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WILDLIFE CONSERVATION IN WEST AFRICA

Proceedings of the Symposium
held at the University of Ibadan, Nigeria,
during the
7th Biennial Conference of
The West African Science Association
2 April 1970

Published with the assistance of the Fauna Preservation Society

International Union
for Conservation of Nature and Natural Resources,
Morges, Switzerland, 1971

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Proceedings of the Symposium held at the University of Ibadan, Nigeria, during the Seventh Biennial Conference of the West African Science Association on 2 April 1970

Edited by
D.C. D.Happold

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Foreword

This symposium on 'Wildlife Conservation in West Africa' formed part of the seventh biennial conference of the West African Science Association, which was held at the University of Ibadan, Nigeria from 31 March to 3 April 1970. It took place in the Drapers' Hall of the Institute of African Studies on 2 April 1970.

There have been several conferences on conservation in Africa in recent years, notably those at Arusha in 1963, Fort Lamy in 1967 and Lome in 1969, but none of them have dealt exclusively with West Africa. The importance and value of wildlife conservation is not widely appreciated in West Africa at the present time; this is due to several causes and has resulted in the rapid destruction of most of the larger mammals, and the habitat necessary for their survival. Many people are beginning to realise that unless something is done quickly there will be few large mammals left and several species may become extinct. Rapid action is needed to form more reserved areas where poaching is prevented and the animal populations have a chance to recover; and new realistic laws and law enforcement are required.

Moreover, there has been virtually no contact or exchange of views between West African countries on conservation problems of mutual interest—the vast size of West Africa, inadequate communications, and the division into French or English speaking countries, has resulted in a complete lack of knowledge in most West African countries about what is happening (or not happening) in the others.

The symposium, therefore, was designed to provide an opportunity for an exchange of views and information between conservationists in West Africa. Five countries—Cameroun, Dahomey, Ghana, Nigeria and Senegal—were represented, and about 70 people attended. It was unfortunate that from many other countries of the region no information could be made available. Nevertheless, the papers in these proceedings cover a wide range of topics. That many aspects of conservation which ought to have been discussed are missing is due to the regrettable fact that there are still practically no people working full time on wildlife in West African countries or doing the work which is essential for the development of their National Parks and reserved areas. The papers now published do, however, place on record some progress made with wildlife conservation and the understanding of conservation problems in West Africa by the year 1970.

I am especially grateful to the following who helped to make the symposium a success:

1. The International Union for Conservation of Nature and Natural Re sources, which arranged to be represented by a Member of its Executive Board.
2. The Food and Agricultural Organization of the United Nations, which was represented by its wildlife officers working in West Africa.
3. The West African Science Association for suggesting that the symposium should be held as part of its Seventh Biennial Conference.
4. The Fauna Preservation Society, which sent two films from London for showing to the symposium delegates.
5. The National Parks authorities of Kenya and Tanzania for contributing posters and booklets to a display on National Parks mounted at the symposium.

D. C. D. Happold

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Nigeria.

1 June 1971

Opening Address on Behalf of IUCN

BABA DIOUM[1]

Monsieur le Président, Mesdames, Messieurs,

Lors de la Xème assemblée générale de l'UICN tenue à New Delhi en décembre 1969, le Conseil Exécutif auquel j'appartiens, m'avait demandé de représenter l'Union à votre Conférence et de vous adresser en son nom des encouragements pour le plein succès de vos travaux.

C'est pour moi un immense plaisir de m'acquitter de cette tâche.

L'Union Internationale pour la Conservation de la Nature et de ses Ressources est une Organisation non-gouvernmentale regroupant des Organismes de statuts gouvernementaux et privés préoccupés totalement ou partiellement par les problèmes de la Conservation de la Nature et de ses Ressources.

Sa création date de la fin de la 2ême guerre mondiale sous les auspices de l'UNESCO et de personnalités imminentes.

Très tôt ses activités se sont largement développées et l'Union est devenue actuellement une des Organisations les plus réputée pour les problèmes de conservation.

Elle collabore étroitement avec les Organisations Internationales telles que l'UNESCO, la FAO, le WWF, le PBI, la BIRS et aussi avec l'OUA.

De nombreux pays africains sont également membres de l'UICN et y sont représentés par une ou plusieurs organisations nationales.

Il peut être cité parmi ces pays: le Tchad, la République démocratique du Congo, le Dahomey, l'Ethiopie, le Ghana, la Côte d'Ivoire, le Kénya, le Malawi, la République Malgache le Maroc, le Nigéria, le Sénégal, le Soudan, la Tanzanie, l'Ouganda et la Zambie.

L'UICN aborde tous les problèmes relatifs à la Conservation de la Nature.

Les six commissions principales chargées d'étudier en profondeur les divers aspects de la Conservation sont: la Commission d'écologie, la Commission d'Education, la Commission d'aménagement des paysages, la Commission de législation[2], la Commission internationale des parcs nationaux et la Commission du service de sauvegarde.

Son siège est à MORGES en Suisse et le Secrétariat général est tout disposé à fournir des éléments d'information et des documents relatifs à la Conservation de la Nature à tous les pays qui en font la demande.

La conférence intergouvernementale d'experts sur les bases scientifiques de l'utilisation rationnelle et de la Conservation des Ressources de la Biosphère tenue à Paris en 1968, et convoqué par l'UNESCO, avec la participation active de l'UNION a permis de créer des groupes de travail chargés d'élaborer un véritable programme international sur la conservation de la Nature.

L'Union grâce à ses nombreuses publications donne des compte-rendus sur les multiples activités déployées et établit des études sur tous les problèmes touchant la conservation de la Nature. Elle effectue des travaux sur la demande des Institutions telle que les Nations Unies. C'est ainsi que sous l'égide de l'UNESCO elle a publié un livre intitulé "La Nature est notre Mère", accompagné de films fixes pour son illustration. Cette publication constitue un matériel pédagogique pour l'introduction des notions de conservation de la Nature dans les programmes d'enseignement primaire et secondaire des pays soudano-sahélien.

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1. Directeur, Département des Eaux, Forêts et Chasses du Sénégal, B.P. 1831, Dakar, Sénégal.

2. Actuellement la Commission des politiques, du droit et de l'administration de l'environnement.

La commission internationale des parcs nationaux a également publié sur la demande des Nations Unies "La liste des Nations Unies des Parcs Nationaux et Réserves Analogues" en francais et la version anglaise paraîtra très prochainement.

Grâce aux "Red Data Books" de la Commission du service de sauvegarde l'Union attire l'attention de l'humanité sur la nécessité de protéger les espèces rares et menacées.

C'est vous dire que l'Afrique notamment en cette partie du Continent gagnerait à suivre de près les travaux de l'UNION pour mieux définir la politique de conservation et déployer un plus grand effort comme l'a déjà fait l'Afrique de l'Est dans ce domaine.

Monsieur le Président, Mesdames, Messieurs, ces propos n'avaient d'autre but que de vous définir la réelle vocation de l'UICN, ses nombreuses activités et peut être toute l'assistance que vos pays pourraient attendre d'elle.

Il me reste à saluer au nom de l'UICN l'heureuse initiative qu'à eue la WASA d'inclure cette année dans son programme un symposium spécialement consacré aux problèmes de la Conservation de la Nature dans l'Ouest Africain.

J'espère que les conclusions de vos travaux déboucheront sur une meilleure prise de conscience afin que la tâche gigantesque rendue nécessaire pour la protection de la Nature dans cette partie du continent soit mise en oeuvre pour le plus grand bien des populations.

Mon dernier propos sera plutôt un souhait.

C'est de voir de plus en plus de pays africains adhérer à l'UICN afin de bénéficier des travaux fructueux qui y sont menés.

THE PRESENT STATUS OF CONSERVATION IN WEST AFRICA

A History of Wildlife Conservation in Nigeria, and thoughts for the future

D. C. D. HAPPOLD[1]

INTRODUCTION

A recent book by Engelhardt (1962) recorded that Nigeria does not have any reserved areas for its wildlife. This is not true, but it emphasizes that little attention has been given to the establishment of National Parks, game reserves and other protected areas in this country. The attitude to conservation programmes is better developed in other West African countries than in Nigeria, but this is not because of a complete lack of interest; many ideas have been suggested in the last forty years but no definite plans have resulted. At the present time the populations of most wild species are at a low level; yet in the neighbouring countries of Dahomey and Cameroun, under comparable environmental conditions, large populations are maintained. Nigeria has always had a large human population, but it is possible for large human and animal populations to co-exist side by side. The economic, cultural, scientific and aesthetic values of reserved areas are well known to everyone interested in conservation, and a large wealthy country like Nigeria should have a properly organized system of parks and reserves.

FORMER IDEAS ON CONSERVATION

The forest reserves in Nigeria have played an important role in wildlife conservation. The first reserves were established in 1900, and at the present time forest reserves form a considerable part of Nigeria. Many of these are too small to be of much importance for wildlife protection, but some of the larger forest reserves are the main refuges of many species which are very rare or have been exterminated elsewhere. In the forest reserves, the trees and their exploitation are the main consideration, but the absence of hunting and human settlement has had a beneficial effect on the animal populations. However, poaching and the dubious future of forest reserves does not ensure the continued security of the animal populations. Consequently the formation of areas protected exclusively for the protection (and utilization) of wild animals is essential. The longer this is delayed, the harder it will be to find suitable areas.

In the early 1930s, several articles on game preservation were published in the journal *The Nigerian Field* even in those days many observers noted the rapid decline in wild animals in many parts of Nigeria, but there were conflicting views on how this decline should be stopped and whether it was worthwhile to establish reserved areas. One viewpoint expressed by Collier (1934) was that conservation of animals could not be justified unless it provided a supply of protein for the local people. He also suggested that (1) after the animal populations had increased, it might be possible to set aside some areas as National Parks and Game reserve; (2) there should be 'hunting forests' and in the centre there should be *small* areas for breeding; and (3) hunting should be encouraged since a genuine interest in wild animals will help to stimulate interest in their protection. The opposite point of view was given by Shorthose (1935), who suggested that the immediate wishes of the local inhabitants were not the most important consideration. If reduction of

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the animal populations continued, within a few years there would be few animals, if any, to hunt. Indiscriminate hunting and shooting in the breeding season results in a large wastage of animals and therefore stricter rules are necessary. The long term survival of wild animals and their subsequent availability requires the immediate formation of reserves and national parks. Shorthose advocated *large* reserved areas for breeding where the animals are not disturbed at all. These two articles written nearly forty years ago differ on three fundamental points: (1) whether there are areas of uninhabited land in Nigeria suitable for reserves, (2) whether the government is prepared to establish a game department for conservation, and (3) whether the short term interests of the local population should have priority over long term interests.

In the early 'thirties, it seems that the main stumbling blocks to progress were:

1. The system of land tenure, since such an important social system should not be altered in the interest of wild animals.
2. The density of the human population, which makes it difficult to find suitable areas for conservation.
3. The large herds of Fulani cattle grazing in northern Nigeria, which cause continual disturbance of game animals.
4. The high amount of hunting by individuals and by organized drives, which have resulted in the present rarity of many species.

At about the same time, in the early 'thirties, Col. A. H. Haywood had made a survey of the wildlife resources in West Africa. In Nigeria, he found many people in the administration sympathetic to the establishment of reserved areas. In his recommendations to the Government, Haywood (1932) suggested the following:

1. There should be a system of game reserves which includes some of the existing ones and the creation of new ones.
2. New reserves should be formed in the savanna regions: one in the Borgu/Oyo area which might be designated a National Park at a later date; and another in the Wase/Muri region (south of Bauchi and north of the Benue River) or in the Chafe-Kwiambana area between Sokoto and Zaria.
3. A Game department with a Game Warden and 64 Game Guards should be established. The cost of this service would be paid from revenue from licences, wild animal products, and from import and export duties on guns and ammunition.
4. There should be a ban on organised drives, spring traps and night hunting with lights.
5. There should be a register of non-Nigerian hunters to ensure that hunting licences, trophy fees and permits are not evaded.
6. Special consideration should be given to endangered species, e.g. gorilla, chimpanzee, rhinoceros, giraffe, water chevrotain, pigmy hippo and ostrich.

Other areas suggested as conservation areas in the 1930s include part of Yola Province east of the Gongola river where rhinoceros and giraffe were fairly common, and some regions near Kontagora. Although many of these articles suggest that no progress was being made, certain regions of the northern Province did take practical steps, mainly as a result of the co-operation of the Emirs. For example, hippo reserves were created on the Benue, Donga and Katsina rivers, certain areas were closed for the hunting of elephants, hippos, giraffes and rhinoceroses, and it was illegal to capture and sell small birds ('Observer' 1934). In retrospect, none of these measures had a lasting beneficial effect.

THE BOYLE REPORT

In 1948, the secretary of the Fauna Preservation Society came to Nigeria to assess what progress had been achieved in wildlife conservation (Boyle, 1948). He concluded that the established reserves were ineffective since they included ancient hunting areas and, therefore, the reserves were in fact indiscriminately used for hunting by local people. Since there was no way of enforcing the game laws, the whole idea of conservation was regarded with contempt; yet countries outside Nigeria were under the impression that wildlife con-

servation was effectively carried out since, to them, the game laws appeared adequate. He considered that a new approach to the problem was necessary:

1. Every effort should be made to encourage more interest in conservation among Nigerians, who are in the best position to convey the conservation idea to their fellow countrymen.
2. Conservation should be confined to specific areas only, where there is no clash with hunting and agricultural interests.
3. In each reserve there should be a 'sanctuary' for breeding.
4. Hunting methods should be reviewed, but must not be unduly limiting.
5. All revenue from licences and other wildlife products should be used for continued wildlife conservation.
6. Special attention should be given to the protection of the chimpanzee, gorilla and several other rare species.
7. Management of wildlife conservation should be handled by a single government department and not, as was then the case, jointly by the Administration, Police and Forestry department. However, the idea of having a separate wildlife department and a system of National Parks was, for the time being, unrealistic.

In the early 1960s, there was a renewal of interest in conservation in the whole of the African continent, since, as in Nigeria, the numbers of many species were declining. The IUCN-sponsored African Special Project, under joint FAO/IUCN management and operation, attempted to focus attention on the problems of African wildlife and to provide some answers which could help African countries (many of whom were gaining independence at that time) conserve their wildlife resources. After a preliminary survey, the second stage of the project was a conference held at Arusha in Tanzania in September 1961, at which many of these problems were discussed. Papers were presented by, among many others, delegates from Senegal and the Ivory Coast, but in none of the papers or discussions, as recorded in the Proceedings of the Conference (IUCN 1963), was any mention made of what was happening in Nigeria. Part of the third stage of the project, however, was a visit to Nigeria by two specialists, T. Riney and P. Hill, from 25 March-5 April 1962. They attended a meeting of forestry officers in Jos where the possibility of having a single wildlife Ordinance for the whole of the country was discussed. Later they went to Yankari game reserve, founded in 1956, on which they commented generally and, in particular, on the fact that a considerable downgrading or deterioration was apparent, with an increase in the amount of bare ground, which suggested, for example, that the burning policy should be reviewed. They also recommended a number of research topics for the management of Yankari and other areas of the northern region (Riney and Hill, 1967).

THE PETRIDES REPORT

The most comprehensive survey of the Nigerian wildlife situation is that made by Professor G. Petrides of Michigan State University later in 1962. After a brief survey of species which have become extinct and those threatened with extinction, he reviews all the evidence for the depletion of wildlife. Comparisons with neighbouring countries suggest a considerable reduction in the number of animals in Nigeria. He concludes that the principal cause of the lack of game animals is excessive hunting; this is in contrast to other countries with a similar density of humans as in Nigeria, where it is more the intensive land use that is the important factor affecting the abundance of wildlife. Many hunting methods used in Nigeria are extremely destructive to wildlife populations and there needs to be stricter legislation and enforcement of game laws. The main recommendations of the Petrides Report are:

1. Prevent hunting or capture of all species which are threatened with extinction.
2. Strictly limit the hunting or capture of all species whose numbers are reduced, until it is evident that it is in the general interest to permit it.
3. Prohibit those actions which are most detrimental to wildlife e.g. hunting with lights, hunting of species in a designated close season, killing of females and young where the

symptoms of sex and age are obvious, the use cf traps and snares for hunting and capturing protected species, the burning of vegetation to assist hunting, and the sale of bushmeat and other wildlife products, or the transportation of these products across regional and provincial boundaries during close seasons.

4. Establish all forest reserves, game reserves and parks as wildlife sanctuaries where reduction of populations is undertaken only if strictly necessary for conservation purposes.
5. Assign fees from hunting and gun licences and all other revenue derived from wild animal products for conservation programmes including law enforcement, research, education and the formation of further refuges.
6. Establish within the federal government a wildlife advisory agency of university trained ecologists whose duty is to protect the wildlife resources and to promote management programmes, research and public education.

The final part of the report outlines a National Park policy for Nigeria to include all the biotic regions in the Federation. At the time of the report, the only area functioning as a game reserve was Yankari in the northern region, although about a further 5,000 square miles (12,950 km^2) had been designated elsewhere as reserves. Possible areas suggested by Petrides are in the vicinity of Lake Chad, Jos, Lafia (north of the Benue), Mambilla, Obudu (especially for gorillas and chimpanzees), Cross river, Upper Ogun, and Gilli-Gilli. He also recommended the area at Borgu which has in fact since been constituted as a reserve. The various areas would, according to the report, cover all the types of habitat that ought to be preserved for posterity and as true examples of the ecosystem. In addition to these areas, the report suggests that other suitable ones might be designated as game production areas where wildlife ranching is supervised by qualified ecologists.

FURTHER RECENT DEVELOPMENTS

Two further developments occurred recently which should have a beneficial effect on wildlife in Nigeria. First, FAO have established a wildlife consultant post in the Department of Forestry at the University of Ibadan to teach forestry students the principles of wildlife management and to make recommendations to the government on wildlife problems; last year W. N. Holsworth (Canada) came to Nigeria and his work is now being continued by J. Henshaw (USA). A similar appointment is that of G. S. Child as Wildlife Officer to the Kainji and Volta Lakes Research Projects. Secondly, the new "African Convention for the conservation of Nature and Natural Resources" was signed by Nigeria, together with 37 other African States, at Algiers on 16 September 1968. By becoming a signatory[1] to the Convention, Nigeria is obliged to take action to conserve her wildlife. Perhaps the most important clauses relevant to Nigeria are the following:

1. Certain species are to be totally protected, and others may be hunted or captured only under special authorization.
2. National Parks and conservation areas already existing shall be maintained. The range of parks and conservation areas should be designed and, if necessary, extended (a) to protect a representative sample of the typical ecosystems of the country, and (b) to ensure continued conservation of those species listed in appendices to the Convention.
3. There must be promotion and encouragement of research related to conservation, management and the rational use of natural resources. Particular attention needs to be paid to ecological and sociological factors.
4. Since development plans are often antagonistic to conservation needs, conservation and management requirements must be considered as an integral part of national and regional development plans.
5. Each country should, if possible, establish a single agency to deal with all matters covered by the Convention.

1. Though at the date of writing (April 1970) this has not yet been ratified.

GUARDIANS OF WILDLIFE

As already noted in connection with the Boyle Report, the arrangement in Nigeria was formerly that three government departments—Administration, Police, and Forestry-were responsible in various ways for wildlife management. Later, the Forestry department alone took over the responsibility, and this is the situation at the present time. The Forestry departments of the Northern, Western and Eastern Regions (and later the Mid-West region as well) each formulated their own laws and methods of protecting wildlife. A game warden was eventually appointed in each region, but because of lack of funds, it was not possible to have really active, well-supported game departments. In the early 1960s, a committee headed by P.C.Randell (then Chief Conservator of Forests, Northern region) tried to bring the various regional wildlife Ordinances into line.

Since 1959, the interests of wild animals in Nigeria have been the special concern of the Wildlife Preservation Committee, composed mainly of the Chief Conservators of Forests. This committee has met ten times since its first meeting in Enugu. Some of the earliest recommendations and suggestions were about the formation of reserved areas, the development of zoological gardens and a Museum of Natural History, the necessity for good wildlife laws, and control of the export of wild animals. At the original meeting, the committee expressed concern at the large numbers of animals, including a number on the protected list, which were being exported from Kano without export or capture licences. The necessity for appointing a wildlife adviser to the government has been suggested at practically every meeting of the committee. Although the committee has been an immense help in stimulating interest, allowing an exchange of ideas, and formulating policy, one has the impression that many of its good suggestions have never come to anything because all decisions have had to be approved at a higher government level. Also, one day per year does not give enough time for dealing with all the problems of Nigerian wildlife. Maybe the right moment has come for setting up a rather different arrangement, under which there would be a committee of wildlife experts who, in association with foresters, administrators and others, are able to meet often to deal with specific topics as they arise, in addition to more frequent regular meetings.

Last year, 1969, the Wildlife Preservation Committee appointed three small sub-committees, of six people each, to review certain problems and to make recommendations to the government. It was felt that small groups interested in wildlife could probably consider these problems in greater detail than a larger group of forestry specialists only able to meet infrequently. The three groups are to consider 'National Parks and Game Reserves', 'Legislation', and 'Education and tourism'. It is to be hoped that some positive action will be taken when the recommendations of each committee are known.

One hopeful sign is that many of the States in Nigeria are now anxious to look after their wildlife resources. A survey of the present position and of plans for the future in each of the States reveals that:

1. Most States have a desire to do something about their wildlife resources (replies in that sense have been received from 9 out of 12);
2. None of the States have trained ecologists able to supervise and organize the creation and management of reserved areas;
3. Most States have not allocated sufficient funds for creating reserved areas and ensuring enforcement of game laws; and
4. Some States do not appear to fully distinguish between a zoological garden and a game reserve.

A FEDERAL WILDLIFE SERVICE

Nigeria is now divided into twelve States, each with its own Forestry Department responsible for the wildlife of the State. This is clearly an unsatisfactory condition, and one that is likely to be detrimental to the future of wild animals in the Federation. A more satisfactory arrangement would be to have a central organization to coordinate policy throughout the Federation and to ensure that the same laws, management programmes and organizational procedures are applicable throughout the country. A cen-

tral organization will also be more economical to run, and will ensure the best use of trained zoologists and ecologists who are an essential part of a wildlife organization. There will be difficulties in communications, but I think that these are outweighed by the advantages. The exact relationship between Federal and State authorities will have to be worked out, but the States have everything to gain from such an arrangement. Other African countries with well-managed wildlife resources have a single independent organization to deal with all wildlife problems. The routine running of reserved areas can be undertaken by individuals in the State itself, and funds derived from wildlife should remain in the State of origin and can then be devoted to further wildlife research and conservation. Perhaps at a later time, when there are more Nigerian zoologists with ecological and wildlife management training, there will be a case for greater independence of each State in its wildlife policies. Any wildlife and conservation work requires highly trained personnel and at the present time there are hardly any Nigerians with this type of training, but one hopes that this will change in the next few years. In the meantime, it is probably necessary to recruit non-Nigerians to do the job. With a single wildlife department, a specialist can be available to give advice to any State.

Naturally some States have a better wildlife potential than others. It would seem to be sensible, therefore, in the first instance to concentrate on those areas which are of National importance or are of particular importance to conserving rare species, and where there is sufficient interest and enthusiasm to make any project a worthwhile enterprise. It is because of lack of funds and trained staff, as well as the importance of a coordinated system, that I think a Federal Wildlife Service is the best solution to act as an advisory, policy-making organization. Another possibility which should be investigated is the formation of an autonomous National Resources Board (as in Zambia), which is answerable directly to the Head of State and is responsible for soil, water, vegetation and wildlife conservation in the country.

Many of these suggestions were first expressed 30 to 40 years ago, which shows that there has not been much progress. Certainly there has been some progress, but it has not been fast enough or determined enough to counteract the gradual destruction of the wildlife resources of Nigeria. As each year passes, it will become more difficult to build up the wildlife of the country to be the national asset that it ought to be and that the country deserves to have. In view of the fears which were first expressed so many years ago, it is in some ways remarkable that there is still any wildlife left at all.

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The Present Status of Wildlife Conservation in Ghana

E.O.A.ASIBEY[1]

INTRODUCTION

It is widely accepted nowadays that although the preservation of limited areas is of value for purposes such as scientific study, the main emphasis should be on conservation rather than preservation. Wildlife Conservation means wise use of wildlife, with prevention of waste and despoilment and maintenance or restoration of the quantity, quality and usefulness of wildlife. Ghana undertakes wildlife conservation in the Mole Game Reserve; the Shai Hills Game Reserve is in transition from preservation to conservation; and the proposed Volta Game Reserve is expected to be a wildlife conservation area. The Kujani Bush and the Owabi Water Works Game Reserves are examples of areas where there is complete wildlife preservation.

Wildlife conservation is as complicated, and requires equally specialized knowledge, as agriculture, forestry, veterinary and allied applied sciences. The complexity of wildlife conservation is only just beginning to be appreciated even by very well-meaning people. Now that man has become conscious of his environment which he has degraded, the ideas of wildlife conservation are becoming known to many people. In Ghana, for instance, the qualification until recently for entry into the Game Branch was ability to shoot and an unspecified interest in game.

FOUNDATION

Ghana's laws on wildlife, in the context of the British Parliamentary System of laws, date back to 1901, and game reserves were first legally constituted in 1909. Unlike some African countries, e.g. Uganda and South Africa, a Game Department with the duties of game preservation, was never established in Ghana. The enforcement of the Game Preservation Ordinance was made the function of Departments already fully occupied with other duties such as the supervision of agriculture, or of staff under a District Administrative Officer (then called District Commissioner). Consequently the effectiveness of wildlife preservation in the past depended largely on the interest and concern of the individual officer, and the amount of energy and time that his normal duties would allow him to devote to the subject. Some foresters like Mr. George Cansdale did express alarm at such an ineffective approach to the problem; Collins (1961) has described it as official apathy.

Meanwhile, in the late 1930s, some traditional institutions like the Asanteman Council created Game Sanctuaries under Native Ordinance and left their care to the Forestry Department. These areas are still legally Game Sanctuaries, but are regularly hunted and have failed as game preservation areas. For the period 1949-52 a Game Warden was appointed, without any staff and funds, to organize a Game Department. This, too, not unexpectedly was a failure.

In 1953, game preservation came within the duties of a Tsetse Control Department. The irony is that the avowed policy of the Tsetse Control Department was the eradication of tsetse flies through game shooting and habitat clearing along river and stream courses. The magnitude of such operations can be estimated by the fact that arms bequeathed by that Department have been sufficient to meet all the needs of the present Department of Game and Wildlife, and the ammunition will still last for another five years. Soon after independence in 1957, the Tsetse Control Department was abolished: the Forestry Department assumed responsibility for the enforcement of the Game Preservation Ordinance, and a Game Branch, which later became Ghana's first Game Department, was established. A new Act, "The Wild Animals Preservation Act, 1961 (Act 43)", was formulated under the Forestry Department, and although the Act is now overdue for revision to bring it into line with the modern concept of conservation of wildlife, it is upon this law that the Game

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Reserves of Ghana and the present status of woldlife conservation in Ghana depend.

Finally, in 1965 the Game Branch of the Forestry Department gave way to a Department of Wild Animals Preservation *de facto,* and at the end of 1967 a Department of Game and Wildlife *de jure* was established. The establishment of a National Wildlife Trust has now been suggested; the important thing is that we are now conscious of the need for wildlife conservation in Ghana. It is already late, but not too late, to build up the country's wildlife resources and repair the damage that was done to them, for the benefit of posterity.

THE STRUCTURE

The Department of Game and Wildlife is headed by a Chief Game and Wildlife Officer, supported, in theory, by professional, technical and administrative staff. It is "in theory" because of the most serious problems of the Department is lack of suitably qualified personnel who are genuinely interested in the task of a wildlife conservationist—to be a jack of all trades and a master of some. The staff list of the Department as at December 1969 is set out in Table 1:

TABLE 1: ESTABLISHMENT LIST OF THE DEPARTMENT OF GAME AND WILDLIFE AS AT DECEMBER 1969

Grade	Establishment	Strength	Vacancies
1. Chief Game and Wildlife Officer	1	1	–
2. Game Warden	1	–	1
3. Senior Assistant Game Warden	3	1	2
4. Assistant Game Warden	4	%	2
5. Senior Game Protection Officer	2	3	1+
6. Game Protection Officer	2	–	2
7. Zoo Superintendent	2	1	1
8. Senior Executive Officer	1	1	–
9. Higher Executive Officer	1	l	–
10. Senior Game Ranger	2	–	2
11. Game Ranger	15	5	10
12. Zoo Supervisor	2	1	1
13. Executive Officer	4	1	3
14. Senior Game Scout	5	5	–
15. Clerical Officer	9	3	6
16. Head Keeper	2	2	–
17. Store Keeper	2	1	1
18. Mechanical Superintendent	1	–	1
19. Draughtsman	1	–	1
20. Assistant Catering Officer	1	–	1
21. Camp Supervisor	l	1	–
22. Game Scout	65	30	35
23. Game Assistant	55	31	24
24. Game Guard	15	3	14
25. Zoo Keeper	27	7	20
26. Clerical Assistant	15	13	2
27. Typist	6	3	3
28. Store Assistant	2	1	1
29. Telephone Operator/Telephonist	1	1	–
Total	248	118	130

Besides these established posts there were also 275 temporary personnel employed on a daily-rate basis.

The authorized strength of the Department's staff (excluding temporary labourers) has steadily increased from 38 in 1960, to 55 in 1965, and to nearly 250 in 1969. The foundation is now laid ready for the structure to be built. Although people are now beginning to see a career giving reasonable prospects in wildlife conservation, it was and still is

hard to find enough men who want to enter into this field. There is hardly any encouragement that is commensurate with the risks, skill and knowledge that the job demands. The few dedicated staff in service are constantly discouraged and frustrated by conditions, and by the apathy and attitude of their countrymen who are supposed to be well-meaning and knowledgeable.

The staffing problem is being solved by the setting up of three categories of training. These are:

1. Pre-entry and in-service training based at the Mole Game Reserve offers training for the lower technical staff. The pre-entry course is broadly orientated to enable people who are not used to living in the wild to build up their stamina and adapt themselves to the work of Wildlife personnel. It presupposes that the candidate is keen and interested in the job ahead. The broad field covered deals with discipline; fire arms; identification of fauna and flora; anti-poaching and patrolling; guiding and interpretation, including mapwork; constructional work; general health and hygiene; wildlife policy and economics; law and some basic administration. This locally based and orientated course forms the backbone of the efficiency of the Department in general and conservation work in particular. It is anticipated that this course will be opened to students from other African countries who wish to avail themselves of the training we offer. When this does occur, the scope of the training will be widened.

2. Middle Grade Technical Officers are either trained at the College of African Wildlife Management, Mweka, Tanzania or at any of the local Forestry, Veterinary or Agricultural training institutions. The training offered by these institutions is naturally biased towards their own needs and requirements. None the less, they provide a discipline which makes it easier for the wildlife aspects to be added to during the course of the in-service training mentioned above. The Middle grade technical staff can be promoted to Senior Technical staff grade by experience, and by in-service training.

3. The professional grade officers are university trained graduates who have passed through a Biological Sciences, Geography, Forestry, Agriculture or Veterinary Training. They should be capable of scientific investigation and their training, while in the service, is geared towards that end.

These ideals have not been achieved yet but they dominate our staffing scene; this is considered an essential condition of the modern concept of wildlife conservation. The old system of being a good shot and trigger-happy was all very well and good for the preservation era, but it is not valid when every sum of money spent needs to be justified.

LAW ENFORCEMENT

The administration of the Wild Animals Preservation Act is the duty of the Chief Game and Wildlife Officer but he is helped, legally, by the Police Service in the enforcement of the laws pertaining to wildlife. However, the Departmental staff must be able to prepare court cases effectively before the Police take over prosecution. It is very rarely that the Police make arrests connected with offences under the Act on their own initiative. This situation is largely due to ignorance. It is for this reason that it now behoves the Department of Game and Wildlife to ensure that the Police do get to know the animals of the country: only then are enforcement measures likely to be effective. Naturally, at present, the Police Service concerns itself primarily with crime, law and order and considers wildlife offences as of minor significance. Law enforcement is therefore very weak indeed and the understaffed Department is not able to give effective protection to the few reserves, let alone the wildlife of the country in general. However, measures are being taken to revise the laws, and to adopt a new system which can operate reasonably well with a smaller number of staff than is currently required.

Despite such moves, all present indications, based on available knowledge, indicate that the future of wildlife in Ghana lies in specially declared reserves and conservation areas. Outside areas specifically set aside for wildlife, some species of small mammals and wilflife can survive and even thrive under changing systems of land use and under changing agriculture and forestry techniques and practice; but larger mammals will be doomed to extinction. Wildlife management is compatible with modern forms of land use but, due

to ignorance and prejudice, the old ideas still persist. Wildlife survival is expected to be enhanced by a new approach which emphasizes the economic value of wildlife as a source of direct income to land owners and to the country at large.

UTILIZATION OF WILDLIFE

The survival of wildlife depends upon the uses to which it can be put. The politician, the ordinary people and all concerned, need to be satisfied that any sacrifices made in respect of such uses, for the cause of wildlife conservation, are justified. This justification varies from plate to place, but is generally summed up in terms of aesthetic, cultural and educational value, prestige, and the concern for posterity. The quality of the environment in which man exists is now coming to be accepted as related to the use of wildlife. This widening of horizons may, in the forseeable future, include the spiritual value of wildlife as well. To this list, I venture to add protein or food production. The emphasis in any evaluation of wildlife may be on education and recreation in a developed country and on tourism in East Africa, but I feel that in West Africa it needs to be on food, ordinary people are to identify themselves with the conservation movement. None the less, all these kinds of use presuppose the possession of a wildlife resource.

In East Africa, until recently, there was poaching of big game for ivory, rhino horn, leopard skin etc. In West Africa, poaching has always been for meat, with skins and ivory no more than natural by-products of the poacher's activities. One can hardly, if ever, in West Africa find big game that has been killed and allowed to rot after the removal of just a part of the animal. Yet it is easy enough to protect the really big game if Governments mean to do so. Big game hunting requires effective weapons whose use Governments can prohibit. But the lesser game which the West African requires for the bushmeat trade can be drastically reduced even by snares.

The over-utilization of wild animals as a source of food poses a serious problem in the present state of wildlife conservation in Ghana. Table 2 below gives a list of animals recorded as entering into the bushmeat trade in Damongo, Techiman and Accra. In Damongo, warthog produced the largest quantity of meat with the giant forest hog producing the least. In Techiman Market, baboon was the most important and tree pangolin the least important, and in Accra the grasscutter[1] was the most important source of bushmeat.

In one market in Accra, during one year, 73 tons of grasscutters made up of 15,564 animals were sold at the equivalent of US 373,000. Asibey (1969) estimated the annual yield of bushmeat for Ghana to be 8,486 tons valued at US $7,358,172. This is a conservative estimate.

In a protein deficient country, with a good market for wild animal meat, any wildlife conservation policy that ignores human hunger may be useless or very expensive indeed. It has been essential to work on the meat production potential of wildlife alongside with the more widely accepted uses of wildlife such as tourism. It is unfortunate that when financing projects in developing countries, many people tend to ignore the fact that the native fauna forms a considerable biomass and is of high economic value as food source. If even a nominal proportion of capital investment and manpower of West African countries were spent on wildlife projects, it would soon be evident that wildlife has a high economic potential. Other direct and indirect benefits mentioned above can be obtained side by side with the use of wildlife for meat.

TOURISM AND ACCOMMODATION

There has been a general belief that wildlife can never be significant in terms of tourism for Ghana. This well known theory has done a lot of harm to wildlife conservation, which will continue as long as the tourist value of wildlife constitutes the dominant justification for the expenditure of public funds and private investment in wildlife conservation. It must be stressed that it takes time to increase the numbers of animals where they have been ruthlessly exploited. Ghana is in no exception to this general rule, and the exploitation of wildlife continues. However, the Mole Experiment indicates that there is high

1. The cane rat *Thryonomys swinderianus.*

TABLE 2: WILD ANIMALS OF THE BUSHMEAT TRADE OF GHANA (Listed in order of importance)

Damongo 1964/65 (Northern Guinea savanna)	Techiman 1967/68 (Semi-deciduous forest)	Accra 1968/69 (Coastal plains savanna)
1. Warthog	1. Baboon	1. Grasscutter
2. Baboon	2. Warthog	2. Giant Rat *(Cricetomys)*
3. Hartebeest	3. Grasscutter	3. Royal Antelope
4. Bushbuck	4. Hartebeest	4. Bushbuck
5. Crowned Duiker	5. Kob	5. Bat
6. Aardvark	6. Bushbuck	6. Green Monkey
7. Grasscutter	7. Roan Antelope	7. Crowned Duiker
8. Roan Antelope	8. Aardvark	8. Black Duiker
9. Buffalo	9. Waterbuck	9. Red River Hog
10. Waterbuck	10. Oribi	10. Monitor Lizard
11. Kob	11. Crowned Duiker	11. Togo Hare
12. Patas Monkey	12. Green Monkey	12. Mongoose
13. Crested Porcupine	13. Patas Monkey	13. Tree Hyrax
14. Oribi	14. Red-flanked Duiker	
15. Green Monkey	15. Crested Porcupine	
16. Colobus Monkey	16. Buffalo	
17. Crocodile	17. Red River Hog	
18. Reedbuck	18. Reedbuck	
19. Hunting Dog	19. Bay Duiker	
20. Giant Forest Hog	20. Colobus Monkey	
	21. Royal Antelope	
	22. Crocodile	
	23. Elephant	
	24. Genet Cat	
	25. Monitor Lizard	
	26. Hippopotamus	
	27. Puff Adder	
	28. Civet Cat	
	29. Yellow-backed Duiker	
	30. Tree Pangolin	

tourist potential provided that West African Governments start in time to protect wildlife, so as to ensure numbers of animals can and will increase. Mole shows that this is possible and also that people like to come to new areas off the beaten track. The number of visitors staying in the reserve has grown steadily from 548 in 1964/65 to 1,437 in 1967/68 (Table 3).

TABLE 3: VISITORS TO THE MOLE GAME RESERVE

Year	Ghanaians	Foreigners	Total
1964/65	298	250	548
1965/66	229	392	621
1966/67	173	613	785
1967/68	404	1033	1437

The Department started a catering service by ordering food items on credit from a local store. This was an experiment to find out whether it was economically feasible to provide a Motel or hotel service for the limited number of visitors to the reserve. The result of this experiment, as shown in Table 4, indicated that although no account was taken of capital depreciation, the motel system, when properly run, can be a viable entity and any expenditure involved can be fully justified. If one bears in mind that the Mole facilities have never been advertised at home nor abroad, the significance of the growth is even more remarkable.

TABLE 4: MOLE GAME RESERVE MOTEL RUNNING COSTS FOR THE PERIOD JANUARY—JUNE 1968 (NC2. 45 = £1, NC1. 00 = US $1.02)

Income		Expenditure	
Accommodation	NC2.208.50	Wage-Staff	NC1,917.66
Transport and Guide Fees	596.50	Electricity	963.34
Catering	2,634.35	Water	277.47
Bar	1,425.34	Catering	1,658.57
Swimming Pool	21.05	Bar	1,131.01
		General Maintenance 5%	297.40
	NC6.885.74		NC6,245.45

A word of warning is essential. As a part of the normal running of the Reserve the number of permanent Motel staff is based on the slack period for visitors. At peak periods, one needs a larger staff to cope with the work involved. During such periods, staff can be withdrawn from other jobs to supplement the Motel staff. They are then debited against the Motel operations. If the Motel were separate, this would be impossible since it would be necessary to base staffing on peak visitor numbers; as a result revenue is then lost during the slack period due to high salaries and wages at a time when there is little or no income.

CONSERVATION EDUCATION

Educational lectures have been given to schools, colleges and universities, and undergraduate students are given vacation jobs to enable them to acquire first hand experience. It is most interesting that some of these students have either joined the Department or gone into an allied field on completion of their University studies. Overseas educational institutions are encouraged to come and use the educational facilities of our reserves on the same basis as other Ghanaian institutions. It is hoped to create the post of a Conservation Education Officer in the near future to cope effectively with the duty of making the public aware of the wide field for the utilization of wildlife resources. In this way, it is hoped that the general public will ensure that its wildlife heritage is properly managed.

The cultural significance of wildlife, is best appreciated by aged Ghanaians who have been brought up with wildlife and who are aware of the cultural value of wildlife resources. It is the so called "educated Ghanaian" who, out of ignorance, feels that wildlife is of little or no use except for its meat value.

FINANCE

There has been grave Government concern for wildlife conservation in Ghana. It appears

TABLE 5: FINANCIAL ALLOCATION FOR WILDLIFE CONSERVATION IN GHANA FOR THE PERIOD 1960-1970 (NC1.00 = US $1.02,NC2.45 = £1)

Year	Recurrent (NC)	Development (NC)
1960-61	42,660	—
1961-62	53,070	—
1962-63	46,280	—
1963-64	112,700	—
1965	82,660	246,700
1966	117,600	69,800
1966-67	140,000	69,800
1967-68	211,920	55,480
1968-69	282,000	92,650
1969-70	348,000	207,000
1970-71	350,000	167,820

that there has never been such a growing concern in the history of wildlife conservation or preservation in Ghana as there has been since 1960. This is reflected in the growth of allocation of funds for wildlife conservation (Table 5). The 1949-52 attempt failed for lack of funds and staff; now we have funds, and staff is becoming increasingly available. It is ironical that at present there is still indiscriminate slaughter of wildlife and game is not controlled although laws have been passed and funds are becoming increasingly available, because at the same time there are simply not sufficient trained personnel available to use the money and effectively administer the laws.

CONCLUSION

I agree with Collins (1961) that "To preserve game for the sake of preservation, to constitute game reserves haphazardly ignoring the basic wants of the population, is as foolish as to allow its indiscriminate slaughter. Game must be controlled and harvested. There must be laws and people and money to administer the laws." This sums up the present status of wildlife conservation in Ghana.

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Le Parc National du Niokolo-Koba. Premier des Grands Parcs Nationaux de la Republique du Senegal

A. R. DUPUY[1]

HISTORIQUE

C'est par un décret du 10 mars 1925 qu'est institué au Sénégal, en Haute-Casamance, un parc de refuge de 340. 000 ha environ. Tantôt situé à l'Ouest de la route Sénégal-Guinée tantôt assise entre la Gambie et le Niokolo, cette zone reste jusqu'en 1950 la terrain de chasse des peuplades Bassaris,une des races africaines dont l'activité essentielle demeure encore la chasse. Mais, c'est seulement en 1954 qu'un décret a créé le Parc National du Niokolo-Koba avec une superficie de 250. 000 ha environ. De 1954 à 1960 des agrandissements successifs ont porté sa superficie à près de 475.000 ha. En 1968, la réerve cynégétique de la Boucle du Damantan est rattachée au Parc National du Niokolo-Koba amenant la surface de ce dernier à près de 600. 000 ha. Dernièrement, le décret n° 69. 028 du 18 Septembre 1969 agrandit le Parc d'environ 226. 000 ha, en lui rattachant les territoires limitrophes bordant ses limites au Nord et à l'Est. Actuellement, le

1. Chef du Bureau des Parcs Nationaux, B.P. 37, Tambacounda, Sénégal.

Parc National du Niokolo-Koba couvre une vaste région représentant un ensemble protégé de près de 813.000 ha.

ORGANISATION-FONCTIONNEMENT

Depuis toujours, le Parc National du Niokolo-Koba avait été administré par le service des Eaux et Forêts (Ministère du Développement Rural). Mais ce service chargé de missions multiples (gestion des forêts, pêche fluviale, chasse etc...) n'avait pu consacrer les moyens nécessaires à la mise en valeur du Parc. Conscient de ce problème, le Gouvernement de la République du Sénégal, désireux de promouvoir le Niokolo-Koba dans le cadre d'une politique de développement touristique, décida en 1967 de réorganiser le Parc et de la rattacher directement à la Présidence de la République. Bénéficiant ainsi directement de l'impulsion gouvernementale, le Niokolo-Koba reçut rapidement les moyens indispensables à son expansion rapide.

Le Parc National du Niokolo-Koba est dirigé par un Conservateur nommé par décret assisté d'un sous-Directeur. Son effectif titularisé est de 37 surveillants de faune. A ces personnels, s'ajoutent 40 auxiliaires. Une main-d'oeuvre temporaire d'environ 200 personnes travaillent saisonniêrement sur les chantiers du Parc. Un assistant scientifique (écologiste ou vétérinaire) est prévu.

Le Parc est organisé militairement, les personnels possèdent donc une tenue uniforme, un paquetage, un fusil de guerre, jumelles, bidon etc... ainsi qui du matériel de campement.

Territorialement, le Parc est divisé en plusieurs zones de surveillance, chacune dirigée par un chef de zone ayant sous ses ordres des chefs de poste et des surveillants de faune ainsi que ses moyens propres (poste émetteur-récepteur, véhicules, bicyclettes etc...). Certains autres moyens sont groupés à l'échelon directionnel pour être détachés selon les demandes et au fur et à mesure des besoins (camion de dépannage, camion-benne, bull-dozer, graders, bâteau à moteur etc...). A la demande du Conservateur, l'armée met régulièrement à la disposition du service, un avion Piper ou un hélicoptère suivant le cas, pour les opérations de contre-braconnage ou les recensements de faune. La coordination du fonctionnement des zones et l'acheminement des ordres est rendu possible grâce à un réseau radio (BLU) suffisamment important, constitué par 6 stations fixes plus 3 véhicules radio.

Le parc automobile est composé de 15 véhicules tout-terrain, généralement de marque Land-Rover et Willys. L'implantation des postes de commandement est réparti comme suit: la direction est installée à Tambacounda (80 km du parc); la sous-direction, au campement de Niokolo-Koba ainsi que le garage, les magasins de réserves logistiques et de maintenance; un P.C. de zone â Badi, un autre à Niokolo, un autre à Dalaba et un autre à Damantan. Chaque P.C. a son poste de radio. Parallèlement aux implantations de postes fixes, il existe des postes saisonniers (qui sont repliés à la saison des pluies), répartis aux points de passage obligés et notamment à tous les gués des rivières. Par ailleurs, un groupe mobile fortement armé patrouille dans le Parc en permanence et peut agir également sur renseignements de manière très rapide. Le Niokolo-Koba a été l'un des parcs les plus braconnés d'Afrique mais depuis 1967, l'efficacité de son système de surveillance a permis l'arrestation de près de 350 braconniers. Cela laisse augurer favourablement de l'avenir.

LE TOURISME

Un Parc National doit répondre à plusieurs objectifs dont le principal est la Conservation de la Nature, la protection et la multiplication de la faune. Mais, il en est un autre tout aussi important qui est l'éducation du public et sa récréation. Tout cela est représenté par le tourisme au sens le plus large. En Afrique, la plupart des pays sont malheureusement sous-développés et par tous les moyens ils cherchent â faire rentrer de l'argent pour aider à leur développement. Le tourisme, industrie des temps modernes, reste pour la plupart une source de revenus indiscutables. Au Sénégal, le Gouvernement l'a bien compris en concrétisant son option par la création récente d'un Commissariat Général au Tourisme, d'un Bureau des Parcs Nationaux chargés de mettre en place dans un avenir

très proche, un Parc de type guinéen en Basse-Casamance, un Parc des Oiseaux dans le delta du fleuve Sénégal et un Parc de type sahélien dans le Ferlo.

Cet ensemble, directement rattaché au Premier Ministre attirera sans aucun doute de très nombreux visiteurs si l'on en juge par les résultats spectaculaires obtenus au Niokolo-Koba depuis ces trois dernières années. En effet, le Parc a reçu en 1966 un peu moins de 1. 000 visiteurs, 1967 en a vu plus de 2. 800,1968:3. 500, plus de 4. 000 personnes sont venues en 1969; nous en attendons près de 6. 000 pour cette saison. Plus de 1. 300 voitures et 400 avions circulent par saison sur les 600 kilomètres de pistes de visite du Parc ou se posent sur son terrain d'aviation. Dernièrement, des conventions ont été signées avec de grandes agences européenes de tourisme et, depuis décembre 1969, des Jets Charters arrivent chaque semaine à Dakar avec prolongation au Niokolo-Koba. Si le développement d'un Parc se mesure au nombre de visiteurs qu'il reçoit, nul doute que le Niokolo est en pleine expansion et d'ores et déjà en tête des installations similaires de l'Ouest et Centre Africain.

Sur le plan infrastructure touristique, le Niokolo-Koba est l'un des parcs le mieux équipé de cette partie de l'Afrique. En effet, l'hôtel de Siminti a une capacité d'hébergement de 1000 lits, il possède l'eau filtrée courante, l'électricité et 20 chambres climatisées; il possède donc déjà un standing élevé. Un campement de style folklorique installé à Badi a une capacité d'hébergement d'environ 60 lits et est composé d'un ensemble de cases. L'eau courante est installée à un bloc sanitaire commun au campement. L'installation de l'électricité est prévue. Enfin, le campement de Niokolo-Koba a une capacité d'hébergement de 50 lits environ et se trouve composé de trois îlots différents: un petit hôtel en dur, des bungalows en dur mais toît de chaume et des cases de style régional. L'eau courante et l'électricité existent dans l'ensemble. Ces trois installations sont actuellement gérées par une compagnie hôtelière privée (les Relais Aériens). Complémentairement, le service du Parc National a installé en des sites favorables (bords de la Gambie), des haltes aménagées réservées aux campeurs. Des miradors d'observation, des caches photographiques ont été réalisés aux endroits favourables. 600 kilomètres de pistes de visite existent actuellement, 300 autres sont en cours de réalisation. Enfin, pour les avions existent le terrain de Siminti (piste de 1. 300 m); un deuxième doite être prochainement construit à proximité du campement de Niokolo-Koba.

En ce qui concerne les prix de séjour, la Régie des Chemins de Fer organise, pour moins de 15.000 F CFA, frais de transport d'hôtel et toutes taxes comprises, un séjour de 48h au Niokolo-Koba. Dans ce tarif, le prix du permis de visite du Parc est compris (1. 000 F CFA). Pour les visiteurs, des voitures de location avec ou sans chauffeur, des cars pour les groupes, des guides et des pisteurs sont à leur disposition. Rappelons que le règlement intérieur interdit aux visiteurs de descendre de voitures, de quitter les pistes, de circuler de nuit etc… Pour les visiteurs venant avec leur propre voiture, en atelier de réparations et deux stations-service sont en place respectivement à Siminti et au campement de Niokolo-Koba.

LA RECHERCHE SCIENTIFIQUE

Sous l'impulsion du Conservateur qui est également Directeur de la Recherche Scientifique pour les Parcs Nationaux et, en liaison avec des spécialistes de l'institut Fondamental d'Afrique Noire de Dakar et du Muséum National d'Histoire Naturelle (PARIS), la prospection zoologique s'est poursuivi régulièrement. Outre, la recherche permanente menée par le Conservateur et ses collaborateurs, et portant plus spécialement sur l'inventaire systématique des Vertébrés et sur les effets des feux de brousse, diverses missions internationales se sont succédées de plus en plus nombreuses dupius 1967, au rythme d'une douzaine environ par an. Ces missions sont généralement sénégalaises (IFAN, Faculté des Sciences,—DAKAR) et bien entendu françaises (ORSTOM, Muséum, CNRS etc…) mais aussi anglaises (OXFORD, CAMBRIDGE) et américaines (Université ROCKFELLER, ILLINOIS, ARIZONA). Le but de ces missions était généralement l'étude des Mammifères et plus spécialement des Primates. Mais, l'Entomologie, l'Ecologie des Antilopes ont été traitées. Conjointement, des études ont été menées sur le cri des animaux (bio-acoustique), la Toponymie des lieux, l'Archéologie, l'Etnographie, l'Hydrographie, l'Hydrologie, la Cartographie etc… L'ensemble des résultats obtenus en ce qui concerne la recherche permanente a déjà fait l'objet de diverses publications en liaison avec **l'IFAN** et pour la plupart regroupées dans les Mémoires de l'IFAN n° 48-62 and 84 ainsi

que dans Mammalia et diverses autres revues spécialisées. Les divers compte-rendus des missions sont actuellement en cours de publication, notamment par le CNRS.

Les décomptes de faune (4 par an correspondant aux différentes saisons) et la mise a jour de l'inventaire systématique des Mammifères et des Oiseaux menés quotidiennement par le service du Parc National, a permis depuis 1967 de trouver dans le Parc 11 espèces nouvelles de Mammifères dont le Grand Pangolin *(Smutsia gigantea)*, la Loutre à joues blanches *(Aonyx capensis capensis)*, le Caracal *(Caracal caracal)*, le Guépard *(Acinonyx jubatus)*, la Nandinie *(Nandinia binotata binotata)*, l'Aulacode *(Thryonomys swinderianus)* etc… et plus de 160 espèces nouvelles d'oiseaux, ce qui porte actuellement à 71 espèces de Mammifères et à 324 pour les Oiseaux les espèces connues à ce jour dans les limites du Parc.

Pour les Mammifères, toutes les espèces connues de l'Afrique de l'Ouest sont pratiquement représentées au Niokolo-Koba, de la Souris naine à l'Eléphant, mais malheureusement la Girafe et le Damalisque ont été exterminés au début du siècle, d'une part par les épizooties qui sévissaient, d'autre part par un braconnage intensif (mais un projet de réintroduction est â l'étude pour ces deux espèces). D'après nos décomptes menés régulièrement depuis 1967, environ 150 Eléphants, 650 Hipopotames, 2.000 Buffles, 25. 000 Antilopes de toutes espèces réunies dont plus de la moitié représentée par le Cobe de Buffon et le Cobe onctueux, vivent au Niokolo-Koba. Les Lions sont estimés à une centaine, les Panthères, Caracals et Servals sont nombreux mais difficilement estimables. Le Guépard est présent mais extrêment rare car sur la limite de son habitat. Pour les Primates, 5 espèces sont connues du Parc dont 2 depuis l'année dernière: le Chimpanzé et le Colobe bai, tous deux à la limite nord-ouest de leur répartition géographique; ils ne sont représentés au Niokolo-Koba que par quelques dizaines d'unités. Seuls les Cynocéphales sont très nombreux (plusieurs milliers) ainsi que les Callitriches et les Patas. Les Phacochères sont communs et les Potamochères beaucoup moins rares qu'on ne le pensait.

En ce qui concerne l'Avifaune, les deux-tiers des espèces sont représentés par des oiseaux de type éthiopien, l'autre tiers étant représenté par l'apport de migrateurs paléarctiques et parmi ces derniers, ce sont les oiseaux d'eau qui dominent. Pour les éthiopiens, les oiseaux de savane sont les plus nombreux. Mais, le Parc étant implanté à une charnière bio-géographique comportant à la fois des biotopes soudaniens et guinéens, les oiseaux de forêt sont également bien représentés et notamment parmi la famille des Picidés. Pour terminer les Vertébrés, les Reptiles comportent 3 espèces de Crocodiles, 4 espèces de Tortues, des Varans, des Geckos, des Lézards. Les Serpents sont nombreux mais peu visibles, parmi lesquels: le Python de Séba, le Naja à cou noir et la Vipère heurtante sont les plus souvent rencontrés. Pour terminer, signalons qu'il existe plusieurs espèces de Batraciens et plus de 61 espèces de Poissons.

En ce qui concerne les Invertébrés, l'inventaire Entomologique est en cours et comporte d'ores et déjà plusieurs centaines d'espèces dont certaines ne sont connues que du Parc (Termites et Mantes notamment).

Pour la Botanique, plus de 1. 500 espèces végétales ont été à ce jour répertoriées mais l'inventaire est loin d'être exhaustif.

Conjointement à ces recherches, sur le terrain, le service correspond en permanence avec les grandes organisations internationales chargées de la Conservation de la Nature (UICN, World Wildlife Fund, UNESCO). Il fournit aux nombreux Muséums et Centres de Recherche qui lui en font la demande, des renseignements à thème zoologique. Il a mis sur pied une bibliothèque spécialisée et une photothèque. Il a démarré l'étude des cris d'animaux par l'enregistrement sur bandes. Le service organise en outre, des stages pour la formation des surveillants de faune, des causeries pour les groupes de touristes avec projection de diapositives et de films, des conférences pour les associations. Enfin, des camps d'initiation à la Nature sont à l'étude en liaison avec l'Université de Dakar.

La recherche Scientifique au Niokolo-Koba connait actuellement une activité soutenue. Mais, celle-ci va encore s'accroître dans un proche avenir avec la construction prévue à proximité du campement du Niokolo, d'un laboratoire de Recherches Ecologiques ouvert aux chercheurs du monde entier.

PERSPECTIVES D'AVENIR

Avec la création récente du Bureau des Parcs Nationaux rattaché au Premier Ministre et que sera chargé de diriger les 4 Parcs Nationaux (un par région bio-géographique) dont doit être pourvu le Sénégal, la Conservation de la Nature, sa mise en valeur et son avenir sont assurés.

En ce qui concerne le Parc National du Niokolo-Koba il doit atteindre prochainement (avant 1975), le seuil des 15. 000 visiteurs, cela compte tenu de son taux d'accroissement depuis 1967. Pour répondre à ces prévisions encourageantes, un projet de financement en ce qui concerne le développement, l'aménagement ou mieux, la création nouvelle d'infrastructures d'accès, d'accueil, a été demande au Fonds Français d'Aide et de Co-opération. Le montant du projet s'élève à près de 5000 MILLIONS de F CFA. Cet investissement excessivement important, permettra au Niokolo-Koba de faire face à l'accroissement extraordinaire en si peu de temps, du nombre de visiteurs, ce qui lui permettra d'atteindre rapidement la première place des Parcs Nationaux de l'Ouest Africain, place qui lui est due pour son antériorité.

Le Sénégal, depuis 1967 est certainement le pays de l'Afrique francophone qui a consenti le plus gros effort (législatif, humain, financier et matériel) pour assurer à la Nature en général et à sa faune en particulier, le maximum de chances de survie. Dans le même temps mais toujours avec un souci d'équilibre, il a opté pour une politique de développement touristique basée sur la visite de ses sanctuaires naturels et de son folklore original. Dans la course que les Etats Africains ont amorcé sur le plan touristique, nul doute que la République du Sénégal qui fournit actuellement un effort sérieux, ne soit prochainement récompensée par un afflux excessivement important de touristes internationaux, juste récompense de sa politique de développement, basée sur la mise en valeur de ses ressources naturelles.

The National Parks and Game Reserves of Dahomey[1]

T. HOUNTO-HOTEGBE[2]

There are two National Parks in Dahomey; these are the 'Parc National du W du Niger' and the 'Parc National de la Pendjari'.

PARC NATIONAL DU W DU NIGER

This National Park is in the extreme north of Dahomey along the southern bank of the river Niger. It covers 502,050 hectares. The flora is essentially a savanna one consisting of *Daniellia oliveri, Pterocarpus erinaceus, Afzelia africana, Burkea africana, Prosopis africana, Anogeissus schimperi, Acacia campilacantha, Acacia samoryana, Detarium senegalense, Butyrospermum parkii, Anona senegalensis, Terminalia glaucescens, Combretum verticillanum, Trichilia emetica, Tamarindus indica, Diospyros mespiliformis, Khaya senegalensis, Bombax buonopozense, Adansonia digitata and Ekebergia sengalensis.*

The fauna is very abundant, and it includes the following species: roan antelope, hartebeest, kob, Waterbuck, bushcow, several species of duikers, bushbuck, Sitatunga, warthog, hunting dog, several species of monkeys, hippopotamus, crocodiles, and monitor lizards. The most obvious birds are guineafowl, francolins, great and lesser bustards, crowned cranes and several species of vultures, kites, and hawks.

The park was established on 3 December 1952.

1. Re-written editorially from notes in French.
2. Directeur du Départment des Eaux, Forêts et Chasses, Cotonou, Dahomey.

PARC NATIONAL DE LA PENDJARI

This National Park is in the north-west of the country, and it covers 275,500 hectares. The flora is a type of Soudano-Guinean savanna with *Combretum, Acacia* and *Terminalia* and a well-developed herbaceous layer. Along the length of the Pendjari river is an extensive gallery forest with *Cola laurifolia, Diospyros, Anogeissus* and *Acacia ataxacantha* forming an almost impenetrable forest. In addition there are *Mitragyna inermis,* some *Khaya senegalensis* and borassus palms.

The fauna is abundant and varied, and similar to that in the National Parc du W. There are many roan antelope, Waterbuck, kob, reedbuck, bushbuck, hartebeest, korrigum (or topi), Sitatunga, oribi, bushcow (or buffalo), warthog, lion, hippopotamus and elephants. The bird fauna is also very abundant and varied.

The park was established on 6 May 1961.

TOURIST VALUE OF THE NATIONAL PARKS

In order to promote hunting safaris the two National parks, which are strictly protected, are flanked by three large hunting reserves or 'zones cynégétiques'. These are:

1. The Djona reserve: situated on the southeast of the Parc National du W. It has an area of 225,000 hectares, and there are control posts at Alfakoara and Guene.
2. L'Atakora reserve, situated to the southwest of the Parc National du W and the southeast of the Parc National de la Pendjari, adjoining the two parks. It has an area of 175,000 hectares, and there is a control post at Keremou outside the reserve.
3. The Pendjari reserve is on the westernside of the Parc National de la Pendjari. It has an area of 200,000 hectares. There is a large camp at Porga, and control posts at Porga and Batia. This reserve is very popular between December and June.

There are about 250 kilometres of tracks in the Parc National de la Pendjari and the Pendjari reserve.

OTHER RESERVES IN DAHOMEY

There are many other forest reserves throughout the country. Customary hunting is allowed in some of the forest reserves where there are large mammals. Because of their importance, size, and fauna, customary hunting is allowed in the following reserves:

Monts Kouffe: 180,300 hectares
L'Alibory: 256,000 hectares

But there are some reserves where hunting is forbidden. These are:

Forest Reserve	Area (hectares)	District	Date established
Toui	29.030	Parakou et Save	30 January 1954
Ouenou-Benou	30.000	Parakou	15 October 1943
Quari Maro	107.500	Parakou-Djougou	2 December 1946
Trois rivieres	259.500	Parakou- Nikki-Kandi	6 September 1949
Oueme superieur	177.540	Djougou	10 July 1952
Goungoun	73.200	Kandi	14 April 1950
Sota	53.000	Kandi	16 May 1947
Ketou	11.000	Ketou	9 May 1946
La Lama	16.000	Allada	24 February 1946

PROTECTION OF THE FAUNA

The present regulations are adequate for the protection of the fauna (being based on a

decree of 18 November 1947, as subsequently amended). But the administration of the 'Eaux et Forêts' department still does not have sufficient people or equipment for all its duties. However, hard work and vigilance on the part of all the personnel have resulted in a relatively satisfactory control of poaching. The National Parks and the hunting reserves, especially the Pendjari,are the only ones where there is adequate maintenance and management.

For a recent account in English of the two National Parks in northern Dahomey see:- Happold, D. C. D. and Philp, B. 1971. The National Parks of Northern Dahomey. *Nigerian Field* (in press).—Ed.

The Yankari Game Reserve: 1955-1970

M. O. N. JIBIRIN JIA[1]

At the end of the second World War, the then Director of Forests, Mr. F. S. Collier, suggested that the few remaining wild animals in Nigeria should be preserved. Because of the growing human population and extensive agriculture, many animals were being killed and the remainder survived only in forest reserves and uninhabited parts of the country; it was only a question of time before these were killed as well. In order to support his suggestions to the government, Mr. Collier wrote and illustrated articles for the journal 'The Nigerian Field' with the hope of stimulating public interest among both Europeans and Africans.

The first Nigerian Minister of Natural Resources in the Northern Region was Mallam Mohammadu Wali of Bornu. During his tenure of office he visited the Republic of the Sudan where he was taken up the White Nile on board a steamer through one of the National Parks. He was sufficiently impressed that on his return to Nigeria, he thought there should be an area in northern Nigeria where animals could be observed like those he saw in the Sudan. As a result the Game Preservation Committee was formed to look into the possibility of establishing a game reserve.

The first meeting of the Northern Region Game Preservation Committee was held in 1953; general matters of importance were discussed including the necessity of appointing a Game Warden, and finding a suitable stretch of uninhabited woodland where animals still existed. Two large areas of woodland were considered, one in the Duguri district of Bauchi Province, and the other in Borgu Division of Ilorin Province.

During the second meeting of the Committee in March 1954, it was agreed that a Game Warden was essential and that the woodland in Duguri, Fali and Gwana districts of Bauchi Province would be ideal for a pilot Game Reserve. This, in fact, was one of the areas suggested by Col. Haywood during his special mission to West Africa in 1931. Mr. Robert Coulthard, formerly a veterinary surgeon with 29 years in government service, was selected as the first Game Warden in Nigeria. On 1 January 1956 he took up full responsibility as Game Warden in the Yankari Game Reserve.

The Yankari Game reserve originally had an area of 720 square miles (186,473 hectares) and it is situated some 45 miles (72 km) to the southeast of Bauchi town in the North-eastern State. The survey and demarcation were made in 1955 by the Forest Division of the former Ministry of Animal and Forest Resources of the Northern Nigeria. The reserve was extended in 1968 to include a further 82 sq. miles (19,237 ha) in order to protect the elephants and other game animals that frequent the Tonglong valley, to the south and west of the reserve, at certain times of the year. The total area of Yankari Game Reserve is now 802. 04 sq. miles (207,720 ha).

1. Chief Game Warden, Game Preservation Unit, Forestry Division, Bauchi, North-East State, Nigeria.

The reserve is on a gently undulating plain rising to the north and to the south. In the centre is a sandridge running east to west, which drops gently towards the north and abruptly towards the south forming distinct landmarks in places. On the west and south boundaries, there are some other isolated ridges. The main river, the Gaji, flows through the reserve from northwest to southeast, and it is joined by several tributaries. Most of the reserve is covered by deep sands although in a few highlying areas gravel appears on the surface. The flood plains *(fadamas)* of the Gaji and Yuli rivers are covered by river alluvium.

The reserve is situated on sedimentary rocks, probably of Cretaceous and Tertiary origin. The area northwest of the Gaji river is underlain by sandstones, with crystalline rocks of the Precambrian Basement complex appearing about half a mile to the northwest of the entrance. In places, there are exposures of hard, medium-grained dark red sandstones. About half a mile west of the river Gaji there is a sandstone escarpment about 200 ft (60 m) high running parallel to the river. At one place, known as Wikki, a spring emerges from a 30 ft (9 m) high sandstone escarpment and the water flows out into a wide stream which runs into the Gaji river. The water is crystal clear, fresh and fast-running. The temperature of the spring water remains constant at 88°F (31 °C). There are other springs along the Gaji valley, but none of them are as spectacular as that at Wikki.

The Gaji river is perennial and divides the reserve into two unequal areas: two thirds of the reserve lie on the right bank (west) and one third on the left bank (east). The surrounding woodlands are waterless in the dry season (December-May) and consequently most of the game animals are concentrated along the Gaji river and the *fadamas.*

The reserve is mostly northern guinea savanna which is quite open, although more or less closed in certain localities. The average height of the trees is about 20-30 ft (6-9 m). The savanna vegetation is similar to that throughout most of the northern guinea region; the commonest trees are *Afzelia africana, Pteleopsis habeensis, P. suberosa, Burkea africana, Pterocarpus erinaceus, Combretum* spp., Terminalia sp, *Zisiphus* spp., *Afrormosia* (=*Pericopsis*) *laxiflorus, Strychnos* spp., *Lannea* spp., *Prosopis africana, Balanites aegyptiaca, Kimenia americana,* and *Nauclea* sp. Along the edges of the Gaji river are fine gallery forests of *Khaya senegalensis, Daniellia oliveri, Pterocarpus erinaceus, Vitex* spp. and *Raphia sudanica,* and in some of the forest outliers there are *Anthocleista, Malacantha, Astonia,* and *Antaris.*

The reserve contains most of the animals found in the Northern States of Nigeria (see Appendix), with the exception of kob, Dorcas gazelle, Dama gazelle and Sitatunga. There is no evidence that the rhinoceros lives in Nigeria at present. Some kob live outside the reserve to the south.

ADMINISTRATION AND DEVELOPMENT

The first task was a survey of the animals and plants, and demarcation of the reserve boundaries. This was followed by the establishment of the base camp at Mainamaji at the entrance to the reserve, and the location of game patrol posts around the perimeter of the reserve. During four years from 1956-1960, 113 miles (182 km) of jeep track were made.

At first, there were two types of uniformed staff: the game scouts who were local ex-hunters with knowledge of the reserve, and game guards who were formerly in the police or army, but in April 1967 the Game scouts were merged with the Game guards. In July 1959, I was posted as Senior Forest Assistant to the Game Preservation Unit for training as the Assistant Game Warden. During the first four years of the Game Preservation Unit, the staff consisted of one Game Warden, one Assistant Game Warden, five game guards, four game scouts, one clerk and one driver.

The years 1961-63 saw many activities: a further 51 miles (82 km) of jeep track were constructed including the 27-mile (44 km) Ahmadu Bello road from the basecamp to Wikki; new game patrol posts were established around the perimeter of the game reserve; the numbers of staff were increased; and the reserve was opened to the public. Because the water supply at Mainamaji was poor and it was a long way to where the game animals concentrate in the centre of the reserve, it was decided to develop a site

near the Wikki warm springs as a visitors' camp. At Wikki, there is good crystal clear water and the game animals are within easy reach of the camp. The first Game Warden, Mr.R. Coulthard, died in May 1961 and his name is remembered by naming one of the roads as 'Coulthards Way'.

After seven years of strict protection and the development of jeep tracks, the reserve was first opened to the public from 1 December 1962 to 31 May 1963. Because of the bad road from the base-camp to Wikki, visitors left their cars at the base-camp and travelled into the reserve by Game Unit Land-Rovers. They lived in tents since, in those days, there were no buildings of any sort at Wikki. The reserve was open for six months during the dry season, but it was closed during the wet season from June to November since new foliage and tall grass prevent easy observation of animals, most jeep tracks, especially along the marshy plains, become soft and overgrown by long grass, and many of the animals breed during the rains and they require quietness at this time.

The highlight of the fourth open season was the creation of the Yankari Catering Rest-house (now known as Yankari Warm Springs Restaurant) administered by the Ministry of Information. The resthouse was opened on 1 December 1965, to give better amenities to visitors to the reserve. There are thatched chalets, most of them with their own washing and toilet facilities, a bar and terrace with easy chairs, and a dining room where all meals can be obtained. These improved facilities allowed the sixth open season to be prolonged for one month from 1 December 1967 to 30 June 1968. Subsequently the open season was extended to eight months, from November to June. Visitors during June and November were more or less confined to Wikki camp, but they seemed to enjoy themselves swimming in the warm springs. During the 1968-69 season there were about 2,000 fee-paying visitors.

The present open season (November 1969-June 1970) shows many improvements from the early days. There is better accommodation at Wikki with electricity and running water, many tracks cover the whole of the reserve, and visitors can be taken out twice a day in special game-viewing Land rovers. The herds of animals have increased during the 15 years of protection, especially elephants, buffalo, Waterbuck, roan antelope and hartebeest.

For further information on Yankari Game Reserve see:-

Happold,D.C.D. 1970. The rodents of Yankari Game Reserve. *Mammalia* 34: 491-495.

Henshaw, J. and G. S. Child. 1971. The game reserves and game animals of Nigeria, *Oryx* (in press).

Keay, R. W. J. 1962. Yankari Game Reserve, Bauchi Province, Northern Nigeria. Dept. For. Res. Tech. Note 17. 9 pp. (Vegetation Survey).

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APPENDIX

THE PRINCIPAL SPECIES OF MAMMALS, BIRDS AND REPTILES IN YANKARI GAME RESERVE

Mammals

Aardvark	Genet	Leopard	Reedbuck
Baboon	Giraffe	Lion	Roan antelope
Bushbuck	Green (Vervet) monkey	Korrigum (Topi)	Serval
Bushcow (Buffalo)	Grimm's duiker	Oribi	Spotted hyaena
Cheetah	Hartebeest	Patas monkey	Warthog
Civet	Hippopotamus	Porcupine	Waterbuck
Cutting-grass (cane rat)	Honey badger (Ratel)	Red-fronted gazelle	White-tailed mongoose
Elephant	Jackal	Red-flanked duiker	

Birds

Black-bellied bustard *(Lissotis melanogaster)*
Lesser bustard *(Lissotis senegalensis)*
Sudan bustard *(Choriotis arabs)*
Crowned crane
Bateleur Eagle
Fish Eagle *(Cuncuma vocifer)*
Francolin spp.
Spurwing goose
Guineafowl
Hadada
Hammerkop
Great white heron
Buff-backed heron
Ground Hornbill
Sacred Ibis
Stone-partridge *(Ptilopachus petrosus)*
Pelican sp.
Sandgrouse sp.
Secretary-bird
European stork
Marabou stork
Vulture spp.

Reptiles

Crocodile sp.
Nile monitor
Royal python

Progress in Wildlife Conservation in Western State of Nigeria

A.ADEKUNLE[1]

INTRODUCTION

In recent years, the Government of the Western State has shown a new awareness and concern for the conservation of the natural environment. In the past, no serious attempt had been made to conserve the fauna, and most of the effort was directed towards protection of the flora. At the beginning of this century, a fairly large part of Nigeria was covered with forests (high forests and savanna) inhabited by large animals. Some of these forests were protected by taboos and folklore, but now some of their species of animals have been killed out and others are in the process of extermination through hunting. However, there is still a chance of preventing their total destruction. The importance of wild-life as a source of food-supply to rural communities, which may be unable to afford domesticated animals, cannot be ignored. A large number of them depend solely on bushmeat as their only source of protein. If only to ensure a steady supply, wildlife must be protected. Although forestry activities in Nigeria began in the West, it is rather unfortunate that today the State cannot boast of a single constituted or effective Game Reserve or sanctuary where animals can either be watched or cropped. Much of our efforts had been directed towards preserving the forest for the purpose of exploiting the trees. The Western State has not escaped the rapid rate of destruction of the flora and fauna resulting from the technological revolution of this century. We can save the situation only by a change of direction in thought and action.

OLDER FORESTS

The formation of Game Reserves is still in the early stages of development in the Western State. In order to appreciate the problems involved, it is relevant to describe the attitude of the ordinary man towards game animals.

1. Conservator of Forests, Forestry Division, Ministry of Agriculture and Natural Resources, Western State, Ibadan, Nigeria.

At the turn of the century, the forests of the south of Nigeria and the savanna of the North carried a large number of various types of fauna. The people then (and even at the present time) regarded the forest as a God-given reservoir of food. The reduction in wild animals as a source of food has been due to several reasons: the clearing of forests for agriculture, the excessive annual burning-ritual (deliberate and accidental), the increasing number of people in settled towns, villages and farmlands, and the use of sophisticated weapons. Our early contact with the Western European commercial interests stimulated a greater interest in hunting. The demand for ivory and other tropies brought about a rapid reduction in the stock of wildlife. The persistence of some species of wildlife despite the rapid rate of destruction has been due to their rapid adaptation to changing conditions.

In the Western State of Nigeria, forestry records show that large tracts of uninhabited forests, in remote and inaccessible areas as well as around towns and villages, existed in many parts of the State at the beginning of this century. Only daring hunters, heavily armed with defensive and offensive weapons could enter them. Relicts of those forests now exist as forest reserves. The oldest of them are the former Mamu Government Forest (now part of Gambari Forest Reserve) 1899,01okemeji 1900, Ilaro 1901, Oshun (now de-reserved and taken over by the Western Nigeria Development Corporation) 1904, and Omo 1918. These are high forests where hunting can be regulated. Apart from Olokemeji Forest Reserve which was later declared a Game Reserve, only the flora in these reserves was protected. Hunting rights were permitted and, as a result, a large number of animals that originally inhabited these forests have been exterminated.

GAME PRESERVATION UNIT

The present effort towards game preservation commenced in 1963, when a Danish officer, Mr. E. C. Brandt, formerly of the Game Preservation Unit of the Eastern Region, was appointed Game Warden in the newly established Game Preservation Unit of the Western State. His task was to organize game preservation in the State, and find out areas suitable for future Game Reserves. At this time, there were only two Game Reserves in the State: Old Oyo and Olokemeji. Both reserves were Game Reserves on paper only, as no staff had been made available to look after them. Olokemeji Forest Reserve is not ideal as a Game Reserve because there are no really interesting species there, and because it is largely high forest. The vegetation in Old Oyo is suitable and stocked with interesting species but lacks adequate water for the animals in the dry season. Consequently, the game moves south into the Upper Ogun Forest Reserve, an adjacent forest reserve where the game was being rapidly depleted. It was therefore decided to combine Upper Ogun with Old Oyo to form a compact Game Reserve. Initial attempts to do this failed due to the lack of support from the local population, which regarded it as a deprivation of their right to hunt. Later, when the people began to realise the benefits which they could expect from the establishment of the Upper Ogun as a Game Reserve, they relaxed their opposition to the project.

With the establishment of the Wildlife Preservation Unit as part of the Forestry Division of the Ministry of Agriculture and Natural Resources in 1963, the work of conservation began. The possibility of another Game reserve in Opara Forest Reserve was investigated; there is actually more game in Opara Forest Reserve than in Upper Ogun Forest Reserve but it is extremely inaccessible and therefore not suitable for tourism at present. In addition, the Western boundary of the reserve follows the international boundary between the Western State and Dahomey, thereby increasing the difficulties of protection. Apart from lion and hippo, all other species to be expected there are also found in Upper Ogun.

Progress made since the Unit was set up is considerable though not without heart-rending difficulties. There has been renewed opposition from the local population inspired by hunters from the townships. The agitation has political undertones but most of the farmers around the Reserve support the project. Old Oyo is 270 sq. miles (700 km^2) in extent and Upper Ogun 740 sq. miles (1717 km^2). They form a compact block of savanna vegetation lying between latitude 8° 15' and 9° 0'N and longitude 3° 45' and 4° 20'E,and situated south of Borgu Game Reserve in the Kwarra State. There are no settlements or villages within the Reserve but around it there are big towns like Oyo (21 miles or 31 km away), Ogbomosho (also 21 miles) and Iseyin (26 miles or 42 km),

and smaller towns such as Ikoya (12 miles or 19 km), Igbetti (7 miles or 11 km), Kishi (10 miles or 16 km) and Shepeteri (17 miles or 27 km). Closer to the reserve and adjoining the boundary in some places are numerous farm camps which, no doubt, serve as bases for animal poachers. It is probably a slight under-estimation to say that one out of every five adults in the area carries a dane gun[1] and that perhaps one in every fifty is a potential animal poacher.

Old Oyo was constituted a Game Reserve in 1952, when the communities of Igboho, Kishi and Igbetti ceased to enjoy their former hunting rights. When Upper Ogun was made a forest reserve, the communities around the boundaries of the forest reserve were granted the right to hunt, fish and collect minor forest products there, and to have temporary residence while hunting. These rights are incompatible with the growth of the animal population but now the rights are being revoked before the reserve can be gazetted as a Game Reserve. At present, protection is being enforced by persuasion, cajoling and the use of threats. Local hunters believe that wildlife is inexhaustible even when killed without any form of control. They do not consider that the destruction of the habitat is a factor which affects the growth of animal populations, and so they indiscriminately set fire to the grass to aid their hunting. Consequently, it is necessary to educate them so they appreciate the need for preservation and a logical method of cropping.

By 1967, the two reserves had been resurveyed and consolidated. An access road, of 17 miles (27 km), has been constructed from Shepeteri town to Ibu Iya, a base camp in the Game Reserve. This is the only motorable access route into the Reserve. Ibu Iya is the confluence of Ogun River with Opo stream and together they form a pool of deep water. In Old Oyo/Upper Ogun, water is a problem during the dry season, but here there is enough water so that in the historic past Ibu Iya was a common meeting ground for hunters, fishermen and animals for watering. "Ibu Iya" is a Yoruba place-name: "Ibu" means a deep pool of water and "Iya" is the tree *Daniellia oliveri,* so that Ibu Iya is "the pool of water by the *Daniellia oliveri",* A few jeep tracks have been constructed but these are motorable only in the dry season. More jeep tracks will be constructed to facilitate patrol and protection, although they will also make the reserve more accessible to poachers.

SPECIES OF MAMMALS

A partial survey of the animals has been carried out and the appendix to this paper tabulates the species recorded or expected to occur in the reserve.

STAFF AND FINANCE

At present, the Unit is headed by a graduate Assistant Conservator of Forests, Mr. S. A. Karimu assisted by Mr. J. O. Oladejo (who has a diploma from the School of African wildlife Management in Tanzania, and is the only member of the staff with any formal wildlife training). Other staff includes a Forest Ranger, 3 Forest Guards and 35 patrolmen. Another graduate Assistant Conservator of Forests is taking a M.Sc. in wildlife at Michigan University with a view to taking over the Unit.

The project is financed from a Development Vote and since its inception the following funds have been provided:

1965/66—£6,500
1966/67—£14,000
1967/68—£10,000
1968/69—£9,000
1969/70—£10,000

The State Government, through the Ministry of Trade and Industry, has included the Game Reserve on its programme of development for tourism. A site has been selected at the base camp to build a Rest House with catering facilities and work has already started.

1. A locally made shotgun.

LEGISLATION

The 'Wild Animals Preservation Law' was first published in 1916. This law, on paper, gave protection to most animals and birds by prohibiting the use of poison, the use of certain traps and nets, dogs and the use of bright lamps to aid hunting at night. There is no law to prevent hunters from carrying locally made guns. The law also gives details of hunting licences and fees, but there is no way in which the number of animals killed can be checked, nor is there any control on local hunting. All activities which could lead to the extermination of certain scheduled animals, birds and reptiles were made illegal. Unfortunately, the law is difficult to enforce and therefore ineffective. The law is being revised at present.

APPENDIX

MAMMALS OF THE UPPER OGUN AREA
(Compiled by D. C. G. Happold, Department of Zoology, University of Ibadan)

Primates

Galagodemidovii	Demidov's galago
Cercopithecusaethiops	Green monkey
Erythrocebus patas	Patas monkey
Papioanubis	Baboon

Lagomorpha

Lepus zechi	Togo hare

Rodentia

Heliosciurusgambianus	Sun squirrel
Protoxerus stangeri	Giant squirrel
Tatera kempi	Kemp's gerbil
Lemniscomys striatus	Striped mouse
Mastomys natalensis	Multimammate mouse
Myomysdaltoni	Dalton's mouse
Thryonomysswinderianus	Cane rat

Carnivora

Mungosgambianus	Gambian mongoose
Panthera leo	Lion

Tubulidentata

Orycteropus afer	Aardvark

Proboscidea

Loxodontaafricana	Elephant

Hyracoidea

Procavia ruficeps	Rock hyrax

Artiodactyla

Tragelaphus scriptus	Bushbuck
Syncerus nanus	Buffalo
Cephalophusrufilatus	Red-flanked duiker
Sylvicapra grimmia	Grimm's duiker
Adenotakob	Kob
Kobus defassa	Waterbuck
Hippotragusequinus	Roan antelope
Alcelaphusbuselaphus	Hartebeest

The following are likely to occur:

Atelerix spiculus	Hedgehog
Galagosenegalensis	Senegal Galago
Cercopithecus mona	Mona monkey
Manis tricuspis	Pangolin
Funisciurus anerythrus	Redless striped squirrel
Xerus erythropus	Ground squirrel
Arvicanthis niloticus	Nile rat
Cricetomys gambianus	Pouched rat
Leggada musculoides	Pigmy mouse
Atherurus africanus	Brush-tailed porcupine
Canis adustus	Jackal
Genettamaculata	Genet
Civettictis civetta	Civet
Phacochoerus aethiopicus	Warthog
Potamochoerus porcus	Red river hog
Reduncaredunca	Reedbuck
OurebiaOurebia	Oribi

ABSTRACT

Wildlife Conservation in Eastern Nigeria

A.E.ETTAH[1]

Wildlife conservation in Nigeria is still undeveloped. Efforts must be made to intensify its practice which must be more scientific than its present casual and limited approach. Past work done in wildlife conservation cannot, however, be totally discounted. The Obudu highlands, provide a unique territory for carrying out organized and systematic investigations in wildlife conservation. Work done for Nigeria in 1962 by Professor Petrides should help in Nigeria's wildlife conservation aspirations.

Priorities in Bird Conservation in Nigeria

R. H.PARKER[2]

It is generally accepted that in meetings and discussions on wildlife conservation in West Africa, birds are considered of little importance. Presumably that is because they are, to a great extent, eclipsed by the more spectacular large mammals. Some African countries, however, have realised that their bird populations are also of considerable importance, although admittedly less of a tourist attraction than large herds of ungulates or elephants. These countries in South and East Africa are making special efforts to protect their birds by setting aside areas that have important species but which are devoid of big game. In 1933 Britain, on behalf of Nigeria, signed the African Convention for the Conservation of

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2. Department of Zoology, University of Ibadan, Nigeria.

Nature and Natural Resources which gives a measure of protection to a large number of animal species in danger of being over-hunted in Africa. Nigeria, as an independent country, re-signed an amended treaty to the same effect in 1968 in Algeria. On schedule 'A' of this agreement, which classifies the species that are supposed to receive full protection, the White or European Stork *Ciconia Ciconia* and all the representative species of the vulture family (Aegypiidae) are listed.

THE WHITE STORK AND VULTURES

The White Stork is a Palaearctic migrant visiting the Northern States of Nigeria in considerable numbers. It is a large, slow and very unwary species owing to the avid protection it receives on its European breeding grounds, where it is usually found in close association with man. It therefore makes easy prey for hunters who apparently shoot for the "pot" as well as for "sport", although the latter is difficult to understand as the bird has little fear of man. The other major exploiters of storks are bird exporters who sell them to zoos and private collectors who are not allowed to disturb, kill or trap them in Europe. The Wild Animals Law of Northern Nigeria (1963) permits, by special licence, the killing and/or trapping of two White Storks per year, for which a hunter is required to pay an additional fee of 10/- per bird. Yet in a recent count (February 1970) of the birds held by one of the five major bird dealers in the city of Kano, 260 White Storks were observed being kept in atrocious conditions, together with several other so-called protected species. Informed sources consider that in a normal year it is possible that a total of about 700 White Storks pass through this dealer's hands during the dry season (November-June). If this number is then multiplied by four (the example cited is the largest of the businesses involved) an estimated figure of over 3,000 birds pass through Kano alone, between the months of September to March. These figures, however, are not really a true indication of the total "catch" of this species in Northern Nigeria, as a far larger number are slaughtered on the spot and plucked, the reasons for which are not entirely clear.

The Crowned Crane *Balearica pavonina*, the Nigerian National Bird, which is also a protected bird under the Wild Animals Law, is exported and hunted in large numbers throughout the year. Vultures, also protected by law, are perhaps in less danger as they are in addition protected to a great extent by local beliefs that it is unlucky to molest them. It might be argued that as the Crowned Crane and the vultures are resident Nigerian birds it should be left to the national conscience as to whether the increasing extermination of their natural avifauna is allowed to continue until the time arrives when Nigeria's national bird becomes as scarce as that of the United States of America. On the other hand, the White Stork is not a resident in Nigeria and I feel that Nigeria should be made aware of a moral obligation to those European countries, especially the Netherlands and Germany, which spend large amounts of money each year giving complete protection to this species. The ministries of natural resources of Northern Nigeria should be fully aware of this disgraceful traffic in protected birds, and should take a long and careful look at the countries which left the protection of its more spectacular species until it was almost too late to save them.

LEGISLATION

It is, however, utterly pointless to have laws for the protection of any kind of animal or bird unless an attempt is made to educate the police and the public, so that they know what the most important protected species look like and the penalties to which offences against the law make the perpetrators liable. In areas of concentrated trapping or shooting, permanent posters could be displayed illustrating protected species and regular checks could be made by the conservation officers of each state involved. Finally the bird exportation laws should be completely revisedand the mass capture or killing of protected birds should be severely restricted.

PASSERINE BIRDS

It is impossible to make much progress with the protection of passerine species, until

relevant provisions of the conservation laws of Nigeria are changed from the present system of listing protected species. Most European and North American countries now protect all bird species, but list those that it is permissible to hunt. However, it is worth pointing out one major trend that could adversely affect the passerine populations of Nigeria in the future.

The *Acacia* and *Salvadora* vegetation belts, which lie on the southern fringe of the Sahara desert, play an immensely important role for the enormous numbers of Palaearctic passerine migrants that spend the European winter in Africa. These vegetation belts are the first major viable habitat for birds after they have crossed the desert and also the last area in which they can build up the large fat reserves needed for the return journey. There is no immediate danger of this habitat being destroyed on a continent-wide basis, but the speed with which the only small area of Sahelian savanna is vanishing in the extreme north-east of Nigeria is an indication that much more thought should be given to the future of this area. It is generally considered that the major cause of the destruction of this important habitat in Nigeria is the widespread irrigation schemes of the Chad Basin Authority.

WILDFOWL

In his report to the International Wildfowl Research Bureau, Roux (1969) says that in West Africa "the government authorities responsible for the fauna are mainly interested in questions dealing in big game and, with the exception of Senegal, are generally ignorant of or only slightly concerned about those concerning wildfowl". This is certainly true of Nigeria. Moreover, it is strange that although the only Ornithological Society in West Africa is based in Nigeria, Senegal is about to become the first West African country to create a solely ornithological reserve, namely the one to be situated in the delta of the Senegal River.

Probably more is known about wildfowl in Nigeria than in any other country in West Africa. Most of this information has been gathered by members of the Nigerian Ornithologists' Society who have participated in the International Wildfowl Research Bureau (I.W.R.B.) mid-winter censuses of wildfowl since the scheme started in 1967. Fry (1967) clarifies the problems involved by recording that in the early 1967 census, only 12 observers were attempting to make a census of an area equal to France, Belgium, the Netherlands, Switzerland and Italy put together. Subsequently the number of members who have been able to help with the work of counting ducks in Nigeria has fallen considerably.

It has been argued that Nigeria is not yet ready to consider doing anything about conserving its wildfowl, since the hunting pressure is considerably lighter in Nigeria than it is in Great Britain or the United States of America. However, the pressure is building up, especially in other parts of West Africa (mainly in the ex-French territories), and suitable habitats are drying up through several causes. The danger is aggravated by the fact that at the same time of year as most of the Palaearctic species of duck are arriving from the north, many resident species are still breeding, especially the Hottentot Teal *Anas punctata* (which has only recently been found to breed in Nigeria) and the Egyptian Goose *Alopochen aegyptiacus*. If, therefore, the formation of wildfowl reserves is premature, then the next best step would be to have a close season for duck hunting.

By way of comparison, it may be useful to cite as an example, the measures taken by the United States of America for the conservation of wildfowl. The Fish and Wildlife Service manages about 30. 8 million acres of reserves of which 4. 5 million are exclusively for waterfowl. Approximately 45 million dollars a year are spent upon wildfowl protection and habitat preservation. In the 1968/69 season the duck shooting licence revenue totalled over 5. 5 million dollars, while 1969 revenue from hunting licences (which have to be bought before a duck shooting permit is given) amounted to 88. 7 million dollars.

Eventually wildfowl reserves will have to come to Nigeria, and in the mean time it is suggested that careful attention is given to the lakes and *fadamas* in and around Nguru, which lie on the borders of the North Eastern and Kano States, and which are probably the most important area for wildfowl in Nigeria.

ACKNOWLEDGEMENTS

It would have been impossible to produce this paper without the great assistance of Mr. R. E. Sharland and many other ornithologists and conservationists in Nigeria, with whom I have discussed this subject. I am also deeply indebted to the United States Information Service in Ibadan, which arranged for the figures quoted in the latter part of this paper to be cabled to Nigeria from Washington.

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ABSTRACT

Nigeria's Wildlife: A Forgotten National Asset

J.R. Charter[1]

The economic value of Nigeria's wildlife and wild animal products, livestock and fisheries was analysed with the aid of the most recent statistics.

Much detailed information on the rural consumption of animal food was obtained from the Rural Economy Survey of Nigeria conducted by the Federal Office of Statistics, Lagos, in 1965-66. This data indicated that for locally produced animal foods in the three southern regions of Nigeria, 19% was from wildlife, 60% from fish (mostly freshwater) and only 21% from domestic animals. Consumption of 'bush meat' was valued at £N10.2 million in the year.

1. Federal Department of Forest Research, Ibadan, Nigeria.

RESEARCH, EDUCATION AND MANAGEMENT

Priorities of Wildlife Research

J.HENSHAW[1]

In the academic and scientific world, the pursuit of knowledge for the sake of knowledge, research for the sake of research was, until quite recently, a much proclaimed virtue. But when money is short and the problems are long, a more pragmatic and down to earth approach is clearly indicated. It should involve the student and his supervisor in the physical problems of their time and their country. The somewhat artificial prestige of pure research should be largely supplanted by a more laudable and tangible prestige: that of ameliorating the problems of society and environment. This, surely, is the research that all countries can afford.

In narrowing down these generalized notions to the subject of wildlife, we should first look briefly at the contribution that this resource can make, and in this respect I am thinking particularly of Nigeria. Of primary importance is the use and value of wildlife as protein for human consumption. It has been shown already that bush meat constitutes as much as 30% of the animal protein consumed in some parts of Nigeria, and that in the southern portion of this country the resource is valued at more than £9,000,000 annually. We know that wild animals in relatively undisturbed ecosystems in Africa and elsewhere are more productive in terms of meat and are less susceptible to disease than are domestic animals occupying comparable range. This suggests that there is a potential for managing wild ungulates as a food resource on a sustained yield basis.

Of secondary importance is the appeal of wildlife to the overseas and the internal tourist. Although the West African tourist industry may never quite approach that of East Africa it is certainly growing. Hopefully, it will elicit some envy of, and active competition with, the report that in Kenya last year, tourism—based largely on wildlife viewing and to a lesser extent hunting—toppled the coffee industry from its former position as the country's leading earner of foreign exchange.

Thirdly, there is the place of wildlife as a natural and cultural component of ecosystems. These ecosystems need to be protected from industrial or agricultural over-exploitation since they serve as reservoirs of biological productivity and as areas for the replenishment of the world's supply of oxygen. People who need peace and solitude find satisfaction in natural and unspoilt environments.

Whether for food, tourism, multiple land use, or for less tangible purposes, wildlife can be conserved or exploited only through sound and modern methods of management. I am happy to say that there is a widespread awareness in Nigeria both of the justifications for wildlife management and of the current needs for this. What is much less evident, though, is an appreciation of the position of research as an essential prerequisite to management. It is sometimes thought that management is a process whereby a specialist is employed to issue plans and proclamations on a basis as slender as his training and experience. This is trial and error management, a process which ignores the fundamental truth that each ecosystem is unique, and may react differently and even inexplicably to a prescribed management practice.

Few people would now attempt to manage Nigerian forest or agricultural resources on such a basis, and the research being undertaken in these disciplines is both impressive and usefully applied. The results of bad ecosystem modification and management, undertaken without thorough previous research, are dramatically illustrated by such ill fated ventures as the ground-nut scheme in Tanganyika and Unesco's attempt to turn part of

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Amazonia into a sort of equatorial breadbasket. Wildlife is no exception and similar upsets have occurred and for the same bas.ic reason. These have involved, for instance, reindeer in Alaska, red deer in New Zealand, and predator elimination in Arizona; in each example there has been a degradation of the environment and a reduction in both primary and secondary productivity.

Research, then, is the key to successful wildlife management, whether it is a question of the development of the resource for economic or aesthetic reasons, or of its control where it is incompatible with other land use programmes. Despite the current and genuine interest in managing Nigeria's wildlife we lack the tools for this trade. We do not have the appropriate knowledge; and there are no intensive ecological studies of single wildlife species or of wildlife communities upon which a management programme could be confidently based. In some respects this is not surprising, for wildlife traditionally has been the adopted child, perhaps even the unwanted problem child at times, of the nation's foresters; but they have enough difficulties in finding time, educated manpower and money for solving their own problems. The federal government has not yet produced a policy for wildlife research and management, to be operated by wildlife specialists, and with a pathway to the exchequer whereby it can actively compete with other natural resources for direct funds.

What is surprising, however, is the absence of wildlife research in the universities. For example, projects on the basic ecology of kob, roan, hartebeest or elephant involving habitat requirements, food preferences, density and dispersal, are suitable for the graduate student working for 2 or 3 years for his M.Sc. or Ph.D. Furthermore, the results of this type of research can be used to solve the problems of management that are now arising.

There is no special mystique in wildlife research. Much can be done with little money, with a notebook, pencil and observation. With leadership and encouragement I feel sure that graduates will come forward to do this kind of work. In Nigeria there are unequalled opportunities for original research, and it is ethically satisfying in that the results can be used for the development of wildlife resources for the benefit of society as a whole.

Research, then, is a major wildlife priority in Nigeria at this time. It can be academically quite pure or it can be governmentally applied. It may either illuminate the problems of management or it may be designed to produce information required for present or future management. The former type of research may be, quite simply, the basic ecology or life history of a certain species in a certain area. The latter type may involve the statistics of censuses, population increase and decline, the ecological reasons for such changes, and the ecological ramifications of cropping schemes, total protection and over-hunting. It will certainly involve carrying capacities, the habitat requirements of different species and the trends in habitat quality, all of which are essential to the management of game reserves. It is also necessary to look into the use of fire and its effects on plant and animal succession. Even behavioural aspects should not be ignored, since animals, especially where totally protected, may increase to the point where their interactions and competition may be reflected in habitat degradation, disease or unwanted dispersal.

Without such research, wildlife management in Nigeria, and elsewhere for that matter, will be speculative only and will be restricted to ameliorating problems when or after they arise rather than in preventing their occurrence. It would seem that the time to start such research is today if the wildlife of Nigeria is to be managed efficiently tomorrow.

Wildlife Utilization and its relevance in West Africa

G. S. CHILD[1]

INTRODUCTION

This paper attempts a brief review of wildlife utilization in East Africa and its possible application to West African conditions. The word "utilization" is used in a restricted sense and implies the harvesting, processing and marketing of animal products from wild populations.

HISTORICAL INFORMATION

Wild animals have been hunted for food by traditional methods in various parts of East Africa until recent times. The introduction of precision firearms and other more efficient methods of taking animals, together with the improvement of transport, communication, and increased hunting pressure has led to commercialization of what was originally subsistence hunting. A reaction to this process began as early as 1900, with the drawing up of an international convention for the protection of wild animals by the then Colonial powers and independent African Governments. Although not ratified, this convention prompted the enactment of national legislation to protect wildlife.

Later, the 1933 London Convention Relative to the Preservation of Fauna and Flora was adopted and this document then formed the basis for most wildlife thinking and legislation in Africa. The London Convention attempted to curb and regulate the ivory, trophy and live animal markets, and at the same time the necessity of licensed sport hunting, customary hunting rights and killing animals in defence of life and property was recognized.

The interpretation of the Convention in the East African countries and the enactment of legislation to implement its objectives virtually precluded commercial hunting. The only legal hunting of animals in large numbers was carried out by, or under the supervision of, the Game Departments in the course of crop protection work. Trophies such as ivory, hippopotamus teeth, rhinoceros horn and the more valuable skins were removed from carcasses and sold to licensed dealers at official auctions as a source of Government revenue. There were, however, no regular procedures for dealing with other products.

During the 1950s East African wildlife policies and practice began to move away from the rather negative ideas implied by "preservation" towards the more positive concept of "conservation". There was a lack of basic biological and ecological information on African game animals. In an effort to rectify this, the first wildlife biologists' posts were created and at the same time other workers, supported by overseas foundations, were encouraged to carry out wildlife research projects. Much of the work subsequently undertaken resulted in the accumulation of data upon which plans for utilization schemes could be based.

This work was augmented by wardens and other field staff who were encouraged to make quantitative appraisals of the wildlife in their areas. Populations of ungulates were studied with a view to drawing up recommendations for their exploitation. The possibility of utilizing more fully the carcasses of animals destroyed by crop protection work was investigated, and the possibility of integrating control work and utilization schemes was examined.

The dynamics of wild populations elucidated in other parts of the world, particularly North America, also influenced thinking. One of the results of this was that the problems of overpopulation were appreciated.

At this stage it was felt in some quarters that the practice of game cropping would be contrary to the principles and ideas embodied in the 1933 London Convention. However it was recognized eventually that, in fact, the Convention itself was in need of revision.

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IMPLEMENTATION OF UTILIZATION SCHEMES

1. Execution of Schemes: A primary consideration in the implementation of utilization schemes is the selection of an agency or agencies to undertake the work involved. At one extreme a scheme could be executed entirely by a Government organization and at the other, by a private individual or commercial enterprise. In between, various combinations of the two can be envisaged. The choice of method will depend upon the location and objectives of a scheme and for this reason it is of little help to generalize.

In practice a number of variations have bean used in East Africa. Some schemes have been executed entirely by Game Department employees, from the culling of animals, the removal of trophies and skins and the processing of the meat, to the eventual disposal of the products. In other instances, the cropping and preparation of meat has been carried out by government agencies while distribution and marketing has been placed in private hands. The authorities have, in some instances, merely selected and shot animals and sold the fresh carcasses to butchers for retailing to the public. Finally, other schemes have been executed by a commercial enterprise or private individual under the supervision of the authorities. In general, this type of cropping involves the harvesting and marketing of a quota of animals agreed upon between the authorities and the cropping organization, after appropriate investigations have been made and upon payment of prescribed fees.

2. Field Organization of Schemes: There are two methods. The first entails the establishment of a permanent plant to. which the carcasses of culled animals are transported for processing. It is obvious that the investment of capital in such a project can only be justified if the wild animal populations in the vicinity are capable of supplying a sufficiently large and sustained crop to ensure economic utilization of the installations. There is the advantage with this system that associated administrative and maintenance support can be located near the processing plant. Staff housing and amenities, of a permanent nature, can also be provided at the work site.

The second possibility is to have a mobile or portable plant which can be taken to the area where the harvesting is to be carried out. Where the crop to be removed is limited, or where climatological or other factors permit cropping only at certain times of the year, this second alternative is preferable.

PRACTICAL CONSIDERATIONS

1. Cropping Methods; In East Africa, most cropping is carried out with firearms. Obviously the ballistics of a weapon have to be weighed against the species to be cropped, and the price and availability of ammunition taken into account. The actual shooting is usually carried out from a vehicle. In some circumstances, night shooting with a spotlight may be more effective.

Some organizations prefer a syringe projectile with an overdose of drug. It is felt that this minimises the disturbance to herds of animals which is an important factor where cropping is being conducted within a game viewing area. This method has been used on both elephant and buffalo with good results.

One commercial organization developed a specialized technique for the cropping of elephant. The method employed a helicopter to locate the animals. Hunters were then dropped nearby with repeating rifles and the elephants were herded towards them by the helicopter, for cropping. A ground party was then guided in to process and transport the carcasses to base.

An alternative to mobile hunting methods is that of "still-hunting". The hunter conceals himself in a hide within range of some point to which game will be attracted such as a waterhole or salt lick. The method has not been used extensively in East Africa to my knowledge.

The use of traps has only been adopted on any scale for the taking of hyrax. A wooden live trap has been developed for this. It has been suggested that the controlled use of snares might be explored as a means of harvesting animals.

Finally, the possibility of driving animals into an enclosure by way of a wide-mouthed and long-armed funnel, after the style of the "keddah" system used for the capture of

wild elephant in Asia, has been considered. The practical aspects of this idea have yet to be worked out in the field. In particular, the specifications and material to be used for the funnel and enclosure need investigation. The numbers and species of animals to be dealt with, the nature of the habitat in which it is to be used, and the extent to which the structure is required to be portable, need to be taken into account. The various methods available for the driving of animals must be tested and evaluated for the different species to which this procedure might be applicable.

2. **Processing of Products:** There is an increasing demand for the skins, hairs and feet of wild animals by the curio and luxury markets associated with tourism. These are sold alongside older established products such as ivory and crocodile and leopard skins. Commercial tanners are showing an increasing interest in well prepared game hides where they are produced in quantity. Further outlets are required for the by-products of cropping operations.

Trophies are normally sold after a minimum of field preparation. This normally consists of the removal of all traces of flesh which might putrefy, and salting or drying as appropriate. The subsequent processing of these items is carried out by specialists and is not usually the concern of those involved in the utilization projects.

The processing of meat has received considerable attention within the context of cropping schemes in East Africa. One of the aims of meat production has been to make available a cheap, good quality protein for local consumption. Various methods designed to preserve meat, with this end in view, have been evaluated. In deciding on a suitable method for a particular scheme, due consideration must be given to the nature and economy of the market to be catered for, the distance and communications between production area and market, the species which are to be cropped, and the requirements of public health and veterinary regulations.

Where cropping is to be carried out in areas adjacent to population centres, carcasses can be sold direct to butchers who in turn can retail the fresh meat. For the marketing of carcasses further afield, chilling or freezing techniques can be employed. However, this involves additional investment and requires suitable storage facilities at the distributor's premises.

Sun-drying is the most commonly used method for the preservation of meat. In order to ensure that a reasonable standard of hygiene is maintained, attention must be paid to cleanliness during preparation. Meat cutters should be provided with suitable clothing and sufficient water and disinfectant should be available for washing hands and instruments. It may be necessary to take precautions against contamination of the drying meat by flies. The drying itself must be carefully supervised to ensure that it proceeds correctly and that conditions which might induce putrefaction of the meat are avoided. The presence of a meat inspector will ensure that no unfit carcasses are processed for human consumption.

The salting of meat to produce "charqui" has been tried experimentally with success but has not been adopted as a regular procedure. The traditional method of partly drying and partly smoking meat on a rack over a fire was discarded on public health grounds. To my knowledge the employment of more sophisticated techniques for the smoking of meat has not been attempted on any scale.

Experimental canning of the meat of a number of species of wild animals has been carried out. Various recipes have been used and on the whole the results have been extremely palatable. It is considered that in addition to local sales, such products might form the basis of a limited export trade.

LEGISLATIVE, ENFORCEMENT AND ADMINISTRATIVE CONSIDERATIONS

The regulation of cropping schemes in East Africa had to be fitted into the framework of laws which were mostly based on the 1933 London Convention. A number of the procedures adopted were originally formulated to regulate the crocodile skin and sport hunting industries. "Concession systems" and "permit systems" and the fixing of quotas have been adopted for the control of cropping schemes which are carried out by non-Government agencies.

The Law with respect to trophies and game meat in the East African countries is strict. This has proved useful in the regulation of marketing. Generally speaking, it is unlawful to possess the more valuable trophies such as ivory, rhinoceros horn and leopard skins without a certificate of ownership. In respect of any other trophy the onus of proving lawful possession rests upon the person found in possession of the trophy. The legislative provisions for fresh and dried game meat make it unlawful to buy or sell except under a permit issued by the Game Department. In some countries, as with trophies, unlawful possession is assumed unless the contrary is proved.

As indicated above, the obvious outlet for fresh meat is through established butchers. The main consideration of the enforcement agencies in this connection is to ensure that the meat in a butcher's shops is derived from legitimate cropping schemes. For similar reasons, the marketing of dried meat requires careful regulation. In practice, dried meat is disposed of to a considerable extent by Government wildlife agencies themselves.

Attention must be paid to animal disease regulations. The main effect of these on the marketing of fresh and dried game meat is to restrict the movement of such meat, particularly across international boundaries. Usually it is the meat of artiodactyls, which are capable of transmitting such infections as foot and mouth disease, that is affected by such regulations. Thus the meat of elephant, which forms a large proportion of the meat production from East African cropping schemes, is unaffected in this respect.

An important point is that wildlife exploitation schemes should be put into effect by persons of the highest integrity, who have a sympathy for the management of the animal populations they are dealing with. There is no place in wildlife utilization for the individual whose motivation is solely personal gain.

RELEVANCE OF EAST AFRICAN WILDLIFE UTILIZATION EXPERIENCE TO WEST AFRICA

It would seem, from impressions gained in some West African countries, that certain of the techniques and procedures evolved in East Africa could be applied here. There are, however, differences between the present wildlife situation in West Africa and that in East Africa at the time when the implementation of utilization schemes was imminent. For example, there is less supervision by the authorities with respect to the possession and sale of game meat and trophies. The so-called "professional hunters" of West Africa, who rely upon the sale of game meat for their living, have no lawful counterpart in East Africa. Further, it would appear that in certain habitats in West Africa, the smaller-sized species of mammals would contribute significantly to regulated utilization programmes.

There is a great demand for bush meat in West Africa. Traditional methods of utilizing wild animals as a source of food are exerting severe and increasing pressures on the remaining wildlife populations. It is a measure of the resilience of animals such as the cane rat and the duikers that they continue to be taken in large numbers. One possible approach to the implementation of controlled utilization projects in West Africa, would be to formulate schemes designed to replace the present destructive hunting activity with sustained yield harvesting.

In conclusion, it must be stressed that there are still large gaps in the basic knowledge essential to sound wildlife management practices. These can only be filled by field research. It cannot be over-emphasized that the drawing up and implementation of any utilization scheme should be preceded by appropriate ecological investigations, and that the monitoring of an exploited population and its habitat is an essential part of any such scheme.

Formation de Personnel Specialise et Education en Matiere de Conservation

J. DUBREUIL[1]

Le rapport de la troisième session du groupe de travail de l'Aménagement de la faune (Lomé, Togo, 15-18 janvier 1969) de la commission des forêts pour l'Afrique, insiste à plusieurs reprises sur le besoin de personnel qualifié pour la protection de la Faune, son exploitation rationnelle, la gestion et l'administration de Parcs Nationaux, réserves et zônes cynégétiques.

Dans une recommandation particulière, les Etats francophones demandent que la FAO, le Fonds Spécial des Nations Unies et le Gouvernement de la République Fédérale du Cameroun prennent toutes les mesures nécessaires pour que la formation spécialisée qui doit être donnée à l'école qui est en cours d'installation à Garoua, puisse commencer dans les plus brefs délais.

Ceci ne doit pas surprendre les personnes averties de la situation des Parcs Nationaux et réserves en Afrique tropicale, et on ne peut que regretter qu'il ait fallu attendre si longtemps pour essayer de satisfaire ce besoin.

Depuis une dizaine d'années on constate une prise de conscience très nette du rôle que peut jouer la faune dans le développement économique. La participation de nombreux pays aux réunions d'Arusha, Nairobi, Fort-Lamy, Lomé, les prises de position sans équivoque de quelques Chefs d'Etat, montrent bien le désir de conserver la faune et de l'exploiter rationnellement.

Ceci est encore affirmé par les dispositions concernant la Faune, incluses dans la Convention Africaine pour la Conservation de la Nature et des Ressources Naturelles, signée par les Chefs d'Etat et de Gouvernement de l'OUA en septembre 1968 à Alger.

En effet pendant longtemps la préoccupation principale a été la constitution des Parcs et Réserves, et l'aménagement de la faune s'est limité à la simple protection et conservation du gibier, sans même quelquefois se préoccuper de son habitat. C'était d'ailleurs là une première étape indispensable, et le manque de personnel mais également le peu de connaissance qu'on avait, à l'époque, de la faune africaine, ne permettaient guère de faire mieux.

Si à l'époque on reconnaissait à la faune une valeur scientifique, culturelle, éducative, récréative et esthétique, on ne savait pas encore qu'exploitée rationellement elle pouvait être dans certains cas la meilleure forme d'utilisation des terres et bien peu soupconnait les possibilités qu'elle offre comme source de revenus grâce au tourisme et à la chasse sportive.

L'observation, l'étude de la faune dans les Parcs et Réserves, l'évolution des populations animales ainsi protégés, ont permis d'acquérir des connaissances indispensables à l'aménagement tandis que, dans le monde, l'extension des loisirs, la facilité des voyages à longue distance, la recherche du soleil et de paysages nouveaux offraient à la faune africaine la possibilité de prendre une place de plus en plus importante dans la vie économique de la nation.

L'exploitation rationnelle de la faune apparait désormais comme une science appliquée complexe qui nécessite une formation particulière et ne saurait se passer de recherches fondamentales.

Nous n'aborderons pas ici le problème de la recherche et des chercheurs mais celui de la formation de personnel de gestion tant au niveau élémentaire qu'au niveau supérieur.

Depuis quelques années personne ne conteste plus la nécessité de créer une Ecole pour la formation de ce personnel, mais si le Collège of African Wildlife Management de Mweka en Tanzanie dispense, depuis 1963, cet enseignement spécialisé au personnel d'Etat anglophones ce n'est qu'en fin de 1970 que l'Ecole pour la Formation de Spécialistes de la Faune de Garoua au Cameroun, pourra recevoir le personnel des Etats francophones.

1. Ecole pour la formation de spécialistes de la faune, Garoua, Cameroun.

Pour tenir compte de l'organisation administrative de ces Etats, les méthodes de Formation employées à Garoua seront quelque peu différentes de celles du Collège de Mweka, et viseront à donner une spécialisation à du personnel appartenant déjà aux Services des Eaux et Forêts des Parcs Nationaux ou de l'Elevage. Le but à Garoua comme à Mweka est de rendre aussi utile, aussi efficace que possible un personnel dont les effectifs pendant longtemps encore seront certainement insuffisante par rapport aux besoins.

Tant au cours supérieur qu'au cours élémentaire, et sans doute plus encore à ce dernier, l'enseignement pratique sur le terrain tiendra une place importante de facon à ce que chacun sache observer, noter ou rapporter les faits importants. Il sera ainsi possible de recueillir une masse d'informations qui aidera le personnel de conception et de direction à définir et mettre en oeuvre un programme d'exploitation rationnelle et qui pourra, également, être utilisé par la recherche.

Il semble d'ailleurs que certains dispositions naturelles de l'individu—bon sens, sens de l'observation, intérêt pour telle ou telle activité—soient ici aussi importantes que les connaissances théoriques, et on pourrait envisager pour sélectionner les candidats, des tests qui feraient apparaître les plus aptes à profiter de l'enseignement dispensé et à remplir les fonctions qui leur seront confiées à leur retour dans leur pays.

En fait, puisque les élèves seront choisis de personnel déjà en services, les responsables des services qui seront également les utilisateurs, sauront certainement choisir et bien choisir.

Si connaissant chaque année un peu mieux la faune africaine, nous pouvons espérer l'exploiter rationnellement au profit de tous, nous ne devons pas oublier qu'elle est chaque année également de plus en plus menacée par le développement de moyens de communications et la prolifération d'armes de chasse trés efficaces qui rendent le braconnage particulièrement néfaste. L'ouverture de nouvelles routes, l'emploi de véhicules tous terrains permettent à la fois un accès plus facile aux zônes encore habitées par la faune et une évacuation rapide de la viande de chasse, et il est probable que dans chaque Etat on pourrait citer une ou plusieurs zônes d'où la faune a été ainsi éliminée ces années.

Comme en général l'effectif en personnel de surveillance ne permet pas de tout garder et que ce personnel a été à juste titre concentré là où la protection devait être la plus "payante", c'est-à-dire autour de Parcs Nationaux et zônes cynégétiques réservées à la chasse sportive, il est à peu prés inévitable que le braconnage sévisse ailleurs; mais il pourrait certainement être moins destructeur si les habitants des régions ainsi braconnées pouvaient se rendre compte de ce qu'ils perdent en réalité. Eux-mêmes vivent en partie de la faune et pratiquent une sorte de braconnage qu'on pourrait appeler braconnage de subsistance pour améliorer leur ration alimentaire. Ce braconnage, parce qu'ils ont généralement des armes peu meurtrières et sont peu nombreux, n'est pas trés nuisible, et sorte de droit d'usage, ne compromet guère l'avenir de la faune. Par contre le braconnage qu'on peut appeler braconnage commercial est lui une menace directe pour la faune. Récolter en une nuit de chasse un camion de viande en ne dépensant que le prix des munitions et. quelques centaines de francs en cadeaux aux guides qui auront permis cette expédition fructueuse, est une excellente opération sauf pour les habitants de la zône ainsi ravagée. Il est certainement possible de leur faire comprendre, et c'est dans des cas comme celui-ci que l'on ressent toute la nécessité d'informer et d'éduquer, c'est-à-dire d'expliquer aux citoyens d'un Etat comment ils peuvent eux-mêmes participer et aider à la protection de la faune.

Cette vulgarisation des notions de conservation est certainement indispensable mais elle n'est pas facile. Il faut trouver le moyen d'y intéresser des personnes dont le souci primordial est d'assurer leur subsistance et qui seront peu sensibles, on le comprend, aux arguments esthétiques ou scientifiques. Par contre leur dire que les braconniers viennent prendre une viande qui leur était destinée, montrer que la faune n'est inépuisable, sont des sujets qui pourraient sans doute être traités par le personnel au cours des tournées dans les villages, et pourraient l'être avec d'autant plus de succès qu'une bonne connaissance du pays et de ses habitants permettrait de leur présenter sous la forme qui leur serait la plus assimilable.

Cet aspect de l'enseignement ne sera pas négligé à l'Ecole de Garoua et c'est probablement à la suite d'entretiens entre élèves et professeurs, confrontation d'expérience, qu'il sera possible de dégager des idées, et d'essayer de mettre au point une stratégie de la vulgarisation qui pourra être améliorée si les anciens élèves veulent bien faire part de

leur expérience et des résultats obtenus.

Il est normal de vouloir profiter de la présence en brousse de personnel et de ces tournées pour diffuser des notions de conservation mais ce serait insuffisant et, toujours dans le cadre de moyens limités, il semble que ce soit par l'intermédiaire de l'Ecole qu'on a le plus de chance d'atteindre un auditoire important. On ne peut guère compter sur la radio, il y a si peu de postes récepteurs en dehors des villes.

De plus on dit généralement que vouloir changer ou modifier la mentalité d'un adulte est pratiquement impossible; c'est donc à l'âge scolaire qu'il faut apprendre à l'homme â aimer et protéger la faune comme les autres ressources naturelles.

Il suffit de donner une bonne formation aux instituteurs dans les Ecoles normales, les instituteurs la transmettent à leurs élèves, et ceux-ci â leur tour le partagent avec leur parents, leur famille. C'est théoriquement très simple et on y pense depuis longtemps, mais il ne semble pas malgré cela qu'il y ait eu jusqu'à maintenant d'expérience vraiment concluante.

Plusieurs pays d'Afrique Tropicale ont eu, ou ont actuellement en cours, des programmes d'éducation et d'information du public en matière de conservation, et l'article XIII de la Convention Africaine pour la Conservation de la Nature et des Ressources Naturelles demandent aux Etats contractant de veiller "à ce que les populations prennent conscience de l'étroite dépendance dans laquelle elles se trouvent vis à vis des ressources naturelles et comprennent la nécessité et les règles de leur utilisation rationnelle".

Il est souhaitable qu'au cours de ce symposium de nombreuses informations soient échangées. Les expériences des uns et des autres devraient permettre de dégager petit à petit le meilleur moyen de provoquer cette prise de conscience.

The Educational Value of Zoos in West Africa

R. R. GOLDING[1]

The following remarks refer almost entirely to Nigeria but will probably have some bearing on other West African countries.

During the 6½ years that I have been at the University of Ibadan Zoo I have come into frequent contact with people whose work is connected with wildlife in the field in Nigeria. These include foresters and game wardens employed by Nigerian Governments or Universities, and wildlife experts carrying out various surveys. The two most important reasons for an interest in wildlife in this country are said to be that it may be possible to build up stocks of wild animals which can be used for human consumption, and that it may be possible to establish game reserves throughout Nigeria as tourist attractions. This second reason is stressed more frequently than the first, and it is this aspect that particularly interests me.

I sometimes wonder if some of those personnel whose work is associated with wildlife and reserve development here are in close enough touch with reality. Just why are the game reserves developing so slowly and exactly who are the tourists, or rather potential tourists, who are so often referred to and apparently taken for granted ? Are they resident foreigners, foreigners who come to the country specifically as tourists, or Nigerians?

Before considering this, some figures from Yankari game reserve in the North Eastern State of Nigeria, at present the only game reserve in the country open to visitors, are relevant. The open season is from 1 November-30 June. During the first six months of the 1968-69 season, the total number of fee paying visitors was 1,987. Considered on the basis of nationality the representation was as follows:— Britons 631, Americans 554,

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Nigerians 225, Indians and Canadians each 67, Germans 65, followed by smaller number of 31 other nationalities. Although there is no way of checking these figures, there can be little doubt that the vast majority of these foreign visitors to Yankari were working and/or resident in Nigeria. One can reasonably assume that resident foreigners will form a high percentage of visitors to existing and additional game reserves in Nigeria for some years to come. However, it seems extremely doubtful whether this sector will ever provide enough tourists to be regarded as a satisfactory form of patronage from any point of view.

It is also difficult to see how game reserves here can be developed and made viable based on overseas tourism, at least within the forseeable future. People abroad who wish to observe wild animals in Africa seem likely to continue to take advantage of the already highly organized tours to National Parks in East Africa, where there is now a well established system of routes, transport, communications and international standard hotels. It would appear that the terrain there is generally more spectacular and attractive than in Nigeria and large animals are more plentiful and easier to see.

It seems to me that in the long term the main hope for the development of game reserves and National Parks here can only be that the Nigerians themselves will visit them in sufficient numbers to make them viable. If this concept is acceptable, and if the concept of a system of Nigerian game reserves supported mainly by Nigerians is accepted, then I suggest that wildlife and game reserve officers are concerning themselves far too little with educating and securing the interest and support of the Nigerian public. All the Committee meetings and reports, especially when they are largely confined to expatriates and important Nigerians, will have delayed and limited practical results unless efforts are made to generate this wider interest.

It is my opinion that properly managed zoological gardens open to the public are in a position to help a great deal here. It is interesting that the Nigerian Wildlife Preservation Committee, which is responsible for coordinating matters relating to wildlife, appears to agree with this and has recognized the potential educational value of zoos. Since the first meeting of the Committee in 1959 zoos have been discussed several times in this context and subsequently Regional zoos were opened in Enugu and Ibadan by the respective Governments. Kano State is just about to embark on a very large zoological park project as an amenity for Kano City. Last October I was asked to hold a short conference in this Department to consider the creation and management of zoos in West Africa, and from this it transpired that several other Nigerian States may shortly embark upon similar, though smaller projects.

The University of Ibadan Zoo began on a very limited scale about 20 years ago as a facility for zoology students. One of its several functions is still as a teaching collection, but it has only been realized comparatively recently just how greatly this collection interests the general public. The total numbers of visitors during the last few years are as follows:-

1965–74,072
1966–74,336
1967–75,807
1968–87,097
1969–116,888

At the time of writing (March 1970) the number of visitors for the year so far is a record for any similar previous period. Compared with Yankari game reserve, at least 95% of our visitors are Nigerians. These figures seem to indicate that there is a substantial interest in looking at wild animals, at least as objects of curiosity. I am convinced that this is indeed true and that this interest can be developed. Zoos could assist in this development, although there are difficulties which have to be overcome.

There is little or no indigenous tradition of looking at wild animals in Nigeria. The concept is mainly a foreign one which has little relevance to the majority of the people. Nigeria is densely populated and most of that population lives by farming or associated activities, as have countless previous generations. Farmers going about their daily business regard animals either as a source of danger or meat or both, and kill anything that will provide even a small amount of food, for example pangolins, pouched rats, most birds, frogs, and snails. Nature is generally distrusted and has to be fought, and even non-crop plants around farms and compounds have to be cut back constantly. Life is hard

and down to earth and for most people the conditions in which animals can be looked at from a purely aesthetic viewpoint simply do not exist. Thus one is asking people to think in an entirely new way.

How can zoos help in this? One of the most effective ways is by showing visitors that certain apparently 'dangerous' specimens can be approached and handled without fear or injury and that it is possible to establish a certain mental contact with them. The two gorillas in our zoo illustrate this point perfectly. Most visitors obviously find it fascinating to be able to watch large apes at close quarters, probably for the first time. Even so, many people remain highly nervous and, particularly if viewing the animals in the indoor accommodation, will often retreat rapidly from the building if the animals display any apparently aggressive behaviour. If, however, one of the staff enters the cage to talk to the gorillas and to play with them, the mood of the onlookers changes vastly. Many people seem hardly able to believe what they see and a huge crowd quickly gathers to watch this incredible contact between man and beast. Such an example may well sound frivolous to an outsider but I do emphasize most strongly that the observation of this type of man-animal contact makes a very strong impression on people here in the zoo, presumably because it is something quite new. When I am in the zoo on a busy day I am frequently stopped and asked if I or one of the staff would please go into the elephant compound, or play with the gorillas or even handle a snake. On many occasions, I have seen children practically fighting each other in their attempts to hold or touch a tame python; yet, if they had seen a python in the bush they would probably have killed it on the spot.

Our gorillas and chimpanzees have recently been provided with large outside compounds which make a rather spectacular exhibit. I am informed that news of this has already gone around Ibadan, and even Lagos; perhaps this is why we received nearly 8,000 visitors in 4 days during this Easter holiday—nearly double last year's figure.

During November and December we receive thousands of school-children in school parties, some of them travelling long distances from other States. The interest of these children is often enormous and if given the opportunity they will ask endless questions, often jotting down notes and drawings. However, I regret that we have not so far taken advantage of this opportunity to educate at such an ideally receptive age, although we are frequently asked to do so. This is partly because of the staffing difficulties involved, but also because of the way in which I feel this situation should be dealt with. This brings me to a further potential function of zoos in West Africa. I feel that in addition to the staff normally required to run a zoo, there should be a number of guides whose function is to make contact with the public, show them around, answer questions and perhaps issue informative literature and allow the handling of certain specimens. Such guides could carry their activities a stage further and point out to visitors that some of the animals may be seen in game reserves in Nigeria—elephants for instance, a statement that frequently causes surprise.

If such a scheme is started at this zoo, I consider that if it is to have a maximum effect, it should be run in conjunction with those Government wildlife officers currently involved with the development of game reserves. For example, it might be a good idea for those States concerned to post one or two of their reserve personnel down here at busy times of the year to supplement our own guides, or even to replace them. With such a combined effort it should be possible to provide in the zoo some really first rate photographic exhibits, for example, with large colour and black and white photographs and captions, fully depicting the special features of each reserve. Photographs could be included showing the type of accommodation and services provided, so that people understand that they are not necessarily going to have an uncomfortable weekend in the bush. If a small lecture theatre could be built in the zoo, colour slides and films taken in the reserves can be shown, and further information can be given by reserve personnel. There are other possibilities, but in general terms I am quite convinced that by using such methods, some of the great interest being shown in wild animals in our zoo could be gradually channelled to the country's game reserves.

This year I expect our total number of zoo visitors to be around 130,000[1]. If only 1% of these could be persuaded to visit Yankari game reserve annually, this would provide about 1,300 paying Nigerians, compared with the rather dismal 225 of the 1968/69 season. A slightly more optimistic 5% would provied about 6,500 such visitors. Surely a great opportunity is being lost here.

1. The number of visitors in 1970 was 157,860-Ed.

With experienced and imaginative direction, Nigerian zoos could be of great help in stimulating the public support that game reserves will need if they are to progress and mature. As I have written elsewhere (Golding 1966), we are in a position to encourage people to watch animals without a stick in the hand or a gun on the shoulder.

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Trypanosomiasis and Wildlife in Nigeria

A.A.AMODU[1]

Everyone concerned with the Trypanosomiasis of man and animals ultimately becomes involved with the role of wild game in the maintenance and transmission of pathogenic trypanosomes. Thus Buxton (1955) conceded that destruction of wildlife can be an effective method of tsetse control but finds the destruction distasteful and regrettable. Glover (1961) considered any further killing of game in Nigeria already sorely depleted of its wild animal life not only regrettable but abhorrent.

The factors affecting the role of wildlife in trypanosomiasis can be split into two parts:-

1. That wild animals form the basic food source for tsetse flies and their elimination would remove the flies.
2. That the wildlife acts as reservoirs for pathogenic trypanosomes and are instrumental in maintaining and transferring the infections to man and his domestic animals.

To investigate these two aspects, the Nigerian Institute for Trypanosomiasis (NITR) introduced the method of analysing the blood meals of tsetse flies from various parts of Nigeria many years ago. The first of the attempts tried to correlate the level of infection in wild flies with the percentage of infection in the flies. Jordan (1965a) discussing the work at Ughobigha in the Midwest could only identify about 20% of the blood meals taken by tsetse flies. Of these he found that *Glossina tahaniformis,* 5% of which fed on the Bovidae, had a 3..2% natural infection rate and *G. longipalpis,* 96% of which fed on the Bovidae, had a 21.5% infection, mainly of vivax and congolense group trypanosomes. The Bovidae involved were mainly bushbuck and buffalo. The same pattern was observed in other areas of the derived and southern Guinea savanna.

An attempt was made with *Glossina morsitans submorsilans* Newstead to correlate the recent spoor of vertebrates with the blood meals of flies caught. Cats and duikers produced half the spoors seen but only 2% of the blood meals, while the warthog *(Phacochoerus)* produced 10% of the spoors but 51% of the blood meals (Jordan 1965b).

Cockbill *el al* (1969) were able to associate the decline in the populations of *G. morsitans* on an island in the Kariba Lake with the demise of large numbers of warthog inspite of relatively large numbers of impala *[Aepyceros),* baboon *(Papio)* and sable antelope *(Hippotragus).* They were also able to show a lower fat content for flies on the adjacent mainland where warthog *(Phacochoerus),* bush-pig *(Polamochoerus),* kudu *(Strepsiceros)* and bushbuck *(Tragelaphus)* were present.

The investigation of host preferences by tsetse flies by analysis of blood meals have been further refined and the following are results obtained in various parts of Nigeria between 1966 and 1969.

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TABLE 1: INFECTION RATES FOR TRYPANOSOMES AT VARIOUS SAMPLING STATIONS IN NIGERIA

	BADAGRI	ILORIN		OYO-IBADAN			YANKARI		
	G. pal-palis	G. pal-palis	G.mor-sitans	G.pal-palis	G.tachi-noides	G.mor-sitans	G.pal-palis	G.tachi-noides	G. mor-sitans
Primates									
Man	2	1	—	—	—	0.8%	—	27.3%	30.2%
Baboon/ Monkey	—	—	—	—	—	—	—	—	2.3%
Unidentified	1	—	—	—	—	—	—	—	1.8%
Total	3	1	—	—	—	0.8%	—	27.3%	34.3%
Suidae									
Warthog	—	—	—	—	—	—	—	4.5%	16.8%
Bushpig	2	—	—	—	1	—	—	27.3%	13.5%
Unidentified	—	—	—	—	—	—	—	31.8%	6.9%
Total	2	—	—	—	1	—	—	63.6%	37.2%
Bovidae									
Buffalo	—	—	—	—	—	—	—	—	3.6%
Bushbuck	—	—	—	—	—	—	—	—	5.8%
Roan antelope	—	—	—	—	—	—	—	—	—
Duiker	—	—		—	—	—	—	—	—
Ox	—	8	96.2%	—	—	90.8%	—	—	—
Eland	—	—	—	—	—	—	—	—	—
Unidentified	1	—	2.8%	1	—	7.1%	—	9.1%	7.5%
Total	1	8	99%	1	—	97.9%	—	9.1%	22.7%
Other Mammals									
Porcupine	—	—	—	—	—	—	—	—	2.3%
Hippo-potamus	—	—	—	—	—	—	—	—	0.6%
Unidentified	1	—	—	—	—	—	—	—	1.2%
Total	1	—	—	—	—	—	—	—	4.1%
Reptiles	—	2	—	1	1	—	—	—	—
Birds	—	—	—	—	—	—	—	—	—
Total Number	7	11	76	2	2	126	1	22	171
	100%	100%	99%	100%	100%	99.5%	—	100%	98.3%

Note:
Badagri-06° 26'N, 02° 54'E
Ilorin-08° 30'N, 04° 32'E
Oyo-07° 51'N, 03° 54'E
Ibadan—07° 24'N, 03° 54'E
Yankari (Wikki Camp)—09° 45'N, 10° 30'E

From the figures in Table 1 it can be inferred that the feeding habits of flies differs with location. In Yankari which is a game reserve, Primates (particularly man) and the Suidae constitute the bulk of the hosts of *G.tachinoides* and *G. morsitans.* In Ilorin and Oyo-Ibadan, cattle form the bulk of the feeds of *G. morsitans.*

It remains to say that in surveys around the areas adjoining the game reserves, it has been found that flies rarely trespass across the boundaries. In surveys along cattle trade routes passing through the Borgu Game reserve, G. *morsitans submorsitans* were found not to extend beyond the southern boundaries and only small numbers of *G.palpalis* and *G.tachinoides* were caught. These were found to be about 0.1% infected (Amodu 1969).

The second possible role of wild life has been less susceptible to investigation in Nigeria. Keymer (1969) investigated the blood protozoa of the duiker *(Sylvicapra grimmia)* in central Africa—Malawi, Rhodesia and Zambia—and found only Megatrypanum trypanosomes in a study of 110 animals. NITR had earlier attempted to survey the trypanosome infection of wild ruminants without killing them (Leach 1965, 1966). The attempts were not very successful and no pathogenic trypanosomes were found.

In a less direct way, there is experimental evidence that pathogenic trypanosomes would infect wild life and be recovered from them (Amodu 1969). In dissections of wild flies for infection, *G. morsitans* are 8-12% infected, *G.palpalis* 8-10% *G.tachinoides* 8-12% and *G. longipalpis* 20-25% infected. In the high forest tsetse flies on which not much work has been done, there is evidence of a much lower infection rate of the order of 0-3. 5%.

The current conclusion supports Ford (1960) that game areas infested by tsetse flies should be separated from livestock supporting areas. In Nigeria, this is not going to be easy but the overwhelming evidence of cattle to cattle transmission of trypanosomiasis does not justify wholesale destruction of wildlife.

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Savanna Burning, Soil Fertility and Herbage Productivity in the Derived Savanna Zone of Nigeria

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INTRODUCTION

Over two thirds of the land area of Nigeria is covered by savanna of one type or another. Either by design or by mistake, large acreages of this vast savanna land are burnt repeatedly every year. In Western Nigeria, burning takes place between the months of December and early March, while in the far North burning continues for much longer, since the dry season is also longer.

Annual burning constitutes a very important ecological factor in savanna ecosystems. It has profound effects on floristic composition, productivity, and energy flow within the ecosystem.

The effects of burning on the species composition of woodland savannas have been studied in some parts of Nigeria (Charter and Keay 1960, Onochie 1961, Hopkins 1965). Ramsay and Innes (1963) have made a comprehensive review of studies made all over West Africa on the effect of burning on the floristic composition of woodland savannas. Changes in floristic composition are just one of the many changes that may take place when savannas are burnt. Very little is known here about other responses, e.g. chemical changes and soil fertility, erosion, changes in microflora and fauna, and productivity of the ecosystem following repeated yearly burning. This paper aims at discussing some of these other responses to burning in the light of preliminary results from an experiment currently in progress at Fasola, near Oyo in the derived savanna zone.

The experiment was designed primarily to study the effect of time of burning and treatment before burning (burning in situ or slash and burn) on the primary productivity and soil chemical changes of the ecosystem.

The mean annual rainfall of the area (1948-1968) is 120. 8 cm. There are three months, December, January and February in which the total monthly rainfall is less than 10 cm. Following the definition of Baker *et al.* (1965), these months can be considered dry since the mean monthly rainfall is less than 4 inches (10. 76 cm).

The trees in the study area were removed and the soil was ploughed in 1964. The area was not cropped, but abandoned and was allowed to revert to bush. The present vegetation is grassland dominated by *Andropogon gayanus* Kunth (Northern Gamba). The vegetation has been burnt yearly since 1965, to encourage new herbage growth for cattle which range freely in the area.

The soils have been tentatively classified as Fasola sandy soils, with the following mechanical composition: clay 6%, silt 4%, fine sand 35%, coarse sand 55%.

Previous studies in various parts of the world, reviewed by West (1965) and more recently by Daubenmire (1968), indicate that there is no generalized pattern of reaction to burning, and that the effect of fire on the ecosystem is influenced by conditions such as the amount of combustible material present, the dryness of the material, the direction of the wind and the time of burning.

CHEMICAL CHANGES DURING BURNING

Considerable chemical changes take place when vegetation is burnt. Nitrogen and sulphur are volatilized and lost to the ecosystem. Phosphorus and the cations are suddenly released to the top soil in form of soluble salts. The amount of nitrogen and sulphur lost and the ash deposited depends on the quantity of all combustible materials present, the dryness of the materials and the degree of burning achieved during the burning. Very little is known about these chemical changes when the tall tropical savannas are burnt.

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Table 1 shows some preliminary data on biomass of three stands before and after burning, and some chemical changes that occur as a result of burning at different periods. Sulphur loss has not yet been estimated. The differences between the dry matter content before and after burning gives a measure of the degree of burning.

TABLE 1: BIOMASS, TOTAL NITROGEN AND TOTAL ASH CONTAINED IN THE DERIVED SAVANNA BEFORE AND AFTER BURNING, WITH ESTIMATES OF NITROGEN LOSS AND ASH DEPOSITED

Date of Burning	21 December 1969		20 January 1969		23 February 1969	
	Pre-burning	Post-burning	Pre-burning	Post-burning	Pre-burning	Post-burning
Biomass kg/ha	8397 ± 2090	3714 ± 580	8928 ± 3300	1155 ± 408	9981 ± 3050	1370 ± 146
Percent Nitrogen	0.24	0.17	0.23	0.16	0.30	0.19
Total nitrogen in herbage (kg/ha)	20.15	6.3	20.53	1.85	29.94	2.6
Estimated nitrogen loss (kg/ha)		13.85		18.68		27.34
Percent ash content	3.50	3.20	3.45	3.25	5.0	3.65
Total ash in herbage (kg/ha)	283.9	118.8	308	38	498	50
Estimated ash deposited (kg/ha)		165.1		270		448

Table 1 shows that burning is more severe in January and February than in December. While only 56% burn was achieved in December (21 December 1969), as much as 86% burn was achieved in January and February (20 January 1969 and 23 February 1969). Similar results have been recorded by Hopkins (1963) for a similar experiment sited at Olokemeji, some 40 miles south west of Fasola. Hopkins recorded a low percentage burn of 25% in an early burn on 7 December, and values ranging between 64-96% (mean 84%) between January and 15 March. These differences can be accounted for in the drier nature of the herbage during January and February. The amounts of nitrogen volatilised and ash deposited are also larger during January and February.

Data on nitrogen volatilisation when savanna is burnt is very scarce. Elwell *et al*. (1941) estimated that the loss of Nitrogen was 30 kg/ha when ungrazed grassland was burnt in Eastern Oklahoma U.S.A. A very low figure of 5 kg/ha was estimated to have been volatilised and lost when grass was burnt in the Northern Territory of Australia (Norman and Wetselaar 1960). This relatively low value was due to the low yield of pasture (1300 kg/ha) in the area.

Volatilisation of nitrogen from the herbage constitutes a loss to the. ecosystem. The importance of such losses are not known, but may be of some significance in areas known to be deficient in soil nitrogen, as in our savanna soils. However observations made by Norman and Wetselaar *(loc. cit.)* show that losses due to volatilisation of nitrogen were more than compensated for by inputs in the precipitation (2. 2 kg/ha) and soil fixation (2. 2 kg/ha) during the same period.

There is no data on the amounts of nitrogen added to the ecosystem on the site. There are scarcely any reliable data on the inputs of nutrients due to precipitation in tropical areas, even though there is a lot of information on this in the temperate areas of the world. Jones (1960) recorded a very high input of 56. 9 kg/ha/yr of nitrogen by precipitation in Northern Nigeria. This high amount may have been obtained as a result of dust combina-

tion during collection of rain water. Similarly, there is no information on the fixation of nitrogen in the soil within the area. However Odu *(pers. comm.)* has estimated that the annual fixation of nitrogen by non-symbiotic organisms would be of the order of 20 to 25 kg/ha.

It appears, therefore, that the input of nitrogen in the precipitation and the addition due to fixation in the soil could to a large extent compensate for losses due to volatilisation.

Although it appears that the sudden volatilisation of nitrogen in a grass fire does not affect seriously the nitrogen cycle of the whole ecosystem, it nevertheless seems that it may be the main reason for the very low total nitrogen values of our savanna soils.

SOIL CHEMICAL CHANGES

Following burning, the chemical composition of soils may be affected for the following reasons:-

1. Changes directly resulting from ash deposit.
2. Changes through the effect of heat on the soil. This may be heat generated during the burning or heat resulting from the effect of direct solar insolation when vegetated cover has been burnt off.
3. Changes resulting from microfauna and flora populations.

TABLE 2: CHEMICAL COMPOSITION OF A DERIVED SAVANNA SOIL, BEFORE AND AFTER BURNING

Depth in cm.	pH	% Organic matter	%N	Available P ppm	Available K ppm	Exchangeable m.e.%			
						Na	K	Ca	Mg
Preburning									
0-5	6.4	1.33	0.05	1.6	28	0.14	0.14	1.14	0.84
5-10	6.4	1.40	0.05	1.3	37	0.11	0.11	1.04	0.52
10-15	6.4	1.17	0.04	1.0	36.2	0.03	0.11	1.00	0.58
Post Burning I									
0-5	6.6	1.45	0.05	1.9	63	0.09	0.25	1.22	0.73
5-10	6.5	1.29	0.04	2.2	34	0.09	0.08	0.08	0.72
10-15	6.3	1.22	0.04	1.4	28	0.08	0.07	1.10	0.58
Post Burning II									
0-5	6.6	1.40	0.05	1.6	44.5	0.08	0.12	1.22	0.93
5-10	6.4	0.17	0.04	2.2	34	0.06	0.06	1.09	0.58
10-15	6.2	1.24	0.04	1.9	27	0.06	0.05	1.03	0.50

Table 1 shows the amount of ash estimated to have been released to the soil surface during the different periods of burning. The large difference between the February and January estimates cannot be explained. Table 2 shows the chemical composition of the top 0-15 cm of soil before and after burning. Post-burning I were samples collected a day after burning, and post-burning II were those collected after the first rain. The sudden release of ash elements would be expected to lead to an increase in the pH and the cations in the top soil. There was a slight increase in pH from 6. 4 to 6.6. Similar increases in pH have been recorded by Moore (1960) in the derived savanna of Nigeria. Moore observed that annual late (March) burns raised the pH from 6 to 6. 2 and early (December) burns raised it to 6.3.

With the exception of potassium, and to some extent calcium, there were no apparent differences in the chemical composition of the 0-15 cm top soil before and after burning. The increases in potassium and calcium are probably due more to ash deposit rather than temperature effects, since grass fires are never strong enough to raise soil tem-

perature more than a few degrees above normal (Daubenmire 1968).

There were no noticeable changes in the values of total nitrogen, available phosphorus, exchangeable sodium and magnesium following burning. Cook (1939) reported similar results on veldt burning in South Africa, where six years of burning produced little or no effect on the amount of soluble salts, and there was a slight loss of nitrogen.

In a recent review on the ecology of grassland fires, Daubenmire (1968) shows that they do not appreciably affect the chemical composition of soils, and noted that the controversy about the effect of burning on the chemistry of the top soil may be due to not distinguishing between forest fires, in which a considerable amount of dry matter is burnt, leading to a large ash deposit, and grassland fires in which the ash deposit is relatively small. Nye (1959) also noted that the quantities of plant nutrients released in burning the herb layers of a savanna is only a fraction of that released by burning forest.

Although it appears from this study that immediate changes are not very pronounced when savanna is burnt, repeated annual burning has been found to have pronounced effects on the chemistry of the top soil when compared with soil in protected savanna. This was clearly shown when Moore (1960) analysed the savanna burning experiment commenced in 1929. This experiment was designed primarily to compare the effect of early (December) burning, late (March) burning, and total protection. Table 3 shows that early burning done in December at the start of the dry season over a period of thirty years tends to increase soil organic-matter content, total nitrogen, cation exchange capacity, exchangeable cations and available phosphorus, while late burns in March for the same length of time reduced cation exchange capacity, exchangeable cations and available phosphorus. Soils on protected sites had intermediate values.

TABLE 3: Chemical composition of soils carrying savanna that have been protected from fire for thirty years compared with that in which the vegetation has been repeatedly burnt early (December) and late (March) for the same number of years (Moore 1960).

	Protected	Early burnt	Late burnt
pH	6.3	6.6	6.5
%Organic Matter	3.8	4.3	3.0
%Nitrogen	0.19	0.18	0.13
C/N	11.7	14.0	13.0
Initial No_3-N ppm	0.5	2.9	0.1
No_3-N after 2 weeks incubation. ppm	48	45	33
Total P.ppm	200	210	190
Available P. ppm	3.6	6.1	3.4
CEC m.e.%	14.1	15.4	12.2
Calcium m.e.%	7.4	9.4	7.3
Magnesium m.e.%	2.8	3.0	2.4
Potassium m.e.%	0.22	0.34	0.20
% Saturation with Ca + Mg + K	74	82	80

The probable reasons for these differences may be found in the effectiveness of the burning and its consequences on species composition of the sites, with time. Early burning is mild and destroys less of the surface organic matter while late burning is fierce and destroys all surface organic matter. The reduced cation exchange capacity and exchangeable cations associated with the fiercer burns may be in consequence of a reduced humus content.

HERBAGE PRODUCTIVITY

One major reason for which savanna is burnt annually is to encourage new growth of grasses which are more palatable and nutritious to grazing animals. Controlled burning is a regular feature of range grazing in many countries, and various other reasons have been adduced for the use of fire in range management (Scott 1947, Campbell 1960). Burning is known to encourage the growth of certain desirable species over undesirable species.

Table 4 shows the quantities of herbage produced at monthly intervals following burning at different periods. Although production of new herbage started equally on both burnt and control plots, the rate of dry matter production was faster in the burnt plots. The poorer initial rate of dry matter production in the control plots could be attributed to the depressing effect of the heavy litter accumulating in them. Measurements indicate that the litter of last years growth disappears very slowly and does not allow new shoots to develop fast enough.

TABLE 4: Dry matter accumulation and dry matter increases in g/m^2 following burning in January and February

	Slash and burn January		Burning in situ January		Slash and burn February		Burning in situ February		No burning	
Mth	Dry matter	Dry matter increase	Dry matter	Dry matter increase	Dry matter	Dry matter increase	Dry matter	Dry matter increase	Dry matter	Dry matter increase
Apl	146	146	154	154	129	129	156	156	162	162
May	270	124	265	111	266	127	288	132	158	-4
Jun	504	234	465	200	463	197	487	199	393	235
Jul	650	146	745	280	605	142	693	215	534	141
Aug	930	280	1121	376*	855	250	1090	398	593	59
Sept	1457	527*	1934	013	1767+	912*	1637+	547*	1329	736*
Oct	1773+	316	1821	-113	1503	-267	1581	-56	1343	14
Nov	1410	-373	1390	-431	1161	-342	1335	-146	1527+	184

\+ Maximum biomass

* Maximum dry matter increase

Neither the time of burning, nor treatment before burning (burning in situ, or slash and burn) appear to have much effect on the amount and rate of dry matter production.

Dry matter accumulation in the stands varied between 16 and 19 tons/hectare[1] in the burnt plots, whilst 15 tons/hectare were recorded for the control plots.

Maximum biomass was attained in the months of September and October in the burnt plots while it was attained later in November in the control plots.

The highest rate of dry matter production was recorded in September and this varied between 17 g/m^2/day to 30 g/m^2/day.

Burning has been found to increase productivity of perennial grasses as a result of increase in the number of tillers, while it reduces productivity in annual grasses since the fire destroys part of the seed output.

West (1965) has shown that the effect of burning on grassland productivity tends to follow a geographical pattern. Burning increases production in relatively moist regions, but reduces it in the more arid zones.

EROSION

One of the many reasons why savanna burning is deplored is that it encourages soil erosion and leads to soil deterioration.

Preliminary observations on the site of this experiment over a period of 2 years failed to reveal any evidence of erosion. Similar observations have been made by Nye and Greenland (1959), who recorded that "the stable land forms developed in the subhumid conditions of the savanna regions are little subjected to erosion even though the protective ground cover is periodically removed by fire".

The probable explanation for this is the rapid growth of new vegetation following burning. New growth of plants starts within 5 to 6 days after burning so that the soil is not left

1. One ton = 1000 kg.

bare for long. By the time the rains begin in March, the ground has been completely covered by vegetation. If, however, hard grazing follows soon after the burning, erosion may set in.

SUMMARY AND CONCLUSION

Preliminary observation on the effect of annual burning on a derived savanna indicates that as much as 86% burn occurred when burning was done in January and February and less than 60% when done in December.

Estimates of nitrogen loss as a result of volatilisation were 13. 9, 18. 7, 27. 3 kg/ha in December, January and February respectively. It was thought that these losses could be compensated for by inputs from precipitation and soil fixation.

The quantities of ash deposited on the ground were estimated to be 165, 270, 448 kg/ha in December, January and February respectively. However, soil analysis before and after burning show that with the exception of potassium and calcium there were no appreciable changes in the chemical composition of the soil. It was concluded that unlike forest fires, the ash deposited in grassland fires is so small as not to affect the chemistry of soil significantly. Changes that may occur in the soil as a result of savanna burning may result from changes in floristic composition with time. Herbage regrowth commenced five or six days following burning and burning encouraged a higher production of herbage compared with unburnt plots by removing litter which hinders rapid development of new tillers. The time of burning or the treatment before burning does not appear to have any effect on the amount and rate of dry matter production.

Contrary to general belief, burning does not promote erosion, since the grasses re-sprout rapidly to provide a protective cover before the rains.

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A Nigerian High Forest Reserve

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Wildlife conservation to most people means conservation of savanna areas where there are large spectacular herds of ungulates, with their associated predators. Few people give much thought to the forest areas which form a large part of the vegetation of tropical Africa. For many years the high forests have been exploited for their timber, and they have been cut to make room for plantations of exotic species or for inefficient shifting cultivation. On a vegetation map much of southern Nigeria is labelled 'high forest', but there is practically no untouched forest left now. If this process continues, one can imagine that in 100 years time, southern Nigeria will be a mosaic of teak, cocoa, oil palms, yams and maize, and the natural forest vegetation will have disappeared. The forest animals, which are unable to adapt to the changed environmental conditions, will also have disappeared. No doubt in many areas it is economically advisable to have farms and plantations, but I believe that in a large country like Nigeria there should be regions where the natural forest and its animals are left undisturbed, and where pure economics is not the first consideration. In many areas it may be wiser to retain the natural vegetation, as a watershed protection and to check erosion.

Nigeria is not the only country where the forests are disappearing and where there is no active attempt to replant indigenous tree species. In the tropical African forest regions that I have visited—Ghana, Ivory Coast and parts of the Congo—a similar process continues. It is difficult to assess the value of high forest since the density and the number of tree species varies from acre to acre. From simple and not very accurate calculations it seems as if the trees which are sufficiently large to cut may be worth not more than about £300 per acre. If it is possible to remove further trees in, say, 50 years time, the revenue per annum is only £6 per acre. (This does not take into account any fees and royalties which the government may charge on the timber.) The slow growth of forest trees suggests that it is not worth replanting or encouraging regeneration of the natural forest trees. Having removed the valuable timber, it is better to use the land for other purposes. It is difficult to refute such an argument on purely economic grounds. But other forest products are of value, such as fibres, chemicals for various purposes and food from different sorts of wildlife. Careful removal of selected trees so that the typical forest structure still remains may not be detrimental to the wildlife except during the actual lumbering operations. Within a relatively short time after the timber has been cut, the forest could be used as a controlled game reserve, and so the total value of products from the forest will be increased. The greatest danger to wildlife is the indiscriminate shooting by local hunters who are able to reach the previously inacessible parts of the forest along the roads built by the timber companies. As more of the forest disappears, that which is left will become more valuable in terms of scientific interest and visual pleasure.

A natural tropical forest is a fascinating area because of its species diversity. A square mile of tropical forest contains more animal and plant species than a comparable area anywhere else in the world. The biology of the African tropical forest is practically unknown, and studies on the interaction of plants and animals are only just beginning. This

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is partly because there have been few trained biologists living in tropical forest regions, and partly because of the complexity of such studies. It is much easier to study a simple environment in the temperate regions where there are fewer species and less complexity. If all the natural tropical forests are cut, it will never be possible to understand these complex inter-relationships. Until this is known, and how certain plants and animals may be beneficial to mankind, it is very short-sighted to destroy something so potentially useful.

Because of the scientific interest, beauty, and uniqueness of tropical forest, I am convinced that some areas need to be totally protected as National Parks or sanctuaries. In these areas there must be no disturbance by tree cutting, hunting or human occupation, so that the full spectrum of plant and animal diversity is kept intact. It may be difficult in Nigeria at the present time to find forests that are large enough, but like other aspects of wildlife conservation, delay will make it even more difficult to find suitable areas.

The forests of West Africa have undergone considerable increases and reduction in size in the last million years, due to the alternating rainy and dry periods. One result of this is that in Nigeria the fauna east of the Niger river is much richer than that to the west of the river. For example, there are at least 16 species of forest mammals, excluding bats, which occur in eastern Nigeria and not in western Nigeria. These are:-

Potamogale velox	Otter shrew
Sylvisorex spp.	Shrew spp.
Arctocebus calabarensis	Angwantibo
Galago elegantulus	Needle-clawed galago
Galago alleni	Allen's galago
Cercopithecus I'hoesti	L'hoest's monkey
Colobus badius	Red colobus
Gorilla gorilla	Gorilla
Hybomys univittatus	Peter's black-striped mouse
Deornys ferrugineus	Rusty link rat (=Congo Forest mouse)
Idiurus zenkeri	Zenker's flying squirrel
Myosciurus pumilio	African pigmy squirrel
Bdeogale nigripes	Black-footed mongoose
Cephalophus dorsalis	Bay duiker
Cephalophus ogilbyi	Ogilby's duiker
Neotragus batesi	Bates' dwarf antelope

There are other species which occur in the Camerouns which may also just exist in eastern Nigeria. Confusion in the taxonomy of many species, and lack of recent knowledge, makes it impossible to compile a complete and accurate list. Some of these species occur in Gabon and the Congo forests but others are exclusive to the Camerouns and Eastern Nigeria. Originally it was thought that the westernmost limit of these species was the Cross river but it now known that some of them extend as far west as the Niger river. The amphibian fauna, too, is much more diverse in eastern Nigeria, and this richness in species composition may be true for other groups of animals as well.

One example of a high forest reserve, which deserves mention is the Banco National Park in the Ivory Coast. This is within 5-10 miles of Abidjan, the capital city, and still to be found in it and other nearby localities with tropical forest cover, are, among many other species—pangolins *Manis tricuspis,* porcupines *Atherurus africanus,* otters *Lutra maculicollis,* civets *Viverra civetta,* golden cats *Felis aurata,* red river hogs *Polamochoerus porcus,* giant hogs *Hylochoerus meinertzhageni,* water chevrotain *Hyemoschus aquaticus,* several species of duiker, black colobus *Colobus polykomos,* red colobus *Colobus badius* and chimpanzee *Pan troglodytes.*

Consequently I hope that eastern Nigeria, especially the South-eastern State, will give serious consideration to the formation of a forest National Park or sanctuary which will fulfil the requirements I have stated. Although such an idea may appear unnecessary and uneconomic now, I think that in years to come it will prove to be a valuable asset. Some of the forests west of the Niger river are also worthy of consideration; the delta region with its mixture of tropical forest and swamp is relatively unspoilt and probably contains species which are now uncommon throughout most of western Nigeria. In other parts of the world, forest national parks combined with pleasant accommodation, camping sites, nature trails, and perhaps a natural history museum are very popular; something similar in Nigeria, if done well, would be a real cultural and scientific asset.

ABSTRACT

The Biological Gardens and Nature Reserve at the University of Ife

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The newly established University of Ife has decided to develop 4 square miles of the campus, which includes an area of forest and three inselbergs, as a biological garden. When completed it will include a zoo, a region of nature trails and a research area. Part of the biological garden will be left in its natural state where forest animals will live in semi-wild conditions.

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