

URGENT RESEARCH PROBLEM ON THE ELEPHANT AND RHINO POPULATIONS OF THE TSAVO NATIONAL PARK IN KENYA

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THE PROBLEM

The present overpopulation of elephant in the Tsavo Park has resulted in widespread destruction to the habitat, which threatens to eliminate the rhino and ultimately the elephant themselves. Whilst elephant are still numerous and even increasing in some parts of Africa, the rhino is in danger of extinction. It is vital that immediate steps should be taken to preserve this animal in the Tsavo National Park where it was once so numerous (Glover, J. 1963).

In order to ensure that sound remedial measures are applied, it is essential that the ecology of these two animals and their inter-relationships should be thoroughly understood. This view is endorsed by Professors Bouliere, Clapham and Ovington in their report on their visit to Tsavo National Park, Kenya, in September 1963, who wrote, "The elephant is an animal of flexible habits and it is possible that considerable numbers might maintain themselves in the Park and its surroundings even if all the woody vegetation were destroyed and replaced by grass. But the population of elephants seems to be increasing fast, as judged from the opinion of those who have worked in the area for some years and from the age-group composition of the family parties encountered. This being so, there is a serious danger of further deterioration, and it seems to us essential to secure some idea of the carrying power of the area at different levels of elephant damage, and some idea of the rate of increase of the elephant population. Only when reliable estimates are available will it be possible to decide what steps, if any, must be taken to control the population of elephants in the Park."

HISTORY

The Tsavo National Park was gazetted as a National Park in 1948. The reason for this was that it was the only large tract of land that was virtually

uninhabited by man because of the presence of several species of tsetse fly, and comparatively low rainfall resulting in an uneven distribution of permanent water. It supported an imported number and variety of wildlife which was in danger of being eliminated. In addition, it constituted a valuable National asset and tourist attraction.

At that time most of the Park was covered in dense scrub with poor grass cover and therefore resistant to fire. Elephant were common throughout the area, but there was little sign of abnormal destruction of the habitat. Rhino were particularly numerous and probably constituted the largest single concentration in Africa.

Two main factors have contributed to the present serious deterioration of the habitat.

(1) Expanding agricultural development in the surrounding reserves which tended to concentrate and confine the elephant to the Park.

(2) Poaching for ivory and rhino horn, which hastened this process and caused a reduction in the number of rhino.

As a result the Park is now no longer able to support safely the existing numbers of elephant. A progressive deterioration in the habitat has taken place in the shape of extensive areas of damaged bush, encouraging a denser growth of grass and allowing the spread of fires into the thickets.

The alarming trends were first recognised in 1954 and the destruction of Baobabs, *Adansonia digitata*, had become particularly noticeable by 1955. By 1959 it had become obvious that if the rate of destruction continued the final result would be the complete destruction of the woody vegetation. The disappearance of shade and opening up of thickets adversely affected the rhino population. Also the lack of suitable food, accentuated by the effects of prolonged drought, resulted in the death of at least 300 rhino during 1960 and 1961.

In September 1961 a meeting was held in the Tsavo National Park attended by Sir Julian Huxley and other delegates to the IUCN Conference at Arusha. A Committee was formed to consider means of alleviating the position. At that time the obvious course appeared to be the reduction of elephant numbers by shooting and it was tentatively suggested that they should be reduced by one-third. Before any action could be taken, however, it was necessary to gain more accurate information regarding population dynamics of the elephant. A number of aerial counts were made over a period of one year which revealed a total of over 15,000 elephant in and around the Park. This meant that many more elephant would have to be shot than was originally anticipated. No organised reduction campaign on the scale required had ever been undertaken anywhere in Africa, and therefore no information was available as to its practicability, cost and long term effects. It was therefore evident that detailed studies of the ecology of the elephant and rhino were urgently required in order to formulate a sound plan for their management.

The Tsavo Park covers an area of some 8,000 square miles and lies roughly midway between Nairobi and Mombasa. It is bounded on the south by the Coast Native Land Unit, and on the north and west by the Mombasa and Masai Reserves respectively. In general the country is flat, and varies between 1,500 and 4,000 feet in altitude. Prominent features are the Ngulia Range which consists of crystalline and metamorphic rocks, and the Yatta Plateau which is a phonolitic lava flow. The remainder of the area lies on basement complex rocks which outcrop to form low hills. A large proportion of the soils consists of red sandy loam interspersed with patches of heavy black cotton in areas of impeded drainage.

The Park is traversed by three main rivers, only two of which are permanent. The Athi River runs NW/SE following the southern edge of the Yatta Plateau for some 75 miles. It is joined by the Tsavo River a few miles north of Tsavo Station. The Tiva, an important sand river, lies to the south of the Athi, and flows parallel with it before turning away eastwards.

VEGETATION AND FAUNA

The following description of vegetation and fauna have been taken from Napier-Bax and Sheldrick, 1963 :

"The vegetation over most of the area consists of *Commiphora-Acacia* mixed woodland with occasional larger trees, the most frequent of which are *Delonix elata*, *Melia volkensii* and the baobab, *Adansonia digitata*. Very common small trees are *Sterculia rhynchocarpa*, *S. africana*, *Lannea alata*, *Platycelyphium voense*, *Boscia* sp. and *Boswellia hildebrandtii*. Prominent bushes are *Cordia gharaf*, *Grewia* spp., *Bauhinia taitensis*, *Terminalia orbicularis* and *Premna resinosa* (Dale and Greenway, 1961). *Sericocomopsis pallida* is a very common shrub. The 'black cotton' soil areas are usually open grassland. The Galana and Tsavo Rivers are fringed by *Populus alifolia*, *Acacia elatior*, *Hyphaene coriacea* (Doum Palm), *Tamarindus indica*, *Newtonia* sp., and species of fig.

The most important grasses include *Chloris myriostachya*, *C. gayana*, *Cenchrus ciliaris*, *Panicum deustum*, *P. meyerianum*, *P. maximum*, *Dactyloctenium giganteum*, *Brachiaria deflexa*, *B. leersioides*, *B. serrifolia*, *Aristida* spp., *Eragrostis* spp. and *Tetrapogon* spp. (Bogdan, 1958 ; Edwards and Bogdan, 1959).

The legumes, *Indigofera* spp., *Tephrosia* spp., and *Crotalaria* spp., occur widely. In the rainy season the creepers *Ipomoea mombassana*, *Ipomoea* spp., *Tunbergia gurkeana*, *Cucumis* spp., allied genera and others may cover much of the country while short-lived herbs including *Heliotropium nudneri*, *Commelina benghalensis*, *Digera alternifolia* and *Tribulus terrestris*, also occupy extensive patches of ground."

The Park is noted for its population of elephant and black rhinoceros. Recent aerial surveys have shown that at times up to 7,000 elephant are

present in the eastern section. Over 30 other species of the larger mammals are also found there. These include not only those with a wide distribution, such as lion, leopard, buffalo, eland, giraffe, zebra, Coke's hartebeest and impala, but also less well-known species associated with dry country, such as fringe-eared oryx, lesser kudu and gerenuk.

ECOLOGICAL STUDIES ALREADY UNDERTAKEN

Apart from the elephant counts mentioned, a series of aerial photographs of random herds of elephant were taken in different parts of the Park. These were later studied by J. Glover (1963) who analysed the herd sizes, proportion of the sexes and age groups. Although these calculations provided much needed preliminary information about herd composition, more work remains to be done. Also further information is required regarding infantile mortality and life expectancy of the elephant in order to discover with certainty whether the population is increasing or not.

Fairly comprehensive studies have been made on food preferences of elephant at different seasons (Napier-Bax and Sheldrick, 1963) and most of the specimens collected have been chemically analysed. This work still continues.

Less work has been done on rhino owing to lack of staff and funds. However, several detailed post-mortem examinations were undertaken by veterinary officers from the three local organisations, and it was generally agreed that all these animals were suffering from malnutrition. It was noticed that many of the rhino had extensive black patches on their sides which microscopic examination showed to be a thin film of dried blood. At first it was thought that it may have been caused by heavy infestations of biting flies, *Luperosia* sp., and another as yet unidentified muscid. Both these flies were found breeding in rhino faecal middens. Efforts have been made to breed them in the laboratory with varying degrees of success, and studies at Voi have revealed that under optimum conditions the muscids appear to have an 18-day breeding cycle. More recent studies of the blood films, however, indicate that the black patches may not be caused solely by biting flies and emphasize the necessity for further research.

Collections of intestinal parasites from rhino have been made and it has been shown that a species of *Microfilaria* is associated with the sores commonly found on the chest and flanks of rhino.

A limited rhino count from the air has been carried out to discover the existing number of rhino in the area studied.

ECOLOGICAL STUDIES REQUIRED

It is recommended that detailed studies on the following lines are undertaken:

- (i) History of the area.
- (ii) Vegetation survey.

- (iii) Food plants and feeding habits of elephant and rhino.
- (iv) Effect of elephant on the rhino habitat.
- (v) Effect of fire on the rhino habitat.
- (vi) Effect of protection from both fire and elephant on the rhino habitat.
- (vii) Population dynamics of elephant and rhino.
- (viii) Possible methods of improving the habitat for both elephant and rhino.
- (ix) To determine accurately the number of elephant and rhino that can safely be supported by the Park under present conditions.

It is realised that similar investigations have been undertaken or are in progress in Uganda, but it must be stressed that the conditions in the two areas are very different, and that the information obtained in Uganda is unlikely to be applicable to Tsavo. Nevertheless, the techniques and experience acquired in Uganda could be of great value if applied to the Tsavo problem.

EXISTING RESOURCES FOR FURTHER STUDIES

A Parks' headquarters has already been established within the area and good water is available. Repair facilities for vehicles and a carpenter's workshop is also in existence. The headquarters is situated 4 miles from Voi and the town of Voi. The necessary skilled labour for building a laboratory and staff houses are employed by the Parks' service and could be used when required.

PERSONNEL REQUIRED

As the problem is essentially ecological, it is considered that the services of two biologists are required. One with a botanical ecological bias and the other specialising in animal ecology. Each of these officers will require two field assistants. Experienced personnel for this latter purpose could be seconded from the Parks' staff.

Efforts to interest foundations and other sources of financial aid have been initiated.

SUMMARY

An over-population of elephants in the Tsavo National Park of Kenya is causing widespread destruction of the natural habitat of this species and of the black rhinoceros, the former large population of which is now seriously depleted through destruction of cover. An ecological study of the problem and on the population dynamics of these forms of wildlife is urgent, and the undertaking remedial measures to balance these populations.

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REFERENCES

- Bogdan, A. V. (1958). A revised list of Kenya Grasses. Nairobi, Government Printer.
- Dale, I. R., and Greenway, P. J. (1961). Kenya Trees and Shrubs. Nairobi, Buchanan's Kenya Estates Limited.
- Edwards, D. C., and Bogdan, A. V. (1961). Important Grassland Plants of Kenya. Nairobi, Pitman.
- Glover, J. (1963). The Elephant Problems at Tsavo. *E. Afr. Wildl. J.*, 1, 30-39.
- Napier-Bax, P., and Sheldrick, D. L. W. (1963). Some preliminary observations on the food of elephant in the Tsavo Royal National Park (East) of Kenya. *E. Afr. Wildl. J.*, 1, 40-51.

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Résumé des auteurs

Une surpopulation en éléphants sévit actuellement dans le "Tsavo National Park" au Kenya et cause une destruction étendue de l'habitat naturel de cette espèce et du rhinocéros noir, dont l'effectif, qui était jusqu'ici très grand, se trouve sérieusement amoindri. Il est urgent d'entreprendre une étude écologique de cette zone et une étude des dynamiques ethniques de ces espèces d'animaux sauvages, avant de mettre en œuvre les remèdes pour en équilibrer les effectifs.

RINDERPEST AMONG WILD ANIMALS IN KENYA, 1960-2

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The spread of rinderpest through East, Central and Southern Africa during the latter part of the nineteenth century has been described by Plowright (1962). Both domestic and wild animals were then completely susceptible and were severely affected. Among wild animals buffalo (*Syncerus caffer* Sparrman), eland (*Taurotragus oryx* Pallas) and warthog (*Phacochoerus aethiopicus* Pallas) were apparently the first to suffer, followed by giraffe (*Giraffa camelopardalis* Linnaeus and *G. reticulata* De Winton), greater kudu (*Tragelaphus strepsiceros* Pallas), lesser kudu (*Strepsiceros blythi* Blyth), roan antelope (*Hippotragus equinus* Desmarest), bushbuck (*Tragelaphus scriptus* Pallas), wildebeest (*Connochaetes taurinus* Burchell) and probably bongo (*Boocercus eurycerus* Ogilby).

There is little doubt that wild animals help to maintain rinderpest in Kenya and elsewhere (Department of Veterinary Services, Kabete, Kenya, 1963; Plowright, 1963). Because of the impossibility of prophylaxis where wild animals are concerned, and despite the attendant disadvantages of endemic rinderpest, there is every likelihood that they will continue to do so. The alternative, elimination of susceptible forms of wildlife, is an untenable proposition in view of the actual and potential value of wildlife through tourism and sport hunting.

Since 1960 a record of apparent outbreaks among wild animals has been kept; these are summarised in Table I and mapped in Fig. 1. Although rinderpest was not confirmed in many of the wild species involved the observed symptoms agreed with those of rinderpest and the disease was usually confirmed in domestic stock in the areas concerned. The species of wild animals in which the disease was diagnosed by veterinary authorities are marked with an asterisk. Unless otherwise specified, both adults and young animals were affected.

SUMMARY

Rinderpest spread throughout East, Central and Southern Africa during the latter part of the nineteenth century, severely affecting domestic stock and wild animals.

Wild animals, with little doubt, help to maintain the disease in Kenya and elsewhere. Because of the impossibility of prophylaxis where wildlife is concerned, and because of the economic value of wildlife which makes its elimination an untenable proposition, this state of affairs is likely to continue.