tamil Nadu also has the oldest bird sanctuary, Vedanthangal, established inl798. Large numbers of birds nest and 27 species of waterfowl visit the area. Madumalai was established as a wild life sanctuary in 1940. The sanctuary is known for wild elephants. It extends over 321 sq. km (124 sq. miles). The nearest airport is at Coimbatore and railway station at Ootacamund, from both of which regular bus services pass through the sanctuary calling at 'Abhayaranyam' Rest House. Altogether there are four rest houses to provide 10 beds in four suites. Forestry operations are conducted. Grazing of cattle is allowed all over the area.

There is no national park in the tropical evergreen rain forest region and it may be noted that there are only four national parks in the whole of peninsular India. They too are not representative geographically: Shivpuri, Kanha and Bandogarh National Parks are all in the northern sector, which cannot be said to provide adequate protection for the bio-aesthetic assets of the region. There is not a single geological or floral reserve, despite the fact that this region constitutes one of the oldest landscapes from the point of view of geological history.

MANAGEMENT

The land and its resources in the Indian Union are 'State subjects'. No land or its produce vests in the Federal Government for direct management purposes. There is no separate department for national parks or wild life as in the U.S.A., Canada and Africa. All national parks and sanctuaries are managed by the State Forest Departments. Since their development and use has been limited, the need for an elaborate separate organization has not been felt.

Probably, it may be planned in the future. However, many well-known parks and sanctuaries, as already mentioned, are being managed by their own separate staff of wardens, rangers and guards. But most of the parks including Kanha, Bandogarh, Betla and Tadoba are supervised by Divisional Forest Officers 'in addition to their other duties'. This type of organization has its own merits. If the officer is park-oriented, it can probably provide the ideal condition of 'one-unit management'. But it is not always so and the parks sometimes get neglected.

In almost all the 125 reserved areas constituted as parks or sanctuaries, forest operations are allowed. Grazing of domestic stock is permitted in all the sanctuaries. In some of the sanctuaries, such as Gir, Sariska, Bharatpur and Bandipur, grazing is very heavy, endangering the existence of the park. Last year (1968), very large numbers of gaur died in Bandipur and Madumalai sanctuaries due to rinderpest transmitted by cattle. The sanctuary, which was known for its gaur, is now totally devoid of them. It will take decades to rebuild the population. Except for a few parks, grazing is free or only a nominal charge is made. It is the greatest uncontrolled evil. But logging, mining and plantations are also not only allowed but even 'prescribed' in the working plans. These working plans are forestry-oriented and wild life is only a secondary consideration.

The parks in India are not yet well organized. Adequate facilities, particularly for the foreign tourists, exist only in a few parks like Kaziranga, Manas, Jaldapara, Corbett, Sariska, Bharatpur, Hazaribagh, Periyar, Bandipur, Madumalai and a few others. Even in these accommodation and transport are not sufficient (except at Corbett) to handle a group of more than 40 visitors at a time. There are elephants or jeeps to take visitors to the sanctuaries but their number is insufficient to cater for large groups. Sometimes where, as at Sariska, only one jeep is available, visitors are just stranded when it goes out of order. In some places one has to depend on a private service which is either not available or very expensive.

None of the parks have landing strips for even small aircraft. There are no special services for taking visitors even near to the parks. Civil aircraft on regular commercial flights only go to large towns or places of maximum tourist interest like Khajuraho. For ease of reference the present position can be tabulated as follows:

Sanctuary	Airport	Distance from airport	Area	Accommodation	Best time and features
Kaziranga	Jorhat	113 km 70 miles	430 sq. km 166 sq. m	Two rest houses	December-March. Rhinoceros,
Manas	Gauhati	175 km 110 miles	578 sq. km 430 sq. m	Forest rest house	Wild boar, hog deer, swamp deer
Corbett	Delhi	320 km 200 miles	526 sq. km 203 sq. m	Forest rest house and dormitory	December-March. Elephant, barking deer, chital, tiger, crocodile

Sanctuary	Airport	Distance from airport	Area	Accommodation	Best time and features
Kanha	Nagpur	320 km 200 miles	251sq.km 97 sq.m.	Two forest rest houses	March-May. Tiger, chital, swamp deer, sambhar.
	An airstrip has been constructed 16 km (10 miles) from the park, but not yet commissioned.				
Gir	Keshod	56km 35 miles	1,295 sq.km. 500 sq.m	Two forest rest houses	January-May. Asiatic lion.
Periyar	Madurai	160 km 100 miles	777sq.km 300 sq.m	Arya Niwas hotel	March-May. Elephant.
Bandipur	Bangalore	160km 100 miles	803sq.km 310 sq.m	Forest rest house	April-May. Elephant, gaur.
Bharatpur	Agra	56km 35 miles	30 sq.km 11 sq.m	Forest rest house	September-February. Migratory and nesting birds.
Sariska	Jaipur Delhi	108 km 67 miles 196 km 122 miles	207sq.km 80 sq.m	Forest rest house Tourist bungalows.	February-June. Sambhar, tiger.
Jaisamand	Udaipur	48km 30 miles	51.8 sq.km 20 sq.m	Jaisamand Hotel	August-Sept. Leopard, chinkara.
Dachigam	Srinagar	21km 13 miles	141 sq.km 55 sq.m	Srinagar	August-Sept. Kashmir stag..
Jaldapara	Hasimora	11 km 7 miles	93.24 sq,km 28.8 sq.m	Forest rest house	February - April. Rhinoceros.
Tadoba	Nagpur	175 km 109 miles	106 sq.km 45 sq.m	Forest rest house	April-May. Chital, tiger, leopard.
Gindi	Madras	6 km 3¾ miles	2.59 sq.km 1 sq.m	Madras	Black buck.
Hazaribagh	Ranchi	113 km 70 miles	71 sq.km	Rest house, tourist lodge at Rajdharwa Abharjaranyam	February-May. Gaur, sambhar, tiger.
Madumalai	Coimbatore	104km 65 miles	321 sq.km 124 sq.m	Rest house	February-May. Elephant, chital.

Turning now to the interpretive programme, most of the better parks supply handy folders which give basic information, but detailed guidebooks are not available. There is no regular guide service in any of the parks except insofar as rangers and wardens act as guides. Since animals, plants and landscapes cannot speak, they require trained naturalists to act as interpreters. Lack of such a facility discourages visitors as they feel they do not get their money's worth.

Our parks have not become popular even at home, because of inadequate publicity. People often do not know how to get there. Most of the booking of the resthouses and elephants is done by the officers posted at the site, who are not on the telephone. In the case of Corbett National Park, booking is centralized at Lucknow, but when a booking is made, it is difficult to arrange for transport to the park. There are no tour operators to take people to parks and it is not within the reach of every man to have his own transport. Public transport is either expensive or not available. Some attempts have been made by a few 'Shikar' and Travel Companies to arrange 'Wild Life Tours', but they have not been very successful because they are expensive by Indian standards. Organization of group tours on an all India basis is needed to make them popular and inexpensive. In short, our parks have not yet been developed as tourist destinations. They lack showmanship. Visitors return with mixed feelings—happy perhaps to have seen a tiger or dejected because they could not get films or even gas when they ran out of fuel. The parks need tourist orientation.

The future of the parks depends on tourism and tourism will also prosper if the parks are developed. The following figures indicate the present status of the popularity of some of the areas:

Name of the Sanctuary/Park	Year	Number of visitors
Bandipur	1967-68	3,717
Bharatpur	1967-68	2,107
Corbett	1967-68	4,556
Kanha	1966-67	8,753
Kaziranga	1967-68	6,439
Periyar	1968	57, 648
Sariska	1968	1,386
Shivpuri	1966-67	333

All facilities at parks are owned by Government and operated at a nominal charge. There is no admission fee except in

Corbett		Rs.2/-
Hazaribagh		Rs. 3/-
Sariska and Bharatpur		Rs. 5/-
Kanha		Rs. 1/-for Indians Rs. 10/-for foreigners
	Cars	Rs. 10/- for Indians
		Rs. 25/- for foreigners

There is therefore practically no revenue from this source. Lodges are also being run on an almost 'no profit no loss basis' and at places are even subsidized. The direct earnings of the national parks are, therefore, nil. The expenditure incurred on the protection and management of the parks is all

from the Government budget and runs into over a million rupees per year. This uneconomic aspect of the national parks is partly responsible for lack of enthusiasm, inadequate attention and temptation to commercially exploit the forests to cover the expenditure incurred on administration of the parks.

However, the International Commission on National Parks will be happy to know that the Indian Board for Wild Life has now set up an Expert Committee to study the present situation of National Parks; and also to suggest ways and means to improve existing ones and create new ones to include outstanding landscapes of the country not yet represented in the Parks system.

ACKNOWLEDGEMENTS

I express my grateful thanks to Shri R.C. Soni, Inspector-General of Forests, Government of India, for providing me all facilities to undertake this study. But for the help of the Chief Conservators of Forests of all the States, the work would not have been an up-to-date study of our national parks. I am grateful to them and the officers who promptly sent the required information and gave their valuable time during my visit to the parks.

LITERATURE CITED

ANON, 1965 Wild Life Sanctuaries in India, Department of Tourism, Ministry of Transport, Government of India, New Delhi. 88 pp.

ANON, 1968. Wild Life of Himachal Pradesh. Publicity Forest Division, Forest Department, Himachal Pradesh, Simla. 68 pp.

CHAMPION, H. G. and S. K. SETH, 1964. A revised survey of the forest types of India. Cyclostyled mss.

CHATURVEDI, M. D. 1969. Wild Life Management in India. IUCN Publications New Series, Supplementary Paper No. 17: Conservation in India. Proceedings of the Special Meeting of the Standing Committee of the Indian Board for Wild Life held at New Delhi, 24th November, 1965. pp. 22-41.

DANG, H. 1968. Govind Pashu Vihar: 'Cheetal'. *J. Wild Life Pres. Soc. of India,* Dehra Dun. 65-83.

DANG, H. 1968. The Musk deer of the Himalayas: 'Cheetal' *J. Wild Life. Pres. Soc. of India,* Dehra Dun. 84-95.

GEE, E. P. 1960. Report on the status of the Brow-antlered deer of Manipur. *J.Bombay Nat. Hist. Soc.* 57(3): 597-617.

GEE,E.P. 1964. The Wild Life of India. Collins, London. 192 pp.

LAHIRI, L. K. 1969. Sanctuaries and National Parks in Eastern India. IUCN Publications, New Series, Supplementary Paper No. 17: Conservation in India. Proceedings of the Special Meeting of the Standing Committee of the Indian Board for Wild Life, held at New Delhi, 24th November, 1965.

SANKHALA, K. S. 1964. Wild Life Sanctuaries of Rajasthan. *J. Bombay Nat. Hist. Soc.* 61(1): 1-8.

SCHALLER, George B. 1967. The deer and the tiger. University of Chicago Press, Chicago: 370 pp.

SEN, N. N. and SANKHALA, K. S. 1962. Wild Life of Rajasthan-a study of ecology. Proc. First All India Cong. of Zoology (1959): 258-268. Zool. Soc. India, Calcutta.

SPILLETT, J. Juan. 1966. A report on wild life surveys in North India and Southern Nepal. *J.Bombay Nat. Hist. Soc.* 63(3): 492-628 (20-7-1967).

SRIVASTAVA, T.N. 1952. Wild Life Reserves in India; Uttar Pradesh (U.P.). *J. Bombay Nat. Hist. Soc.* Vol 51, No. 1. December, 1952.

SUMMARY

The National Park movement in the form of 'Ashrams' and 'Abannyas' is as old as Indian culture. But it got lost during the turbulent period of history. However, a few enthusiastic naturalists prevailed upon the Government to create reserves. The first wild life reserve was created in 1900 and by the end of the first World War, there were three sanctuaries. The first National Park was created in 1935. Today, there are 120 sanctuaries and 5 national parks in India, extending over an area of about 18, 500 sq. km (7,160 sq. miles).

These parks and sanctuaries are located in all the four major geographical zones of the country–the Himalayas, the Indo-Gangetic Plain, the Thar Desert and the Peninsula. Some of the areas like Corbett, Dachigam, Kaziranga, Manas, Jaldapara, Hazaribagh, Simbalpara, Bharatpur, Sariska, Gir, Kanha, Tadoba, Bandipur, Periyar and Madumalai have become well-known for their wild life. Management of the areas lies with State Governments. All areas are grazed and subject to forestry operations except for a few sanctuaries like Kaziranga and Periyar. More efforts are needed to improve and bring them up to international standards and to create more national parks in, for example, high rainfall areas, the highest peaks of the Himalaya, the driest deserts, both cold and hot, along sea shores and even under water, to preserve the national heritage for future generations.

RÉSUMÉ

Le mouvement en faveur des Parcs Nationaux est aussi vieux que la civilisation indienne. Les 'Ashrams' et 'Abannyas' en témoignent. Mais il s'est perdu au cours des siècles. Cependant il s'est trouvé quelques rares naturalistes enthousiastes pour pousser le gouvernement à créer des réserves. La première réserve naturelle fut établie en 1900 et à la fin de la Première Guerre Mondiale l'Inde comptait déjà trois sanctuaires. Le premier parc national a été créé en 1935; il en existe aujourd'hui cinq en Inde, et 128 sanctuaires qui couvrent au total près de 18. 500 km^2.

Ces parcs et sanctuaires sont situés dans les quatre grandes zones géographiques du pays: la chaîne de l'Himalaya, la Plaine Indo-Gangétique, le Désert de Thar et la Péninsule Indienne. Certaines de ces régions, telles que Corbett, Dachigam, Kaziranga, Manas, Jaldapara, Hazaribagh, Simbalbara, Bharatpur, Sariska, Gir,Kanha, Tadoba, Bandipur, Periyar et Madumalai sont déjà renommées pour leur faune et leur flore. Les gouvernements des Etats sont chargés de la gestion de ces régions. Dans aucune d'entre elles, à l'exception de quelques sanctuaires tels que Kaziranga et Periyar, le pâturage ou l'exploitation des forêts ne sont totallement exclus. Il est nécessaire de poursuivre les

efforts entrepris afin d'améliorer ces zones, de les amener à un niveau international et de créer un plus grand nombre de parcs nationaux dans les régions à pluviosité maximum, sur les sommets les plus élevés de l'Himalaya, dans les déserts froids et chauds les plus secs, sur les plages du littoral et sur les fonds marins, pour pouvoir préserver notre héritage national et le transmettre aux générations futures,

Section A(i): Paper 2.

Nature Reserves and National Parks in Indonesia- present situation and problems

HASAN BASJARUDIN,
Wildlife and Nature Conservation Service, Djalan Ir Djuanda 9, Bogor, Indonesia

I. GENERAL INTRODUCTION

1. There are still many difficulties to be overcome in Indonesia in the field of nature protection and conservation, especially concerning the proper maintenance and safeguarding of Nature Parks and of Game which are protected by the Nature Conservation Ordinance 1941 and the Game Ordinance 1931 respectively.

2. The Central Government offices which are responsible in this field (the Ministry of Agriculture, the Directorate General of Forestry and also other institutions such as the National Institute for Biology, the Headquarters of the Police Forces, the Directorate General of Custom and Excise, and others) are giving their full attention and support to combating violations which have occurred in conservation work.

II. THE CONSERVATION SITUATION;

(a) Principal animal species requiring attention:

1. Javanese Rhino *Rhinoceros sondaicus* and Sumatran Rhino *Didermocerus sumatrensis,* of which about 25-30 and 80-90 animals respectively still survive.
2. Orang-utan *Pongo pygmaeus:* less than 1000 animals are left in Atjeh (North Sumatra); in Kalimantan about 3500-4000 animals need special attention and protection with the aid of a special Orang-utan Project.
3. Tapir *Tapirus indicus:* the number is unknown in Sumatra, but we are of the opinion that the situation is becoming dangerous.
4. Dwarf buffalo or Anoa *Anoa depressicornis* in Celebes, also belongs to the endangered species list.
5. Elephant *Elephas maximus:* about 500-600 animals remain in the jungle of the provinces of Lampong, Biau, Djambi and South Sumatra.
6. Hog-deer *Babirussa* in North Celebes: status gives cause for concern.
7. Goat antilope *Nemorhaedus sumatrensis* in Sumatra: needs attention.
8. Javan tiger *Felis tigris sondaicus:* almost extinct; a Wildlife Refuge (60, 000 ha) has already been established especially for the tiger in the East-Java province, in an attempt to salvage the situation.
9. Bali tiger *Felis tigris balica:* at the suggestion of the SSC and Dr Maliepaard, a Bali Tiger expedition will be arranged this year (1969) to visit the island for research into the status of this race.

10. A Sea-turtle project has been established on the South-coast (Indonesian Ocean) of East-Java province especially for turtle breeding.

(b) Principal plant species requiring attention:

1. *Rafflesia* spp. are endangered in several places, especially in Java and Sumatra.
2. Some orchid species such as *Paphiopedilum chamberlaianum* and *Vanda suavis sonderiana* also give cause for concern.
3. Several big tree species such as *Podocarpus imbricata, Eusideroxylon melangangai,* etc. are already becoming scarce in the natural forest of some parts of the country.
4. *Dalbergia latifolia:* new strict Nature Reserves in the East-Java province will be established for this tree species.
5. *Cinnamomum* sp.: new strict Nature Reserves in West Nusa Tenggara (Lombok) will be established for this tree.

(c) Geological features requiring attention:

Beautiful geological formations such as sulphuric craters, stalactite formations, etc. in several places need serious protection against destruction and disturbances.

We should take drastic measures to prevent destructive activities and to safeguard the above-mentioned species, and objects because we are afraid that in a short period they will become extinct forever.

In view of the increasing danger of extinction to which some species of animals and plants are subject, preparations have been made to extend several nature parks and to establish new nature reserves throughout the country.

In general, our nature reserves need to be rehabilitated and upgraded, especially in the islands other than Java.

III. DISTRIBUTION OF NATURE RESERVES IN INDONESIA

The total number of nature reserves in Indonesia at present is 122, with a total area of more than 3 million hectares. These reserves are distributed as follows: 69 in Java, 31 in Sumatra, 7 in Borneo, 7 in Celebes, 3 in Bali, 3 in Nusa Tenggara, 1 in Moluccas and 1 in West Irian. According to their status and function, the nature reserves can be divided into the following categories:

— Strict nature reserves.

— Animal sanctuaries.

— Bird sanctuaries.

— Nature parks.

— Other reserves: botanic, Zoologic, scenic, hydro-orologic, historic, aesthetic, recreational and touristic.

IV. REHABILITATION OF NATURE RESERVES

One of the biggest problems that seems almost impossible for us to solve is to maintain the boundaries and boundary signs of the reserves which cover a

total area of more than 3 million hectares with a total perimeter of 1050 km. According to a rough estimate, there are about 800 kilometers of cleared strips which encircle the reserves and along which about 4000 signs have been placed to distinguish the boundary line. Maintenance of these boundaries and signs has been entirely neglected during the last 20 years (except for some places in Java and Bali) and most of them have probably been lost. Their rehabilitation is a most urgent matter and will undoubtedly involve high expenditures.

V. ESTABLISHMENT OF NEW NATURE RESERVES AND EXTENSION OF PRESENT NATURE RESERVES

In view of the increasing danger of extinction of various legally protected animals, such as *Pongo pygmaeus*, and the illegal hunting of elephants in Sumatra, several nature reserves would be extended and some new nature reserves designated in the near future:

1. *Udjung-Kulon* reserves has already been extended with a buffer-zone on the east side of the present reserve, covering the forest complexes of Gunung Hondje. The total extension of 10,000 hectares is mainly directed to safeguarding the one-horned rhinos.
2. *Gunung Loser* in Atjeh is urgently to be surveyed by experts and experienced conservationists for the effective safeguarding of *Didermocerus sumatrensis, Pongo pygmaeus* and mountain goat.
3. *Kerumutan* in Riau (Central Sumatra): about 120, 000 hectares have already been designated as a nature park for the Sumatran rhinos, tapir and elephant.
4. *Mandor* in West Kalimantan is to be extended by 3000 hectares for *Pongo pygmaeus.*
5. *Wae-Wuul* in West Flores is to be designated as nature park for *Varanus komodoensis.*
6. *Mount Indrapura* in West Sumatra is to be extended for the mountain goat.
7. *Tangkoko-Batuangus* and *Tanggala,* both in West Celebes, are to be extended for the *Anoa.*
8. *Kai* and *Aru Islands* in the Moluccas are to be designated nature reserves for Birds of Paradise.
9. *Ceram* in the Moluccas is to be designated as nature reserve for the crowned pigeon and the Nicobar pigeon.
10. *Pati-Pati* in Celebes is to be designated for the hog-deer.
11. *Meru-Betiri* in East Java (60, 000 ha) has been already designated as a wildlife refuge, especially for the Javan tiger *Felis tigris sondaicus.*
12. *Gunung Batur* in Bali is to be designated as nature reserve for research in geology and flora succession.
13. *Gunung Kapur* in West Java is to be designated as a geological nature reserve.
14. *Sekaruh* in West Nusa Tenggara on the isle of Lombok (8, 000 ha) is to be designated as nature park for *Cervus timorensis,* birds, etc.
15. *Pulau Berkeh* in Riau (Central Sumatra): 500 ha have already been designated as nature reserve for sea-birds.

16. *Pulau Laut* in Riau (Central Sumatra): 400 ha have already been designated as nature reserve for sea-birds and turtles.
17. *Pulau Burung* in Riau (Central Sumatra): 200 ha have already been designated as nature reserve for sea-birds.
18. *Buatan* in Riau (Central Sumatra): 30, 000 ha to be designated as nature park for tapir.
19. A nature reserve with botanic value in East Java is to be designated especially for *Dalbergia latifolia* (rosewood).
20. A nature reserve with botanic value in West Nusa Tenggara (on the isle of Lombok) is to be designated for the *Cinnamomum* sp.

The following areas are also planned and proposed for designation as nature reserves:

West Java

— Tjipanas, 1550 ha—hot water spring, flora, aesthetic.
— Gunung Tjabe—aesthetic, botanic.
— Tjiogong, 1100 ha—animal sanctuary, wild ox, deer.
— Salatri, 1000 ha—botanic, coast vegetation.
— Djajanti, 2000 ha—ature park, refuge for banteng.
— Tjiloto, 300 ha—aesthetic, scenic.
— The forest near Telagawarna, 175 ha—botanic, aesthetic, scenic; beautiful lake.
— Slopes of mount Pangrango—aesthetic, scenic.
— Mount Tangkuban Prahu, 1500 ha—geological monument and recreation.
— Tjumapag—nature park, refuge for wild ox.
— Hutan Lojang—animal sanctuary.
— Several small islands with coral formation in the bay of Djakarta—aesethetic, scenic.

Central Java

— Gunung Tjereling—animal sanctuary, *Cervus* sp,
— Gunung Slamet—aesthetic, scenic.
— Kompleks Pelawangan—aesthetic, scenic.
— Kali Samin—botanic, coast vegetation.
— Gunung Solok—aesthetic, historic.
— Gunung Bekutuk—teak forest.

East Java

— Gunung Wilis—historic.
— Sempolan—natural rainforest; aesthetic.
— Djabung—flora.
— Modjoagung—historical monument.
— Gunung Welirang—natural forest; hydro-orologic; sulphuric crater.

Bali

— Gunung Sangeang—bird sanctuary, white starling *(Leucopsar rothschildi).*
— Kompleks Batukahu—hydro-orologic, botanic.
— Bujan and Tamblingan—aesthetic.
— Gunung Batur—geology, aesthetic; crater-lake; scenic.

West Nusa Tenggara

— Kompleks Hutan Kaju-Manis, Sumbawa—botanic.
— P. Mojo—animal sanctuary.
— Gunung Tambora—geologic, aesthetic.

East Nusa Tenggara

— Extension of S. M. Rintjah—nature park, *Varanus komodoensis.*
— Hutan Tjendana (Timor)—botanic.

VI. ADVANTAGEOUS USES OF NATURE RESERVES

In cooperation with the Directorate General of Tourism and tourist agencies, several strict nature reserves and sanctuaries have been opened to guided tourism, for sightseeing, recreation, wildlife-viewing, photographing, mountain-climbing, etc. These are:

Udjung-kulon, Panaitan, Pulau Dua, Pelabuhan-Ratu, Papandajan, Sukawajana, Mount Gede near Tjibodas, Telaga Patengan, Pangandaran-Panandjung, Laut Pasir-Tengger, Baluran, Kawah Idjen, Yang Plateau, Komodo, Ardjuna Lalidjiwo, Sempu, Dieng Plateau.

Special forest areas have already been designated as 'hunting areas' especially destined for hunting-tourism, such as: Maelang (75, 000 ha) in East Java.

VII. CURRENT PROBLEMS

(1) In implementing the development program of our Department (the Nature Conservation and Wildlife Management Service) to intensify and extend our nature parks and to establish new ones in the near future, we are experiencing numerous difficulties due to:

— shortage of skilled and educated personnel (technical staff);

— shortage of funds and equipment, etc.

(2) According to the decision of the Government, within the 5-year development program of our country, our Department will probably receive a total budget over the whole period of only about $ 120, 000 or $ 24, 000 yearly. With this amount, it is hardly possible to manage and safeguard all our nature parks/reserves as they should be.

(3) The first step in working out our program as mentioned above will be to establish as soon as possible a Nature Conservation Section in every province. We have in total 24 provinces in Indonesia, but we urgently need to establish a Nature Conservation Section in 21 provinces. For this purpose, we need at least $2000 for each province to build one office-building, one house for the Nature Conservation Officer and one motorcar or one motor-boat; and it means that for all the provinces, we need at least $42,000.

(4) Among the 21 provinces mentioned above, we should like first of all to establish a Nature Conservation Section in the 6 provinces judged to have the greatest need: Atjeh, North Sumatra, Riau, East Kalimantan, South Kalimantan and the Lesser Sunda Islands. For this purpose, we need a grant of about $12, 000 for the year 1969/1970.

To realise this program, financial aid from the IUCN or related international institutions is a matter for decision.

VIII. SUGGESTIONS AND NEEDS

(1) Indonesia has an exceptional wealth of fauna and flora which is of great value for education, science and culture. In general, our nature parks and reserves offer excellent opportunities for the ecologist, botanist and zoologist to study the behaviour and ecology of several animal and plant species which are becoming endangered or extinct.

(2) Continuation of cooperation with international institutions such as the IUCN, ICNP, SSC, WWF and other conservation agencies is urgently needed with regard to:

— the sending of more trainees, fellowship-holders, and observers to countries well advanced in nature conservation and wildlife management.

— the application of the International Biological Program (CT check-sheet survey, etc.) at least to our more important nature parks (Udjung-Kulon, Baluran, Yang Plateau, Loser, Sumatra I/II, Kutai, Komodo, etc.).

— aid in the form of equipment such as vehicles, motorboats, movie-cameras, projectors, taxidermic equipment, library, etc.

— grants or funds to support or to realize the rehabilitation and development program.

— assignment of more conservation experts to Indonesia for education, research and survey.

(3) We want and expect more experts to come to our country for research and survey of our nature parks and to give advice and to collect data for the good and proper management and safeguarding of the reserves and also to study the ecology of our endangered species (biology, etc.) such as:

1. Javan rhinoceros in Udjung-Kulon (cooperation with the WWF study of the Javan rhino in Udjung-Kulon now being undertaken by Dr. Schenkel is continuing).
2. The Sumatran rhino in Sumatra and Kalimantan.
3. The Orang-utan in North-Sumatra and in Kalimantan.
4. The Anoa in Central Celebes.
5. The Javan tiger and Bali tiger.
6. The Komodo dragon in Komodo/Flores.
7. The Birds of Paradise in West Irian and South Moluccas.
8. The Maleo bird in Celebes.
9. The Hog-deer in North Celebes.
10. The Malayan tapir in Sumatra, etc.

SUMMARY

The present conservation situation of Indonesia's Nature Parks and Reserves and her endangered flora and fauna are reviewed and a brief outline is given of the governmental institutions which are responsible for nature conservation and wildlife management problems.

The distribution of nature reserves in Indonesia is described. At the present time, there are 122 reserves with a total area of more than 3 million hectares and a boundary length of 1050 km. In general, these reserves are in urgent need of rehabilitation and development, and it is felt that new reserves and parks should be established, especially in view of the increasing danger of extinction of some species of plants and animals. In cooperation with the Directorate General of Tourism and tourist agencies, such as travel bureaux, some of the strict nature reserves and sanctuaries have been opened to the public.

However, the management and safeguarding of the existing nature reserves meet with numerous obstacles owing to the shortage of technical staff, equipment and funds. Grants from IUCN and related agencies are urgently needed for nature conservation work in Indonesia, particularly for the establishment of provincial conservation offices. The visits of foreign experts to conduct surveys and research and training of personnel are also called for.

In conclusion, the author considers that continued cooperation with such international institutions as IUCN (particularly its National Park and Survival Service Commissions), WWF and other agencies is more than ever necessary.

RÉSUMÉ

L'article fait le point sur la conservation dans les Parcs et Réserves naturelles d'Indonésie et sur les espèces animales et végétables menacées, puis donne un bref aperçu des organismes gouvernementaux chargés de la conservation de la nature et de l'aménagement de la faune.

La répartition des réserves naturelles en Indonésie est ensuite décrite. Actuellement, il existe 122 réserves couvrant une superficie totale de plus de 3 millions d'hectares et de 1050 km de tour. En général, ces réserves ont un besoin urgent d'être restaurées et développées. Il parait en outre nécessaire de créer de nouvelles réserves et de nouveaux parcs, en particulier pour parer à la menace d'extinction qui plane sur certaines espèces animales et végétales. Avec la coopération de la Direction Générale au Tourisme et d' organismes touristiques tels que les agences de voyage, quelques réserves et sanctuaires naturels interdits ont été ouverts au public.

Toutefois, l'aménagement et la sauvegarde des réserves naturelles déjà existantes se heurtent à de nombreux obstacles, dus au manque de personnel technique, d'équipement et de fonds. Des subventions de l'UICN et autres organismes apparentés seraient extrêmement nécessaires pour financer les travaux de conservation de la nature en Indonésie, et en particulier pour créer des services provinciaux de conservation. It serait aussi indispensable que des experts étrangers puissent venir en Indonésie afin d'y effectuer des enquêtes, des études scientifiques et d'y former du personnel.

En conclusion, l'auteur considère qu'une collaboration continue avec des institutions internationales telles que l'UICN (en particulier ses Commissions des Parcs Nationaux et du Service de Sauvegarde), le WWF et autres organismes est plus que jamais nécessaire.

Section A(i): Paper 3.

China's National Parks and Similar Reserves—past and present

CHI-WEI YANG* and HUNTER H. T. EU†

I. INTRODUCTION

In a nation plagued by wars for decades the idea of a national park system was understandably hard to develop. In a society with a long cultural history, but remaining agricultural and lacking progress in natural science, the people do not easily perceive and value great natural areas as do citizens with a natural history background or ecological awareness. In most cases, relatively small confines such as temples and tombs were more treasured than lands qualified for national parks. We are quite likely at a stage where a large number of people expect to see decorative structures, fountains, landscaping and other embellishments in natural landscapes.

Changes are apparent, however, particularly since the Chinese Government moved its seat to Taiwan in 1949. The movement to establish national parks now has the clear appreciation of the government and strong support from the scientific community. The pressing demand for recreational space and the recent boom in the tourist industry have certainly provided another spur to a concerted effort. Taiwan is recognized for its outstanding natural beauty that attracts tourists and biologists as well. The island province also offers a wealth of Chinese cultural resources.

It is our sincere hope that the preparatory stage of setting aside the first national parks and equivalent reserves in the Republic of China will soon be accompanied by development towards a better living environment and the provision of adequate areas for scientific needs. This paper reviews certain old parks and plans. It also discusses the evolution of the national park concept rather than the parks themselves, because none has been reestablished in recent years and our study is largely limited to the Province of Taiwan.

II. EARLIER ACTIVITIES

(a) In Mainland China

In 1947, the first and perhaps the only Chinese Government official was sent abroad to study national park administration. On his return to China after an extensive tour of U.S. parks, he submitted a plan to establish eight national parks, including the Great Wall in the northwestern part of China, the Stone

* Chief, Forestry Division, Sino-American Joint Commission on Rural Reconstruction, Taipei, Taiwan, China.

† (1) Secretary, Chinese Association for the Conservation of Nature and Natural Resources; (2) Research Associate, Life Science Research Center, Tunghai University, Taichung, Taiwan, China.

Forest pillar formation in Yun-nan Province, the revered Five Great Peaks and the Forbidden City in Peiping.

The worsening war situation, however, did not permit implementation of the plan. With its great territorial expanses and varied land forms, China could have designated a larger number of future national parks if sufficient time and technical know-how had been available. But one thing was noteworthy in the original proposal: it clearly distinguished national parks (including natural and historical areas) from resort development.

(b) In Taiwan

When Taiwan was under Japanese occupation, the establishment of national parks closely followed that of Japan proper. The National Park Law, together with rules for its enforcement, went into effect on October 20,1935, preceded by the organization of the National Park Council in 1933. Park promoters formed the Taiwan National Parks Association and local organizations of the same nature. In December 1937, the government designated three areas in Taiwan (then a Japanese colony) as national parks of Japan. These were the first and only national parks ever set up in Taiwan. Their major features and related data are summarized in the table below.

National Parks as designated during Japanese Time

National Park	Location	Acreage	Major Characteristics	First Area Study
Mt. Morrison Alishan	South-Central Taiwan	185,980	Included the highest peak in Taiwan. Diversified biotic communities, great forests and wildlife. Rugged country with imposing valleys and cliffs a dozen peaks exceeding 10, 000 feet in elevation.	1928
Mt. Sylvia Taroko	East Central Taiwan	272,590	The superb Taroko Gorge and Mt. Sylvia (second highest). Rugged mountains and high cliffs, dropping abruptly to the Pacific. Rare alpine plant species and community.	1932
Mt. Tatun (now called Yang-ming)	Taipei area	8,265	The only group of volcanos in Taiwan. Dormant craters, sofataras, hot-springs and rolling hills.	1935

The selection of the three parks appeared to have overlooked a landscape type absent in Japan—the tropical. A few scientists subsequently recommended the inclusion of the Mt. Tawu-Hengchun area in the southernmost part of Taiwan and off-shore Orchid Island as another national park, featuring tropical rain forests, coast tropical forests, table lands and communities of corals and algae. The proposal was significant for aesthetic and scientific reasons but was not adopted.

In creating national parks in Taiwan, the Japanese emphasized recreational value and natural beauty, expecting more local visitors and people from Japan to see them. Providing natural habitats for research in biology and forestry was another major park objective.

Japanese experts noted at that time that the designation and protection of park resources were more important than physical development of the areas. The famous cypress forest of Alishan was all but gone and no small part of the natural forests in the two large parks in Central Taiwan had frequently been burned by aborigines. Little primeval forest was left in the Mt. Tatun National Park where grazing, farming and plantations became the dominant landscape. Consequently, it was suggested as early as 1936 that the restoration of the original fauna and flora should be an urgent task of park management.

Nevertheless, the National Park Law was quite lenient in its provisions for the economic exploitation of park resources. In the zoning class of Special Area logging, mining and farming could be carried out if authorized by the Japanese Governor General of Taiwan and, in the rest of the area, construction of dams and factories was allowed. There was no provision to control hunting.

Basically, the zoning scheme was similar to that practised in other Japanese national parks, although it was recognized that the parks in Taiwan were more advantageous in some aspects. Except in the Mt. Tatun park, most park lands lay in national land, almost all in National Forests, compared with the high percentage of private land in the parks of Japan. Secondly, with the prevailing state of arts, the formidable topography of Taiwan's park areas rendered logging and other resource developments difficult or uneconomic, thus minimizing the chances of a conflict of goals.

The heavy demands for materials and energy, however, defied these advantages and the parks endured little actual management and continued exploitation throughout the war years. It should be noted that the Mt. Morrison-Alishan and Mt. Sylvia-Taroko parks were extremely large in proportion to the total land area of Taiwan.

The Japanese also designated many Natural Monuments in Taiwan, including certain species of wildlife, plants and minerals. When World War II ended in 1945, the system of national parks and natural monuments was discontinued.

III. RECENT PROPOSALS

Soon after Taiwan was restored to China, proposals were often voiced to re-establish national parks. Prior to 1960, county assemblies and park enthusiasts urged the government to enact national park legislation. In 1961, the Taiwan Visitors Association published a brochure 'National Parks' and submitted an outline of a draft national park law to the Ministry of the Interior.

It is interesting to note that in the recent park proposals the less outstanding areas of Yangming (formerly Mt. Tatun) and Kenting (part of the Henchun Peninsula) received frequent attention, while the remote but more spectacular areas of Mt. Morrison-Alishan and Mt. Sylvia-Taroko were somewhat overlooked. One factor may have been the proximity of the two lesser areas to the two largest cities of Taiwan where the population has been increasing tremendously. People just need space for outdoor recreation.

Partly in response to public needs and partly stimulated by the growth of the tourist industry, the Chinese Government embarked on a study of the proposed

Yangming National Park. In 1963, a report entitled 'Yangming National Park Plan' was published. As a master plan it was a good document, containing analysis of biological, social and physical factors of the park together with proposed administrative rules and regulations. It also adopted an advanced zoning plan of four classes.

Technically, however, the choice of Yangming as the first national park fell short in respect of several high and essential qualifications. The plan expanded the former Mt. Tatun National Park to nearly three times the size, but there were too many tracts of private land, existing industries, towns and villages to permit early implementation and efficient management. Above all, it lacked the natural qualities of a national park representing the Republic of China. Only a few limited sites within the proposed park area may be qualified as national or provincial monuments: the rare sandstone formations at Yehliu are an example.

Most local and foreign park specialists seemed to agree that Yangming would fit nicely into the category of a national recreation area, especially for the growing metropolis of Taipei, and the main planning concept of the report was not far apart from this.

The Ministry of the Interior started to work on a draft bill for national park laws in 1962. A few revisions have since been made, but the bill has not passed the legislative branch of the government. The lack of a true understanding of national park objectives and of planning skills deterred progress, for fear that all national parks would seriously hamper economic development. The precedent of the Yangming Plan, which called for heavy capital investment and encountered problems of private land and existing industries, appeared to be a contributing factor.

In 1966, with the technical assistance of Dr. George C. Ruhle, an expert of the U.S. National Park Service and consultant to the International Commission on National Parks of IUCN, 'An Advisory Report on National Parks and Reserves for Taiwan' was published. In addition to recommendations on forest recreation and scenic area development, the report proposed the following:

(a) Yu-shan (Mt. Morrison) National Park—Reducing the area of the old Japanese plan to a viable size; mostly for coniferous forest formation, wildlife, scientific and inspirational values .

(b) Taiwania National Park—The Mt. Sylvia (Hsueh-shan or Snow Mountain) area; protection of magnificent forests (*Taiwania* is in fact an endemic Genus, with only one species, found in the natural forest), also other great peaks, wild flowers and wildlife.

(c) Taroko National Park—The most outstanding part of the Taroko Gorge; about 10 km in length and one of the great spectacles of the world.

These were all selected as national parks and parkways of the Republic of China. It can be seen that the proposals either slashed the size or split the areas of the old Mt. Morrison-Alishan and Mt. Sylvia-Taroko National Parks. In the last 20 years, the land-use pattern within the old park areas had changed greatly as a result of population increases and advances in resource use technology. The large parks nearly or exceeding half a million hectares are no longer desirable or practical under present conditions. Obviously, certain choice lands having been lost, the new proposals signify the approximate defence lines which must be held if the Province of Taiwan is to have national parks of a high standard and integrity.

The advisory report, more than anything else, contributed to the understanding of national parks. It convinced officials that nature conservation is a necessity for modern society and made the public realize that Taiwan has some prospective national parks of high order.

IV. SIMILAR RESERVES

Forests cover about 55 percent of the land surface of Taiwan. The forest formations range from tropical types to the alpine spruce and fir communities, presenting a striking altitudinal change of landscape types in a very limited land span. Because most of the future national parks and equivalent reserves must come from these forests and also because some of the forestland retains the characteristics of nature reserves, both in national qualities and on statutory basis, this section discusses their important relationship with nature conservation.

(a) The Protection Forests

About 75 percent of the two million hectares of forested lands in Taiwan are in the National Forests which are in large part managed by the Provincial Taiwan Forestry Bureau by delegation of authority. One management objective of Taiwan's forests is to 'make provision for the growing demands for recreation and tourism and to conserve the forests' beauty and wildlife', and since 1961 the Forestry Bureau has been directly engaged in forest recreation development.

However, most pertinent to our subject here are the Protection Forests, designated for water conservation, landslide prevention, scenic beauty and other protective purposes. The national Forest Laws provide for a strict ban on logging and, in practice, no normal cutting has been allowed in Taiwan' s Protection Forests. Even collection of forest litter requires official permission.

There are about 350, 000 hectares of Protection Forests in Taiwan, mostly in national land scattered in more than 500 localities. They constitute about 18 per cent of the total forested land or about 10 percent of the land area of Taiwan. Their distribution ranges from the sea coast to over 3, 000 metres in elevation. At present, there are 3, 250 hectares of Landscape Forests and 5, 300 hectares of Fish-alluring Forests in the plains and on the coast.

A large part of the Protection Forests are natural, particularly those in the higher elevations such as in the Watershed Protection Forests. As can be seen, the Protection Forests were not assigned so much on a biological basis as for physical reasons, but the degree of protection accorded and the concept of keeping them in as natural a state as possible deserve our special attention. Therefore, in a sense, they may be viewed as one type of nature reserve.

It will be a most happy coincidence if a large percentage of future national park and reserve land can correspond to the present Protection Forests. Of course, this is on the assumption that the areas selected are biologically, geologically and ecologically desirable. A prompt study of this subject, including a field investigation, must be made before the status of these Protection Forests can be changed.

(b) The Experimental Forests

About 50,000 hectares of National Forests managed by research institutions also maintain certain characteristics of nature reserves. In the Experimental

Forests of the Taiwan Forestry Research Institute, studies on forest biology, silviculture and forest management are conducted in various habitat types. Little logging is being done on these forests, usually less than 0. 5 percent of the total area of 13, 400 hectares annually. However, the Experimental Forests are plagued by squatters who go in and clear the land for farming.

Two large universities, both of which have forestry departments, own large tracts of Experimental Forests: the National Taiwan University 34, 057 hectares and the Provincial Chunghsin University, 8, 200 hectares. Part of these Experimental Forests are not forested, however. They are not immune from the encroachment of squatters, especially when the forest is close to settlements.

The National Taiwan University maintains a staff of 88 technicians and 22 working stations to manage the Experimental Forest which presents an altidudinal difference of 3, 774 meters and offers diversified biotic communities. A few remnant trees indicate that the forest was once one of the richest forest resources. A camphor tree (*Cinnamomum camphora*) stands 50.9 meters high, about 1,400 years old and has a D.B.H. of more than five metres. Another giant the Red Cypress (*Chamaecyparis formosensis*), is estimated to be twice that age.

This Experimental Forest lost some of the best stands of important species during and immediately after the war, but about one-half of it is still in national forests, including the protection forest classification. The university has not logged the remaining Red Cypress trees and some studies on the natural reproduction of hardwood forests are being carried on.

In the net productive forests of about 14, 000 hectares, however, the policy of cutting is rather liberal, about 3 percent a year. If the research can shift emphasis to the ecological aspects of the forest and some changes in management policy can be made, part of the Experimental Forest may become well-established nature reserve.

Most of the Experimental Forests mentioned above have about half a century of history in research, but regrettably almost no studies of the animal communities have been made.

V. THE PERSPECTIVE

There has recently been a growing interest among foresters in establishing a system of representative habitat types as permanent nature reserves for scientific purposes. They have a pretty good idea as to where these areas might be located. Presumably, the forest ecosystems conservation study proposal would come under a project of the newly organized National Science Council.

Returning to the subject of national park legislation, a few new ideas have recently been suggested. A committee of specialists, including social and natural scientists, is now working vigorously on a draft bill. In muddling through for a clearer notion, we are not sure what kind of national park standards we will be able to initiate and maintain in face of the high population densities and a very limited resource base. Legislation such as national parks should have perspective, and it is hoped that the new law would provide for the creation of equivalent reserves and, in the national parks, at least for one or two zoning classes which would not have roads and remain unexploited. More officials are coming to perceive a national park as an important asset for education and science, not merely for tourism development.

The prevailing prosperity accompanied by recent success in economic development should be faced with mixed feelings so far as nature conservation is concerned. Before national parks and reserves can be set aside the prospective resources can only be partially protected by designating them as forest recreation areas or as Provincial Scenic Areas, of which Taiwan has 23. Those zoning schemes are applied to control intensive tourism development, resort building and all sorts of other competing uses. The organization of conservation agencies in the Republic of China is not strong enough, either in technical expertise or financially. The Chinese Association for the Conservation of Nature and Natural Resources, formed in 1964, can offer only a very limited service because of lack of funds.

Taiwan enjoys the charming Western name of Formosa (beautiful) derived from the spectacular mountain scenery and lush vegetation of the island. International foresters have compared the indigenous cypresses of Taiwan with the Cedars of Lebanon for the value placed on their timber for building. Their aesthetic, educational and scientific values are no less important in making a comparison. It is to the benefit of society that these and other magnificent forests and the wildlife therein should grow and thrive in adequate numbers and at the right places where they really belong. In developing Taiwan, it is necessary for the Chinese Government to set a good example of a national park and reserve system as a part of the total scheme of things in the overall progress of the nation.

In conclusion, we are very gratified to note that the Government has included 'enactment of national park laws and establishment of national parks' in the 'Outlines for the Present Stage of Social Development' just promulgated and scheduled for implementation before 1972.

BIBLIOGRAPHY

1. College of Agriculture, National Taiwan University, *An Introduction to the Experimental Forest.* Taipei: published by the College, 1968. (in Chinese).
2. Forest and Forest Industry Development Project, *Draft Final Report UNDP FAO Project No. 160.* Taipei: published by the Project (of the Republic of China assisted by the UNDP and FAO), Vol. I, II. 1969.
3. Li, Z.N. *et al. Yangming National Park Plan.* Taipei: Tourism Council, Ministry of Communications. 1963. (in Chinese with an English summary).
4. Ruhle, George C. *Advisory Report on National Parks and Reserves for Taiwan.* New York: American Committee for International Wild Life Protection, 1966.
5. Sasaki, S. *et al. The Forest of Taiwan —A Special Issue on National Parks.* Taipei: Taiwan Forestry Association, 1936. (in Japanese).
6. Taiwan Forestry Research Institute. *The Twenty Years of the Taiwan Forestry Research Institute.* Taipei: published by the Institute, 1965. (in Chinese).
7. Tamura, Tsuyoshi (ed) *National Parks of Japan.* Tokyo: National Parks Association of Japan, 1951. (in Japanese).
8. UNESCO 'Economic Development and Conservation of Natural Resources, Flora and Fauna—A Work Plan for Implementation'. Paris, 1965.
9. Wang, T. M. and Wu W. C. *National Parks.* Taipei: Taiwan Visitors Association, 1962. (in Chinese).

Section A(i): Paper 4.

Status of Conservation in West Malaysia

A. GENERAL DATA

1. Area: c 50,000 square miles.
2. Population: 8 million.
3. Economy: Rubber and tin.

B. GOVERNMENT DEPARTMENTS AND OFFICIAL ORGANIZATIONS CONCERNED WITH CONSERVATION

1. Game Department; Chief Game Warden, Seremban, Negri Sembilan.
2. Department of Forestry, Kuala Lumpur; with State Forest Officers in each State.
3. Department of Fisheries, Director, Kuala Lumpur.
4. Department of Agriculture, Director, Kuala Lumpur.

C. ORGANIZATIONS CONCERNED WITH RESEARCH INTO CONSERVATION

All Departments listed above in B have research branches.

D. PRIVATE CONSERVATION ORGANIZATIONS

Malayan Nature Society (P.O. Box 750, Kuala Lumpur). General conservation.

E. NATIONAL PARKS AND EQUIVALENT RESERVES

1. The Game Department is responsible for establishing and maintaining West Malaysia's National Park (Taman Negara). The aim of establishing and maintaining the Taman Negara is to preserve and protect the flora and fauna and objects of geological, archaeological and other scientific interest, and through its utilization to promote the education, health and recreation of the people.
2. West Malaysia has only one national park (Taman Negara). It was established in 1938, and was originally named the King George V National Park. It is located in the three states of Pahang, Kelantan and Trengganu. The most significant feature of the Park is that its fauna includes most of the species known to exist in the West Malaysian Peninsula, and even some of the rarest species in Asia.
3. Public information is offered in the form of a park brochure.
4. Some training of park staff is being given in an attempt to meet the shortage of trained officers.

5. At present, the park has a 4-roomed rest house, 4 two-roomed chalets, a 40-bed hostel, and 5 two-roomed bungalows.
6. The Taman Negara is under the charge of a superintendent, responsible for the administration and control of the park.
7. Ninety-nine per cent of the park is true wilderness.
8. No exploitation is permitted, except for angling under licence.
9. The protection of the park is presently satisfactory, but problems will become apparent as agricultural development comes nearer to its borders.
10. No exotic introductions have been made.
11. The major problems facing the Taman Negara are:
    (a) Insufficient funds for training of staff.
    (b) Difficulty in recruiting staff of the right calibre.
12. Over half a million dollars will have been spent by November 1969, to create more and better facilities for tourists and to improve accommodation for staff.

F. OTHER AREAS

The Game Department has many other areas under consideration as possible Game Reserves or National Nature Monuments in various parts of West Malaysia. They total some 152 square miles.

G. CONSERVATION OF WILDLIFE

1. The Game Department is responsible for conservation of wildlife.
2. The laws protecting wildlife are found in the Wild Animals and Birds Protection Ordinance No. 2 of 1955. The present ordinance is considered to have many loop-holes and requires revision.
3. Enforcement of this Ordinance is inadequate, since the Game Department is facing a serious shortage of staff and trained officers. Public support is also not encouraging but is improving.
4. No training in wildlife conservation duties is being given at the present time.
5. Staff of the Game Department take action to drive wild animals away from cultivations they are destroying as soon as a case is reported. As a final resort, 'leaders' of the herd may be shot and killed in order to drive the animals away.
6. The full list of reserves is at present:
    (a) The Chior Game Reserve has an area of 14 square miles. It is situated north of Sungei Siput, north of Perak.
    (b) The Taman Negara has an area of 1677 square miles. In addition to being a game reserve, it is also Malaya's only National Park.
    (c) The Sungkai Game Reserve has an area of 15 square miles. It is situated north of Sungei Siput, north of Perak.

(d) The Krau Game Reserve is situated east of Raub, Pahang. It has an area of 252 square miles. In this Game Reserve are many elephants and Seladang.

(e) Sungei Dusun Game Reserve has an area of 10, 700 acres. It is situated southwest of Tanjong Malim, Perak.

(f) Bukit Batu Game Reserve, with an area of 7½ square miles, is situated east of Kuala Kubu Bahru, Selangor.

(g) Golf course, Kuala Lumpur Reserve.

(h) Port Dickson Island Bird Sanctuary is situated on Pulau Burong (2 roods), Pulau Babi (1 rood) and Pulau Perjudi (1½ rood) to the southwest of Port Dickson.

(i) Segamat Wild Life Sanctuary (146 square miles) and Endau-Kluang Wild Life Reserve (401 square miles). Both these reserves are situated on the northern border of Johore and Pahang.

(j) Endau-Kota Tinggi Wildlife Reserve, 878 square miles, situated north of Kota Tinggi, Johore.

(k) Kuala Pahang Bird Sanctuary, with an area of 5 square miles, situated to the east of Pekan, Pahang.

Note: The objectives of (a), (c), (d), (f), (i) and (j) is wildlife conservation. In addition, as is the case with (b), they also serve as a place of recreation for tourists; (g), (h) and (k) are chiefly for the conservation of birds. Finally, (e), the Sungei Dusun Game Reserve, was specifically created for the conservation of the Sumatran Rhinoceros found there.

7. Wildlife Research:

(a) Research projects are being carried out.

(b) A research division is being formed in the Game Department.

(c) In addition to the rhinoceros, research on elephant *Elephas maximus,* gaur or Seladang *Bos gaurus* and sambar *Cervus unicolor* is deemed most urgent.

H. THREATENED SPECIES OF ANIMALS AND PLANTS

1. Javan and Sumatran Rhinoceros *Rhinoceros sondaicus* and *Didermocerus sumatrensis.* Both species are believed by Malays and Chinese to be 'miracle animals', so that all parts of the animals are thought to have some medicinal value to cure all kinds of illness. An ounce of rhinoceros horn will fetch anything up to $ 350. 00 (Malaysian dollars); dried rhino blood can be sold at $45. 00 an ounce and even its dung is readily bought by Chinese practitioners.

   The gaur or Seladang (*Bos gaurus*) is poached for its meat.

2. Action in the right direction is being taken to save the rhinoceros; however, more could be done if more funds were available.

3. Measures to prevent extermination: the creation of more game reserves in areas where these animals are found; severer penalties, since the maximum penalty under the present ordinance (six months imprisonment

and/or a fine of $ 1, 000 for killing a totally protected animal, which includes the rhinoceros) is insufficient to act as a deterrent; and, finally, the recruitment of more officers and Game Rangers to enforce the law.

I. TRAINING OF CONSERVATION PERSONNEL

1. Training schools: There are training schools for forestry personnel, but none for wildlife management, none in national park management and none in other aspects of conservation. Nor is there any opportunity for advanced training in the above subjects (as such).
2. For training we believe that it would be preferable to send local personnel abroad to established institutes, rather than to bring in 'international experts' unacquainted with local conditions, without special sponsoring from the Government, but see below.

J. URGENT CONSERVATION PROBLEMS

We give below comments of an officer of the Game Department:

'In my opinion, the most urgent conservation problems facing my country today are as follows:

(a) the shortage of staff of the Game Department;

(b) lack of facilities and trained staff to do research work;

(c) lack of facilities to train the staff of the Game Department;

(d) lack of public support.

To approach the above problems particularly on a), b) and c) above, high officials of the Government should be made to see and understand the importance of the conservation of wildlife to this country and the world at large by local individuals or organizations and international organizations like the IUCN and others. Once the high officials of the Government see the point and give us their support, I feel sure the problem will solve itself. As for d) above, once problems a),b) and c) are solved, then we could start on the 'education' of the public by running civic courses and lectures at school, etc. Presently, international organizations could help immensely by sending us experts to help us in doing research work and also by training our officers overseas'.

Annexe

RESEARCH IN RELATION TO NATIONAL PARKS AND NATURE RESERVES

BERNARD KWONG SIN THONG
Office of the Chief Game Warden, States of Malaya, 202 Temiang Road, Seremban, Negri Sembilan, Malaysia.

INTRODUCTION

National Parks and Nature Reserves are important especially for countries in South East Asia when much of their cultural richness is directly related to

nature and natural objects, plants and animals. Under modern conditions, true national identity can only emerge if this natural context is carefully preserved. Therefore, realistic and soundly based plans must be made for the establishment of national parks and nature reserves. Successful planning can only be based on research.

The plant and animal communities of our country are rich and diverse, comprising many different species of great variety. In this diversity, characteristic animals or plants are frequently specialized in their ecological requirements. If precise requirements can be discovered by research, it may be possible to ensure the survival of particular plants or animals, or of whole inter-related animal communities, by setting aside tracts of land fulfilling these requirements.

It is important to stress that the characteristic tropical diversity of species is associated with relative scarcity of individuals of each component species. In other words, although there are many kinds of plants and animals in a given area, relatively few individuals of each kind will be found. In temperate countries, there are fewer kinds of animals or plants but more individuals of each kind. Therefore, in a tropical country like ours, proportionately larger areas of suitable habitat will be necessary to ensure the survival of a given plant or animal population. Research carried out on related forms in a temperate country will not provide a reliable basis for judgement of the minimum desirable area.

The estimation of the numbers of animals present in a given area selected as a potential reserve can be based on direct observation only in a few cases; for example, birds favouring open habitats like the waders and other water birds, or large mammals of gregarious habit like the elephant or Seladang. Both the elephant and Seladang are conspicuous and often of economic importance as potential pests of cultivation or as game animals. Herds of both these animals are therefore generally well-known in areas where they occur. Reasonably accurate estimates of numbers and distribution can be based on reports of people who have an interest in the matter.

TECHNIQUES

Throughout our country, forest is the natural climax vegetation. Most genuinely indigenous animals are therefore restricted to forest habitat, in which it is not possible to make direct counts of the smaller or non-gregarious animals, but research programmes to establish the numbers present in a selected area are not difficult to devise. Some authorities recommend total collection from sample plots as a possible technique but it is felt that this method is not a good solution to the problem. It could be disastrous if the species concerned was already rare. The use of the mark-release method is considered advisable, by which animals are trapped, marked in such a way that they can be recognized on subsequent capture, and returned to their original home range. The method of marking must not prevent the animal from continuing to behave in a normal manner. Within this limitation a variety of techniques can be used, ranging from dabs of paint or dye, to numbered metal leg-rings or eartags. In an area in which a known number of individuals have been marked, it is possible to calculate the total population present from a factor based on the proportion of marked to unmarked animals in any sample.

If this technique of mark-release is continued long-term, research projects involving marked individuals will also yield indispensable data on longevity,

reproductive cycles and other periodicities such as moult or antler shedding, fecundity, population structure and social relations, local and long distance movements, and many other aspects of animal biology that are essential background knowledge. Unless such details are known, efforts will be wasted on setting up reserves which will fail to achieve their intended purpose.

RESERVE BOUNDARIES

For example, boundaries may not be correctly drawn. Many of our larger animals travel long distances during the course of the year. Some undertake regular migrations, others like the elephants and Seladang move irregularly within circumscribed areas. It is virtually impossible to alter the course of such movements, even by establishing artificial barriers. Unless the full range of the herd at all times of the year is totally enclosed within reserve boundaries, the animals may be subject to hunting and poaching at certain points on their habitual route. The effects of partial protection within the reserve can thus be completely useless.

There may also be natural seasonal fluctuations in numbers of animals, particularly of the smaller species. The annual climatic changes in tropical Malaysia are not associated with the marked variation in temperature characteristic of a temperate country. However cyclic variations in rainfall produce distinct seasonal changes which are reflected in the reproductive biology of our indigenous wild animals, many of which prove on investigation to have restricted annual breeding seasons. Reserve boundaries drawn on the basis of population densities calculated at seasonal peak of numbers could enclose an area too small to ensure the survival of the species through the subsequent drop in numbers.

MANAGEMENT

Even after the establishment of a reserve, continued research is indispensable to ensure that the reserve fulfils its intended function. At the very least, marking and sampling of animals should continue as a check that populations are being maintained at a satisfactory level.

Under foreseeable conditions in the future, it is in fact inevitable that in our country, as already in many temperate countries, reserves will require active management. When animal or plant numbers drop below a minimum level, it will be necessary to take action to prevent the extinction of the species concerned. Such action may include, for example, felling or replanting parts of the forest, draining or damming water sources, application of fertilizers, or provision of food sources or feeding stations for animals. But to be effective, the appropriate action must always be based on the results of thorough and systematic research.

It must be recognized too that the reverse situation may arise; that the numbers of one animal or plant (even the species which the reserve was designated to protect) can so increase that it begins to destroy the habitat, thus endangering associated forms of life or even its own species. In this case again, research will be needed to discover appropriate remedial action, perhaps felling or culling, replanting or translocation.

RESEARCH

In the few examples given the value of research in relation to national parks and nature reserves is illustrated. At this stage it must be borne in mind that the word 'research' is not something only a scientist or someone with a university background can do. In fact most of the procedures involved are simple and straightforward. 'Research' in this context refers to the systematic collection of information about wild animals or plants. In everyday life, we try to take action only on the basis of sound knowledge of facts and a reasoned estimate of the consequences. In relating research to the problems of conservation, it is felt that in this field we should apply the same rule as we do in every day life.

Section A(i): Paper 5.

National Report on the Wild Life of Nepal

I. INTRODUCTION

To state that wild animals once teemed in Nepal in multitudinous herds is not to make any wild exaggeration, nor is it to recount any legend of the unchronicled past. The history of the wild life of the country is replete with the sensational saga of shikars of foreign and native dignitaries. History has it too that in spite of these massacres and the lack of a streamlined management, the wild life did not suffer any such disturbance as to be forced off the natural balance in their distribution. This state of affairs continued till 1950, when the country experienced epoch-making political change and democracy was ushered in.

The decade (1950-1961) that followed has been calamitous to the wild life population, as in the sweep and drive of enthusiasm to bring about socio-economic uplift, projects like the Malaria Eradication Project and the Rapti Valley Multipurpose Project were launched with the main objective of settlement of hill populations in forest areas. As a result, forest areas, the once undisputed abode of wildlife, were invaded, encroached and cleared and the wild animals were elbowed, hunted and hounded out of their sanctum. In 1962, the Department of Forests approached the Government strongly representing this precariously chaotic state of wildlife. Since then steps have been initiated towards systematic wildlife conservation.

In course of time various wildlife experts have conducted wildlife surveys and left their reports with various suggestions and recommendations. Of these reports, E. P. Gee's survey of rhinoceros of 1959 and 1962, Mr. J. J. Spillett and K. M. Tamang's report of 1967, and Dr. Caughley's report of 1968 deserve special mention.

II. SANCTUARIES

The Chitwan Rhinoceros sanctuary

Part of the the sanctuary was declared 'Mahendra National Park' by His Majesty's Government. The park is 60 sq. miles in area. The rest of the sanctuary on the south of the Rapti river, approximately 200 sq. miles in area, is in close proximity to the National Park. The rhinoceros population is concentrated in this part.

The main object of the establishment of this sanctuary is to protect the rhinoceros, but other big game, viz, wild elephant, bison, sambhar, chital, hog deer, barking deer, wild boar, tiger, leopard, Himalayan and sloth bear, which are badly preyed upon by poachers, are also given protection.

This sanctuary has been of special interest to foreign naturalists. Almost all of these experts have left their individual estimate of the rhinoceros population: Mr. P. D. Stracey's estimate in 1957 was 400, E. P. Gee's was 300 in 1959, Spillett and Tamang's was 100 in 1967, and Dr. Caughley's figure was 108 in 1968.

There was a heavy influx of illegal settlers into the santuary area between 1959 and 1962. A mass clearance in the encroached area was effected in 1965 and the encroachers resettled in other areas by a committee specially appointed for the purpose.

Forest guard quarters and a rest house have been constructed and the vulnerable (from the poaching point of view) parts of the area have been fenced, which has added to the safety of the wild animals.

Staff: A wild life preservation officer, one assistant officer, 4 subedars, 22 hawalders, and 146 guards and 4 clerks are on the staff of the sanctuary.

Tiger Tops Hotel: The tiger tops hotel, a private enterprise located in the sanctuary area, has been a great source of amenity to the tourists.

Suklaphanta Sanctuary

Another sanctuary of approximately 50 square miles forest area is at Sukla in the Kanchanpur district of western Nepal. The area has been demarcated and a forest rest house has already been constructed. Several jeep roads have been constructed within the sanctuary.

The wild animals abounding in this area are elephant, chital, hog deer, barking deer, wild boar, tiger, leopard, bears, swamp deer (in surprising abundance) and the black buck.

Staff: Two forest rangers, two foresters and two forest guards are on the staff of this sanctuary, and the staff of the Shikar Reserve at Kanchanpur will reinforce the protection unit of the area. Dr. Caughley, the D. F. O. expert on wildlife, had very, high words of praise for the sanctuary. To put it in his own words, 'very little need to be done to turn this sanctuary into one of the greatest in Asia'.

Tappu Sanctuary

The sanctuary would be located near Biratnagar in eastern Nepal and has been proposed for the protection of the last breeding population of wild buffalo in Nepal. A preliminary survey has been carried out by Dr. G. Caughley. Besides the buffalo, tiger, leopard, wild boar, barking deer and chital are present in some numbers.

In addition to the above sanctuaries, the department is investigating the establishment of a mountain sanctuary at Lamtang in Rasuwa, a hill district in western Nepal, for the protection of holarctic fauna, viz.: Tibetan or goat antelope *Pantholops hodgsoni,* blue sheep or bharal *Pseudois nayaur,* great Tibetan sheep or nayan *Ovis ammon hodgsoni,* Himalayan thar *Hemitragus jemlahicus,* brown bear, snow leopard, clouded leopard and red panda.

Royal Shikar Reserves

As a very recent development in this sphere, the department is busily taking up the execution of H.M.G's decision to establish Royal Shikar Reserves in the forest area of approximately 2467 sq. miles in 9 different plain, hill and mountain districts of the country which have a good wildlife potential. These shikar reserves will be well-staffed by guards equipped with adequate arms,

ammunition, walkie-talkie sets and vehicles. The area and situation of the reserves will be as follows:

Name of district	Approx. area in sq. miles
Kanchanpur—West Nepal	70 sq. miles
Bardia—West Nepal	142 sq. miles
Lumbini—West Nepal	409 sq. miles
Biratnagar—East Nepal	22 sq. miles
Dhaulagiri—West Nepal	218 sq. miles
Rasuwa—West Nepal	137 sq. miles
Janakpur—Central Nepal	245 sq. miles
Chitawan—Central Nepal	740 sq. miles
Birgunj—Central Nepal	484 sq. miles

III. LEGISLATION

The wild life protection Act. of 1958 with its latest amendment of 1967 and the Hunting Rules of 1967 are in effective operation.

IV. ESTIMATE OF PROGRESS MADE

It is gratifying to note that progress is gathering momentum in slow but sure degrees every year as a result of the various conservation measures. The control over poaching has been considerable. The timely and prompt conviction and punishment of a few poachers has been quite an effective deterrent in this regard. The concerted effort of the Department and the Government to stop human interference in the wildlife areas in order to minimize the environmental deterioration bids fair to have encouraging results and it is hoped that the wild animals are getting more elbow room to themselves and better opportunities to maintain their breeding potential at a biologically favorable rate.

Equally significant to note is the ever growing tourist attraction. The rush of visitors to the Tiger Tops Hotel and that of foreign and native shikar enthusiasts to the Department for licences has been more tremendous every season as compared to the preceding one.

Elephant Camps: The Department has established elephant camps in different districts of the country, which have been of special advantage to the foreign shikar enthusiasts and sightseers who can also enjoy elephant rides.

Last, but not least, the patrolling unit of an Austin Jeep and a motor boat presented by the World Wildlife Fund has been quite an asset to the Department.

Section A(i): Paper 6.

The National Park situation in Laos

Based on a statement by the Laotian delegation at the Conference on the Conservation of Nature and Natural Resources in South-East Asia, held at Bangkok in November 1965, the second edition of the United Nations List of National Parks and Equivalent Reserves, published in 1966, was unable to include any Laotian parks and reserves as fulfilling the criteria established by the International Commission on National Parks.

The present situation is that there are ten 'Protected Forest Reserves' in the country which are ultimately destined to be upgraded into National Parks. In the present paper the details of each of these protected areas are given in the expectation that some of them will in fact qualify for the next edition of the U.N. List.

In general, it may be noted that the legal basis of all the reserves is a Royal decree, that their administration is the responsibility of the Direction des Eaux et Forets and that the land is in all cases owned by the State. Due partly to the still unsettled political situation, it has not yet been possible to organize tourism or carry out scientific research in these forest areas, which very few people enter. They are, however, generally protected and in principle are strict reserves, in which no cultivation or hunting is allowed, except for the limited enclaves in which the local country people are allowed to gather firewood. Supervision is usually exercised by personnel of the local Forest Division (the name of which is quoted in brackets after the name of the reserve in the list below), and budgetary provision is made to cover their salaries but for no other purpose.

List of protected areas

n.b. numbered headings as in UN List (q.v.)

1. Phouteung Reserve.

II (b) Area: 1, 700 ha.

III Date established: 28 December 1948.

IV Altitude: 1584 m.

(a) Mountainous region, to the west of the Plaine des Jarres, covered with pines *(Pinus merkusii, Keteleeria davidiana).*

2. Ban Ban Reserve.

II (b) Area: 17, 000 ha.

III Date established: 14 May 1949.

IV Altitude: 1343 m.

(a) Mountainous region near the Plaine des Jarres. Dominant trees are *Quercus, Dipterocapus and Artocarpus* spp., also *Keteleeria davidiana.*

3. Dane Soung Reserve (Vientiane)

II (b) Area: 15,000 ha.

III Date established: 7 August 1961

IV Altitude: c. 500 m.

(a) Open forest, dominated by *Vatica astrotricha, Lagerstroemia macrocarpa, Shorea vulgaris, Dipterocarpus obtusifolia, Terminalia* spp. and bamboos.

(b) Deer, hare.

4. Dong Sebangfai Reserve (Khammouane)

II (b) Area: 15, 000 ha.

III Date established: 7 August 1961.

IV Altitude: not known.

(a) Comprises eleven open forest zones and one of rather dense forest, consisting of *Vatica astrotricha, Hopea odorata, Dipterocarpus* sp., *Lagerstroemia* spp. and an understory of bamboo thickets.

(b) Tiger, various deer, monkey, hare, fox, wild boar; peafowl, pheasant, jungle fowl, partridge, doves.

5. Dong Xiengthong Reserve (Wapikhamthong)

II (b) Area: 42, 500 ha.

III Date established: 28 March 1958.

IV Altitude: c. 700 m.

(a) Alluvial plain bordered by mountain ridges: pine forests *(Pinus merkusii),* in nearly pure stands in the plain, mixed with rainforest species and bamboo patches on higher ground.

(b) Elephant, tiger, wild boar, various deer, buffalo and banteng.

6. Phouset Reserve

II (b) Area: 6, 800 ha.

III Date established: 20 January 1950.

IV Altitude: 683 m.

(a) Rainforest, dominated by *Pterocarpus pedatus, Hopea odorata* and *Dipterocarpus alatus,* and a bamboo zone.

7. Phouchieng Reserve (Sédone)

II (b) Area: 7, 000 ha.

III Date established: 20 January 1950.

IV Altitude: 904 m.

(a) Mountain covered with forest of dipterocarps, *Hopea, Shorea* spp. and bamboos.

8. Dong Heuaxao Reserve (Sédone)

II (b) Area: 26, 000 ha.

III Date established: 20 January 1950.

IV Altitude: 100-1167 m.

(a) Alluvial flats and sandstone ridges. Dominant vegetation: *Pterocarpus pedatus, Pahudia (Afzelia) cochinchinensis, Vatica astrotricha, Dipterocarpus alatus* and bamboos.

(b) Tiger, elephant, deer, hare.

9. Dong Veune Kham Reserve (Hatsaikhoune, Sithandone Prov.)

II (b) Area: 20, 000 ha.

III Date established: 28 March 1958.

IV Altitude:

(a) Rainforest.

(b) Very plentiful animal life: tiger, elephant, buffalo, banteng, various deer, wild boar, hare.

10. Phoukhong Reserve (Hatsaikhoune, Sithandone Prov.)

II (b) Area: 1, 500 ha.

III Date established: 7 August 1961.

IV Altitude: 239 m.

(a) Sandstone. Dominant vegetation: *Pterocarpus pedatus, Shorea obtusa, Xylia dolabriformis, Hopea* spp.

V There are ten other forest reserves not intended or expected to qualify as national parks:

1. Dong Namthone: 20, 000 ha.
2. Muong Phine: 20, 000 ha.
3. Dong Natat: 8, 000 ha.
4. Lomsak: 5, 000 ha.
5. Dong Nong Pheu: 5, 000 ha.
6. Phang Ham: 3, 000 ha.
7. Nong Heo: 1, 935 ha.
8. Kok Padek: 1, 600 ha.
9. Nam Khem: 1, 366 ha.
10. Ban Xan: 1, 025 ha.

Section A(i): Paper 7.

Rapport sur la situation de la Conservation au Vietnam en 1969

NGUYEN-VAN-HIEP
Chef du Service de la Conservation de la Nature, Saigon, Vietnam

En attendant que des études scientifiques approfondies puissent dresser le bilan exact des effets de la guerre sur la nature, et proposer des mesures adéquates qui s'imposeront dans la période d'après-guerre pour sa sauvegarde, le simple bon sens nous permet d'affirmer dès à présent que l'épandage systématique et souvent répété des défiolants sur de vastes zones forestières, les bombardements, les combats dans ces mêmes zones ont causé des dommages certains à la flore et à la faune.

I. MESURES ACTUELLES DE CONSERVATION

Une question se pose: Comment sont appliquées les mesures de conservation en temps de guerre?

Le Service des Eaux et Forêts est gestionnaire du domaine boisé de l'Etat s'élevant à 5. 620. 000 ha, dont des forêts, de la faune et du sol, sauf du sous-sol. Mais l'exploitation du sous-sol—carrières, mines—est aussi soumise à son avis préalable.

Le personnel squellettique dont ce Service dispose, environ 600 agents actifs de tous grades, ne peut pratiquement plus vaquer à ses occupations habituelles en forêts à cause de l'insécurité et des combats. Plus aucun contrôle n'existe en forêts en ce qui concerne l'exploitation du bois et de la chasse depuis 1962. Les Montagnards sont libres de pratiquer la culture itinérante, les paysans de s'approvisionner en bois de feu et en colonnes de maison. La chasse n'est plus un sport mais un moyen commode de se procurer de la viande, par tous temps, avec des fusils de guerre pour tous ceux qui vivent dans les forêts.

L'épandage des défoliants sur de vastes étendues de forêts est en dehors du contrôle du Service des Eaux et Forêts. Les dégagement militaires sur les principaux axes de communication qui traversent les forêts, souvent sur plusieurs centaines de mètres de profondeur des deux côtés des routes, sont une nécessité militaire que personne ne songe à objecter.

En bref, toute la règlementation minutieuse en vigueur pour la conservation et la protection des réserves forestières, de la flore et de la faune est devenue inopérante devant des situations de fait.

H. ESQUISSE DES DEGATS

1. Flore

Les bombardements et les tirs d'artillerie causent des dégâts importants à la superficie des forêts: arrachage et brûlage des arbres sur pieds. Mais les

éclats de bombes et d'obus logés dans les troncs font et feront du sciage et du déroulage une opération hasardeuse.

L'opération dite défoliation, étendue sur de grandes étendues dans tout le pays, pose des problèmes angoissants:

— mort sur pieds de centaines de milliers d'hectares de forêts denses et de mangrove sans aucune possibilité pratique d'évacuer le bois.

— changement du climat avec la perspective certaine que les dites forêts denses seront converties en bambouseraies, buissons et herbes à paillotes pour des centaines d'années, si des travaux coûteux de reboisements ne sont pas effectués à temps.

Une liste jointe ci-après énumère les principales essences forestières du pays ayant subi des conséquences directes et indirectes de l'épandage des défoliants.

2. Faune

Des déplacements de la faune à l'intérieur du pays ou des migrations à l'extérieur se sont produits, certainement pour trouver des refuges. Refuges temporaires quand elle aura la possibilité de retrouver ses habitats anciens.

Aucun inventaire de la faune n'ayant pu être exécuté avant cette guerre, it serait hasardeux de chiffrer les dégâts causés à cette faune. Un sondage fait auprès des Montagnards, des bûcherons, permet d'affirmer dès à présent que la longue liste des mammiféres, des rapaces, des oiseaux aquatiques, etc. a diminué en quantité.

En ce qui concerne les bêtes dont l'abattage est strictement défendu, telles que:

— *Rhinoceros sondaicus* et *Didermocerus sumatrensis*

— *Artictis ater*

— *Tapirus indicus*

— *Panis crassicaudata*

— *Nemorhaedus sumatrensis*

— *Pteromys yunnensis,* etc.

et les bêtes dont l'abattage des femelles est interdit:

— *Elephas maximus*

— *Bos gaurus*

— *Bos bubalis*

— *Bos banteng*

— *Rucervus eldi,* etc.

notre pronostic est plus réservé. Il ne serait pas exagéré de craindre que les quelques derniers représentants de *Rhinoceros sondaicus* ou *Tapiras indicus* aient disparu pour toujours.

3. Sol et climat

L'étude de Fred H. Tschirley, 'Defoliation in Vietnam'* sur les conséquences écologiques de cette opération est, à ma connaissance, l'étude la plus documentée publiée jusqu'à ce jour. Je renvoie à cette étude ceux qui désirent de plus amples détails.

Dans l'état actuel des choses, je ne peux que suivre la ligne générale des conclusions de Tschirley en disant qu'il est très difficile de faire des estimations précises en ce qui concerne les conséquences subies par le sol et le climat à la suite de la guerre.

Mais il y a un fait évident: le domaine boisé qui occupe le tiers de la superficie du pays est bouleversé de fonds en comble. Pour ceux qui s'intéressent à la conservation, à l'environnement humain et à l'écologie, ce fait est suffisamment important pour prêter à réflexion.

4. Saigon

La capitale du pays, renommée pour ses avenues ombragées, est occupée à abattre ses arbres d'ombrage morts sur pied, à la suite d'épandage de matières défoliantes loin de Saigon mais qui sont apportées par le vent.

Les habitants de Saigon apprécient mieux l'ombrage et la beauté des arbres quand ils se raréfient. Le vocable 'Thiên-Nhiên'—Nature—est de plus en plus utilisé dans les quotidiens et revues. Le repos en forêts et au bord de la mer est devenu une nécessité pour toutes les couches de la population de cette cité surpeuplée.

5. Le Parc National Bach-Ma Hai-Van,

dont le project de création date de 1963, est livré à l'exploitation du bois de feu et de bois d'oeuvre sur les flancs est et sud. Le Col des Nuages qui fait partie du Parc est souvent obstrué par les éboulements de rochers pendant la saison des pluies à la suite des coupes abusives et des dégagements militaires.

III. PERSPECTIVES D'AVENIR

1. Dans une étude récente intitulée 'Programme forestier pour le développement d'après-guerre des cinq Provinces du Nord', j'ai proposé, en vue de la conservation de la nature et de l'amélioration de l'environnement humain, l'établissement:

— du Parc National de Bach-Ma Hai-Van, de 78. 000 hectares dont le dossier de constitution reste en panne depuis 1963.

—de la Réserve Naturelle de Son-Tra de 5. 000 hectares.

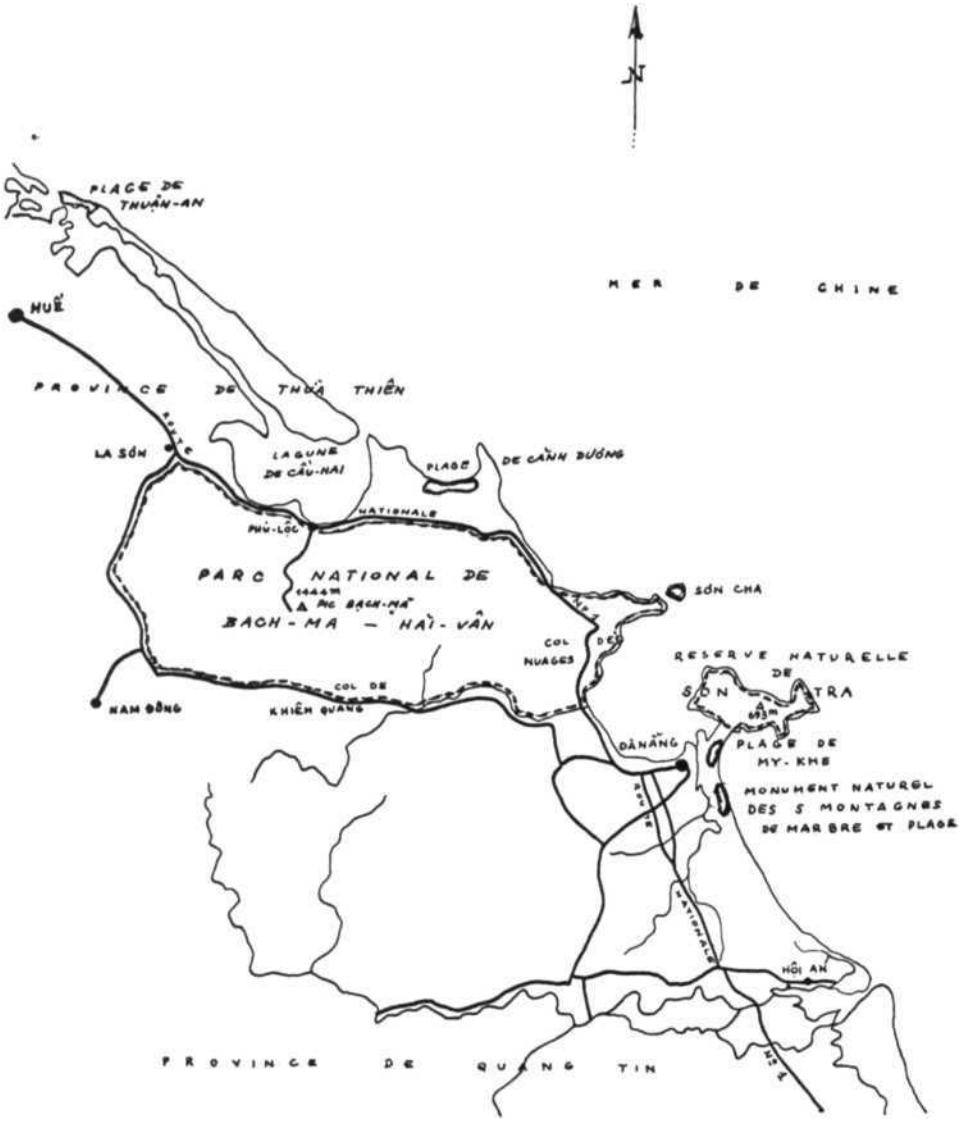
—du Monument Naturel des 5 Montagnes de Marbre (Ngu-Hanh-Son).

—et de la plantation de *Casuarina equisetifolia* sur les plages de Thûan-An, My-Khê, Ngu-Hanh-Son et Canh-Duong.

---

* Science, 21 February, 1969. Vol. 163, No. 3869, pages 779-786.

PARC NATIONAL DE BACH-MA ET SES ENVIRONS
PLAN DE SITUATION



Je m'empresse d'ajouter que ce programme partiel a besoin d'être complété pa la création d'autres réserves, de sanctuaires et de refuges quand la paix revient, pour permettre de sauver tout ce qui pourra être sauvé des représentants les plus intéressants de la flore et de la faune de cette région.

2. Des études similaires pour d'autres régions du pays seront poursuivies, dans lesquelles je ne manquerai pas d'inclure des programmes de conservation de la nature pour que le développement économique du pays ne se fasse pas au détriment de la flore, de la faune, de l'eau, du sol, des sites pittoresques et de l'environnement humain.

3. L'étude sus-mentionnée est diffusée dans les sphères gouvernementales, legislatives et jusque dans les provinces, pour préparer une opinion favorable et consciente de l'importance de la conservation de la nature dans un pays en voie de développement, ravagé par la guerre.

Par ailleure, le Service des Eaux et Forêts a proposé l'envoi de deux jeunes ingénieurs des Eaux et Forêts aux Etats-Unis d'Amérique, pour participer en 1970 à un cours de formation du personnel de gestion des Parc Nationaux, de cinq semaines, organisé par le Service des Parcs Nationaux.

IV. MESURES DE SAUVEGARDE

Pour que les programmes de longue durée puissent produire leurs effets, des mesures de sauvegarde s'imposent dès qu'il y a un cessez-le-feu. Des équipes de conservationnistes devront parcourir le pays, faire des prospections, des inventaires sommaires et proposer des plans et des mesures de conservation qui devront-être appliquées au plus tard dans un délai de six mois ou un an.

Pour cette tâche, le pays ne dispose pas d'un nombre suffisant de conservationnistes. Afin de les aider, des 'task-force' envoyés par l'Union ou d'autres associations internationales et nationales, composés d'hommes de borne volonté tels que le Dr. Boonsong Lekagul, Dr. George Cornelius Ruhle, Dr. et Mme Lee M. Talbot, etc., en plus de leur valeur symbolique, seront d'une importance et d'une nécessité vitales pour la cause de la conservation au Viet-Nam. Enfin, des associations telles que le Sierra Club ne seraient-elles pas disposées à parrainer l'établissement d'un Parc National ou d'un sanctuaire au Vietnam?

Puissent ces suggestions à une entraide internationale être entendues ! Les forêts et la nature au Viet-Nam en auront réellement besoin au sortir d'une guerre d'un quart de siècle.

Influences de l'épandage des défoliants constatées sur les essences forestières vivant à Saigon et dans ses environs jusqu'au mois de Septembre 1969.

Familles botaniques	Noms scientifiques	Influence des défoliants
Abietaceae	*Pinus khasya*	Mort sur pied.
—	*Pinus markusii*	Mort sur pied.
Anacardiaceae	*Mangifera* (toutes variétés)	Pas de floraison.
Anonaceae	*Cananga odorata*	Mort sur pied.
—	*Plumeira rubra*	La floraison continue.
Apocynaceae	*Wrightia tomentosa*	Jeunes feuilles recourbées.
—	*Alstonia scholaris*	Jeunes feuilles recourbées. Pas de floraison.

Familles botaniques	Noms scientifiques	Influence des défoliants
Bixaceae	*Hydnocarpus anthelmintica*	Aucune influence notable
Combretaceae	*Terminalia catappa*	Jeunes feuilles recourbées puis mort sur pied.
Casuarinaceae	*Casuarina equisetifolia*	Mort sur pied.
Combretaceae	*Anogeissus rivularis*	Influence perceptible mais l'arbre continue de vivre.
Cupressaceae	*Thuja orientalis*	Mort sur pied.
Datiscaceae	*Tetrameles nudiflora*	Mort sur pied dès après l'épandage.
Dipterocarpaceae	*Hopea odorata*	Pas de fructification la première année, les branches se dessèchent. Après quelques années et plusieurs épandages de défoliants consécutifs, mort sur pied.
—	*Dipterocarpus alatus*	Pourcentage de morts sur pieds moindre que Hopea odorata.
	Shorea cochinchinensis	Pas de floraison.
Euphorbiaceae	*Hevea brasiliensis*	Les feuilles se dessèchent puis repoussent. Pas de floraison.
Gramineae	*Bambusa*	Les pousses de bambou pourrissent sur pied.
Guttiferae	*Mesua ferrea*	Peu d'influence. La floraison et la fructification continuent.
Leguminosae caesalpiniaceae	*Cassia siamea*	Pas d'influence
—	*Pahudia cochinchinensis*	Les feuilles se dessèchent.
—	*Poinciana regia*	Mort sur pied.
—	*Tamarindus indica*	Les feuilles se dessèchent puis repoussent. Après plusieurs épandages, pas de floraison, mort de l'arbre sur pied.
—	*Peltophorum ferrugineum*	Mort sur pied.
—	*Sindora cochinchinensis*	Pas de floraison.
Leguminosae mimosaceae	*Albizzia lebbeck*	Mort sur pied.
—	*Acacia aneura*	Les fruits sont vides, les branches se dessèchent, puis l'arbre meurt sur pied.

Familles botaniques	Noms scientifiques	Influence des défoliants
—	*Pithecellobium saman*	Mort sur pied.
—	*Enterolobium cyclocarpum*	Mort sur pied.
—	*Pithecellobium dulce*	Peu d'influence notable.
Leguminosae papilionaceae	*Pterocarpus pedatus*	Mort sur pied.
—	*Millettia nigrescens*	Pas d'influence.
Lythraceae	*L age rstroemia tomentosa*	Floraison mais pas de fructification, ensuite mort sur pied.
Malvaceae	*Ochroma lagopus*	Mort sur pied.
—	*Bombax malabaricum*	Mort sur pied.
—	*Eriodendron anfractuosum*	Mort sur pied.
Meliaceae	*Khaya senegalensis*	Pas de floraison.
—	*Swietenia macrophylla*	Mort sur pied plus accélérée que *Hopea odorata.*
—	*Melia azadarach*	Pas de fructification.
—	*Sandoricum indicum*	Pas d'influence.
Moraceae	*Ficus religiosa*	Pas d'influence.
—	*Streblus asper*	Pas d'influence.
—	*Artocarpus integrifolia*	Mort sur pied accélérée après un épandage massif.
Myrtaceae	*Careya arborea*	Les feuilles se recourbent.
Rubiaceae	*Sarcocephalus orientalis*	Pas de floraison.
Sapindaceae	*Nephelium chryseum*	Mort sur pied.
Sterculiaceae	*Pterospermum grewiaefolium*	Mort sur pied.
—	*Sterculia foetida*	Pas d'influence.
Tiliaceae	*Berrya ammonilla*	Les feuilles se dessèchent. Les jeunes feuilles repoussent sur le tronc puis se dessèchent. Ensuite mort sur pied de l'arbre.
—	*Brownlowia tabularis*	Mort sur pied.
Verbenaceae	*Tectona grandis*	Les feuilles se dessèchent. Mort lente.

Familles botaniques	Noms scientifiques	Influence des défoliants
Mangrove		
Rhizophoraceae	*R. conjugata*	Toutes les essences des differentes familles qui constituent la mangrove meurent sur pied en même temps après un épandage de défoliants.
—	*R. mucranata*	
—	*R. gymnorhiza*	
—	*R. eriopetala*	
—	*Bruguiera parviflora*	
—	*Ceriops candolleana*	
—	*C. roxburghiana*	—
—	*Kandelia rheedii*	—
Verbenaceae	*Avicennia marina*	—
—	*A. marina inlermedia*	—
—	*A. marina rhumphiana*	—
—	*A. officinalis*	—
Lythraceae	*Sonneratia griffithii*	—
—	*S. acida*	—
—	*S. abla*	—
Meliaceae	*Carapa obovata*	—
Combretaceae	*Lumnitzera coccinea*	—
Euphorbiaceae	*Excoecaria agallocha*	—
Myrsinaceae	*Aegiceras majus*	—
Arrière-mangrove		
Myrtaceae	*Melaleuca leucadendr on*	Mort sur pied apprès épandage de défoliants.

SUMMARY

It is certain that the war in Vietnam has caused and is causing damage to the flora and fauna of the country, though scientific assessment and any possible measures for rehabilitation cannot be carried out. The skeleton staff of 600 responsible for the 5, 620, 000 ha of forest are virtually unable to carry out their duties and uncontrolled exploitation of resources by the inhabitants is a matter of survival.

For the flora the greatest menace is represented by the military use of defoliants, which have destroyed hundreds of thousands of hectares and caused changes in the ecoclimate and invasion of bamboos and shrubs, which may make it impossible to restore the forest unless expensive re-planting can be achieved in time. A list of recorded effects on the more important plant families is given at the end of the paper.

It is impossible to estimate the losses suffered by the fauna, although questioning of local people indicates that many mammals, birds of prey and waterbirds, in particular, have decreased, though some may well have found refuge elsewhere and could return again one day to their old habitats. For the strictly protected species and the other species of which the killing of females used to be prohibited, one can be less sure of any recovery and there is reason to fear that the Javan rhinoceros and the tapir may have gone for good.

The adverse situation in the capital Saigon, where the inhabitants, overcrowded and deprived of the shade-trees which used to be such a feature of the city, take a growing interest in Nature, is briefly described, as is the damage being caused in the area of the National Park of Bach-Ma Haì-Vân, between Da Nang and Hué, planned since 1963. Plans for the future, with particular reference to the Bach-Ma Haì-Vân complex, of which a sketch-map is appended, are outlined. Other studies of a similar nature are planned, elsewhere in the country and it is proposed to send two young officials of the Eaux et Forêts department abroad for a special National Parks course. Plans are also being made so that within six months or a year of a cease-fire a conservation programme can be set up. In this task all the expert aid and financial backing that can be provided by IUCN and other international, as well as national, agencies will be essential.

Section A(i): Paper No. 8

Development of National Parks and Equivalent Reserves in the Philippines

JESUS B. ALVAREZ. JR.
Philippine Wildlife Conservation Foundation, c/o Economic Development Foundation, J. M. Tuason Building, Ayala Avenue, Makati, Rizal, Philippines

The national park and wildlife reserves of the Philippines are administered by the Parks and Wildlife Office, under the Department of Agriculture and Natural Resources at Diliman, Quezon City. They are established by virtue of Act 3915 and Republic Act 826, both as amended; while game and bird sanctuaries are established by Act 2590, also as amended.

National parks may be established by Presidential Proclamations or Congressional Acts. By the same means, they may be disestablished or reduced in size.

There are 54 national parks and 8 game refuges and bird sanctuaries today, located in different parts of the Philippines, covering an area of 234, 909. 94 and 1, 679, 895.18 hectares, respectively. These totals do not include the areas of 9 national parks of recent proclamation, which are pending survey. As defined in Section 1 of Act 3915, national parks are selected portions of the public domain which, because of their panoramic, historical, scientific or aesthetic value have been withdrawn from private ownership or disposal and established as national parks for the benefit and enjoyment of the people and for posterity.

Actually, national parks areas are repositories of the most unique and outstanding species of flora and fauna. They are repositories of primeval areas of wild and natural character, scenic and phenomenal features, historical monuments, relics, fossils and plant and wild animal life, which are of high reference value to various fields of natural science.

The prime purpose of setting aside these areas as reserves, is to preserve the qualities and features found therein, if possible in their original primitive state, because it is only under that condition wherein the benefits—recreational, scientific, aesthetic and otherwise, can be made available to the public, for whom they have been intended in the first place.

A pertinent portion of Section 2 of Republic Act 826 vests the Office with responsibility... 'to conserve the scenery and the natural and historic objects and the wildlife therein, including birds, fishes, mammals, and other animals and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the benefit and enjoyment of all generations'. Only such developments as are needed for the protection and administration of the areas or required for the comfort and convenience of those who sojourn there, are permitted.

Obviously, because natural areas are dedicated mainly as recreational areas, the basic features therein should be emphasized in their full glory. Only minimum improvements would be permitted, which would tend to increase and en-

hance their recreational value and, thus, facilitate maximum enjoyment of the area on the part of the people. Projects which might court attention on themselves, or even compete with the natural qualities and features (which ought be the focal interest), are not allowed. Only the simplest, most needed facilities-such as comfort stations, picnic tables, sheds, viewing decks, jumping boards, lighting and water facilities, pathways and seats—are permitted. An exception is a mostly recreational area like Arayat National Park, where the maximum recreational facilities are introduced. We take cognizance of the fact of course that it is in preserving the integrity and natural state of national park (and wildlife) reserves that their value as such can be realized and made available to the people. Hence, the Parks and Wildlife Office has constantly pursued this end, never losing sight of the fact that modifications of or damages to the basic qualities found in reserves defeat the very reason for their existence.

The following national parks are now provided with basic facilities for visitors' comfort: Arayat National Park in Pampanga, Hundred Islands in Pangasinan, Bulusan Lake in Sorsogon, Callao Cave in Isabela, Tiwi Hot Spring in Albay, Bicol in Camarines Sur, Quezon in Quezon Province, Bulabog-Putian in Iloilo, Luneta in Manila, Mayon Volcano in Albay and Pagsanjan Gorge in Laguna.

Out of 54 national parks, only these ten have been developed, due to the very limited funds of the Parks and Wildlife Office. For the current fiscal year (1969) 665, 000 pesos have been allotted for the maintenance, construction of facilities, road, etc. in national parks.

So, therefore, development is a matter of priority. National parks which are popular among tourists—local and foreign—received more improvements, like Arayat, Hundred Islands, Bulusan. Some of the national parks however, are developed by other organizations. The Luneta National Park for instance has been developed by the National Park Development Committee headed by our First Lady. The bathhouses in Tiwi are owned by private individuals, who established bath resorts in the area before it became a national park. The resthouse in Mayon was constructed by the Bureau of Travel and Tourists Industry, as was the resthouse in Callao Cave. Most of the cottages and restaurants in Pagsanjan Gorge are privately owned.

We would also like to mention here, that we determine the amount of improvements given to a national park by what kind of park it is. In a nature or forest park, basic facilities are necessary like comfort stations, picnic areas and water supplies. In purely recreational areas like Arayat, facilities for recreation like swimming pools, changing rooms, dancing pavilion, parking area, viewing deck, electricity and water supplies have been introduced.

There are several more national parks slated for similar development in 1970.

National parks in the Philippines can be classified as forest, historical, geological or recreational areas. Except for Capas Death March Monument in Tarlac province, all areas reserved under the foregoing classification fall under the national parks category.

About 60 per cent of our national parks, however, are forest parks, established mainly for their scientific value, and also to preserve the superlative natural scenery found therein.

DISTRIBUTION:

The Philippines comprise three major islands, namely Luzon, Visayas and Mindanao and our national parks are distributed as follows:

Luzon 33 national parks and one monument

Visayas 8 national parks and one monument

Mindanao 13 national parks and one monument

The present population of the Philippines is around 38 million and the aggregate area of the national parks and monuments is 234, 909. 94 hectares. So roughly we have . 9424 sq. metre of national park per head of population. But as mentioned earlier only the most popular and accessible national parks are frequented by visitors. Other national parks not only lack facilities for visitors' comfort, but are also inaccessible. Most of our forest parks are found in remote mountains and a great number are not even approachable by motorable road. The Callao Cave National Park in Cagayan province can be reached only on foot or horseback, which is true also of the Manleluag National Park in Pangasinan, Caramoan N. P. in Camarines Sur and several others.

Any plan for the development of national parks therefore must include the construction of roads leading to the national parks, and development must be tied up with promotion of the tourist industry in this country.

THE NATIONAL PARKS:

The Philippines can definitely be developed as one of the most interesting tourist centers in the Far East. In this, it can lean on its 54 national parks, which are treasure-houses of exotic features and wildlife species, many of which are among the rarest in the world.

The mountains are not very high, but are beautiful and easy of access, combined with streams, rapids and waterfalls, lakes, forests, springs (including mud-springs and hotsprings), natural bridges and other exciting features, thus giving every possible variety and appeal in the scenery. The most unique mountains, of course, are volcanic ones, which can be a paradise for mountain-climbers and nature-seekers during summer and their inactive stages. They can also be awesome, lethal fountains of fire. Positively, they are most useful in giving fertility to the soil in the surrounding areas. Mts. Mayon in Albay and Taal in Batangas, are the most famous of Philippine volcanoes. Recent destructive eruptions of Mayon and Taal focused international attention on this country and even attracted tourists! There are many other volcanoes which, though not as violent, are as picturesque and interesting. Some of these are Mts. Mahagnao in Leyte, Bulusan in Sorsogon and Canlaon in Negros Oriental.

The rivers, though not very long, flowing down through the mountains, offer wonderful scenic delights. Most of the lakes are surrounded by mountains or situated close to the sea, and they are ideal for boating, swimming or other such sports.

In the volcanic regions are often found quaint mountain lakes ideal for pleasure boating. Examples of these are the placid Lake Taal by the ferocious Taal Volcano, Bulusan Lake, which combines romance with indescribable beauty, and Lake Buhi, which is the habitat of one of the smallest fish species of the world, also a favorite recreational spot and ideal for water sports.

Being a volcanic country, the Philippines besides having romantic lakes is proud of its abundance of hot springs. Like the volcanoes, most of these are found within national parks and the more popular ones are found in Mt. Canlaon National Park, Negros Oriental; Roosevelt National Park, Bataan; Bulusan Volcano National Park, Sorsogon; Mt. Apo National Park, Davao; Tongonan Hot Spring National Park, Leyte; Mayon Volcano National Park, Albay; Mado Hot Spring National Park, Cotabato; and Manleluag Hot Spring National Park, Pangasinan.

HISTORICAL NATIONAL PARKS:

Many of the greatest historical experiences of the Philippines have been immortalized in certain national parks, which are the precise sites of memorable national events. These parks are not only significant because of their historical connections, however, but in addition, have other recreational or phenomenal features, which make them all the more attractive. Examples are Rizal National Park in Dapitan, Zamboanga, the place where Dr. Jose Rizal, Filipino National Hero, was exiled prior to his unfortunate execution, noted for its beautiful seascape and historical relics; Northern Luzon Heroes Hill National Park, Ilocos Sur, once the haunt of the famous Diego Silang, who led a series of revolts against the Spanish colonial government: later it became the site of a building which is intended as the repository of busts of Filipino national heroes and figures, and it is also marked by beautiful sandy beaches and landscapes; Tirad Pass National Park, Ilocos Sur, where the brave young General Gregorio del Pilar made his hopeless but gallant stand against the American forces, who were then pursuing the late Gen. Emilio Aguinaldo; Besang Pass, where Filipino-American forces fought side by side against the Japanese Imperial Army in defence of liberty and democracy; Bataan National Park, where the memory of Japanese brutality still invokes great feelings of fervour and nationalism; and of course, the Luneta, formerly known as Bagumbayan Field, where the Great Malayan, our National Hero, was executed by the Spanish forces.

There are numerous spas throughout the country, capable of attracting a great number of tourists from home and abroad. The principal ones are located in scenic mountains and national parks, lakes or seaside areas and near the big cities.

Finally, the coastline of the Philippines is indented with numerous promontories, cliffs, bays, beaches and small islands of every size and shape, not to mention wonderful caverns, rock formations, marine life and other wildlife species.

Section A(l): Paper 9.

Wild Life Conservation in Thailand

PONG LENG-EE
Royal Forest Department, Bangkhen, Bangkok, Thailand.

INTRODUCTION

The total area of Thailand is approximately 200,148 square miles, of which 51. 50 percent is forested land; 20. 03 percent farmland; 0. 40 percent swamp land; and 28. 07 percent other unclassified land—highways, railroad, airports, vacant unused land, rivers, etc. (Ministry of Agriculture, 1961). All forested land, with the exception of some mangrove forest plantations and farm woodlots, is nationally owned. Farmlands, particularly rice fields, the habitat of water-fowl during the rainy season, are mostly owned by private individuals.

The climate of Thailand is very regular. Its major pattern is imposed by the seasonal monsoon, modified by local topography. Two types of climate are generally recognized: the tropical rain, and the tropical savannah. The former type is characterized by uniformly high temperature and heavy rainfall almost all year round, with no distinct season: annual rainfall is about 80 inches or more. This type of climate is typically found in the southern and eastern portions of the country. The tropical savannah climate is distinguished by less precipitation and a distinction between wet and dry seasons. This climatic type is considerably modified by local altitude. It is sometimes called a mountain climate. The wet season, the main season of plant growth, extends from about May to September or October, while the dry season falls between October and early May.

Forests are broadly classified as evergreen and deciduous. The evergreen type occupies about 30 percent of the whole forested area and is subdivided into four categories, namely tropical evergreen, hill evergreen, mangrove, and coniferous or pine forests. The deciduous type covers about 70 percent of the total forested land and contains two distinct categories: mixed—deciduous, with and without teak, and dry deciduous dipterocarp forests.

Unlike the climate, soils of Thailand are highly diversified. This is primarily the result of the wide range of parent materials from which the soils are derived. Formation of each forest type is influenced by many complicated factors. Samapuddhi (1963, p. 64) says '. . . . . the factors leading to the formation of the various forest types could not be any single value of any one property of the soil, but rather it requires many or a combination of many physical and chemical characters blended together in a specific way. Further, the soil relief, elevation (evident in the case of Hill Evergreen, Pine, and Mangrove Forests), precipitation and climatic conditions might still play even a more important role than the soil itself in the shaping up to the different forest types'.

Based on variations in climate, soil, vegetation, physiography and geology, four biotic zones could be proposed. They are the Central Valley, the North and West Highlands, the Korat Plateau, and the Southeast Coast and the Peninsula South.

Thailand's 1960 census totalled approximately 26, 257, 916 people (about 131 per square miles), of which 21. 50 percent, 34. 24 percent, 31. 50 percent, and 12. 46 percent are distributed in the northern, northeastern, central, and southern regions respectively (National Economic Development Board, 1962). The human population is increasing at the rate of about 2. 8 percent each year; in 1969 it is expected to reach 32, 000, 000. The 1960 census also revealed that 71. 80 percent of the Thai people were literate. In the latter connection, Thailand has two institutions directly offering education in Forestry and Natural Resource Conservation. One is the School of Forestry at Kasetsart University, where curricula of three and four years leading to the diploma and bachelor's degree in Forestry, respectively, are offered. The other is the Forestry Training School, Prae, conducted by the Royal Forest Department. This has a two-year ranger course arranged for qualified junior staff or those who hold the high school certificate.

A study of Thailand's economic situation during the past ten years reveals that the country enjoyed a satisfactory rate of economic growth during that period. The national income increased at the rate of approximately 5 percent a year, permitting an annual rise of more than 2 percent in per capita income (National Economic Development Board, 1964). This agency also reports that although the economy is growing, some basic economic problems exist, such as the rapid population growth, the danger of unemployment, low agricultural and industrial productivity, high cost of capital, and the growing need for conserving natural resources. Unemployment, however, has not yet become a serious problem in Thailand, where a vast majority of the people still live in the rural areas.

LEGAL AND ADMINISTRATIVE BASIS OF WILDLIFE CONSERVATION

As in other tropical countries, Thailand's wildlife is diversified, but most species are not very abundant. Before the Second World War, it was said that wild animals were still plentiful in every part of the country. Soon after the war, the impact of a rapidly increasing human population, declining economic wealth, and greater numbers of powerful firearms and vehicles resulted in severe reduction of both game populations and their habitats. At the present time many wildlife species have been reduced to very low population levels.

Before 1960 the only game law in existence was the Wild Elephant Act of 1921. However, the idea of protecting some important wild animals is not new for Thailand. In 1931 the Siam Society recommended that the cows of wild buffalo and some other big mammals be protected (Harper, 1945). Unfortunately such proposals failed to find the support necessary to become law.

When it appeared that many wildlife species were being threatened with extinction, the Royal Forest Department and some societies, such as the Nature Reserve Society, proposed to enact the present wildlife law. Finally, because of the understanding attitude of the government to the conservation of natural resources, the new game law known as the *Wild Animal Preservation and Protection Act B.E.2503* was passed in 1960 and came into effect in January 1, 1961.

According to this act. two major groups of wild animals are recognized: the reserved and the protected. The reserved wild animals are those animals which are considered rare or endangered; they are not allowed to be hunted either for sport or meat. The protected group is subdivided into two categories: killing of the first category, except for scientific purposes, is pro-

hibited, while hunting of the second can be done by securing a hunting licence authorized by an appointed official.

The law is enforced by many authorities from different government agencies:

(1) All police officials of the Police Department, Ministry of Interior, are directly responsible for the enforcement of every kind of law in the country including the game law;

(2) All forest police officials in the Forest Police Division, Royal Forest Department, are responsible for the enforcement of all the forestry laws including the game law;

(3) Forest officials are empowered to enforce the game law by the Ministry of Agriculture;

(4) All provincial governers and chief district officers are empowered to enforce the game law within the province or district of their jurisdiction: these officials belong to the Ministry of Interior, but are empowered to enforce this law by the Minister of Agriculture.

The Royal Forest Department is under the Ministry of Agriculture. Its present administrative organization consists of central and regional administrations. The former is composed of six divisions and many other equivalent offices. Each division is subdivided into sections. The section of wildlife management was established within the Division of Silviculture in 1961, a year after the Wildlife Act was passed. The regional administration consists of 61 Provincial Forest Offices and 382 Township Forest Offices.

Presently, there are 4, 653 graded personnel employed by the Department, who could be classified as 8 special grade, 66 first grade, 352 second grade, 2134 third grade and 2093 fourth grade, plus 1, 647 ungraded permanent staff. This year, 1969, there is a total of 37 personnel working in the Wildlife Management Section, classified into 9 second grade officers, 7 third grade officers, 9 fourth grade officers and 12 subordinate staff.

PRESENT PROBLEMS OF WILDLIFE CONSERVATION

The important current problems in the conservation of wildlife in Thailand are overhunting and destruction of habitats. Many species are suffering from these pressures. Some large mammals, for example hog deer, Eld's deer, goral, wild buffalo and the rhinos, are likely to be wiped out unless effective measures in conservation are immediately taken. The extinction of the Schomburgk's deer in the past forty-five years is an obvious example of the danger. Extensive clearing of forested areas in the past has rapidly reduced the animals' habitats. Wherever the forest is opened up, they have become more vulnerable to poaching.

These developments have been rapid, especially during the Post-War period and particularly in the more accessible areas such as the forests near the towns. Watersheds of the important rivers have also been damaged. Many million hectares of such areas in the north have been cleared by the nomadic hill-tribes, numbering 300, 000 to 400, 000 people (Banijbhatana, 1962), who subsist by hunting and shifting cultivation (slash farming). Much of the valuable timberland in accessible areas, the lower hill slopes, at the foot of the mountains, or in the valleys in which the sandy loam and alluvial soils are favorable for cultivation, have been extensively destroyed and turned over to sugarcane

plantations, paddy fields and other farm crops. These areas were previously inhabited by many kinds of large mammals and other game.

In the northeastern region, which is considered the poorest part of the country, both in productivity and personal income, wildlife habitats have been denuded by these practices. Extensive tracts of open dry dipterocarp forests and grasslands, which are the important habitat of hog-deer and Eld's deer, have recently been changed into agricultural fields. Similarly, the clearing of tropical rain forest in the South for rubber plantations, orchards and tin mines, is responsible for the disappearance of gaur, sambar, barking-deer and other big game. This situation is also very critical in the eastern part of the country which is near the sea coast and the city of Bangkok.

CONCLUSIONS AND RECOMMENDATIONS

It is, however, not too late for Thailand to embark on a large scale wildlife restoration program by creating game sanctuaries, national parks and other similar areas, and enforcing the law effectively. However, the problems cannot be tackled individually, as they are more or less the concern of all the people in the nation. The solution can be attained in the following ways:

(a) Law Enforcement. It is quite obvious that illegal hunting and destroying of habitats are most critical problems that must be urgently checked. Since the Wildlife Act was passed in 1960, law enforcement has been largely ineffective. This can be confirmed by the record of the 111 offenders actually arrested during the past eight years. This figure does not indicate that there is little violation of the law. Poaching is conducted by people from all walks of life wherever they have a chance. Their attitude is to kill animals basically for food; sport is not important. It is therefore, essential that:

(1) The officials concerned are fully empowered to enforce the law effectively and encouraged to carry out their duties firmly and impartially;

(2) Penalties are high enough to deter violations of the law

(3) The conservation budget and personnel, especially game wardens, are increased proportionally as the workload increases.

(b) Education. Education of the public is most important for the conservation of any kinds of natural resources. Natural Resource Conservation should be taught from primary school level up to university level. This measure was initiated by the Ministry of Education about ten years ago but has not received satisfactory support. The Royal Forest Department, which is also directly responsible for the educational function, is distributing information and exhibiting wildlife displays to the public on many occasions during annual fairs and festivals: such activities should be extended to rural communities.

(c) National Parks and Reserves. In order to conserve rare species, such as the hog-deer, Eld's deer, wild buffalo, rhinoceros and goral, sanctuaries should be provided in suitable areas where such species previously lived. These sanctuaries must be supervised by qualified personnel who have been previously trained in the wildlife field. The creation of national parks is another important aspect and demonstrably successful method of restoring wildlife populations, which merits fullest support.

(d) Demonstration Game Management Areas. It must be remembered that the Wildlife Act is only nine years old, and the public has not yet become accustomed to it. Law enforcement alone will not succeed unless the coopera-

tion of the public is obtained. Education of the public through extension is necessary, but it takes a very long time and is probably too uncertain to insure the survival of animals which are already rare.

In order to meet this situation, it is suggested that the Royal Forest Department might set aside a suitable area which was an original habitat of commoner animals, such as gaur, sambar and barking-deer, and control and run it on the basis of game management techniques. When the animals increased up to a harvestable level, the area would be opened for public hunting on a permit basis. If such a pilot project is successful, it is hoped that the people will come to realize the importance of wildlife conservation automatically. Psychologically, whenever the people can get a harvest from the crops on a reasonable scale, they will undoubtedly cooperate with the government work. By this means, conservation can become a reality in a relatively short period of time.

(e) Establishment of wildlife research station. Since little or no technical information about wildlife management and biology is available in Thailand, the establishment of a wildlife research station should obviously have very high priority.

(f) Wildlife Conservation Policy. Finally one or two principles which need emphasis in developing a natural wildlife conservation policy and which tend to be overlooked are that-

(1) A level of balance between the animal population and the carrying capacity of the land must always be maintained;

(2) Wildlife management should be made compatible with private land use by minimizing damage that might be caused by the animals;

(3) Provision should be made for maximum recreation and recreational harvest by the public: exploitation of game must be conducted on the basis of sustained yield:

(4) Restocking of depleted species in suitable areas where they previously occurred should be undertaken, for instance by establishment of game farms.

REFERENCES

Banijbhatana, D. (1962). Brief note on forest and forestry problems in Thailand. Royal Forest Dept. publication No. R. 48.

Harper, F. (1945) Extinct and vanishing mammals of the world (Special publication No. 12 of American Committee for International Wildlife Protection) New York Zoological Park; New York 60, N. Y.XVI + 850 pp. illus.

Government of Thailand (1964). The National Economic Development Plan 1961-66 (second phase 1961-66). Published by the Nat. Econ. Dev. Board, Bangkok, Thailand.

Ministry of Agriculture (1961). Land utilization of Thailand 1961; published by Div. of Agricultural Economics, Office of the Under-Secretary of State, Ministry of Agriculture, Bangkok, Thailand.

National Economic Development Board (1962). Thailand population census 1960. Published by Central Statistical Office, Nat. Econ. Dev. Board, Bangkok, Thailand.

SECTION A(ii): A comparative study.

The Principles of Organization of Nature Reserves in the USSR and their role in Conservation of Nature

V. B. KOZLOVSKY
Chief of the Nature Reserves Division, Ministry of Agriculture, Orlikov, Moscow U-139, USSR.

At the present day the fight for conservation and for multiplication of all natural resources, without exception, has acquired a particularly large amount of attention in our country. Newspapers and periodicals publish pertinent paragraphs, feature-stories and articles by scientists, specialists, public men and citizens of differing professional and social standing. Great attention is paid to nature conservation topics in films, as well as on the radio and TV. And this interest is in no way accidental. Up till quite recently nature seemed to mankind like a storehouse from which everyone could draw all he needed without any limits. But now even those people who are taking the most direct part in utilization of renewable natural resources, realize the indispensability of wise consumption. In addition, man's conflicts with nature are revealing themselves more and more often, and nature is beginning to avenge itself on man for the errors he has committed. The disastrous consequences of these errors are spreading outside purely local limits, and one can reasonably suggest that within the life span of a generation people will no longer have opportunities for normal existence, unless they can solve the problems of rational utilization of the whole natural complex. In this situation the function of nature reserves as intrinsic laboratories of nature, becomes especially useful and important for the whole cause of knowledge, conservation and development of natural riches, as well as for understanding the problems of rational utilization of natural resources.

The greater part of the nature reserves of the U.S.S. R. are widely scattered in different geographical zones and represent the most typical landscapes in each of these zones. In this connection it is worth stressing that the study of questions relating to the management of natural resources in various types of landscape not only contributes to human knowledge, but also has a deep practical importance. For it is evident that recommendations for the most rational utilization of natural resources essentially depend on comparative investigations, carried out on lands protected by law and those which are commercially utilized.

At the present time the total number of nature reserves in the Soviet Union is 89. They occupy 6. 5 million hectares which makes up about 0. 6% of the whole territory of the country. Under the relevant legislation the land comprising these nature reserves is finally and fully withdrawn from economic utilization and set aside for scientific and cultural purposes. Every kind of commercial activity is prohibited, including hunting and fishing. In our country nature reserves may be recognized only if they represent 'Land areas, including natural objects, having particular scientific or cultural values as well as typical or rare landscapes .. .'. (The Principles of Land Legislation of the USSR, Clause 40).

Unlike reserves established for their historical interest, such as the country estate of L.N. Tolstoi in Yasnaya Polyana (which are not examined in this report), the aims and objects of nature reserves are generally very uniform. These objectives may be formulated as follows:

Conservation of the native aspect of typical natural landscapes for interdisciplinary studies of the corresponding dynamics of the system and their interactions, with a view to devising optimum methods for utilization of natural resources, without causing damage to their subsequent reproduction, and studying the methods to be recommended for controlled modifications in the productivity of the different ecosystems involved;

Conservation of the maximum number of plant and animal species (and rare ones in particular) in their natural environment, with the goal of further enriching commercially utilized unprotected areas: this will include the discovery and study of phenotypes and genotypes of all species which exhibit some outstanding property, such as resistance to critical factors, immunity to diseases and pests and adaptability to changing habitat conditions brought about by the anthropogenic activities;

Promotion of special investigations in the field of nature conservation which can be undertaken outside the boundaries of the protected areas; propagation of conservation ideas among the general public and furthering the development of intelligent and scientifically-oriented tourism.

The identity of purpose, diversity of tasks and wide range of relevant questions to be studied in nature reserves, make it imperative that every care should be exercised when choosing the areas to be set aside and withdrawn from commercial management. Since 1900, when the first nature reserves in Russia were set up, the principles determining the choice of suitable areas for the reserves have varied enormously at different times and this has left its mark on the present approach to these problems. One of the consequences is that nature reserves in the USSR have been and are created according to a number of different criteria, which is, of course, reflected in peculiarities of activity and emphasis in the main tasks stipulated by the law.

Special priority has, in the first place, been given to the protection of samples of typical landscapes characteristic of a big geographical region and especially the zones where inherent natural features have been influenced by man to the least extent. The necessary criterion, in the choice of such samples, is the extent to which they are typical and this is always given preference, even when it is possible to find more aesthetically valuable areas in the neighbourhood but ones in which the natural formations are less characteristic of the particular region.

The second and most common criterion for selecting nature reserves, up to the present time, has been the necessity for protecting the last natural refuge of rare and disappearing species of animals. Organization of particularly careful protection of animals and their breeding stations was, of course, an essential pre-condition for effective preservation and the survival of valuable species. Nevertheless, it often failed to make provision for the development of the complex investigations which alone could yield certain practical results and allow recommendations to be worked out that might be useful and applicable to a region as a whole.

Thirdly, some of the nature reserves in our country have been established for the purpose of protecting unique natural features or representative samples of especially remarkable and attractive scenery found in a particular geo-

graphical district. The aesthetic value in such cases is indisputable, but the practical possibility of applying elsewhere any conclusions reached on the character of inherent natural processes and their dynamics, is non-existent, even when these conclusions are founded on a programme of research carried out in the protected area. In our opinion reserves in this category can best be classified in the group known as 'nature parks', for their ultimate objectives and potential differ essentially from those of the previously mentioned classes of nature reserve.

Finally, some individual pieces of land and waterbodies characterized by the presence of very rare or endemic communities of plants, exhibiting peculiar properties, or by other features of an unique type (for example, wintering grounds of great numbers of migratory birds), are also subject in our country to special protection by law as nature reserves. With rare exceptions, this type of reserve is seldom very large and, unlike reserves in the previous category, may not always qualify as a complex standard sample of a natural environment.

The organization of a new nature reserve in any particular district is a practical measure which is wholly dependent neither on the economic opportunities nor on occasional initiative or wishes of private persons. Under the existing conditions of socialist society and of the public ownership of land, a certain order of priority is observed in choosing the areas to be withdrawn from commercial management. When solving this problem, the first criterion taken into consideration is preservation of inherent natural features typical of the geographical district under consideration. The second criterion is associated with the rate of exploitation of local natural resources and the time required for their rapid restoration under the extensive forms of existing utilization. Next, preference is accorded to the possible importance of scientific investigations to be carried out in the areas to be placed under a special regime of protection and, finally, the size of the zone or the geographical district is also taken into account. In other words, protection is given in our country above all to areas where the original landscape, characteristic of a wide geographical region, may in the foreseeable future be wholly or partly destroyed by man's activity; and where, on the other hand, by protecting a selected sample in a state in which it can still operate, there is a possibility of organizing investigations which have as their goal the elaboration of the most rational methods for utilizing the whole natural complex, irrespective of the possible economic efficiency resulting from exploitation of one or two particular natural resources. In such conditions creation of nature reserves makes it possible to study the different factors leading to changes caused by man's activity. This task is becoming still more important due to the fact that in many districts economic activity exerts its influence on all natural processes, including the evolution of the biosphere. The rate of such influence is becoming quite evident already when one notices the changes in landscape alone. Visible changes observed in this way undoubtedly reflect still greater changes in nature as a whole.

The changes produced by man's activity in the biosphere are extraordinarily diverse, and, what is more, they are still not clearly understood in relation to the period of time in which they have grown and become relatively large in scale. For this reason, the majority of our new nature reserves are now set up with a view to studying changes originated by man in the inherent course of natural processes. These studies are aimed at averting undesirable shifts in the properties of the natural habitat.

It is because of all these considerations and irrespective of their initial objectives, that all the nature reserves of the U.S.S.R. have now become complex organizations. Most of them have their own regular staff of research workers, who carry out the investigations scheduled within their relevant terms of reference, drawn up on the above-mentioned basis. But the ever growing aspirations of the great mass of people to use these areas, which have been placed under special protection by law, as nature-recreation sites, is posing certain difficulties in the work of our nature reserves at the present time. These aspirations are quite natural, because visitors become readily interested in the history and geography of the places which they visit. The information services organized by natural history museums and the availability of popular publications about nature enable people to appreciate what they are looking at and to want to see more of it. And yet when the number of visits to nature reserves grows too big, it complicates the scientific work which is being undertaken. Thus the nature conservation service in our country nowadays faces the task of diverting the flood of the people striving for nature-recreation opportunities, by creating the required natural environment for them outside the protected areas. Fortunately those visitors who are chiefly longing for out-doors recreation, fresh air, bathing, etc., may easily be given opportunities for enjoying these things without going into the nature reserves, that is without disturbing the natural balance of the areas enjoying special legal protection.

Nature reserves are playing a great role in the common cause of conservation of nature in our country. A lot of extremely remarkable natural landscapes have remained intact, preserved from destruction within some fully industrialized areas, through the organization of nature reserves. Among these can be mentioned the Askania-Nova Nature Reserve representing a virgin steppe; the ancient oak-groves and pine forests of the central chernozem zone to be found in the Voronezh Nature Reserve; the mixed Siberian pine and broad-leaved forests of the Far East in the Sikhote-Alinsky Nature Reserve; the typical dark-coniferous taiga of the north-European part of the U.S.S.R. in the Pechora-Ilych Nature Reserve; the highly productive complex spruce-groves of the north-western part of the country in the Central Forest Nature Reserve; and the virgin-forest-covered mountains of the Caucasian Nature Reserve. If it were not for these and many other nature reserves, survival of many valuable species of game-animals would be improbable. Some species (such as sable, elk and saiga, etc.) have by now increased in population to such an extent that, in most areas, where sufficient suitable habitat is assured, the density of population can again be treated as commercially productive.

On the other hand, the nature reserves of the U.S.S.R., being independent scientific institutions, have made a very notable contribution to the proper understanding of the laws of nature, revealing the ways and methods to be recommended for wise utilization of natural resources. The papers published by those working in nature reserves are well known to the majority of students specializing in the field of natural sciences. The total volume of these published works has now reached nearly 50, 000 printed pages. The practical recommendations resulting from the research work carried out in nature reserves are widely used in agriculture, forestry, the hunting or trapping industry and other branches of the national economy.

Among the researches carried out in this field one should mention the studies on the nitrogen cycle and on the balance of soil elements in all different types of natural forest. These have made it possible to elucidate the processes and explain how basic elements in the mineral nutrition of plants return to the soil in the annual defoliation. On the strength of the data obtained it has

become possible to work out and put forward certain systems for regulating and increasing the efficiency of ecological systems in commercially utilized areas. Studies carried out in the nature reserves on the dependence of podzolization processes in soils upon their hydrological regime are also of great interest. On their basis some practical recommendations have been elaborated for raising the fertility of soils by means of artificial regulation of the groundwater tables.

Great practical significance is attached to the research conducted in nature reserves on the biology and ecology of beavers. These led to the possibility of restoring populations of these animals, which were once on the verge of extinction, even under the conditions of the modern cultivated landscape, being fully proved theoretically. In due course the application of this conclusion has allowed the number of beavers to be built up in a comparatively short period of time from an original stock of a few dozen individuals to the level at which the commercial trapping of animals for skins can be permitted. Similarly, investigations undertaken in nature reserves on the ecology of elk, mountain antelope, muskrat, saiga, spotted and red deer, mountain goat, bison and many other species have made an original and important contribution to the cause of conservation and multiplication of valuable beasts.

As can be seen from the material presented above, the operations of the the nature reserves and the investigation conducted in them are being developed in two directions:

(1) protection of nature itself, involving preservation of the whole natural complex within the limits of a particular area (the passive form of nature conservation);

(2) organization and realization of artificial translocation of wild animals with a view to enriching neighbouring unprotected areas and applying the lessons of special investigations to the problems of rational utilization of the natural complex to be found on the commercially utilized lands (the active form of nature conservation).

At the same time all the nature reserves of the Soviet Union, in the past as well as today, represent what may be called standard samples of nature. By means of these samples it becomes possible to find out what changes nature has undergone both in the process of its inherent evolution and as a result of man's activity. This is one of the most important and noble tasks facing the nature reserves. Conservation of all the natural complex in zones comprising protected areas depends on its successful solution, for only by means of such standard samples is it possible to define in the shortest possible time the consequences resulting from irrational utilization of one or more natural resources and, on this basis, modify or abandon the application of certain methods which may have been adopted in economic management of nature.

POINTS MADE IN DISCUSSION

Prof. D. H. Henning (U.S.A.) asked whether success had been achieved in the USSR in ruling out all commercial activities in the reserves, even logging or mineral exploitation, or whether there was any legal provision for permitting such activities in special cases. Ing. V. G. Kozlovsky replied that generally speaking all disturbances were excluded, except that in special zones comparable to national parks elsewhere, the provision of tourists facilities is permitted. These exceptions, are however, rather infrequent, since visiting of reserves is normally only for scientific purposes and in the USSR generally large-scale 'wildlife tourism' has not yet developed.

In answer to a question by H. H. Yuvraj Digvijay Singh (India) Mr. Kozlovsky said that there were certainly still a number of animal species in the USSR, including large mammals of special interest to science, which do not occur in any established reserve, but survive in unprotected forests and wilderness, usually in rather remote areas. Nevertheless, the list of species within reserves available for scientific study is large.

The Chairman, Prof. J.-P. Harroy, referring to remarks in Mr. K. S. Sankhala's paper about the definition of the term 'national park', said that the International Commission on National Parks (ICNP) would be discussing a resolution during the present Assembly which in some respects would modify that adopted for the Second Edition of the U.N. List. In this connection he thought it would be interesting, following Mr. Kozlovsky's exposition of the USSR situation, to hear something of the complex system in Japan from Mr. Tetsumaro Senge, Chairman of the National Parks Association of Japan and a Member of the ICNP. Mr. Senge said that the parks were divided into National Parks proper and 'Quasi National Parks' for both of which the National Parks Bureau in the Ministry of Health and Welfare has administrative responsibility. In general, however, the main difference between the situation in Japan and that described in most of the country reports, as well as in Mr. Kozlovsky's comparative study, lies in the fact that the land of the parks remains largely in private ownership, which creates a problem of control. Hence, there is a policy of establishing 'Special Protection Areas' in the heart of the parks, where the natural environment is preserved in as near a wilderness state and natural condition as possible, although visitor facilities and related developments may to some extent be allowed. The rest of the park area is, in short, treated as a buffer-zone where many activities take place, but where park officials still have a measure of authority. To some extent, therefore, the USSR and Japanese patterns represent two extremes, but both of them offer useful guidance in the problems of developing national park systems in southern Asia, which had emerged during the Session.

SECTION B.

Pre-Conference Study Tours to National Parks and other Areas of Conservation Importance Situated in India

INTRODUCTORY NOTE

The background of the Pre-Conference Study Tours has already been described in the Preface and Introduction to this Volume of the Proceedings of the XIth Technical Meeting of IUCN. It seems appropriate, however, to make a few additional remarks by way of introduction to the Reports of the six Study Teams and the Summaries of the discussions of these Reports.

The aims and procedures of the Study Tours can be conveniently summarized in the words of an Abstract of the proposal submitted to the Smithsonian Institution when financial support, which was duly accorded and without which the studies could not have been undertaken, was being sought:

'The project comprises a short-term intensive study of six . . . conservation problems, selected by the host country as being representative of those with which it is at present faced, to be carried out by small groups of qualified experts, sponsored by IUCN, in collaboration with local experts who have a continuing responsibility in respect of the problems investigated. Following upon the study, each group will present to the Technical Meeting of IUCN, as a basis for discussion and appropriate action, a first-hand and up-to-date assessment of the situation, with recommendations for the solution of the problems involved and for such further research as may be needed to ensure that the solutions are sound. The aim is to provide not only a constructive answer to the particular questions examined, but also guidance on the policy to be adopted in similar situations occurring with increasing frequency and urgency in India and other countries'.

It was planned that as far as possible each team should have five clear days at the study site, allowing it to form a clear impression of the situation on the ground as well as to discuss it with those most actively concerned at all levels. It was also hoped that a statement of the main problems and issues and other relevant documentation could be supplied to each team in advance, so that despite the very short time available definite and constructive conclusions could be reached and embodied in a brief written report, to be prepared on the final day of the tour in time for duplication and presentation at the Technical Meeting.

Although, in the event, the inevitable organizational difficulties did not permit these plans to be fully implemented, it is satisfactory to record that all the teams were in fact able to complete and present their reports in time for the appropriate sessions. That this was achieved, despite all the pressures and, often, other responsibilites falling upon members during the very limited time available, is a matter for congratulation and for very real appreciation and gratitude on the part of IUCN and indeed all participants in the Technical Meeting. Nevertheless, it should be remembered that the reports presented and reproduced below could not, in the circumstances, be highly polished and detailed documents. They should be read and regarded as representing the reaction to given situations of experts exceptionally well qualified to make a

rapid appraisal. No doubt if time had permitted fuller discussion, many points could have been elaborated or even modified, but it is much to be hoped that the guidance provided will prove helpful, both in the particular cases discussed and in a wider field, and thus justify the Study Tour experiment.

Guindy National Park, Madras, Tamilnadu

Study Team:

MR. E. BARNARD
Lande sbaudirektor, Landschaftsverband, Westfalen-Lippe, Ami für Landespflege, Münster (Westf.), Germany

MR. P. R. MOHAMMED BASHEER
Indian Forest Service, State Wild Life Officer, 81 Mount Road, Madras 6, Tamilnadu, India.

MR. H. K. EIDSVIK
Chief, Park Planning Division, National and Historic Parks Branch, Department of Indian Affairs and Northern Development, Ottawa, Canada.

DR. GEORGE C. RUHLE
U.S. Department of the Interior, National Parks Service, Washington D.C.20240, U.S.A.

INTRODUCTION

Although recently accorded National Park Status, the area under study is still usually known as the Guindy Deer Park and is referred to as such in this report. The Guindy Deer Park exists as an island of tranquillity in the midst of the congestion, noise and pollution common to major metropolitan areas. The opportunity to see readily a segment of the native wildlife, in this case chital and the only Indian antelope, the blackbuck, in abundance, is one which is rare in urban areas. These free-roaming ungulates form the basis for an inspirational and enjoyable experience for the visitor. The Park is adjacent to Guindy Industrial Area in the south-west part of the city of Madras. The area of 1, 262 acres (500 ha) is roughly a square, out of which the 260-acre Raj Bhavan is the residence of the State Governor and a crescent of 407 acres on the east and south-east forms the campus of the Indian Institute of Technology. The remaining 595 acres constitute Deer Park. A tract of 22 acres on the north-east edge is a recreational site called the Children's Corner. An eight-foot wire fence extends along the western and southern border, and separates the Children's Corner and the Institute grounds from the Deer Park proper. There is no restraining fence between the Governor's estate and the park; animals move freely from one area to the other. An elongated tank (fresh water pond or lakelet) separates the Technology Institute and Deer Park. In times of heavy rains, the tank may be filled with water throughout its length, but in periods of prolonged drought, this dwindles to a small water hole on the southern edge. Two small ponds are located in Raj Bhavan. A small tank and a circular well, some 15 feet in diameter and 20 feet deep, lie in the centre of the Deer Park. A system of straight unsurfaced lanes and trails radiates from Raj Bhavan and connects with a boundary road that completely encircles the park.

The general aspect of the Park is one of flat, red, gravelly, relatively barren open areas fringed by and interspersed with dense, thorny thickets characteris-

tic of the dry zone of South India. Small stands of larger trees-mangoes, tamarinds and flame trees, many of which have been planted—grow here and there.

Except for random pockets grasses and forbs are scarce, their appearance contrasting strongly with lusher growth outside the fence. Conditions may have appeared more deplorable at the time of observation as the result of two years of severe drought broken just during our visit.

More common trees within the area include several species of thorny acacia (*A. planifonnis, A. leucophloea*),*Albizzia amera, Canthium didymum, Chloroxylon swietenia, Feronia elephantum* and *Mangifera indica; Azadirachta indica* and *Tamarindus indicus* are common larger trees, and *Eugenia jambolana* grows near tanks. *Atalanlia monophylla, Capparis* spp. *Carissa carandas* (common, thorny), *Dichrostachys cinerea, Flacourtia indica* and *Zizyphus* sp. are shrubs and small trees. There is an abundance of fruit-bearing trees and shrubs for birds.

Two species of ungulate inhabit the Park in considerable numbers: the black-buck, *Antilope cervicapra,* the sole representative of the genus in India, a dainty creature with striking dark and light color pattern and beautiful long, spiral horns; and the chital (*Axis axis*), a small graceful deer with a heavily white-spotted rufous coat. A 1968 count of animals gave an estimated 625 blackbuck and 825 deer.

PRESENT FACILITIES AND USE

The predominant current visitor use occurs in the 'Children's Corner', where-as the chief service of the Deer Park area is on behalf of wildlife and uses related to the existence of a forest environment. The majority of the visitor facilities are located in the Children's Corner. Approximately 1, 200 to 1, 500 visitors per day utilize the area. On Sundays and holidays, the number is many times larger. Facilities provided include:

1. Children's playground equipment; a tree-house, swings, mechanical slides, sandpits, etc.;
2. Rides on an elephant, ponies, and a miniature railroad;
3. A zoo with cages, mostly small and cramped, for birds and mammals, some of which are domesticated species;
4. A library with books on wildlife and children's books;
5. Miscellaneous facilites for camping and school tours.

Deer Park. Visitation level is approximately 20-30 persons per day on an annual basis. Present facilities are roads, trails and equestrian paths. Visitors are guided through the area by members of the Forest Department staff. Two equestrian clubs with stables on the north perimeter make 1½-2 hours daily morning and evening use of specific trails.

Permits for making commercial movies for theatre and television use provide the largest source of revenue to the park. Permits to collect products of fruiting trees constitute the second largest source. There is limited grazing of domestic animals belonging to the Governor's domestic staff. Neighbouring residents draw water for domestic purposes from the tank on the south edge. A very limited amount of scientific study and collection has taken place.

PLANNING FOR FUTURE USE OF THE AREA

The study team recommend that, in the main, future usage of the area should be an intensification and refinement of present use with gradual elimination of conflicting, non-conforming practices. Specifically, this means:

1. Improvement of facilities for observing mammals and birds. Present alignment of roads and paths should be redesigned to be meandering, the existent straight, unbroken lines to be broken as suggested later. Rest stops, observation sites, and overlooks should be provided for relaxation and for viewing animals. The public should not be permitted to wander at will nor to mingle with animals, but its presence segregated and its circulation controlled by hedges, ditches, thornbush and properly marked paths, always designed to blend into the landscape and the natural environment.

2. An increasing interpretive and educational use; by

   (a) creation of a visitor centre, possibly through expansion of present library quarters, to provide information, an assembly room, facilities for projecting motion pictures and slides, seasonal displays and exhibits;

   (b) providing self-guiding trails, with explanatory signboards;

   (c) specialized naturalist service especially designed to accommodate school and larger visitor groups;

   (d) building up a library of relevant slides and films;

   (e) pertinent, popular publications for sale or free distribution by the information service under (a) above.

3. Increased scientific use:

   (a) promotion of study and research needed for intelligent management and care of the park and its assets;

   (b) cooperative endeavours in research and investigation with the Institute of Technology, University of Madras, and other schools of higher learning: this would enable technically trained students to observe and develop an appreciation of conservation matters to which they would not otherwise be exposed;

   (c) cooperative projects with national and international groups including IUCN, Colombo Plan, USAID, FAO and private foundations.

4. Promoting tourism. Visits by small groups should be encouraged, especially by school, religious and private parties such as the YMCA, youth organizations, Boy Scouts. Local tour groups would be taken round the Park by guides provided from the official staff. This implies only a very limited, controlled use of roads in the Park by motor vehicles, greater use being on foot, leaving vehicles parked at the entrance.

THE FUTURE DIRECTION OF GUINDY DEER PARK

The future physical development, management and visitor programmes of the park should be based on prior intensive ecological studies and on the develop-

ment of a long-range plan. To attain this objective, some of the principle factors which must be given consideration are:

1. ***Inventory and analysis.*** To bring the ungulate population into balance within the carrying capacity of the range, and to maintain this balance it is essential to initiate a series of scientific studies, including an inventory of present situation. Factors to be considered include (a) the fact that the vegetation outside the fence, especially on the land of the Technology Institute, is more abundant and more palatable to buck than that which remains inside the Park: over-population is undoubtedly the cause; and (b) park hydrology, i.e. periodic scarcity of water, and the physical condition of the stock (the wild herd) also point to the need for drastic reduction in numbers, which now exceed the carrying capacity of the range.

The role of predation with the thought of possible introduction of natural predators should be reviewed (caracal, cheetah, etc.). In the long-range dangers inherent in the inbreeding of the herd could be the subject of special studies. Other means for enhancing the physical condition of wildlife and its habitat should be studied.

2. **Research.** Research projects oriented at resolving problems should be initiated with universities having a capability in botany, range management, biology and zoology. A closer alliance should be sought with the park's neighbour, the Indian Institute of Technology. The students of the Institute could be exposed to an insight into conservation by assisting the park officers in the resolution of technical problems. This would be of great value in the future. The study team suggests a 'Research Advisory Committee' to assess the potential in this area; the committee should include university representatives as well.

3. **Flora.** At the present time the indications are that the gradual replacement of exotic species by desirable native species of forest, range and shelter plants, would enhance the natural character of the area and produce more and better food material for the wildlife. As this programme is expanded and the animal population is brought into a natural balance, it is desirable to eliminate summer feeding and the practice of cutting high branches off trees to provide feed. In order to increase the tempo of rehabilitation a reduction of herd size by up to fifty percent should be considered. This should, however, be undertaken gradually and be subject to checks and further detailed study.

4. **Domestic grazing.** This is not a critical problem at this time, but is one to which future consideration should be given. There is inherent danger in introduction of domestic diseases and pests to which the wild ungulate herd may prove highly susceptible. The objective should be to curtail in the Deer Park area the grazing of the animals belonging to the domestic staff of the Raj Bhavan. Suitable alternatives which do not work a hardship on the individual owners must be developed. The mingling of cows and other domestic stock, with deer and antelope is not in keeping with the natural scene.

5. **Facilities.** The objective should be retention of the natural character of the area, minimizing the number of structures present and designing those that are required in such a manner that they blend with the landscape rather than intrude upon it.

(a) *Roads and riding pa paths*–instead of the long tangents of the present roads, a swinging alignment should be the objective. On the present riding paths this could be obtained by a planting programme, which would be better for the visitor, the animals and the landscape. One-

way traffic should be instituted wherever possible and the motorable roads restricted to administrative use and a small quota of public or private tour buses. Private motorcars should be parked outside the Park boundaries.

(b) *Structures*—massive, thick, walled concrete structures should be avoided wherever possible. These structures impose themselves upon the landscape rather than blend with it. Plant species native to the area should be utilized to screen buildings and fences from view. An excellent example of thorn and scrub growing through a fence and obscuring it is evident in the Children's Corner. This could well be applied to other areas of the park. Native thorny plants make excellent material for screens and hedges.

(c) *Equestrian facilities–the* present broad paths are not in keeping with the natural environmental character which the park should express. Plantings should be utilized to narrow passegeways and to curve and break the long vistas. The possibility of equestrian clubs utilizing the nearby race-course grounds should be intensively studied. The racing season extends for only 4-5 months and if the clubs could utilize these grounds in the off season, it would enhance the opportunity for recovery of the deteriorating landscape in the Deer Park.

6. Children's Corner. In order to bring about a re-emphasis on free roaming animals in a natural environment, it is suggested that some changes in the present use of the Children's Corner should take place. There should be no expansion of the present zoo-type facilities. The objective should be to try to simulate to a much greater degree the natural environment of the animals which can be safely contained in the park. Caged animals rarely exhibit the natural characteristics upon which the park's future is dependent. As the cages depreciate in value, they should gradually be removed and replaced with exhibits relating to the overall character of the park and the life cycles of the animals within the park. In suitable enclosures some familiar domestic animals may be utilized to familiarize youth with animal habits and characteristics. In much the same manner there should be a gradual de-emphasis on swings, slides and similar playground equipment.

7. Education. Conservation education for youth shouldbecome a primary objective of the park. This can be done through cooperation with the film companies in producing films based on the park, nature walks, signposted trails, popular talks by the park staff and practical demonstrations. Gradually, the Children's Corner can become the conservation corner.

SPECIFIC QUESTIONS

Before the field study began, the team was asked to comment on three technical questions. Time did not permit these to be investigated in length or discussed at length in this report but our general conclusions are as follows:

1. Methods of containing the wild herd. It became evident that the question is closely related to the density of the deer and buck population. The loss of animals through the fence was regarded not serious from the point of view of the ungulate population. A reduction in this population would reduce the social pressure on the ungulates and thereby reduce the tendency for animals to wander or break out of the Park area.

2. Population census. Copies of technical papers provided by the Canadian Wildlife Service were left with the Chief Conservator of Wildlife. These papers discuss various methods of range analysis, productivity, carrying capacity and census methods. The application of the student census technique utilized for the 'George Deer Reserve' of the University of Michigan was discussed in relation to its possible application to the Indian Forest Ranger Training School.

3. Use of capture-guns. Copies of technical papers on the actual usage of capture-guns and the success of various drugs were made available to the Park staff and, in addition, technical papers on capture by netting and live trapping. It seems rather unlikely that the capture-gun method would be the most suitable for dealing with the chital and blackbuck in the Park, which are relatively tame and small in size, should research needs or artificial reduction of the populations make capture desirable.

CONCLUSION

Guindy presents an unusual opportunity for aesthetic, educational, and scientific benefits, of which intelligent management can take advantage to enhance the pleasure and profit, on a durable basis, both of the people of India and of visitors from abroad. It can only be hoped that the Madras community will seize this opportunity and protect the park as a precious heritage for enjoyment now and for future generations.

ACKNOWLEDGEMENTS

Our visit to Guindy Deer Park was greatly facilitated by the Tamilnadu Forest Department and by Mr.Rexgaraj, the Park Superintendent. Their unstinted cooperation was invaluable. The participation of the foreign members of the team was made possible by the generous financial support of Smithsonian Institution, the Canadian National and Historic Parks Branch and the U.S. National Parks Service, respectively.

Report 1: Guindy National Park

POINTS MADE IN DISCUSSION

In Maharashtra State we are in the course of developing a national park near Bombay, known as the Borivli Park, and several of the points made in the Report in Guindy are relevant and show that there is a considerable similarity in the problems. It is true that the Borivli Park is much larger, about 35 square miles, and is situated 15 miles from the city, but it is subject to the same kind of pressure: a heavily industrialised area borders it on one side and on the other side industrial development is approaching. We do not want to develop it as a sanctuary or strict game reserve, nor as a municipal park, but rather as a national park in which the natural beauty, enhanced by two lakes, which we are proud to have kept largely unspoilt despite the proximity of a great city, can be visited and enjoyed by large numbers of people without spoiling it. At present we are having a study made by an expert from the U.S.A. to work out how the Park can be developed and managed for that purpose (K. D. Vasant, India).

The Report lays stress on the maintenance of natural vegetation rather than the introduction of exotic species, but I am not convinced that the latter necessarily harm the quality of a park. Sometimes the natural vegetation has very little interest for the ordinary person and to introduce other species which are worth preserving gives a better idea of the variety of nature (K. L.Datta, India).

The view just expressed means that the concept of a national park has not been properly understood. A national park should give an opportunity for people to see not an artificial flora, that some person or committee has decided to plant, but on the contrary a sample of what the place looked like maybe one hundred or one thousand years ago. Even when some planting is necessary, perhaps to restore an area which has been allowed to deteriorate, the aim should be as far as possible to establish natural ecological conditions and this, for instance, is what we always try to do in Delhi zoo: it is the indigenous flora which bears God's signature (K. S. Sankhala, India).

The last speaker is quite right, but the point he makes raises the question how far Guindy should properly be considered a 'national park'. It is, after all, a very small area and the number of species, both plant and animal, is very limited and difficult to maintain in the face of the pressures exerted by large numbers of visitors. It can in fact be best described as a zoological park. On the other hand, as the Report shows, it does give an opportunity to preserve a small sample of the wild life of India in a sound natural state. This is surely an objective that is well worthwhile, even if it is on a much smaller scale and much less expensive than the care and, where necessary, rehabilitation of wild areas included in the country's wild life sanctuaries and national parks proper. That remains the greatest problem, of which we will no doubt hear more in the next two or three Reports (unidentified speaker).

In view of the previous speaker's reference to Guindy as essentially a 'zoological park' and to the intense visitor pressure on the area, which is likely to increase greatly as the city's population grows in the next 10-15 years, it might be worth mentioning a possible alternative or extension to the recommendations put forward in our report, although it is one on which no agreement was reached and which would need very careful consideration. This

would be to develop the Park or at least a section of it into a zoological park of the most modern type with the animals in large enclosures in nearly natural surroundings. This would allow it to replace the present unsatisfactory Madras zoo which would be turned into an ordinary public park. I believe this idea could be carried out without necessarily sacrificing the quality and purpose of the existing Guindy Deer Park (Barnard, Germany).

SECTION B: Pre-conference study tours report 2

Sariska Wild Life Sanctuary, Rajasthan

Study Team:

MR. J. R. B. COLEMAN
former Director, National and Historic Parks Branch, Canada, Member of the International Commission on National Parks of IUCN: RRI, Dunrobin, Ontario, Canada

MAJOR I. R. GRIMWOOD
former Chief Game Warden,Kenya, Member of the Survival Service Commission of IUCN: P.O.Box 5079, Nairobi, Kenya

DR. JEAN-PAUL HARROY
Professor of Brussels University, Chairman of the International Commission on National Parks of IUCN: Avenue Jeanne 44,1050 Brussels, Belgium

DR. PAUL LEYHAUSEN
Director of Research, Max Planck Institute for Physiology of Behaviour; Assistant Professor, University of Dusseldorf; Re search Associate, Smithsonian Institution, Washington D.C.: Max-Planck-Institut für Verhaltensphysiologie,Arbeitsgruppe Wuppertal, Boettingerweg 37, 56 Wuppertal-E, Germany.

MR. MOHINDER PRAKASH
Indian Forest Service, Conser vator of Forests (Development), Jaipur, Rajasthan, India.

I. INTRODUCTION

The study tour to Sariska Wild Life Sanctuary was proposed by the Indian authorities in order to gather information on the possibility and the opportunity not only to upgrade this sanctuary to the status of a national park, but also to ensure that it deserves this status by making a few improvements in order to meet criteria now internationally accepted and reflected in the preparation of the 'United Nations List of National Parks and Equivalent Reserves.'

The study was financially supported by the Smithsonian Institution of Washington D.C, which paid the travel expenses of two members of the group, those of the other two foreign members being paid for by the Belgian Government and the Canadian Government, respectively. Local accommodation and transportation were covered mainly by the Government of Rajasthan, which is gratefully acknowledged. Thanks are also expressed to members of the Forest Service of Rajasthan who took great pains to make the visit to Sariska as fruitful and as agreeable as possible, and especially to:

Mr. Vicendra Sahai Saxena, I.F.S., Divisional Forest Officer, Bharatpur
Mr. Jai Singh, Game Warden, Sariska

The report is set out in three sections:

(1) General discussion of the national park concept throughout the world, and specifically in India.

(2) Description of the present situation in Sariska Wild Life Sanctuary and its potentiality for being upgraded to the status of a national park.

(3) Recommendations on the measures which need to be considered to ensure optimum development of the proposed Sariska National Park.

In the interests of brevity, a full geographical description of the sanctuary is omitted, since the information is readily available, in existing literature, from the Forest Department or Park authorities at Jaipur and Sariska. Its area is 49.182 ha (183 sq. miles) and it was the ancient hunting preserve of the Maharaja of Alwar, declared as a wild life sanctuary in 1955 and modified in 1958. It is located in the north-east of Rajasthan about 200 km from Delhi, and being hilly and forested it supports a relatively abundant fauna, of which the most notable species are tiger, leopard, caracal, nilgai, sambhar, spotted deer, four-horned antelope and a very few chinkara.

II. GENERAL COMMENTS ON THE NATIONAL PARK CONCEPT THROUGHOUT THE WORLD AND ESPECIALLY IN INDIA

A. An international definition of the term 'national park'.

The International Commission on National Parks has prepared a draft definition which will be further considered and improved upon at its meetings during the course of the IUCN General Assembly at New Delhi, with a view to submission to the Assembly in the form of a Resolution (see Resolution No. 1 adopted by the General Assembly of IUCN on 1 December 1969 and published in the insert to IUCN Bulletin New Series Vol. 2 No 14 of January/March 1970- *Edd.).* The text of the definition (as finally amended) is as follows:

> 'A National Park is a relatively large area (1) where one or several ecosystems are not materially altered by human exploitation and occupation, where plant and animal species, geomorphological sites and habitats are of special scientific, educative and recreative interest or which contains a natural landscape of great beauty and (2) where the highest competent authority of the country has taken steps to prevent or eliminate as soon as possible exploitation or occupation in the whole area and to enforce effectively the respect of ecological, geomorphological or aesthetic features which have led to its establishment and (3) where visitors are allowed to enter, under special conditions, for inspirational, educative, and recreative purposes.'

This definition covers the various conditions which have been considered necessary for admission of an area to the United Nations List of National Parks and Equivalent Reserves, as prepared on behalf of the United Nations by the ICNP at the request of the UN Economic and Social Council and the second Edition of which was published in French in 1967 (preliminary copies of the English version were made available for inspection at New Delhi and eventually published in 1970). These conditions comprise four selected criteria used in the preparation of the UN list and later approved in Paris, in September 1968, by the Intergovernmental Conference of Experts on Rational Use and Conservation of Resources of the Biosphere, namely—strict protective status and a size, staff and budget not less than the minimum considered adequate to allow effective enforcement of that status. Inherent to the definition and to explanatory clauses attached to it is the distinction to be made between national parks and equivalent reserves. For example, as opposed to a national park, an equivalent reserve (1) need not necessarily be open to ordinary torists (i.e. it may be a 'strict nature reserve'), and (2) can be created and managed by another authority than the central government (e.g. it may be a provincial park, private reserve, etc.).

B. National Parks in India

Fourteen protected areas, comprising five national parks (Hazaribagh, Taroba, Kanha, Shivpuri and Corbett) and nine Wild Life Sanctuaries, rated as 'equivalent reserves', are included in the UN list. One of these sanctuaries is Sariska, whose size, budget, staff and status—despite some necessary reservations explained hereafter—were considered sufficient by the I.C.N.P.to justify its inclusion in the list.

In the chapter of the UN list devoted to India, the following general comments were felt to be necessary to explain the situation in regard to the conservation status of the protected areas: 'Due to the population density in most of India and to the need for the greatest possible utilization of the country's natural resources, it has not usually been possible to establish natural reserves of any great size nor to ban completely the exploitation of forest cover in national parks and equivalent reserves. For this reason, where with the agreement of the Indian authorities areas have been accepted for the List and credited with "total protection," it must be understood that this status, though rather more strictly maintained in the National Parks than in the Wild Life Sancturaries, does not necessarily exclude the exploitation of forests at least in certain zones and under scientific control; the term "exploitation" includes forest management and replanting. In order to offset the disturbance caused by these activities, provision is made for certain areas to be kept strictly protected, which are known as "inner sanctuaries" or "abhayaranya." In theory, grazing of domestic stock is forbidden in the national parks and sanctuaries but in practice is difficult to suppress.

'The establishment and administration of national parks and equivalent reserves in India are constitutionally the prerogative of each State.

'Nevertheless, the Central Government of the Indian Union took certain steps in 1957 to promote some degree of uniformity and in particular to ensure that "any National Park established in a State must justify that title." For this purpose, a "Model Bill for the constitution of National Parks" was proposed, in order to serve as a basis for enactments by the various local legislatures. In 1964, a "National Park Policy" and "Standards for National Parks in India" were drawn up, approved and communicated to all State Governments and it was decided that only those protected areas which conformed to the standards laid down and were approved by the central organization known as the Indian Board for Wild Life, could be upgraded to the status of National Parks by State legislation.

'At the central government level, the Ministry of Food and Agriculture has the responsibility for all problems affecting "national parks, reserves, wild animals and forests." Its chief adviser is the Inspector General of Forests and there is an Indian Board for Wild Life which was responsible, in particular, for drawing up a definition of "national park" at its inaugural session in 1952 (reconstituted 1969).

' The States also have consultative bodies equivalent to the Wild Life Board and most of them also employ a State Wild Life Officer and in some areas have already established a Wild Life Department. In Rajasthan no Wild Life Officer has been appointed and no separate Department has been established as distinct from the State Forest Department; however, some members of the State Wild Life Board have been appointed as honorary Game Wardens for the various sanctuaries.'

Since the above comments were made, there have been some new developments, for example the appointment of a Chief Wild Life Warden (Honorary) for

Rajasthan based on Jaipur. Most importantly, however, the Prime Minister of the Indian Union, Mrs. Indira Gandhi, has on several occasions expressed her very deep concern with the problems of National Parks and Wild Life Sanctuaries and, in particular, her views and guidance on some of these problems have on several occasions been officially notified to competent local authorities. Some significant examples of these statements by the Prime Minister are:-

'Parks and sanctuaries should be viable units, so that they cater for the full ecological cycle. For this purpose, they should be suitably enlarged wherever necessary. . . . . .

'It is important that in a 15-mile belt around sanctuaries and wild parks no crop protection licences should be issued and existing ones revoked. There is no other way of saving animals which stray out of their protected confines. Crop protection in this 15-mile belt should be the duty of the State, as is the case in many countries of Africa...

'There should be a trained veterinary unit for each sanctuary and park, which could inoculate cattle in surrounding villages aginst communicable diseases. They should also be specially trained and equipped, as in Africa, to treat sick wild life.'

III. PRESENT SITUATION IN SARISKA W.L.S.; POTENTIALITIES JUSTIFYING ITS UPGRADING INTO A NATIONAL PARK

As already stated, only those protected areas which conform to the standards laid down in 1964 for National Parks in India and are approved by the central organization known as the Indian Board for Wild Life, can be upgraded to the status of National Parks by State Legislation.

In the case of Sariska W.L.S.,the procedure leading to upgrading has already been initiated. This was confirmed by Mr. G. K. Bosa, M.Sc, Chief Conservator of Forests of Rajasthan, whom the study team met in Jaipur. To what extent the potentialities of Sariska justify the initiative, the present section III of this Report attempts to demonstrate and assess. The final section IV then reviews some of the measures which need to be taken to ensure that not only the standards established by the Indian Board of Wild Life but also the criteria established internationally by the ICNP are properly met.

It is a basic principle of this assessment that a National Park is the highest category of protected area, the value and impact of which can never be calculated in purely monetary terms. It follows that the Nation must and can accept that expenditure incurred in the creation and management of a National Park may well exceed the direct financial return. The Team would like to stress that the fact that the national park concept thus imposes a duty on the State is now widely recognized in most countries of the world.

In each of the following sections the matters to be considered are grouped under three heads, covering, respectively, the basic purposes of every national park: conservation, scientific research, tourism.

A. Potentialities:

1. *Conservation*

Although it has no special and spectacular feature of the type of the rhinoceros of Kaziranga W.L.S., Sariska does offer a refuge for a number of interesting and rare animals such as the caracal *Felis*

caracal, which is a particularly threathened species, tiger *Panthera tigris* and four-horned antelope *Tetracerus quadricornis*, as well as interesting plant associations, which include such scarce species as *Terminalia arjuna* and *Sterculia urens*,

2. *Research*

Linked with the features of the fauna and flora indicated above.

3. *Tourism*

In addition to the fauna, with tiger as the top attraction, the area has four advantages:

a. pleasant hilly and forested scenery;

b. agreeable and stimulating climate;

c. important archaeological sites (notably at Nilkanth);

d. proximity of New Delhi-200 km, an easy drive on good and picturesque roads (Shiliserh Lake near Alwar).

B. Present Situation:

1. *Conservation*

(a) Favourable factors:

(1) abundant and practically unmolested fauna;

(2) watershed protection: although forest exploitation has continued care has been taken to avoid clear-felling and deforestation throughout the sanctuary;

(3) effective conservation of some species both of plants and animals which are threatened outside the sanctuary;

(4) game management (30 jackals were culled in 1968) and forest management (fire control by early burning of the undergrowth or by light grazing): these management interventions, it should be noted, had apparently been beneficial, but the authorities in planning them, especially the jackal-culling, had based their decisions on only very superficial ecological study.

(b) Unfavourable factors:

(1) Human occupation and cultivation: four villages, totalling 1200 inhabitants, along the Alwar-Jaipur road, resulting disturbance extending to two miles on either side of the road, although further extension of development has been prohibited by the authorities; other villages in the Sanctuary include:

(a) Karnaka Bas, near Sariska village—250 inhabitants;

(b) Rajor, fairly large, in the south—350 inhabitants;

(c) Gahrsh, near Nilkanth—150 inhabitants;

(d) Rai Kahsta, in the north—50 inhabitants;

also a few authorized camps for cattle graziers (quadas), involving some dozens of people; relationship between the

people and the sanctuary authorities are, however, relatively good.

(2) Movement of people through the sanctuary: circulation by foot is everywhere and by cars along the main roads is almost entirely unrestricted; the heavy traffic, combined with settlements, along the Alwar-Jaipur highroad constitutes an impediment to wild life migration, especially east of Sariska.

(3) Grazing: this is one of the main adverse influences, leading to diminishing value of the sanctuary as a conservation area, in which the natural ecosystems have some chance of surviving; official statistics indicate that in 1969 there were 3, 210 buffaloes, 2, 465 cows, 9, 327 goats and sheep, and 2,147 camels in the sanctuary and that all of these animals are on the increase; grazing fees, payable to the authorities, amount to about Rs 40, 000/-annually.

The presence of cattle, competing with wildlife for food and water, as well as for the salt licks put out by the park authorities, is tolerated almost everywhere; however, some effort has been made to remove them from the axial north-south road, which branches from the main road near Sariska village. Probably, altogether about three-quarters of the Sanctuary are grazed by cattle, competition with wild species being especially serious in the valleys, where traces of overstocking are evident; the remaining quarter, comprising the steeper slopes and crests of hills, is unaffected. It is worth adding that the cattle-owners, who are almost all vegetarian, are generally speaking not poachers: in fact they are often quite keen to help the park guards in the struggle against poaching, since the latter tends to reduce the amount of natural prey available for carnivores leading to more attacks on cattle especially of course by tiger and leopard.

(4) Forest exploitation: this is another weakness of the sanctuary; exploitation is of two kinds, first that carried out officially by the Forest Service (annual revenue: Rs 30, 000/-), mainly directed to *Acacia catechu* and the production of firewood, charcoal and paper pulp and, secondly, the bamboo harvest which the inhabitants (organized in co-operative societies) are allowed to make every three years.

(5) Fishing: sport fishing is authorized for tourists at a token fee of one rupee a day but is not indulged in by the local inhabitants.

(6) Poaching: as previously mentioned, very little by the local people, but two other categories of poachers are a menace: first, the professional hunters, trading in meat and skins, who decimate the game under the pretence of executing, with the authorities' agreement, a 'cultivation protection' contract; these so-called 'Bawarias' are especially dangerous, because their legal position cannot be questioned as they have an official licence; secondly there are the poachers who are or work for tiger and leopard fur-dealers; they come from Delhi and use powerful and cunning traps. The suppression of poaching is both a dangerous and frustrating task: danger-

ous, because the poachers are bold and violent, frustrating because the magistrates, as in many other countries, are unbelievably lenient with poachers. The forest officers have powers to compound penalities, and use these powers systematically, in spite of the small penalities thay can demand,for they know that a court would impose even smaller ones, despite legislation which provides for a maximum fine of Rs 500/- and imprisonment for six months.

(7) Mining: copper-mining and quarrying is taking place within the sanctuary, often to the detriment of the forest; prospecting is authorized, with very little control over the movement of the prospectors.

(c) Staff:

1. The sanctuary staff is relatively numerous—one warden and twelve rangers supported by some forest guards. But their task is rendered difficult by the fact that any attempt to supervise the sanctuary property is bound to come into conflict with the various permissible activities enumerated under sub-section (b) above. The staff is fairly well equipped from the point of view of mobility and some of the guards are armed.

2. *Scientific research*

The sanctuary has no permanent scientific staff or equipment. Research projects, conducted or initiated with little previous over-all planning, include sylvicultural research conducted by the Forest Service, ecological and taxomonic studies conducted by the University of Rajasthan (Jaipur), several publications, lists, etc., notably those compiled by Dr. L.N. Vyas. No proper scientific use has been made of the wildlife observations available.

3. *Tourism*

(a) Accommodation: two resthouses, one old one new with seven double rooms. Charge: Rs 20/- per person for full board and lodging.

(b) Roads: 73 km of tarred roads and 80 km of unmetalled but motorable forest tracks.

(c) Vehicles: only one jeep is available for hire by tourists and is in great demand, which creates an excessive work-load on the driver.

(d) Machan or watch-towers for observing tiger: a living bait (buffalo) for the tigers is provided twice a week; no fee is charged.

(e) Other facilities for game-viewing: artificial water tanks (some dating back to the time of the Maharajah's hunting Preserve), salt licks, feeding, cutting of bush-cover near the roads (even the use of herbicides has been considered), etc.

(f) Statistics: about a thousand visitors yearly, 1,128 in 1966, 1, 386 in 1968; but the proportion of foreign visitors seem to regress: 254 in 1966, 185 in 1967, 107 in 1968 (these numbers need verification).

(g) Regulations: no entrance fee;Rs 5 are charged for a guide and the hire of a spotlight, the use of a guide not being compulsory; circulation on foot is permitted, as is game-viewing by night (with vehicle and spotlight).

CONCLUSION

The Study Team came to the regretful conclusion that so many exceptions exist to normal criteria for national parks that Sariska Wild Life Sanctuary, as it stands, could scarcely qualify for the United Nations List of National Parks and Equivalent Reserves. It appreciates, however, as did the author of the current edition of UN List, that the high population density of India makes it more difficult for that country to comply with all the normal requirements of a national park. The Team understands, however, that one village has in fact already been removed from the sanctuary and that plans are afoot further to reduce and ultimately eliminate the present human and cattle population within its boundaries. On that understanding, the Team believes that the initiative taken towards upgrading the present Sariska W.L.S.to national park status is justified and hopes, therefore, that Central Government is actively examining the possibility of accepting, as soon as possible, the financial responsibility which would result from the enactment of legislation by Rajasthan, making upgrading official.

IV. RECOMMENDATIONS OF THE TEAM FOR ESTABLISHING THE NECESSARY CONDITIONS FOR A FULLY EFFECTIVE SARISKA NATIONAL PARK.

A. Conservation

1. Measures designed to correct the present unfavourable factors:

(a) Human occupation: resettlement of inhabitants from
—Kiraska
—Karnaka Bas
—Rajor

It is estimated that a few hundred hectares of new land and some Rs 10,000/- would be sufficient compensation to ensure the removal of Kiraska and 1000 ha and Rs 20,000/- in the case of Karnaka Bas. In view of the value of the Nilkanth archaeological area, the neighbouring small village of Garhsh might be left as it is (but with a ban on extensions and even possibly some reduction in its present size): it is less of a nuisance than its neighbour in the north, Rajor. Elimination of graziers (guadas) camps, according to the procedure followed in 1968 for Kalighati, and progressive evacuation of the villages along the Jaipur-Alwar road should follow in due course: meanwhile these settlements could be made less injurious to the conservation of the area, for example by limiting the rights to kill animals in the protection of property.

(b) Movement of people within the sanctuary: prohibit motor-cycle traffic on most of the roads and tracks within the park and all night traffic except on the Alwar-Jaipur road. As soon as the legitimate human occupancy and livestock grazing have been reduced, traffic can be restricted to a network of well-marked routes.

(c) Grazing: the ultimate goal should be to exclude cattle. Start with reducing, then prohibiting night grazing. Make provisions for closing some pastures, through a rotating system, during the monsoon, in order to enable the plant cover to recover. Identify the over-stocked zones and give them special attention. Impose a strict health control on the cattle still tolerated within the park: disease-control inoculation programme by a veterinarian, as suggested by the Prime Minister.

(d) Forest exploitation; timber and fuel exploitation by the Forest Service and the harvesting of bamboo by local enterprise within the park boundaries would have to be brought to an end.

(e) Fishing: activity under this head inside the park also to be terminated.

(f) Poaching; rescind the licences given to 'Bawarias' (see Prime Minister's recommendation) and vest responsibility for crop protection in agents of the Forest Service, who would use scaring devices, such as fire crackers, short-barrelled small-calibre shotguns, etc., rather than kill crop-raiding animals; reinforce police powers of the rangers and guards (giving right to seize and search, etc.), with special reference to certain classes of illicit hunting (tiger and leopard poaching); bring the seriousness of these activities and the need for more severe and exemplary penalties to the attention of the judiciary.

(g) Mining and prospecting: impose closer controls or eventually eliminate.

2. Complementary measures:

(a) C reation within the park of one or several strict nature reserves with properly demarcated boundaries. The recommendation of the Indian Board of Wild Life would thus be achieved '... it is desirable to set aside a completely sacrosanct area. . . to be known as 'Abhayaranya', where nothing is permitted.'

(b) Extension of the present sanctuary to the north-east and south-west (existing shooting blocks), already under active consideration.

(c) Creation of a proper buffer zone around the park, where hunting is already prohibited. This should include the extension to the zone of some of the provisions of the Wild Life Act and the inoculation of cattle in the zone against diseases communicable to wild species, under the control of a veterinarian, as suggested by the Prime Minister.

(d) The National Park boundaries would need to be very clearly marked and signposted wherever they cross a road or track and more use could be made of gates.

(e) Management of the plant cover (e.g. by early burning, very strictly controlled cutting or even grazing?) and of the animal species must be based upon *much more* comprehensive and detailed ecological studies. Greater importance needs to be attached to the protection of *small* carnivores. Possibility of reintroducing some species which have disappeared or became very scarce, such as chinkara, blackbuck and sloth bear, could be considered.

The suppression of the poaching of the large cats, in which some progress has already been made, should be facilitated when an international convention now under discussion between IUCN and all governments, on the control of the trade in these and other wild animals and their products, is finally agreed, ratified and enforced.

B. Research

The essential prerequisite of an effective development plan for the park is a study of its ecology. For this purpose the Team recommends the setting-up at Jaipur of a suitable organization charged with the promotion and co-ordination of scientific research in the park, the working out, with or without international cooperation, of an integrated plan for the systematic investigation of the area and the establishment for that purpose of any possible links with universities or research institutions both in India and abroad. This could well involve the development of precise projects which might be financed by international or foreign institutions or otherwise finding ways of securing additional outside financial assistance.

One of the aims of such an organization would be to establish a Park research station: starting with a room where basic material could be collected and housed (library, microscope, etc.), the next step would be a special building (dark room, etc.) the appointment of an assistant technician and then a local park biologist. Ultimately, with such foreign assistance as might be necessary, all the appropriate scientific material, equipment, documentation and other facilities for a continuing and expanding research programme would be acquired.

C. Tourism

1. Normal development:

   Only a few suggestions can be made concerning normal tourism development, which is clearly dependent upon budgetary considerations and no doubt already planned when funds can be made available—

   (a) Accommodation facilities need to be improved by all-night electricity supplies, continuous supply of hot water etc.

   (b) A better road network is required, including a tarred road to Nilkanth and regular maintenance of selected unmetalled tracks.

   (c) More permanent waterholes would facilitate game-viewing. Investigation is needed to find better methods of enabling visitors to see tiger (the use of a living bait, especially of domestic buffalo, tends to horrify some tourists and experiments should be carried out with other possible alternatives).

   (d) There should be more vehicles available for tourists.

   (e) An educational museum is needed which can be initiated on a small scale with mounted specimens; photographs, casts of foot prints, educational brochures, and expanded later to include full educational and interpretive services, conferences, etc.

2. Exceptional development:

   There is in Sariska an abandoned palace which still belongs to the Maharajah of Alwar and which could be converted into a very luxuri-

ous hotel by expensive alteration and the development of a complex organization, which could be achieved only by an international hotel chain. Within the palace grounds is an attractive site for an outdoor stage which could be used for performances. There also exists moated enclosures for exhibiting tigers or other wild animals.

An airstrip for small planes situated outside the park (aircraft do not appear to be necessary for patrol and other park management) could easily be constructed to ensure communication with Delhi for carrying tourists, food supplies and emergency uses.

The opening of a first-class hotel and airstrip could of course give a great economic lift to the region and an exceptional stimulus to tourism in the national park.

D. General Organization

The series of measures suggested in the three preceding sections regarding conservation, research, and tourism should be incorporated in a general management plan for the improvement of the sanctuary, classified under the following headings:

1. Laws and regulations

   In addition to the Act creating the Sariska National Park, various by-laws and regulations would be needed to implement proposals made in this Report, for example to strengthen the police powers of the warden staff (Forest and Wild Life Service personnel should have full powers to suppress all infractions of park regulations and forestry and wildlife laws) and to restrict and properly control rights to kill animals on the grounds of protecting property.

2. Administration

   (a) Responsibility of Park Director. The responsibility for carrying out the management plan should reside in the Chief Game Warden. There is urgent need for creation of a secretariat, even if on a part-time basis. A park headquarters should be established. The desirability of relieving the Chief Game Warden of the duty of greeting park visitors other than those on official business should be considered.

   (b) Visitor regulations. Detailed regulations should be formulated regarding visitor services and visitor conduct. An entrance fee and a special fee for access to the watch towers and other special services are desirable. Accommodation charges should be revised and placed on a sliding scale according to the facilities provided. Automobiles should be prohibited from leaving highways and tracks, and visitors should not be allowed to leave their vehicles except at authorized places, such as picnic areas, camping sites, market trails, etc. Use of gramophones, radios and other noisy instruments should be prohibited in the park. Tourist regulations should be printed on the back of the entrance permit and also placed on noticeboards.

   (c) The advice of experts, park planners, biologists and interpreters from abroad might be requested, to assist in the improvement of particular aspects of park organization. Conversely, opportunities should be afforded for members of the permanent staff to study conditions in parks of other countries.

3. Infrastructure

   (a) Here, too, budgetary considerations are a limiting factor, although under some circumstances foreign assistance might be available.

   (b) Among the new buildings most urgently required are those for a park headquarters, storeroom, garage, and workshop, and also, youth hostel type accommodation for students and other visitors.

   (c) Pumps may need to be installed to ensure a permanent and reliable water-supply for waterholes.

4. Equipment

   (a) There is vital need for uniforms for park wardens, camping equipment, weapons (special calibre with ammunition not available through local commercial channels) and office supplies.

   (b) Vehicles should be specially painted and inscribed with selected insignia. The guards should be equipped with bicycles. Communication equipment needed includes telephones between headquarters and gates, walkie-talkies for some guards, radio equipment for jeeps, etc.

CONCLUSION

The measures recommended in this Report are in fact in keeping with and a development of those urged by India's Prime Minister as the basis for establishing a National Park in full accordance with international criteria. If they could be progressively and systematically applied and implemented, the Team has no doubt that the upgrading of Sariska to national park status would be desirable.

Report 2: Sariska Wild Life Sanctuary

POINTS MADE IN DISCUSSION

The Indian Board for Wildlife, of which I am a member, would certainly welcome the upgrading of Sariska to national park status, not only because of its general interest—for example its geological features are important—but also because it offers an exceptional opportunity for providing a refuge for such species as tiger and caracal. One of the problems, however, which the Report mentions, is the control of crop depredations in the neighbouring cultivated areas by the ungulate species on which the large carnivores subsist. I wonder whether a greater use of fencing might not be the answer (Kastri, India).

On this subject of crop protection, I am glad that the Report emphasizes the use and value of scaring devices and I think my experiences dating back over 38 years in the vicinity of Cuttack, premier city of Orissa, are relevant. Up till 1947, at least five species of ungulate were still common in the forests only 15 km from the city bordering cultivation. There was no clamour for their destruction and at weekends I often used to join the crop-watchers in their huts and machans on the forest edge. With empty tin cans and bugles, drums operated by remote control, scare-crows, fires, thick hay ropes which were set smouldering with fuses and firecrackers along them, bamboo 'rockets' and not least the power of the human voice, but only very occasionaly an animal killed for the pot, we successfully deterred the crop-raiding animals and in the process enjoyed much good fellowship.

All this has vanished in the last two decades and it is hard to see how, with wild animals so greatly decreased in number and range, the problem of crop protection can have assumed so much urgency that the old methods must be abandoned and the animals wiped out. In fact in cases I have investigated recently, such as one in which two elephants had destroyed a quarter hectare field, no one had been guarding the crop nor had even taken the trouble to put a trip-rope or fire-cracker or two on the well-beaten paths which the elephants regularly used. Yet people are still being issued with crop-protection guns and all that happens is that they are used for hunting, often at machans erected over waterholes and salt-licks. I support the views mentioned in the report that licences issued on the plea of crop-protection should be withdrawn or the guns turned into scaring rather than lethal devices by cutting down the barrels to about 40 cm. The only real conflict between the small remaining herds of wild ungulates and the villagers' interests occurs in competition for grazing with domestic cattle during the annual 'pinch period' of about four months, when the grass has dried up and has often been fired. The answer must surely lie in reducing to a minimum cattle grazing in forests, like those of Sariska, at least during the summer-March to June—, and the same fire protection measures as are applied to tree-plantations. This would go a long way to helping wild life to survive the lean period and incidentally, at a time when they tend to be concentrated and in poor physical condition, escaping the danger of contamination by cattle diseases (S.R. Choudhury, India).

With reference to general questions of National park management, I would like to mention the criticisms made of the construction of a hydro-electric power-scheme in the Corbett National Park, which will submerge about 25-30 sq. miles under 200 feet of water, though steps have been taken to compensate for the loss by extensions to the park. Although a large lake will thus be

formed inside the park, the upland forest will be undisturbed and the general beauty of the park may even be enhanced. So far the numbers and visibility of the park animals do not seem to have been effected (Soni, India).

One species which has been disturbed in Corbett, its habitat having been largely destroyed, is the caracal (Stracey, India).

It should be remembered that valleys are worth more to wildlife than hill-tops, and rising water levels also often have a serious effect on plant communities (Leyhausen, Germany).

There is no doubt that the rule should be, whenever possible, to keep a park as a park and avoid using their terrain for dam and reservoir construction: there have been many examples where this has been shown to be inappropriate and even some in which such projects have been successfully restricted, such as the grand Canyon national park in the U.S.A. (Chairman, J.-P. Harroy, Belgium).

I am surprised that the Report comments on the disturbance to wildlife caused by motor-traffic, but then goes on to advocate increasing the number of vehicles for visitor use (Buchinger, CLAPN).

National Park vehicles should never become a menace, since the drivers should always be trained to drive at low speeds and with proper care: animals of course readily accustom themselves to vehicles driven in this way (Chairman).

SECTION B: Pre-Conference Study Tours; Report 3.

Kanha National Park, Madhya Pradesh, with Special Reference to the Swamp Deer *Cervus Duvauceli:* A Rehabilitation Problem

Study Team:

DR. GEORGE A. BINNEY,
H. W. Oliver Foundation, Suite 1126 Woodward Building, Washington D.C. 20005, U.S.A.

PROFESSOR F. BOURLIÈRE
President Special Committee for the International Biological Programme, Chairman IUCN Commission on Ecology, Faculté de Médecine, 45 rue des Saints-Pères, Paris 6, France.

DR. KAI CURRY-LINDAHL
Vice-Chairman IUCN International Commission on National Parks and Survival Service Commission, Zoological Department, Nordiska Museet and Skansen, Stockholm, Sweden; now UNESCO Field Science Office for Africa, P.O. Box 30592, Nairobi, Kenya.

MR. J. J. DUTTA
Indian Forest Service, Conser vator of Forests (Development), Bhopal, Malhya Pradesh, India.

MR. J. J. SPILLETT
Assistant Leader Utah Cooperative Wildlife Research Unit and Assistant Professor Department of Wildlife Resources, Utah Slate University Logan, Utah 84321, U.S.A.

I. INTRODUCTION

(a) The National Park

The 123-square-mile Kanha National Park, located in the heart of India, consists of an amphitheatre-like plateau in the Banjar Valley of the South Mandla Forest Division in the State of Madhya Pradesh. The centre of the National Park is represented by open grasslands (maidans), surrounded and interspersed with evergreen and semi-deciduous forests, which are composed primarily of sal (*Shorea robusta*).

The centrally located grasslands comprise about 15% of the National Park and have a mean elevation of approximately 600 metres. The surrounding forest-clad hills attain a maximum elevation of about 900 metres. Soils in the maidan areas are sandy to sandy loam, and the underlying rock is archaean, consisting of granites, gneisses and schists. The flat-topped hills are primarily basaltic caps covered with lateritic soils.

The area has 3 distinct seasons: winter (mid-October till mid-March) when temperatures vary from —2° to 21°C, summer (mid-March till the end of June) with temperatures between 24° and 41° C, and the monsoon (end of June till mid-October). Mean annual precipitation

is about 1800 mm, most of which falls during the monsoon, although occasional showers also occur in winter.

Notable mammals common to the National Park are chital or spotted deer *Axis axis*, black buck or Indian antelope *Antilope cervicapra*, gaur or Indian 'bison' *Bos gaurus*, sambar *Cervus unicolor*, swamp deer or barasingha *Cervus duvauceli branderi*, and tiger *Panthera tigris*. Formerly this area was particularly known for the large numbers of barasingha found here. However, during recent years this isolated population, which is now endemic to Kanha, has declined drastically.

(b) Objectives

The primary purpose of the pre-Assembly study tour was to assess a project in which it was proposed to build a 74-acre enclosure within the National Park and to capture and to establish a breeding nucleus of barasingha within the enclosure. Recommendations which would improve the proposed project's chances of success were also solicited.

(c) Acknowledgements

The Study Team visited the Kanha National Park between 17 and 22 November, 1969, and the four foreign members were generously treated as guests of the Madhya Pradesh State Government throughout their stay. The participation of two members (Binney and Carry-Lindahl) was made possible by a project grant from the Smithsonian Institution, Washington, D.C, which assistance covered all travelling costs. Finally, we were accompanied and assisted at Kanha by Shri Ranjit Sinh (Collector at Mandla), Shri Rajwade (Divisional Forest Officer, South Mandla Forest Division), Shri A. Oswald (Divisional Forest Officer, East Bhopal Division), and other Forest Department personnel, to whom our thanks are due.

II. THE PROBLEM

Basically the problem we had to consider was one of evaluating the possible causes for the drastic decline of the population of the isolated local race of barasingha. Prior to the monsoon the barasingha gather on the open maidans, which permits accurate total counts for the population to be taken with relative ease. The rate of decline, according to Forest Department figures, is presented in Table 1.

The age and sex composition for the June 19-20, 1969 barasingha census, as compiled by Shri Ranjit Sinh, was as follows:

Adult Males	Spike Males	Adult Females	Less than 2 years old	Total
10	5	36	22	73

Based on the limited information available, one can only conjecture as to the cause(s) for the dramatic decline indicated by the above figures. Possible factors may be:

1. poaching in the peripheral areas of the National Park;
2. competition from other species, at least during critical period of the year;

3. predation, particularly by tiger;
4. habitat factors, possibly becoming more unfavourable for the species;
5. diseases and parasites.

Table 1. Population estimates and rate of decline for the barasingha (*Cervus duvauceli branderi*) in Kanha National Park, M.P.

Year	Total Population Estimate
1938	3,023
1958	577
1959	411
1960	260
1961	254
1962	244
1963	173
1964	94
1965	109
1966	116
1967	118
1968	98
1969	73

III. DISCUSSION OF SOME OF THE POSSIBLE ADVERSE FACTORS

Forage conditions in the Kanha National Park at the time of the study tour were excellent. It appeared that the National Park could readily maintain several times the present wild ungulate population. It was also the observation of Spillett that forage was much more abundant and luxuriant in 1969 than during his visit to Kanha in 1964. The primary reason for this improvement is that the large number of cattle which formerly grazed near the rest house has been removed. Moreover, the village of Soph had been re-located outside the National Park boundaries. There is still a slight possibility that other species, particularly chital, may directly compete with the barasingha for grazing during short critical periods of the year. According to Forest Department population estimates, chital have more than tripled in numbers during the past 5 years—from 1,146 in 1965 to 3, 854 in 1969. At least, however, the number of cattle presently residing in the central part of the National Park is so low as to be inconsequental. Domestic livestock does, however, appear to compete for forage to a considerable extent with wild ungulates on the periphery and in areas adjoining the Park.

It was claimed by Forest Department personnel and others that barasingha are relatively tame, and that if stalked and charged by tiger they only move

a short distance where they can again be stalked and charged. Schaller [1] also presented evidence that the barasingha may be the preferred prey species for tiger in Kanha. With the present low numbers of barasingha, predation by tiger may indeed be a limiting factor. However, tiger and barasingha have inhabited the same areas since time immemorial and it is difficult to place the blame for the reduction of the barasingha solely on the tiger. Also, with increasing numbers of chital present, this species should act as a buffer hence reducing the effect of the tiger upon the barasingha population.

With the exception of the race inhabiting Kanha, the barasingha in India is noted for its habitat preference for swampy or high grass areas. According to Mr. S. C. Pandeya (Professor and Head of the Department of Biosciences at Saurashtra University in Rajkot) the maidan areas in Kanha anciently were probably swampy areas. Based upon his work conducted in Kanha during the past 6 years, he further claims that Kanha has undergone considerable climatic changes during the last 20-25 years. This is demonstrated by the failure of sal to regenerate during this period in the National Park. This is because sal seedlings are not frost resistant and, whereas previously frosts were uncommon in this area, temperatures as low as —4° C or lower are now common during the winter. Annual rainfall, according to Mr. Pandeya, however, has remained stable during this period. Therefore there is a possibility that the barasingha in Kanha now finds itself in an area which has become rather unsuitable to its requirements. But in the light of the slowness with which climatic and geographical changes normally take place, it still appears that the barasingha would have had sufficient time to adjust to changing conditions.

Rinderpest was reported in Kanha as early as 1925 or 1926. Based on the fact that the annual increment in the barasingha population from 1964-65 was only 7%, Schaller also suspected that brucellosis might be a limiting factor. Based on Ranjit Sinh's population figures for 1969, however, it now appears that brucellosis is no longer a likely suspect. There is no evidence of the presence of any other diseases or parasites in the barasingha population.

IV. HUMAN SETTLEMENT WITHIN AND ON THE PERIPHERY OF THE PARK AND THE EFFECTS OF LIFESTOCK GRAZING ON THE WILD HABITATS

Any biologist undertaking a study of the overall ecology of the Kanha National Park and in particular the declining barasingha population must ultimately take into account the two major influences affecting the management of wild life:

1. the activity of poachers
2. the grazing of livestock within the boundary of the National Park.

An understanding of both of these factors involves consideration of the human settlements within and on the periphery of the National Park and the effects of livestock grazing on the wild habitats.

All the communities within the Kanha National Park boundaries are 'designated forest villages', which signifies that the villagers have usufructuary rights only. Permission to cultivate can be revoked at any time by the Forestry Department of the State of Madhya Pradesh. Ownership and the land rights

---

* 'The deer and the tiger', University of Chicago Press, 1967

entailed therein do not pertain to such villages. There are four villages within the Kanha National Park comprising a total population of 374. Of this total 263 belong to the tribal group known as Gonds, 37 are Baiga, 63 are Ahir, 6 are Ojha and 5 are Panka. Only one of the four communities is exclusively settled by one tribe and this village, Bambui Dadar, consists of 7 Gond households. The four villages together have a total of 904 head of livestock, which includes 9 goats and one horse. In all the villages the preferred grazing areas are inside the National Park. The villages are widely dispersed throughout the National Park rather than being concentrated within any particular area. The male and often female members of each household often serve as a labour reserve for National Park improvement projects and are economically dependent upon the National Park management.

The tribal groups practise endogamous marriage and no cases of Gond/Baiga or Ahir/Panka marriages have been recorded. However, the villagers often marry outside their community. In the case of the Gonds this results in a period of bridewealth service (Lumsena) and temporary residence within the village of the bride ranging from 18 months to two years. Due to the fact that men from forest villages do not have ownership, but only cultivation rights over their fields, there is some difficulty in negotiating for prospective wives from revenue villages, for fathers hesitate to release their daughters to men without ownership rights. This may very well result in a gradual migration of marriageable men out of forest villages.

There are seven villages situated on the periphery and immediate area surrounding the National Park, inhabited by 1448 individuals. Approximately 60% of the households in these inter-tribal communities are Gond. The next largest group are Baiga and the rest, less than 10% of the population, are made up of Ahir and Panka. The total count of livestock is 2428 all of which are cattle and buffalo with the exception of 16 goats and 8 horses. In most of these villages the livestock grazing patterns are predominantly within the National Park where grass and forage are plentiful. These communities are located around the entire boundary, of the National Park in almost every direction of the compass, no border area being completely free from man and his livestock. Livestock has been permitted to graze without restriction in the National Park forest and meadows. If there is an increase in the livestock population, which seems likely, it may well culminate in the problems of overgrazing, vegetation damage and widespread erosion which are common in thorn and deciduous forests.

The effects of rapidly expanding human settlements and their domestic animals on the National Park environment and its fragile ecology should be given thorough consideration in any management scheme contemplating regulation or increase of wildlife species.

V. RECOMMENDATIONS

Based on the fact that a 74-acre 'panther-proof barasingha enclosure is presently being constructed, the following suggestions are presented to enhance the success of the proposed project and to increase the possibility of survival for the barasingha in the Kanha National Park.

First it is suggested that the services of a qualified biologist as well as an assistant, be acquired as soon as possible. This should be prior to the introduction of barasingha into the proposed enclosure. Basically, the study of the overall ecology of the barasingha both in the wild and within the enclosure

should be undertaken. Of particular interest concerning animals in the wild would be:

1. age composition and sex ratio of the population including breeding habits;
2. movements, particularly during the period when the animals are scattered in the forests and perhaps partly absent from the national park;
3. food habits, both in and outside the enclosure;
4. competition for both food and space by other species such as chital;
5. human settlement patterns within and in the periphery of the national park and the effect of livestock grazing on the wild habitats;
6. predation and other mortality factors including poaching, diseases and parasites.

Secondly, it is suggested that a total of 6 (2 males and 4 adult females) be placed in the enclosure. A larger group is not recommended for various reasons, such as—

1. availability of suitable forage on a year round basis;
2. social factors, perhaps resulting in dire consequnces if a large number of animals were confined to a limited area;
3. parasites and diseases, the incidence of which could well tend to increase if the animals were overcrowded.

It has been planned by the Indian authorities that the selected barasinghas should be driven into the enclosure in the month of April. IUCN's study group supports this planned operation. In the event of its proving impracticable, capturing of selected animals would be the only possible alternative.

It is cautioned that only qualified personnel be employed in the capture of a breeding nucleus, and that the problem of capture be fully evaluated prior to action being taken. For example, the types and dosages of drugs must first be thoroughly investigated, as well as other methods of capture. Such tests should be done on the nominate race of the barasingha (*C.d. duvauceli*), which is common in some other areas of India. The possibility of providing supplementary food must be foreseen. And, if the experiment should prove successful, the most advantageous disposition of the offspring from the captive group should be contemplated. Under no circumstance should the captive animals be released directly into the wild where they might fall prey to predators and other mortality factors.

It is recommended that the suggestion that tigers and other predators in the Kanha National Park should be reduced in order to decrease their impact on the barasingha, should on no account be pursued.

Report 3: Kanha National Park and the barasingha (swamp deer) rehabilitation problem.

POINTS MADE IN DISCUSSION.

Having recently returned to Kanha after being posted there from 1952 to 1954, I do not notice very much change in the habitat and, incidentally, the Kanha race of barasingha unlike the northern race is not protected from predators by being able to take refuge in large swamps. In my opinion predation by tiger is the important factor in restricting the barasingha population because, for over half the year (in 1968/69 from mid-December to mid-July), the deer concentrate in a small area of the park about 2 sq. miles in extent and half a dozen tigers also seem to remain and find their prey in that area. Some way should be found of discouraging these predators in the area where the majority of barasingha confine themselves for the greater part of the year (R. M.Singhal, India).

In this problem of predator-prey relationship, it should be pointed out that a situation exists where the tiger can in fact have a serious effect on the barasingha population without itself becoming much affected. Dr. Schaller during his 18 months study at Kanha found that chital represented more than half the tiger's diet, although they were not the preferred prey species. The chital are present in their thousands, so can and do support in sizable tiger population: the barasingha, which is the preferred species, has become increasingly rare but this has not had the normal effect of reducing the tiger population because of the chital 'buffer' situation (Joslin, Canada).

The suggestion has been made that because the barasingha is rare, but tends to concentrate in one area, and because it is 'stupid', tigers can kill it easily and have therefore been responsible for its decline at Kanha and consequently should be eliminated from the park. But as the figures quoted in the Report show, barasingha were abundant 30 years ago and so undoubtedly were the tigers. The drastic decline of the deer was probably due to poaching, perhaps coupled with disease introduced by domestic livestock. In my study of the park in 1964, I in fact noted that the deer had declined from a combination of factors, including poaching, tiger predation and, importantly, very poor fawn production which could possibly be due to a disease causing foetus abortion. But the latter factor corrected itself, for it was noted by other observers in 1968 that fawn production appeared to be good. With normal fawn production and control of poaching, it is highly unlikely that tiger predation alone will affect the population to the point of exterminating it. There is no evidence that the barasingha is 'stupid' or more easily caught than any other deer species. Certainly no predator control should be practised in a national park (Schaller, U.S.A.).

With regard to the project for establishing a breeding nucleus of barasingha in semi-captive conditions and in the small numbers suggested in the Report, there would seem to be a likelihood of in-breeding depression. It would be necessary in order to avoid this to have a plan for introducing fresh stock into the enclosure, as unrelated as possible to animals originally kept there, though I appreciate that this would be very difficult in view of the rarity of the subspecies (Mrs. Spurway, India).

SECTION B: Pre-Conference Study Tours Report 4

Dachigam Wild Life Sanctuary, Kashmir, with Special Reference to the Status and Management of the Kashmir Stag *Cervus elaphus hanglu*

Study Team:

DR. C.W.HOLLOWAY,
Executive Officer Survival Service, Commission, IUCN, 1110 Morges, Switzerland.

DR. GEORGE B. SCHALLER,
New York Zoological Society, Bronx Park, Bronx, New York 10400, U.S.A.

MR. A. R. WANI,
Game Warder Jammu and Kashmir, Srinagar, Kashmir, India

INTRODUCTION

The IUCN Red Data Book of threatened species lists the hangul or Kashmir stag (*Cervus elaphus hanglu*) as critically endangered. This sub-species of red deer occurs only in Kashmir and adjacent Himachal Pradesh. At present, the only known viable population survives in the Dachigam Sanctuary, a mountainous area of 55 sq. miles, with an altitude range of 6, 000-13, 000 feet, near the city of Srinagar in Kashmir.

Some 60 years ago, the Maharaja of Jammu and Kashmir cleared the sanctuary area of its human occupants and until 1947, maintained it as his private hunting reserve. The Forest Department then assumed responsibility for the area and it was designated a wildlife sanctuary in 1951. Other forms of land use in the area include a government sheep farm (the sheep are permitted to graze in the higher reaches of the Sanctuary from May-October), a fish hatchery and a V.I.P's rest house.

No accurate counts of the hangul population in the sanctuary and forests immediately surrounding it have been made. Gee (1965) suggested that in 1947 perhaps as many as 2, 000 deer existed, presumably in the Vale of Kashmir. Numbers have subsequently declined until 1968, when informed estimates placed the surviving population at between 180 and 380 animals (Schaller, 1969; Wani, 1969).

The Study Team toured the Dachigam Wild Life Sanctuary daily from 17 to 21 November 1969, and throughout their stay its two foreign members were the guests of the State Government of Jammu and Kashmir. One of us (Schaller) was also assisted by a grant from the Smithsonian Institution, Washington D.C, covering travel between Delhi and Srinagar. We also gratefully acknowledge the assistance in the field of various members of the Game Wardens staff. The purpose of the tour was to assess the status of the hangul and to recommend action that might help to ensure its survival. We walked the major valleys and along many of the slopes and ridges that comprise the animals wintering grounds, and made one visit to a part of their summer range. In addition, a drive census was conducted on the floor of the main valley,

other forms of land use were examined, the Sanctuary staff were interviewed and discussions held with local sportsmen.

RESULTS

During our visit, the deer were still dispersed over the wintering grounds, making a total count of the population impossible in the time available. However, since no fresh sign of deer was observed above an altitude of 7, 250 feet, it was assumed that most hangul occurred at lower elevations, which in the Sanctuary comprise an area of approximately 15 sq. miles.

A drive census was conducted in approximately 1. 5 sq. miles, or about 10%, of this wintering area. A total of 8 deer were counted by the thirteen beaters and by two observers on the slopes above them. If the census area is representative, these data indicate a total of 80 deer in the wintering grounds.

An experienced Game Guard spent a considerable time, in the weeks preceding our visit, investigating about a quarter of the wintering grounds. He arrived at a figure of 20 deer in this block, which also supports the estimate of a total population of 80 deer in the wintering area.

We walked about 48 miles in the wintering grounds and saw a total of 12 hangul. If an average visibility of a 150 feet on either side of the walker's route is assumed, then there were 4 deer per sq. mile, or a total of 60 animals.

We realize that these census methods are crude. Animals are not distributed randomly, some were undoubtedly overlooked during our travels and others may still have occurred on their summer grounds.

Assuming, arbitrarily, that for one reason or another half of the animals may have been overlooked, *we conclude that at most, 150-200 hangul remain in existence.*

CONCLUSIONS

Our examination of the deer range excludes any possibility that deterioration of the habitat could be responsible for the drastic decline of the hangul.

Illegal grazing by buffalo occurs in the Sanctuary during the summer months, but there is no evidence that deer have been affected by disease contracted from domesticated or other wild animals. Calf production is adequate (Schaller, 1969). The condition of the animals seen during our visit appeared to be very good.

We believe that the principal cause of the decline of the hangul is poaching, both within the sanctuary and in the area bordering it. This view is also generally held by local sportsmen. A poacher was apprehended by the Sanctuary staff in 1967, and Schaller (1969) observed instances of poaching in 1968.

While we applaud the Kashmir Government for creating the Sanctuary, for establishing a management staff, and for providing facilities for a captive breeding unit of hangul, and while we were impressed with the initiative and enthusiasm of the Sanctuary authorities, we were disturbed by several factors: (a) the pressing need for more effective anti-poaching operations; (b) the intrusion of other forms of land use into the Sanctuary; (c) the lack of staff training and continuity of service; and (d) the paucity of data on deer populations and ecology. Our recommendations are based on these misgivings.

RECOMMENDATIONS

1. (a) The first priority is to eliminate poaching. Only two guards are stationed in the hangul's vast summer range. In future, it is essential that several patrols should keep continuous watch over the hills. A reassessment of present staff duties is required and increases in staff may well be necessary. Consideration should be given to rewarding staff members who capture poachers.

   (b) Current penalties for killing a hangul (the maximum is a fine of Rs 50/- or 2 months imprisonment) are so light that they are not effective deterrents to poaching. Either greater penalties should be imposed by the courts or the Forest Department should be given magisterial powers, as it had in the past.

   (c) Efforts should be made through the press and radio to educate the public to the need for conserving this unique deer. Particular attention should be paid to educating military personnel and to seeking their cooperation.

2. (a) The principal object of management in this area must be to conserve the wild fauna and flora for eventual use as a major tourist attraction. Responsibility for overall management should be vested in the Forest Department. No further development of buildings, roads and sheep farming should be undertaken without the Department's approval.

   (b) Uses of the Sanctuary that conflict with the management objectives should be curtailed or eliminated wherever possible. Only essential buildings should be permitted. They should be sited inconspicuously and their construction should blend with the landscape. The number of sheep at the Government's farm should not be allowed to exceed the agreed figure of 800, and under no circumstances should the species composition of the Sanctuary grasslands be altered by the introduction of exotics.

   (c) Illegal grazing in the Sanctuary must be eliminated. If necessary, the cooperation of the police and the army should be sought.

3. (a) The success of future management depends on an experienced and dedicated staff. Continuity of service must be assured provided a guard proves to be well adapted to this type of work.

   (b) A Game Guard's duties are more strenuous and possibly dangerous than equivalent work in other forest areas. Consideration should be given to up-grading the guard force.

   (c) Arrangements should be made for elementary courses for junior staff and more detailed courses in wildlife and park management for senior staff.

4. Provision for advice and assistance is essential in the immediate future. A specialist should be sent to the area in February 1970, to conduct an accurate census of the hangul and to prepare a management plan for the area.

REFERENCES

Gee, E. P. 1965, Report on the Status of the Kashmir Stag; October 1965. *J. Bombay Nat. Hist. Soc.* 62 No. 3, pp. 380-393.

Schaller. G. B. 1969. Observation on the Hangul (*Cervus elaphus hanglu*). *J.Bombay Nat. Hist. Soc.* 66 No. 1, pp. 1-7

Wani, A. R. 1969. Rehabilitation of the Kashmir Stag in Dachingam. Memo for the IUCN 10th General Assembly. Pre-Assembly Tour in Kashmir. Cyclostyled. Jammu and Kashmir Govt., Srinagar, 9 pp.

Report 4: Dachlgam Wild Life Sanctuary and the Status and management of the Kashmir Stag (hangul).

POINTS MADE IN DISCUSSION.

In introducing the Report Dr. Holloway stressed that it would be very desirable for more work to be done to survey and census the hangul in its summer range in the high mountains. But I believe this would be almost impossible because of the terrain and that we may have to be content with estimates based on counts in its wintering grounds (P.B.L. Srivastava, India).

The hangul has a regular migratory pattern and follows well-established routes through certain passes and valleys when it moves down from the heights in September and October. Unfortunately these routes are well-known to the poachers, who lie in wait for the deer, so that it is only the limited number of animals that escape that are found in the wintering area. As the Report says much more continuous patrolling is essential, but perhaps the greater need is patrolling of the routes referred to at the time of the annual migrations. Another point which the Report does not perhaps deal with sufficiently is represented by the Government sponsored sheep-farms. These after all occupy areas previously reserved for the hangul and it is not just a case of one farm—a second and even a third are planned and, if these become established, would definitely threaten the survival of the last remaining deer (Ranjit Sinh, India).

SECTION B: Pre-Conference Study Tours Report 5.

Periyar Wild Life Sanctuary, Kerala, with Special Reference to the Ecological Effects of Eucalyptus Plantations

Study Team:

DR. JOHN BERRY,
Consultant North of Scotland Hydroelectric Board, Member IUCN Commission on Ecology, Tayfield, Newport-on-Tay, Fife, Scotland.

MR. K. I. MATHEW,
Indian Forest Ser vice, D.F.O., Konni P.O. Quilon, Kerala, India

PROFESSOR J. D. OVINGTON,
Department of Forestry, Australian National University, Canberra A.C.T. 2600, Australia; Scientific Secretary IUCN Commission on Ecology.

MR. LLOYD W. SWIFT,
3432 Greentree Drive, Falls Church, Virginia 22041, U.S.A.

1. INTRODUCTION

(a) The Sanctuary

In 1895 a dam was constructed across the river Periyar in Kerala State on the western slopes of the Western Ghats. The waters of the resultant reservoir, Periyar Lake, are used for irrigation of the flat dry plains in the Madurai District of neighbouring Tamil Nadu (Madras) State and for hydro-electric power.

The lake area of nearly 25 sq. km was leased on a 999 year lease to the Tamil Nadu Government, but the responsibility of protecting the catchment and maintaining the forest untouched was retained by the then Travancore State, and later became the responsibility of Kerala State. Initially the area was used largely as a hunting reserve for occasional State Guests, but in 1933 a game warden was appointed and greater emphasis placed on developing the area as a wildlife sanctuary.

The Sanctuary has a total area of 750 sq. km and embraces the catchments of the rivers Periyar and Pamba. The Sanctuary now comes under the Kerala Forest Act and is managed by the Kerala Forest Service. The Forest Service maintains a local staff to protect the area but encroachment by grazing is taking place. The Forest Service planted 4923 hectares with the exotic tree *Eucalyptus grandis* between 1956 and 1966. No further planting has taken place.

There is a long history of occupation by hill tribes who were probably not very numerous but produced a varied pattern of land use by shifting cultivation. The topography is very irregular with flat meadows and steep slopes and ranges in elevation from about 870 m at lake level to around 1800 m. Consequently, the Sanctuary contains a wide diversity of natural and semi-natural habitat types.

The mean annual rainfall is about 300 cm resulting from both the south-west and north-east monsoons. Evergreen rain forest covers about half of the Sanctuary and the rest is deciduous forest, open savannah type forest, grassy areas, exposed rock and eucalypt plantations.

With such a diversity and patchwork of terrestrial habitats, associated with numerous small rivers and an extensive lake, from which numerous dead trees, drowned when the lake was formed, still emerge, there is a very rich flora and fauna, details of which are given in the appendices.

(b) Objectives of the study and acknowledgements

During the past two or three years concern had been expressed about the possible ecological effects of planting up areas of grassland in the Sanctuary with *Eucalyptus grandis.* When some preliminary consideration had been given to the matter by IUCN's Commission on Ecology, an on-the-spot assessment had been recommended. The IUCN General Assembly in India afforded an opportunity of implementing this recommendation and obtaining an up to date evaluation of the Sanctuary. A short-term research project grant by the Smithsonian Institution of Washington D.C. greatly facilitated the Study, covering all travel expenses of one member of the team (Ovington) and local travel and accommodation expenses of the other two foreign members. The Kerala State Government kindly provided local transport and the staff of its Forest Service gave much helpful information on the forestry, land-use and game situation. The team was accompanied by the Hon. Mrs. J. Berry, who assisted greatly in its activities.

(c) Field programme of the Study.

Tuesday November 18: Briefing at Aranya Nivas Hotel, in the Sanctuary, where the Team was based. Travel by jeep along the Kadi—Medganom forest track. Walk through high evergreen forest and the open, swampy grassland of Poovarosu. Inspection of Wildlife Officers' Headquarters.

Wednesday November 19: Inspection by boat of Periyar Lake which is really a ramification of flooded side valleys branching from the channel of the former Periyar river. There are many islands. Large and potentially dangerous animals, such as elephant and gaur (wild ox or bison), can be viewed in safety from the boats. The boat trip also provided an opportunity to watch sambar deer, and many species of birds, not only water birds and lacustrine predators, such as the beautiful Brahminy Kite, but also land birds, notably a flock of Great Hornbills flying around a hillside.

An important factor in the use of the lake for viewing animals is the method of its operation as an important reservoir. Normally the reservoir is kept drawn down some 8 to 10 metres to catch sudden floods. The shores produce a rich growth of short reeds and grasses capable of withstanding long periods of desiccation and short periods of submergence. This marginal growth is grazed by several of the larger animal species and specially during drier periods animals can be seen on the open foreshores, coming to drink or bathe.

The lake is also valued for its fish particularly *Tilapia* sp., a mouth breeder, and Mahseer *Barbus khudree* which is said to attain a weight of 30 kg. and ascends the river to spawn on gravel riffles above the level of inundation. Some fishing for sport and food occurs.

Trees were not felled on ground flooded when the reservoir was made and many project above the water level After more than 75 years, the 'skeletons' of the trees, teak in particular, still detract from the aesthetic beauty of the lake and submerged stumps constitute a danger to boats. The dead trees are, however, of advantage for birds as perches (where they can be easily viewed), although they are excessive in number.

After the boat trip, a meeting was held with Mr. M.C.A. Jackson and Mr. Shuttleworth of the Peermade Wildlife Conservation Society, a private organisation partly supported by the Kerala State and with some official responsibilities such as the issuing of hunting and fishing licences outside the Sanctuary.

Thursday November 20: Inspection of an age range of *Eucalyptus grandis* plantations both inside and outside the Sanctuary. Inside the Sanctuary planting had been largely on open grass areas, but outside some virgin evergreen forest had been clear-felled and planted with Eucalypts. Considerable effort had gone into establishing the plantations, particularly in cutting the grass and weeding the plantations for three years. In all, 7000 ha of grassland have been planted with *E.grandis* since the 1956 experimental trial was established at Vallakadovu and of these 4923 ha are within the Sanctuary. They are highly productive reaching a height of over 33 m at six years of age and represent a considerable investment (probably about Rs 750, 000/- in the Sanctuary alone). Undoubtedly they are causing ecological changes particularly in changing the ground flora, animal species, soil and possibly the hydrological cycle.

Friday November 21: Visit to the head pond and valve house of the Periyar Hydro-Electric Power Scheme in Tamil Nadu (Madras) State. A very varied avifauna, different to that of the Sanctuary and representative of the drier, precipitous east escarpment, was seen. The lights of the Valve House attract a multitude of insects—Death's Head and Convolvulus Hawk Moths and beetles, notably large 'dumbledoors'. The dry slopes were examined at several points and Gudalur, a village in the plains at the foot of the scarp, was visited.

An evening inspection of Lake Periyar was made by boat and proved to be a very good time for seeing big game, the boatman being very skilled at spotting and approaching closely to animals. A mother elephant was observed at close range pulling up grass along the water edge, knocking the earth off the grass against her forefoot then washing the grass roots in the lake before trunking them to her calf. The grass stems were thrown on her back.

Saturday November 22: Discussions with members of the Peermade Wildlife Preservation Society at the Vandiperiyar Club. Return to Cochin.

2. MANAGEMENT PROBLEMS AND RECOMMENDATIONS

The Sanctuary seems to be at a critical stage: this unique area with its remarkable heritage of wildlife is now being threatened in various ways which are largely uncontrolled. Consequently we list what appears to us to be the main problems and make some recommendations for their solution.

(a) Problem

Concern has been expressed about the extensive introduction of exotic plantations of *Eucalyptus grandis* in the Sanctuary and of their impact on

the ecology of the area (loss of grazing, changed grazing habits and viewability of wildlife and possibly reduction in water yield). This impact is likely to increase as harvesting activities mount and possibly lead to increased disturbance and poaching of animals.

Recommendation

Fortunately, the Forest Service has sited the eucalypt plantations so that generally they do not intrude into the landscape around the lake and the plantations are distributed patchily with intervening areas of grassland, rock exposures and evergreen forest. Nevertheless, they represent an undesirable intrusion into the Sanctuary.

Since the plantations represent a considerable investment which should not be wasted, it is suggested: (1) there be no further forest planting of alien tree species in the Sanctuary; (2) strict control is exerted over the tree harvesting operation to minimize disturbance; (3) no people engaged in tree harvesting should be permitted to live in the Sanctuary; and (4) existing plantations should be zoned according to their critical location around the lake and be progressively removed as they are replaced by plantations established outside the Sanctuary. Management should aim at restoring a grassland of palatable native species similar to that existing before tree planting.

(b) Problem

Tourism is considerable and increasing rapidly. From 1966 to 1967 the annual number of tourists who paid an entrance fee (1/2 Rupee) increased from 51, 451 to 57, 515. About 4% of the tourists are foreigners and the sanctuary is undoubtedly a source of valuable foreign currency. Management must aim at providing tourists with a rewarding experience without prejudicing the unique wilderness values of the Sanctuary.

Recommendation

Tourist access should continue to be largely restricted to controlled boat excursions on the lake. Periyar Lake provides a valuable means whereby tourists can view wildlife, particularly elephant and bison, in safety and comfort without causing undue disturbance.

To maintain the attractiveness of wildlife viewing from the boats, all land visible from the lake should be carefully managed to retain its wilderness character whilst supporting and displaying a variety of large animals in reasonable numbers. Boats may have to be excluded from certain branches of the lake, at least on a rotational basis, but tourist boats could be directed by radio to suitable viewing points. Some of the dead trees should be removed to provide safe passage for boats and others retained for bird nesting and perching. Tourism should be controlled to prevent undue disturbance to animals.

(c) Problem

Local residents are using the sanctuary for grazing. As the settlements grow, this use increases the number of domestic animals and the acreage involved. The effect is to reduce the carrying capacity of the Sanctuary for the native herbivores. There is also the alarming possibility of transmission of disease from domestic to wild animals especially the gaur. At present, no effective control of cattle grazing exists.

Recommendation

Cattle numbers should be regulated and the area they can use definitey defined. This could involve both a grazing permit and fee. Concurrent with placing the cattle grazing under management control, studies should be made to see if certain species such as the Grey Jungle Fowl are more common and more readily observed in the livestock use areas.

(d) Problem

The illegal capture and removal of wildlife is a constant and growing problem. The human population about the Sanctuary is increasing and so is the removal of animals or parts of animals for their meat, ivory, skins or other values. The viability and success of the Sanctuary depends on control of poaching, otherwise wild animals will be reduced in number and made more secretive, reducing viewing opportunities. This would be an unnecessary and tragic loss of scientific and recreational values.

Recommendation

There are two main needs: (1) boundary delineation and control to prevent unauthorised entry; and (2) addition of personnel trained in the prevention of poaching and apprehension of poachers.

(e) Problem

Fire is started by local people to burn off the old and dense grass in order to obtain new and more palatable forage for the cattle. The fires spread into areas not grazed by domestic stock. From a wildlife management viewpoint, there are advantages in using fire to manipulate the vegetation, but in the Sanctuary burning should be purposeful, not accidental.

Recommendation

The role of fire in the ecology and management of the Sanctuary should be determined and, based on these findings, the control or use of fire regulated in the most beneficial manner.

(f) Problem

The Sanctuary is not an easy area to administer. There are a number of values and uses, and the responsibility for their administration is not in one place. The waters of Lake Periyar are under the control of the Madras Agricultural Board Irrigation Department and the lake level is regulated by this agency. The tourist business depends on housing and boat facilities operated by the Kerala Government Tourist Agency and other agencies. Fishing in the lake requires a permit from the Madras Agricultural Board Irrigation Department and in the rivers from the Peermade Wildlife Conservation Society. The eucalypt plantations are managed by the Kerala Forest Service. The Wildlife Division of the Forest Service has responsibility for protection of wildlife in the Sanctuary and the prevention of poaching, grazing and other trespass. There is no mechanism for coordinating all these interests and authorities, a situation that has created problems in the past and will surely lead to further conflict as the Sanctuary receives greater use and resource pressures.

Recommendation

The ideal organisation would be to place all authority for land, water wildlife and their protection, regulation and use, under one administration. However, because of agreements and established authorities, this may only be feasible in part, such as placing all wildlife, forestry, tourist guidance and information and land management under one local administrator of appropriate rank and authority. To give him guidance and support an Advisory Board is suggested with representatives of all interests such as the Hydro-Electric Board, Natural History Societies, Tourism, Grazing and Forestry (see also under (j) below).

(g) Problem

The value of the Sanctuary to the public is in proportion to their understanding of its purpose and values. Some good starts have been made such as species labels on native trees at Thekkady. The vegetation and the animal life of the Sanctuary is of great variety and there is much of interest and beauty that many people have no other place or opportunity to see.

Recommendation

To advance understanding and appreciation of the Sanctuary, several educational measures might be employed: (1) provision of a visitor centre at the main public area where there would be a wall or relief map, pictures of specimens of interesting plants and animals and a meeting room where group discussions could be held; (2) preparation of brochures and other informative material to acquaint visitors and others with the character and values of the Sanctuary; (3) as finances permit, consider providing guide-lecturers for the groups on the boats to point out interesting plants, animals and other features, with an explanation of their significance.

(h) Problem

The fact that the Sanctuary has been established, contains hotels and other facilities and is staffed to provide for the administration of the land and natural resources is ample evidence that the Kerala Government and the public appreciate the fine quality of the Sanctuary. Moreover, it is evident that the advancement of the Sanctuary has been realized under difficult conditions and with too few employees.

Recommendation

To carry out and expand the programme underway, to cope with the growing complexities of management and to provide for visitors, it would be desirable to plan and activate a personnel training plan involving: (1) selection and training of scientific staff to evaluate the plants, animals and other resources as to their proper use; and (2) the upgrading of local administrative positions in order to have qualified persons with authority to integrate the activities of other agencies into an overall plan and guide its application.

(i) Problem

Because of the interest in the Sanctuary shown by individuals and natural history societies, the flora and fauna present are reasonably well documented. Unfortunately, historical data, current land use and data of the species present have not been recorded systematically nor brought

together in a readily available permanent record for reference purposes. Such information is an essential basis for wise management.

Recommendation

(i) Assemble existing literature and official reports in two permanent collections maintained at Trivandrum and Periyar;

(ii) based on aerial photography prepare transparent overlap maps to show details of features such as topography, vegetation types, human settlements, grazing, plant and animal distribution, etc.;

(iii) encourage systematic ecological research by ecologists, possibly by international cooperation and special research studentships.

(j) Problem

There is an urgent need for a master plan whereby management is placed on a more rational basis and haphazard development controlled.

Recommendation

Establish an independent Advisory Committee representing all interested groups to be responsible for (1) defining management aims, (2) establishing management priorities and (3) preparing a long-term management plan. All new developments should be submitted to the Committee for approval before implementation. The Committee should also be invited by the Forest Service to suggest the limitations to existing activities where they appear detrimental to the management aims.

3. Conclusions

The Periyar Wildlife Sanctuary represents a remarkable achievement in conservation and is a fine tribute to the far-sightedness of many individuals and groups in Kerala State and the Indian Union. Because of the wide diversity of habitats and plant and animal species within its boundaries, it seems well worthy of National Park status, possibly with the inclusion by agreement of part of the contiguous dry escarpment in neighbouring Tamil Nadu (Madras) State.

Possessed as it is of great recreational and scientific potential and currently subject to pressures of all kinds, there is an urgent need to integrate the various interests and place the management of the area on a planned, scientific basis so that it will be most effectively developed in the interests of Kerala State and of India as a whole.

APPENDIX I

List of tree species of Periyar Wild Life Sanctuary

Artocarpus hirsuta
Hopea parviflora
H. wightiana
Pterocarpus mar supium
Stereospermum xylocarpum
S. chelonoides
Terminalia lomentosa
Dysoxylum malabaricum
Xylia dolabriformis
Lagerstr oemia lanceolata
L. flos -reginae

Calophyllum tomentosum
C. wightianum
Cedrela toona
Albizzia lebbeck
A. procera
A. odoratissima
Vitcx altissima
Adina cordifolia
Schleichera trijuga
Bridelia retusa
Terminalia paniculata
Grewia liliaefolia
Anogeissus latifolia
Lophopetalum wightianum
Terminalia chebula
Mesua ferrea
Valeria indica
Thespesia populnea
Aglaia roxburghiana
Mangifera indica
Tamarindus indica
Bassia longifolia
Sapindus trifoliatus
Canarium strictum
Buchanania latifolia
Hardwickia pinnata
H. binata
Ailanthus malabaricum
Strychnos nux-vomica
Poeciloneuron indicum
Dipterocarpus bourdilloni
D. indicus
Chickrassia labularis
Gluta travancorica
Cinnamomum zeylanicum
Cassia fistula
Polyalthia fragrans
Eugenia jambolana
E. gardenerii
E. chavaran
Acacia arabica
Prosopis spicigera
Kurrimia bipartita
Filicium decipiens
Acrocarpus fraxinifolius
Cullenia excelsa
Bischofia javanica
Chloroxylon swietenia
Shorea talura
Bombax malabaricum
Tetrameles nudiflora
Pierospermum rubiginosum

APPENDIX II

List of birds

About 200 species of birds have been recorded in the Sanctuary. The following list includes only the birds seen in the Sanctuary and its environs by the group *during the four days spent there,* when weather conditions were mostly very bad.

(As named in 'The Book of Indian Birds', Salim Ali, 1968).

House crow	*Corvus splendens*
Jungle crow	*Corvus macr or hynchos*
Tree Pie	*Denrocitta vagabunda*
*Grey Tit	*Parus major* (in the proposed extension dry deciduous area)
Jungle babbler	*Turdoides striatus*
Goldmantled Chloropsis	*Chloropsis cochinchinensis*
Redwhiskered bulbul	*Pycnonotus jocosus*
*Redvented bulbul	*Pycnonotus cafer*
Magpie-robin	*Copsychus saularis*
Blue rock thrush	*Monticola solitarius*
Scarlet minevet	*Pericrocotus flammeus*
Small minivet	*Pericrocotus cinnamomeus*
Ashy Swallow-shrike	*Artamus fuscus*
Black drongo	*Dicrurus adsimilis*
*Whitebellied drongo	*Dicrurus caerulescens*
Racket-tailed drongo	*Dicrurus paradiseus*
Golden oriole	*Oriolus oriolus*

Grackle or Hill myna	*Gracula religiosa*
Rosy pastor	*Sturnus roseus*
House sparrow	*Passer domesticus*
Dusky crag martin	*Hirundo concolor*
Red-rumped swallow	*Hirundo daurica*
Grey wagtail	*Motacilla caspica*
Large pied wagtail	*Motacilla maderaspatensis*
White wagtail	*Motacilla alba*
Greyheaded yellow wagtail	*Motacilla flava thunbergi*
Goldenbacked woodpecker	*Dinopium benghalense*
Crow-pheasant	*Centropus sinensis*
Roseringed parakeet	*Psittacula krameri*
Chestnut-headed bee-eater	*Merops leschenaulti*
Pied kingfisher	*Ceryle rudis*
Common kingfisher	*Alcedo atthis*
White-breasted kingfisher	*Halcyon smyrnensis*
Malabar grey hornbill	*Tockus griseus*
Malabar Pied hornbill	*Anthracoceros coronatus*
*House swift	**Apus affinis*
Indian great horned owl	*Bubo bubo bengalensis*
Kestrel	*Falco tinnunculus*
Brahminy kite	*Haliastur indus*
* Common green pigeon	**Treron phoenicoptera*
*Blue rock pigeon	**Columba livia*
Emerald dove	*Chalcophaps indica*
*Spotted dove	**Streptopelia chinensis*
Grey junglefowl	*Gallus sonneratii*
Jungle bush quail	*Perdicula asiatica*
Darter	*Anhinga rufa*
Grey heron	*Ardea cinerea*
Cattle egret	*Bubulcus ibis*
Paddy Bird or Pond heron	*Ardeola grayii*
Jungle Myna	*Acridotheres fuscus*

* Denotes birds seen outside the Sanctuary

APPENDIX III

Mammals of Periyar Wild Life Sanctuary

(As named in 'The Book of Indian Animals', S. H. Prater, 2nd Ed. 1965)

I, PRIMATES

(1) Bonnet macaque	*Macaca radiata*
(2) Liontailed macaque	*Macaca silenus*
(3) Nilgiri langur	*Presbytis johni*
(4) Slender loris	*Loris tardigradus*

II. CATS

(1) Tiger	*Panthera tigris*
(2) Leopard	*Panthera pardus*
(3) Leopard cat	*Felis bengalensis*
(4) Fishing cat	*Felis viverrina*
(5) Jungle Cat	*Felis chaus*

III. CIVETS

(1) Small Indian civet	*Viverricula indica*
(2) Common palm civet	*Paradoxurus hermaphroditus*

IV. MONGOOSES

(1) Common mongoose	*Herpestes edwardsi*
(2) Striped-necked mongoose	*Herpestes vitticollis*

V. HYENAS

(1) Striped hyena	*Hyaena hyaena*

VI. THE DOG

(1) Jackal	*Canis aureus*
(2) Indian fox	*Vulpes bengalensis*
(3) Indian wild dog	*Cucm alpinus*

VII. BEARS

(1) Sloth bear	*Melursus ursinus*

VIII. WEASELS

(1) Common otter	*Lutra lutra*

IX. INSECTIVORES

(1) Grey musk shrew	*Suncus murinus*

X. RODENTS

(1) Red flying squirrel	*Petaurista albiventer*
(2) Giant malabar squirrel	*Ratufa indica*
(3) Three-striped palm squirrel	*Funambulus palmarum*
(4) Indian porcupine	*Hystrix indica*

XI. HARES

(1) Indian hare	*Lepus nigricollis*

XII. ELEPHANT

(1) Indian elephant	*Elephas maximus*

XIII. WILD OXEN, SHEEP AND GOATS

(1) Gaur	*Bos gaurus*
(2) Nilgiri tahr	*Hemitragus hylocrius*

XIV. DEER

(1) Sambar	*Cervus unicolor*
(2) Muntjac	*Muntiacus muntjak*
(3) Indian chevrotain	*Tragulus meminna*

XV. PIGS

(1) Indian wild boar	*Sus scrofa*

Report 5: Periyar Wild Life Sanctuary, with special reference to the ecological effects of eucalyptus plantations.

POINTS MADE IN DISCUSSION

As the Report does not mention the status of animal species in the Sanctuary, it may be useful in order to complete the picture to give some details of observations on a few of the larger and more prominent species, made during a study I carried out in the Sanctuary for the Zoological Survey of India a month ago. Despite the fact that the elephant is the dominant species, an analysis of herd composition and proportion of immatures showed that it is on the decline, unlike the situation in other parts of the world including, it is said, elsewhere in India. What is seen in the Sanctuary is in fact evidence not of a population explosion but of over-crowding due to loss of habitat outside the area. The gaur is also decreasing in numbers: it has been suggested that this is due to competition by elephant for the available forage, but the feeding habits of the two species are quite different. However, there may be some effect on the gaur in the way of psychological stress. The gaur also suffers some losses, though probably not very serious, from wild dog which are a greater problem in Periyar than in any other sanctuary in India. They stampede the herds of gaur and pounce on the cows and they may also have been responsible for the disappearence of chital from the Sanctuary about 20 years ago. However, their main prey are the sambar, which are also depleted (G.O.Kurup, India).

It seems clear from the Report that the Study Team considers that all planting of exotic species should take place outside the Sanctuary, but it would have been interesting to know whether the Study Team considers that any general principles should be observed when establishing exotics (B.N. De, India).

In this connection and because of its relevance to eucalyptus plantations, reference may be made to the paper by Hajmadi and Qureshi discussed at an earlier session of this Technical Meeting (see Vol. I of these Proceedings, pp. 62-68). It seemed to be suggested that monoculture plantation forests, if properly managed and distributed, do not affect wild life populations and may even be advantages for some species such as deer. However, this view ignores the fact that the Indian forest fauna, birds, mammals and the rest, have evolved in mixed forests. It follows that even if monocultures are sometimes necessary for economic or other reasons, they *must* be less favourable for wild life than the original type of forest (H. Abdulali, Pratap Singh, Y. R. Ghorpade, P. D. Stracey and Ranjit Sinh, India).

One difficulty which the Report only touches on indirectly in its recommendation (g) is that for lower-income Indian tourists, as opposed to foreign tourists who form only 4% of the visitors to Periyar, there is far too little guidance and information, resulting in many difficulties and disappointments over entry times and procedures, accommodation and other facilities in this and most other sanctuaries. For example, at Periyar there is no proper system to ensure that the best use can be made of the launches and boat-trips, which are the great feature of the Sanctuary. Much more needs to be done to analyse the management procedures and pick out the many points which need to be improved, if public interest and support for the Sanctuaries are to be built up properly (Mrs. Almitra Patel, India).

The Northern Salt Lake Zone of Calcutta, West Bengal, with Special Reference to the Proposed Establishment of a Bird Sanctuary

Study Team:

MR. R.J.BENTHEM
Chief, Landscape Planning Department, Netherlands State Forest Service, Chairman IUCN Landscape Planning Commission, Prof.Reinwardtlaan 23, Utrecht, Netherlands.

MISS SYLVIA CROWE C.B.E.
Vice-President International Federation of Landscape Architects, Member IUCN Landscape Planning Commission, 182 Gloucester Place, London N.W.I., U.K.

MR. D.W.GOODE
Member IUCN Landscape Planning Commission, 3 Mandeville Crescent, Toorak 3142, Victoria, Australia.

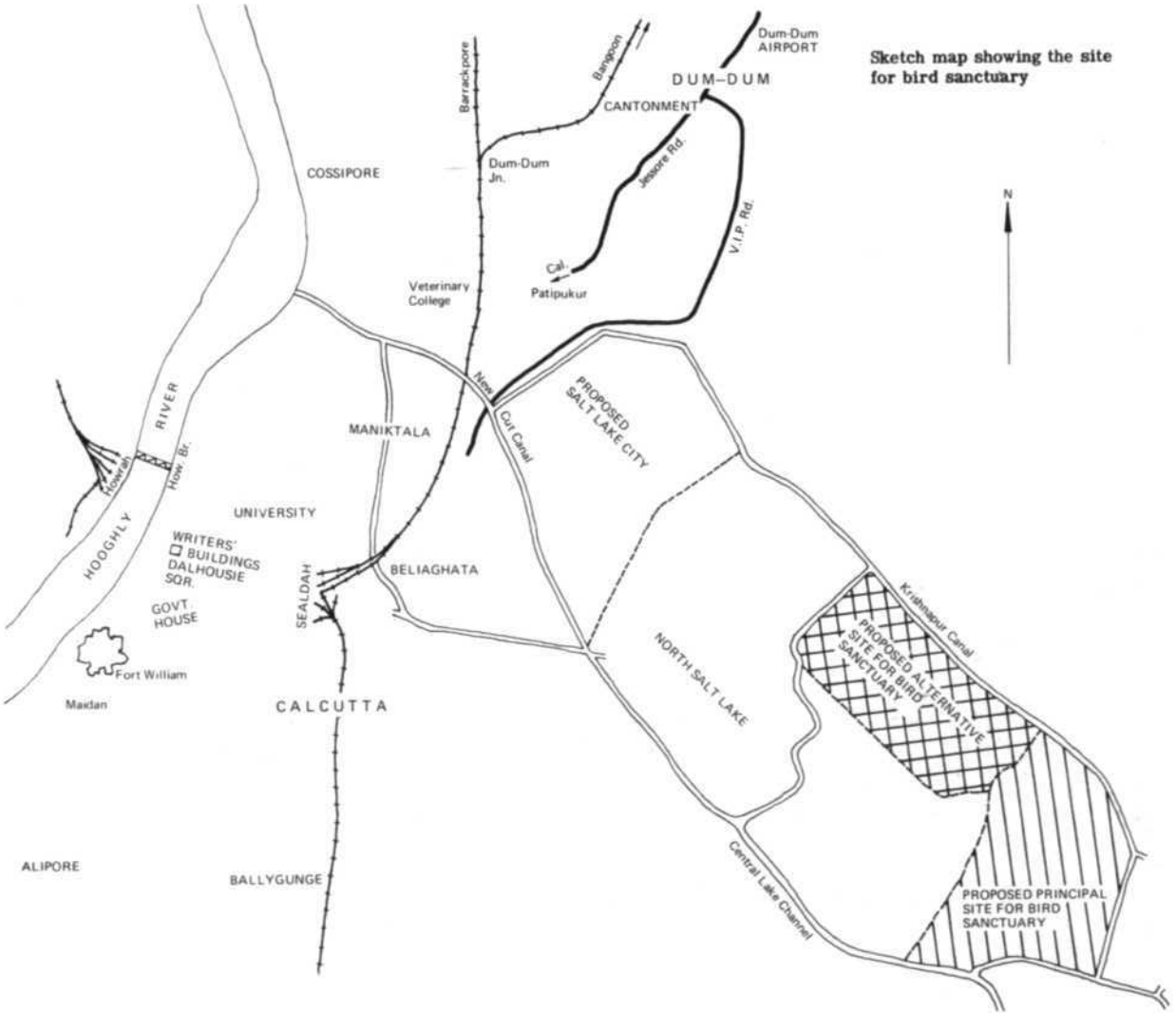
MR. K. L. LAHIRI
Chief Conservator of Forests (West Bengal), 6B Bright Street, Calcutta 19, India.

PROFESSOR DR. HARALD SIOLI
Director Max-Planck-Institute for Limnology, Abteilung Tropenökologie, 232 Plöyi, Germany.

INTRODUCTION

Participation in the study by one of us (Miss Crowe) was made possible by a grant from the Smithsonian Institution of Washington D.C, to which due acknowledgement is made and which also assisted with the local travel expenses of a second member of the team (Prof. Sioli). We also received most generous hospitality and support from a large group of local specialists, who included zoologists and other naturalists and conservationists, land-use and Metropolitan Planning experts, and the staff of the Forest Department under the direction of our Indian member (Mr. Lahiri). Without the advice and information they provided and the excellent transport facilities, which included a flight over the study area, it would have been very difficult to get an insight into the problems in the rather brief time available.

Because of this time factor, it was probably just as well that the scope of the study had been considerably modified since its inception and what we were specifically asked to do was to assess the values of a project for establishing a bird sanctuary in the northern Salt Lake zone. An area of about 2½ square miles (a little more than 6 sq.km) had already been provisionaly chosen and sketch-maps prepared. It is situated between the Krishnapur Canal and the Central Lake Channel east of the Hooghly River, a few miles from the outskirts of Calcutta (see the Sketch-Map of the area, which was given to the Study Team and is reproduced here, showing its general situation and the two sites recommended for the sanctuary). The present land use in the area is characterized by flooded fields for fisheries and pleasantly situated villages, as well as fields


Sketch map showing the site for bird sanctuary
Dum-Dum AIRPORT
DUM–DUM CANTONMENT
Barrackpore
Bangpon
Jessore Rd.
V.I.P. Rd.
Dum-Dum Jn.
COSSIPORE
Cal.
Patipukur
Veterinary College
N
PROPOSED SALT LAKE CITY
MANIKTALA
New Cut Canal
RIVER HOOGHLY
Howrah
Howr. Br.
UNIVERSITY
WRITERS' BUILDINGS
DALHOUSIE SQR.
GOVT HOUSE
Fort William
Maidan
SEALDAH
BELIAGHATA
CALCUTTA
NORTH SALT LAKE
Krishnapur Canal
PROPOSED ALTERNATIVE SITE FOR BIRD SANCTUARY
Central Lake Channel
PROPOSED PRINCIPAL SITE FOR BIRD SANCTUARY
ALIPORE
BALLYGUNGE

for agricultural purposes. Water is still a dominating factor in this landscape, but by comparing a topographic map of 1920 with a recent aerial photograph of the area, it was evident that a rapid change in land use was occurring. More than half of the 1920 water area shown on the map had been transformed into land in the last 40-50 years. This process has accelerated in the last few years, is continuing and is having a considerable impact on the ecology of the area.

It was envisaged that a programme for development of the area as a bird sanctuary, set within a continuing land use pattern of the surrounding area, would provide immediate and long term benefits to the local village people. In the medium and long term the whole region could be raised to international standard and become a major tourist attraction.

CHANGES IN LAND USE

The present changes in land use consist of:

1. filling-up of a considerable part of the north western area of swamp lands for urbanization;
2. draining lakes, previously used for fishing, in order to get land for other agricultural purposes such as paddy fields.

The study team is of the opinion that these recent changes in land use are the beginning of a more drastic modification of the area. If this development cannot be controlled and guided immediately, it can be expected that road construction and the extension of urban development into the villages would occur. Such development would result in the loss of the unique richness of birdlife in the area and destruction of scientific and tourist values.

SPECIFIC VALUES OF THE AREA

This Salt Lake Area of Calcutta has a particular significance in respect of the following points:

1. The existing flooded fields together with surrounding vegetation provide an excellent habitat for a wide variety of birds, particularly waterfowl. The variation of marsh, land and water and the trees and shrubs which surround and occur in the villages create a biotope with great potential for resident and migratory birds. This is clearly demonstrated through the latest records from the Salt Lakes in November 1969, which show a total number of no less than 248 different species of birds.

   Many of these birds, however, use the marshy areas in the vicinity of the proposed sanctuaries, which are in the process of being filled.

   Moreover, the area has proved to be of importance for other forms of animal life; 22 species of mammals have been recorded as well as different types of lower organisms.

2. The combination of lakes surrounded by bunds, with attractive old villages set in trees and associated with village ponds and the interesting pattern of paddy fields has created a landscape of aesthetic value and of recreational and tourist potential. These villages are especially important because of their association with a fishing economy which is rapidly being lost.

3. Historically the area represents a highly interesting type of landscape. It is a magnificent example of the Ganges River Delta, as the whole area has been shaped by human activity over thousands of years and is a legacy of Bengal culture.

4. The fact that this area is situated so close to a big city and to its airport should be considered as a great asset which should be carefully preserved, especially keeping in mind that Calcutta has very little public open space per head of population.* The management of this salt lake area is certainly a challenge to the planning of an up-to-date metropolitan region. Other cities are desperately trying to find open space; here an area is still available but it needs to be conserved and skilfully integrated into a regional plan.

NEED FOR COMPREHENSIVE PLANNING

The primary request made of the study team was that it should select an area from proposed alternatives as a sanctuary for birds. After studying the project by air and in the field and after close consideration of the available material and of reports, the group unanimously agreed that a mere selection of such an area would not provide a satisfactory proposal. The different factors which influence the present use of land prove to be so interwoven that an outline for a broader region is necessary. In such a broader context the sanctuary should be the focal point. A regional plan for an area of at least 20 sq. miles should be set up, in which a bird sanctuary of about 2½ sq. miles needs to be fully protected. It should be an absolute sanctuary. A close study might indicate that there could be two separate sanctuaries of at least a square mile each. The total area of water outside the sanctuary or sanctuaries should be kept under control and should be used, as now, for fishing: fish production could even be extended and intensified.

The City of Calcutta has a very valuable asset in this area. Other cities have made good use of comparable situations. For example, the lagoon of Venice and the river at Bangkok are major tourist attractions. The Krishnapur Canal approach to the sanctuary could be an equal attraction for Calcutta.

ELEMENTS FOR A REGIONAL PLAN FOR THE SALT LAKE AREA

1. A regional plan needs legal provisions. For a part of the area which is under the metropolitan planning region these legislative powers already exist. To cover the whole area of 20 sq. miles the metropolitan planning region will have to be extended to control the land-use pattern.

2. No further extension of any form of urbanization should be permitted outside the already filled area.

3. A sufficiently broad zone of the filled area should be dedicated as a forest greenbelt, in order to provide a transition between the future urban region and the remaining rural landscape.

---

* It has been calculated that it amounts to three-tenths of an acre per thousand people (the 1961 population figure, which has undoubtedly increased greatly since then, being 13, 700 per sq. mile (5, 300 per sq. km) over a total metropolitan area of 490 sq. miles (1269 sq. km).

4. The maintenance of the present character of the villages in the Salt Lake Zone should be an integral part of the regional planning.

5. Fundamental to the future of this specific environment is the avoidance of accessibility by roads. The tourist transport should be by boats on the surrounding canals. Speedboats should be avoided to prevent erosion and disturbance of wildlife. In general noise should be avoided in the sanctuary area.

6. The planting of trees and shrubs for the roosting and nesting of birds and for cover for mammals is required within the landscape plan for the sanctuary and its immediate surroundings. The planting should be on an ecological basis, re-establishing the natural association of the original vegetation of the Ganges Delta.

7. One or preferably both of the areas shown on the diagrammatic sketch-plans reproduced at the end of this report, could well be chosen as the bird sanctuary. Careful consideration would have to be given to the various factors involved, such as the distance from urban development, accessibility, management possibilities and habitat suitability. Only in the light of this further study, would it be possible to prepare the final detailed plans, which would of course be required to put the project into effect.

8. The present changes in land use should be halted. A further decline of the flooded fields outside the sanctuary will impoverish the quality of the environment for bird life.

9. If such stabilization of the present land use is considered injurious to the economic structure, compensation can clearly and quickly be found through alternative sources of income from the working programme, conservation, tourism and recreation.

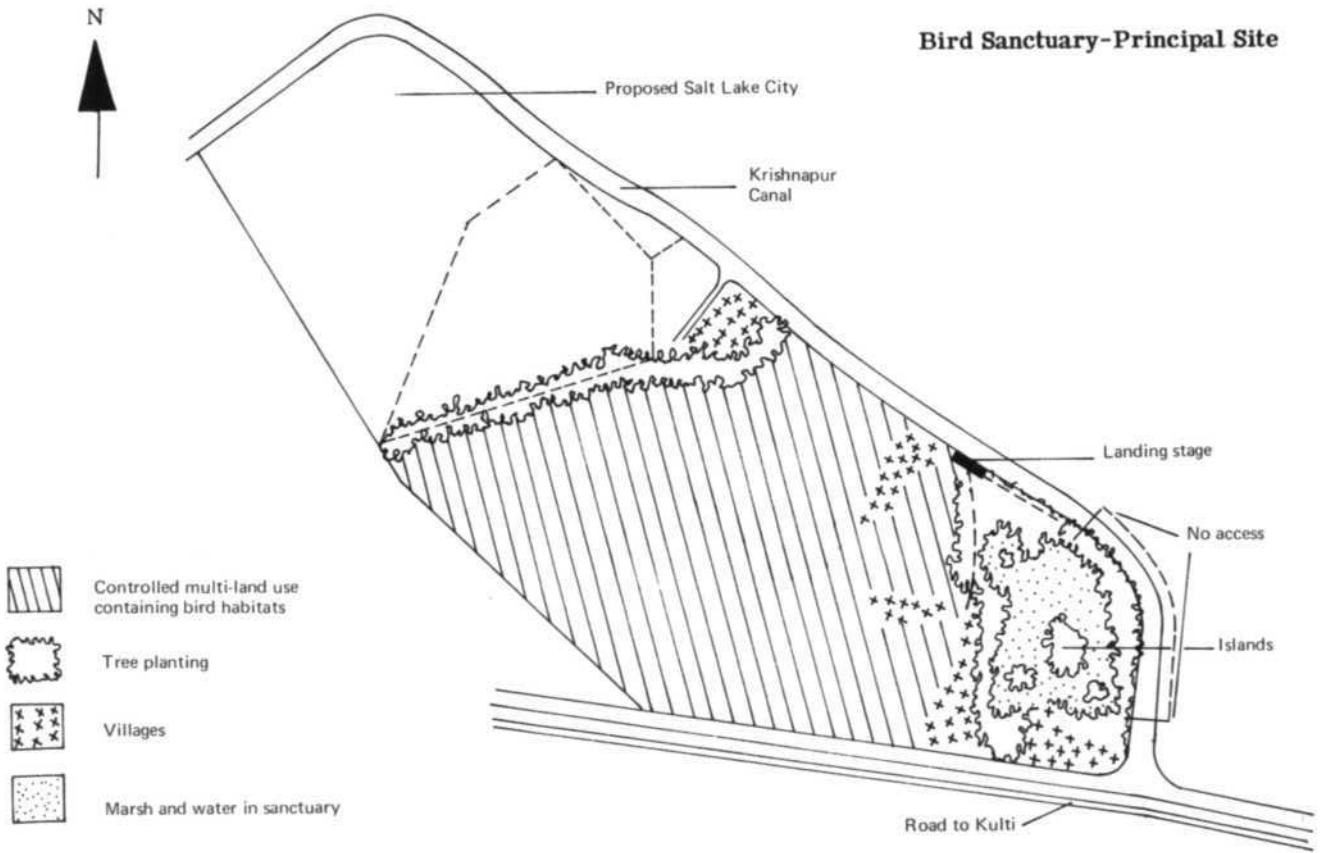
10. A comprehensive land use plan needs the co-ordination of the activities of a number of government bodies particularly concerned with forestry, fisheries, agriculture and tourism and the metropolitan planning organization. It may be necessary to have an advisory body associated with management and research largely comprising biologists, conservationists and foresters.

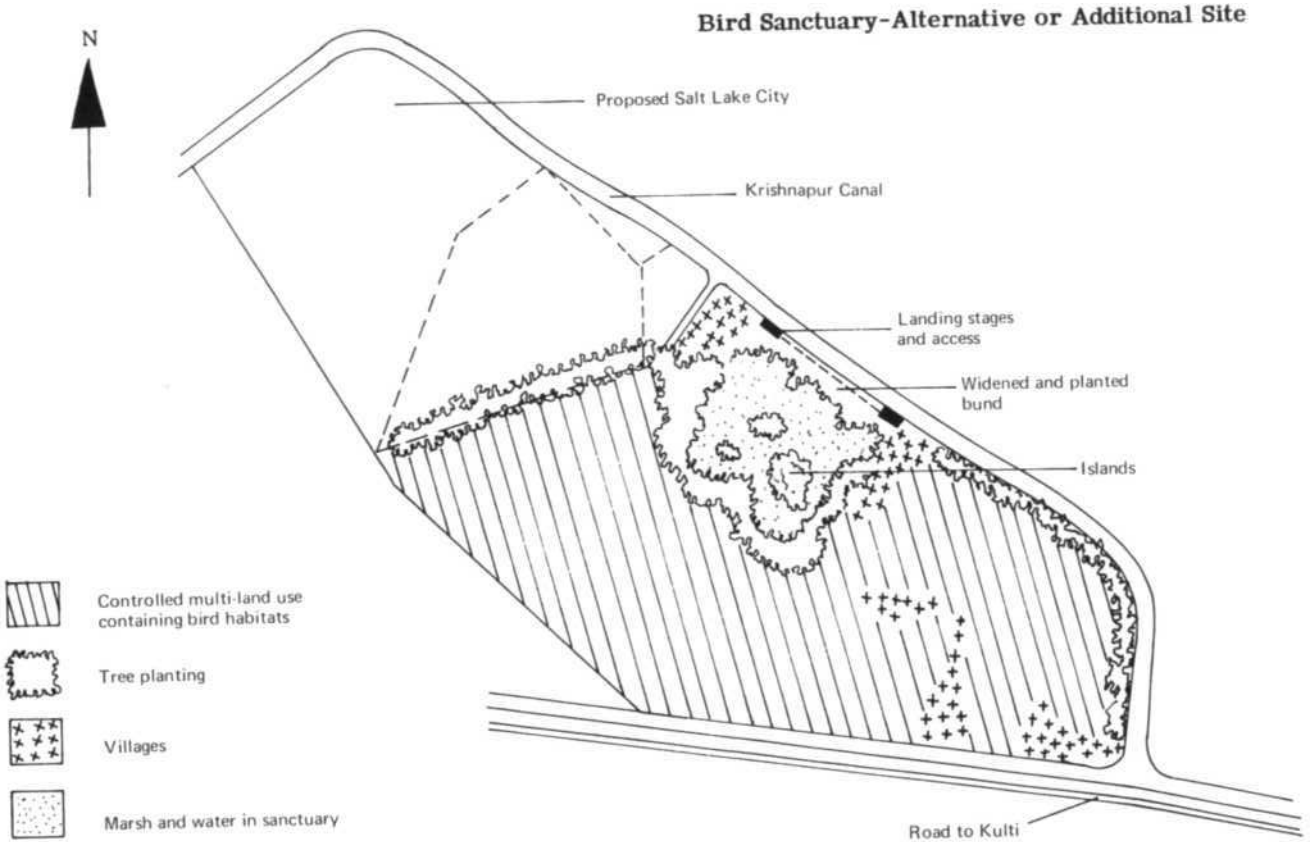
11. Co-operation with the local population in the villages in the area needs to be a main point of policy. A regional plan for the area is not only important for the inhabitants of Calcutta and tourists, but in particular for the rural population.

12. The establishment of a field station for biological research specially directed to the maintenance of the sanctuary and its immediate surroundings is strongly recommended.

13. An educational policy should be developed to make the people aware of the value of the cultural, aesthetic and scientific values in the countryside.

14. Due attention needs to be paid to the stimulation of public interest in the project in order to encourage local and regional support.


N
Bird Sanctuary-Principal Site
Proposed Salt Lake City
Krishnapur
Canal
Landing stage
No access
Islands
Road to Kulti
Controlled multi-land use
containing bird habitats
Tree planting
Villages
Marsh and water in sanctuary


Bird Sanctuary-Alternative or Additional Site
N
Proposed Salt Lake City
Krishnapur Canal
Landing stages and access
Widened and planted bund
Islands
Road to Kulti
Controlled multi-land use containing bird habitats
Tree planting
Villages
Marsh and water in sanctuary

Report 6: Northern Salt Lake Zone, Calcutta, West Bengal, with special reference to the proposed establishment of a Bird Sanctuary.

POINTS MADE IN DISCUSSION

The Report suggests that in the Study area the tendency is for the wetlands to alter not only by drainage for spreading urbanization but also by conversion to rice-growing. This is the opposite to the general tendency in West Bengal, which is to move from rice production to fish production, because the latter brings in a greater income to the land owner. In principle, therefore, the recommendation that the existing land-use pattern in the Salt Lake area should be conserved should be socially acceptable and not cause undue difficulty (Mrs Spurway, India).

I think that the Report brings out the point that the combination of fish production and the development of the area as a tourist attraction, which includes open space facilities for the people of Calcutta, should certainly be capable of giving as good or better return as any alternative type of land use. The important consideration is that the bird sanctuary should be a focal point in a much broader land use plan for the whole 20 square miles area; the two things are interdependent. This gives the answer to those who fear that even a 2½ square miles sanctuary, to meet scientific, recreational and aesthetic needs, might not be large enough to be viable. Provided there is a large surrounding area in which fish culture and even to some extent rice cultivation are the prevailing land use pattern, to provide feeding grounds, the already very remarkable survival of this area in the near vicinity of a great city should be assured (Benthem, Netherlands).

Index

CONTRIBUTORS OF PAPERS AND TO THE DISCUSSIONS

Figures in heavy type refer to the page numbers of Papers.

* Indicates that the author was unable to attend the Technical Meeting.