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## The Endangered Large Mammals of Asia

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### INTRODUCTION

The South Asian countries of Bhutan, Ceylon, India, Nepal, and Pakistan have a wildlife heritage which few areas in the world can equal, both in the variety of large mammals and formerly in their numbers. The cats include the tiger *Panthera tigris*, leopard *Panthera pardus*, clouded leopard *Neofelis nebulosa*, lion, cheetah and snow leopard† There are four species of bear *Selenarctos thibetanus*, *Ursus arctos*, *Helarctos malayanus* and *Melursus ursinus*. Wild buffalo, three species of rhinoceros, elephant *Elephas maximus* and gaur *Bos gaurus* inhabit or inhabited the swamps and forests, as do several kinds of deer such as the sambar *Cervus unicolor*, axis deer or chital *Axis axis*, hog deer *Axis porcinus*, and swamp deer, to mention only a few. The open woodlands harbour blackbuck *Antelope cervicapra*, nilgai *Boselaphus tragocamelus* and Indian gazelle or chinkara *Gazella gazella*. The distinctive fauna of the Himalayas include several kinds of wild sheep, wild goats, yak and such species as the serow *Capricornis sumatraensis* and takin *Budorcas taxicolor*.

Not only is the variety large, but some species once occurred in great profusion. Herds of 10,000 blackbuck were reported from the Punjab, and swamp deer crowded the reedbeds of the Indus and Ganges rivers, also in herds of thousands. Reading the hunting accounts of a century ago, one gains the impression that South Asia was an animal paradise comparable to East Africa. These assemblages have now gone, and each species clings to a small vestige of its former range.

### FACTORS LEADING TO THE DECLINE

The decline, which has been spectacular, has occurred in all countries, with the possible exception of Bhutan, and can be traced to three main causes.

The most important reason is the destruction or degradation of habitat. The majority of South Asian mammals are forest dwellers. The natural vegetation of the area, too, is forest, except in the high montane regions, but most of it has been removed. Less than 20% of India, for example, still retains its forest cover. Official policy in India is to have 30% of the land under forest, but only 7 out of 20 states and territories have achieved this aim. As late as the 16th century, rhinoceros and buffalo, mammals characteristic of moist conditions, were found in western India, in areas which today are desert or semi-desert. The desiccation of the land is undoubtedly due to misuse of the soil by man. Only 12% of the state of Rajasthan is now covered with forest, mostly with dry thorn scrub.

Even the Gangetic basin retained large forested areas until three centuries ago. The removal of the forests was inevitably related to the increase of the human population, which, in India alone, has risen from 270 to 530 million during the last 35 years. The salient fact is that in most South Asian countries some three quarters of the original

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† To distinguish endangered species, scientific names are omitted but will be found in Appendix A, where these species are listed.

wildlife habitats have been destroyed. A few species, like blackbuck, have adapted to cultivation, but their decline can be attributed to other reasons.

Hunting by man has been the second major cause of the disappearance of wildlife. The Moghul emperors from the 13th to 16th century were famous as hunters. Akbar the Great is said to have kept 1000 cheetah for the chase. Hunts were held only sporadically, however, and the right to kill was strictly guarded by the nobility, with the result that the numbers of most species were not seriously affected.

During the period of British rule, hunting became a pastime of the expatriate administrative officers and soldiers. Nowadays it is fashionable to denigrate them but it should not be forgotten that the soldier or administrative officer was among the first to take a serious interest in the wildlife of the country, and recorded almost all that has come down to us about the wild fauna of that period. Moreover, it was in no small measure due to his interest and influence that game regulations were introduced and applied and the first wildlife sanctuaries established. Thus, in spite of the heavy hunting pressure, few species were threatened with extinction and a fair amount of wildlife survived until after the Second World War.

Independence in 1947 swept long-standing controls away, the process being accentuated by the introduction of a plentiful supply of modern firearms. At a time when the conservation movement in Europe, North America and the USSR was gaining momentum, India and Pakistan—as well as Nepal a few years later—ushered in a period of destruction almost comparable to the uninhibited slaughter on the American prairies in the 1880's. Wildlife which had been able to survive the more or less regulated hunts was unable to withstand unceasing poaching. Under the respectable camouflage of crop protection, wild animals were shot everywhere, even in the few sanctuaries. Within five years much of the wildlife had gone—and the decline continues.

The third factor in the disappearance of the large mammals has been competition between livestock and wildlife. India alone has some 250 million cattle and domestic buffalo, as well as 100 million goats and sheep, of which at least 10% graze exclusively in the forests, where most wildlife survives. Diseases, such as foot-and-mouth and rinderpest, which are endemic, are transmitted to the wild ungulates with the result that many populations of gaur, axis deer and other species have been seriously reduced or wiped out. A recent outbreak of rinderpest occurred in August/September, 1968, in the Bandipur Sanctuary, for example, and in the adjoining Mudumalai Sanctuary of India, both areas noted for their herds of gaur. The animals were seriously depleted and sambar were also reduced in number.

Wildlife and livestock also compete for forage. Many forests are severely overgrazed by livestock, to the extent that little wildlife could exist, even if protected from hunting. In addition to overstocking, considerable illegal cultivation and tree felling also take place within the forests and sanctuaries.

Habitat destruction, hunting and disease have reduced one of the world's great wildlife assemblages to a small remnant within the span of a few years. The task facing the present generation is to ensure the survival of this remnant. It is an urgent task. The human population in the area is now over 650 million. If present trends continue it will be 900 million in ten years.

## THE STATUS OF SPECIES

For the purpose of this paper the conservation of the large mammals of South Asia can most conveniently be considered in three broad categories.

First are those species or races which are either extinct or so close to extinction that little if anything can be done for them. They include both the Sumatran and Javan rhinoceroses, hispid hare, cheetah, Malabar civet and the shou (or Sikkim stag). For all practical purposes these animals appear to have passed the point of no return and are not considered further in this paper.

Second are those mammals which through numerical reduction or limitation of habitat are now in danger of extinction. Most species in this category survive only in sanctuaries or can soon be expected to exist only in them. No detailed censuses have been made

of many of the rare or localized species or races, such as, for example, the ural of the Punjab and West Pakistan, the straight-horned markhor of West Pakistan and Afghanistan, the golden langur *Presbytis geei* of Assam and Bhutan, and the Nilgiri langur *Presbytis johni* and liontailed macaque *Macaca silenus* of south India, although Sugiyama (1968) estimated that only 1000 animals of the last-named species survived. The snub-nosed monkey, dugong, Tibetan wild ass and wild yak, all rare and unstudied, occur somewhat peripherally to the region covered by this paper. The snow leopard is by all accounts rare, with Dang (1967) estimating that only 200 to 600 survive in the Indian Himalayas, yet its skins are still offered for sale to tourists by, for example, the Kashmir Government Emporium. On the other hand, the number and distribution of several rare animals are reasonably well known and their status is briefly reviewed below. The international list of rare and endangered mammals of South Asia currently enumerated in the *Red Data Book* Vol. 1 (Simon, 1966) is given in Appendix A.

The third category comprises those mammals which are still relatively widespread and in no immediate danger of extinction. Because this group is large it cannot be given more than passing consideration in this short paper.

### ENDANGERED FORMS

One of the particular purposes of this paper is to focus attention on the second category mentioned above, bearing in mind that although only a few species have the dubious distinction of being enrolled on the international list of rare and endangered mammals, many more are locally rare to the extent that they qualify for inclusion on national lists.

#### Baluchistan bear *Selenarctos thibetanus gedrosianus*

The Baluchistan bear is distinguished from other races of the Himalayan black bear not only by its substantially smaller size but also in its environmental circumstances. Up to 30 years ago it was found in places such as the Kirthar Range in western Sind which were covered with *Juniperus* spp. and *Pinus gerardiana*. It has since been driven from these areas and exists now in arid thorn scrub country. The paucity of forest and natural cover in this semi-desert environment has obliged the bear to supplement its diet by raiding the fields of sorghum and millet as well as stealing dates and occasionally attacking sheep and goats. Such activities have, understandably, brought the bear into direct conflict with man, who treats it as vermin. These factors have reduced the bear numerically; it is now believed to be rare and confined to some low-lying hill ranges of south-central Baluchistan. Few sightings have been made in recent years and there is need for an investigation to determine the animal's status and prospects.

#### Asiatic lion *Panthera leo persica*

Although the lion was distributed widely over the northern half of the Indian peninsula 150 years ago, it is now confined to the 489 sq. mile Gir Sanctuary in Gujarat, a teak and acacia forest managed by the Forest Department. The sanctuary contains 112 villages with over 5000 people and some 16,000 buffalo and cattle. An additional 30 to 80 thousand head of livestock are admitted into the forest when forage in the surrounding area is scarce.

Several attempts have been made to census the lion population. In 1936 the estimate was 287; in 1955 it was 290; in 1963 it was 255. The most thorough census was made by the Forest Department in 1968 when a figure of about 175 was derived. The accuracy of the earlier censuses is questionable, and there is no basis for assuming that the number has decreased during the past 30 years.

Because of the dearth of wild ungulate prey species in the Gir area, the lions subsist almost entirely on domestic livestock. Except for a few lions which are poisoned by irate villagers and the possible slow deterioration of the habitat due to overgrazing by livestock, the lions seem to be reasonably secure at present. P. Joslin and T. Hodd of Edinburgh and Aberdeen Universities, respectively, are currently engaged in a long-term ecological study of the Gir lion.

### Ceylon elephant *Elephas maximus maximus*

The elephant once occurred throughout Ceylon but its range is now substantially reduced, and the total population numbers now 2500-3000 individuals. The decline is attributable to the reduction of habitat due to human expansion, and to direct destruction by man in the interests of crop protection.

Three national parks—Ruhuna, Wilpattu and Gal Oya—have been set aside for the protection of the animal, but the elephant's wandering propensities continue to bring it into conflict with man, especially in those areas where recent agricultural development has cut across migratory routes.

The Smithsonian Institution recently completed a field study designed to provide the data on which an acceptable management programme can be based.

### Indian wild ass *Equus hemionus khur*

Once common in north-western India, West Pakistan and south-eastern Iran, the wild ass now occurs mainly in the Little Rann of Kutch—a salt-encrusted desert region about 1000 sq. miles in extent, and situated along the Gujarat/Pakistan border. The population declined from a conservative total of 2000-5000 in 1947 to about 870 in 1962 (Gee, 1963b). A small herd of 20-30 was also reported in the Great Rann near Nagar Parkar. Although Spillett (1969) was unable to carry out a census, he was inclined to believe that the present status of the Indian Wild Ass is similar to what was reported in 1962. However, Mountford and Poore (1968) reported that a number were shot during the India/Pakistan war and that the total in the Little Rann was not more than about 300. In an aerial census conducted by Dharmakumarsinhji (pers. comm.) in October, 1969, a total of 362 ass were counted, and he felt that the total population numbered about 400 animals.

One threat to the wild ass arises from its susceptibility to disease—notably surra *Trypanosoma evansi* and African horse sickness—transmitted from domestic livestock. A government-financed vaccination programme has been in operation annually since 1961 but has not been wholly successful because a few owners refuse to allow their horses to be treated on the ground that they cannot afford to have their animals idle for the 8-14 days of rest which the treatment requires. Unless vaccination is made compulsory and strictly enforced this constructive programme cannot hope to achieve its purpose.

Most villagers living close to the Rann are sympathetically disposed toward the wild ass; however, there is substantial competition from livestock for the limited grazing.

The wild ass is not yet protected in a legally constituted sanctuary, and it is important that a reserve should be established while the land is still available. There is also a great need for a comprehensive ecological study of the wild ass.

### Great Indian rhinoceros *Rhinoceros unicornis*

Once distributed widely in the basins of the Indus, Ganges and Brahmaputra rivers, this rhinoceros is now confined to eight reserves in Nepal, West Bengal and Assam. A few other small, isolated populations still exist as, for example, in the Tirup Frontier Tract in Assam.

Of the 700 or so animals still in existence, by far the largest concentration of about 400 occurs in the 167 sq. mile Kaziranga Sanctuary in Assam (Spillett, 1966). A major short-coming of this sanctuary is that domestic livestock is permitted to graze within its boundaries. In theory the area available for such use is small, only about three sq. miles, but in practice little attempt is made to adhere to the regulations.

The largest stock in Nepal is to be found in the Chitawan Rhinoceros Sanctuary in the Rapti Valley where 80-100 of the animals survive. Chitawan is of exceptional importance to the future of the rhinoceros, as well as being an unusual example of applied conservation. In the early 1950's several thousand squatters settled illegally in the reserve, destroying the habitat and forcing the rhinoceroses into the swamps south of the Rapti River and on to the islands in the Narayani River. Poachers took advantage of the confused situation to kill a large number of the animals. The result of these activities was that the rhinoceros population declined from an estimated 800 in the early 1950's to about 165 by 1961. Following strong representation by the Forest Department, the Nepalese Government acted decisively. The entire Chitawan Sanctuary was cleared of

settlement and—provided that poaching can be controlled—the outlook for the rhinoceros is now brighter than at any time during the last decade. By its vigorous and timely intervention the Government of Nepal has set a fine example of what drive and determination can do to safeguard an endangered species.

A thorough ecological study of this species is urgently needed.

#### Pygmy hog *Sus salvanius*

The current status of this diminutive representative of the Suidae has not been determined. Until a few years ago it was thought to be probably extinct, but more recently there has been an increasing number of reports, which, although categorized as 'unconfirmed', suffice to indicate that the animal still survives in several parts of the *terai* of Assam, Nepal and Bhutan. The pygmy hog's apparent scarcity may be attributable to the difficulty of observing it. Not only is it small—a full-grown boar is no larger than a hare—and strictly nocturnal, but it is also exceedingly shy, disappearing rapidly at the first hint of danger. Furthermore, the nature of its marshy habitat renders observation difficult, even under favourable circumstances.

#### Swamp deer *Cervus duvauceli duvauceli* and *C. d. branderi*

Once abundant on the marshy grasslands in the Indo-Gangetic basin, the north Indian race of the swamp deer has declined drastically. With most of its habitat under cultivation, it is doubtful if more than 3500 survive in Nepal, Uttar Pradesh, West Bengal, and Assam (Schaller, 1967). Numbers continue to decline, particularly in Uttar Pradesh where the government has been ineffectual in protecting it from poachers, even in the sanctuaries. The main viable Indian populations occur in the Kaziranga Sanctuary of Assam where the herd of 250 seems to be reasonably well protected, and in the Kheri area of Uttar Pradesh where several hundred individuals receive protection on a private farm.

A few scattered groups of a distinctive subspecies (*C. d. branderi*) still exist in the forests of Central India, but only those in Kanha National Park have much prospect of survival. Even there the chances look slim when viewed against the decline that has occurred in that park during the last 30 years: the combination of disease and poaching reduced the Kanha population from 3000 in 1938 to fewer than 100 today, and there is every indication that the downward trend is continuing. An up-to-date ecological study of the Kanha population is required to identify the causes of decline and to make recommendations for ensuring the animal's survival.

The decline of the swamp deer has been so drastic and so continuous in recent years that its perpetuation in the wild state in India is not assured under prevailing conditions, except in the Kaziranga Sanctuary. Only in western Nepal does there appear to be any cause for optimism. There the population totals perhaps 1000 animals, the majority inhabiting the Sukla Phanta area of Kanchanpur District, an area that is in the process of being established as a sanctuary.

#### Manipur brow-antlered deer *Cervus eldi eldi*

Only about 100 of these deer survive in the 11 sq. miles Keibul Lamjao Sanctuary in the south-western part of Logtak Lake in Manipur State. Gee (1936a) conjectured that the animal once ranged over a wider area, but was driven to taking refuge in the swamps of the lake by the increasing human population and extensive agricultural development. So long as it remains in its restricted habitat the animal is reasonably secure, but during the rains it moves away from the flooded lake to drier areas, at which time it becomes vulnerable to poaching.

The deer is protected primarily by the impenetrability of its habitat and by the fact that most of the human inhabitants are vegetarians. Moreover, the Manipur Administration has shown commendable interest in safeguarding the animal.

On the other hand, the villagers along the western and southern boundaries of Keibul Lamjao, in addition to extending the area under rice cultivation into the sanctuary, own large herds of livestock. Although cattle cannot enter the swamps, domesticated buffalo graze over a quarter of the sanctuary. About 1000 canoes are also engaged in fishing throughout the area wherever the vegetation is thin enough to permit their passage.

The immediate requirement is the imposition of restrictions on grazing and cultivation within the sanctuary. There is also need for a biological study on which a sound management programme can be based.

#### **Kashmir stag *Cervus elaphus hanglu***

The Kashmir stag, a subspecies of the European red deer, is now largely confined to the 55 sq. mile Dachigam Sanctuary of Kashmir, spending the summer months on the alpine meadows and wintering in the valleys. Possibly as many as 2000 deer still survived in 1947, but ten years later the population had been reduced to about 400 (Gee, 1966). It is doubtful if more than 180 remain in existence today (Schaller, 1969). Although overgrazing by livestock is a problem on the deer's summer range, poaching has been and continues to be the main cause for the decline. Responsibility for the suppression of poaching rests with the Kashmir Forest Department and unless it is prepared to make a more determined effort to bring the situation under control, the deer is certain to become extinct.

#### **Asiatic buffalo *Bubalus bubalis***

The wild buffalo was once abundant in the Indo-Gangetic basin, as well as from Bengal southwards to the Godavari River. It has been eliminated from the greater part of its former range and is now uncommon, the population totalling no more than 2000. Three-quarters of this total occurs in Assam, of which about 550 are in the Kaziranga and perhaps 400 in the Manas Sanctuary, with others scattered along the Brahmaputra Valley. Herds along the Godavari River total no more than 150 (Daniel and Grubb, 1966), while the Nepalese remnant on the Kosi River numbers about 35.

The wild buffalo's favoured habitat comprised the extensive well-watered grass plains. These conditions were also the most attractive from the human standpoint, and the decline of the animal inevitably stemmed from this situation. Not only was the habitat taken over by man but, as cultivation became more extensive, increasing numbers of buffalo were killed in the interests of crop protection. The practice of herding cattle in areas used by wild buffalo was responsible for heavy losses from disease, notably rinderpest. The survival of this species is not assured, and a comprehensive study of it is needed.

#### **Nilgiri tahr *Hemitragus hylocrius***

One of us (G.B.S.) checked on the status of the tahr in October, 1969, by visiting the major remaining areas in South India where it still exists. About 300 animals survive along the western escarpment of the Nilgiri plateau in Madras, protected largely by the Nilgiri Wild Life Association and by the rugged cliffs at an altitude of 7000 feet to which they retreat in times of danger. Unfortunately the forest department has in recent years built roads into tahr habitat and established extensive wattle plantations, thereby creating considerable disturbance and providing easy access to motorized poachers.

About 500 tahr, the largest existing population, are found in the Eravikulam area of the High Range in Kerala, a private shooting reserve maintained by the High Range Game Preservation Association for nearly 75 years. The tahr in this area have survived solely because of the efforts of the local sportsmen. In neighbouring areas, such as in the Palni Hills, where tahr come under government rather than private jurisdiction, poachers have either wiped them out or reduced them to a few small herds. The total number of Nilgiri tahr in existence is probably about 900-1000.

#### **RELATIVELY COMMON FORMS**

Included in this category are those animals which, although numerically reduced, are still fairly widespread in the forests and mountains and which, given proper protection and management, could once again become abundant in their respective habitats. If present trends are permitted to continue, however, certain species in this category, too, will ultimately be confined only to sanctuaries.

Animals such as the Himalayan tahr *Hemitragus jemlahicus* and blue sheep *Pseudois nayaur* have for long been protected by the remoteness and inaccessibility of their habitat. The recent increase in military activities and road construction in the mountainous



regions, however, is exposing the Himalayan fauna to intensive persecution. Some species have managed to survive because of their retiring dispositions and solitary habits. These include such animals as the serow, sloth bear, and four-horned antelope *Tetracerus quadricornis*. A few species, particularly the gaur, nilgai, langurs *Presbytis spp.* and rhesus monkey *Macaca mulatta*, have been to some extent protected by religious considerations. But such attitudes are changing. The nilgai, once tolerated because of its resemblance to the cow, is now shot, and the state of Uttar Pradesh even pays a reward for each specimen. Rhesus monkeys are extensively trapped for export to medical laboratories. In 1958-59 between 200,000 and 250,000 primates were exported annually from India; by 1965 the figure had dropped to 39,000. Over 10 million rhesus monkeys were said to have once roamed Uttar Pradesh. Southwick *et al* (1965) estimated that only 800,000 survived, and that the downward trend was continuing.

The blackbuck, once the most abundant large ungulate in India and Pakistan, is disappearing at an alarming rate, being now rare in most states including Gujarat, Orissa, Bihar, Madras, Uttar Pradesh and Punjab. It is a sardonic fact that the species exists now in larger herds in Texas and Argentina, where it has been introduced, than in its native lands. Because it is so easily shot in its preferred open habitat, there is little likelihood that this animal can survive outside well-protected preserves. Although small populations occur in a few sanctuaries, the perpetuation of this splendid antelope—as well as the similarly threatened Indian gazelle—calls for the creation of a large desert national park in Rajasthan, where possibly the cheetah could be reintroduced some day.

Elephants still occur in fair numbers in northern, southern and western India. No sanctuary is large enough to contain them, and they often enter cultivations where they may cause extensive damage. Because they have no natural enemies and are not heavily poached by man, elephants may become too abundant in some areas for the limited available habitat.

The two predominant South Asian species of deer—sambar and axis deer—are still widespread, though seldom abundant, wherever suitable forest exists. The axis deer in particular could become an economically important species, in the same way as the ecologically similar North American deer of the genus *Odocoileus*. The economic potential of wildlife is well exemplified in the United States where 2,020,885 deer were shot by licensed hunters in 1966, bringing a great deal of money to the states concerned. This is in marked contrast to the situation in India where no serious attempt has been made to realize the potential inherent in wildlife. In 1961-62 only 88 axis deer were legally shot in the large state of Uttar Pradesh. Most deer are taken by illegal and unselective methods, which not only reduce or eradicate the basic stock but in the process effectively destroy any prospect of the state governments acquiring revenue from the resource.

The large cats present special problems. Not only are their skins sought by the fur trade, but, because most indigenous prey species have been wiped out, they are obliged to subsist on domestic livestock. The secretive leopard is in no immediate danger of extinction: it manages to survive even in quite densely populated areas by preying on dogs and goats. On the other hand, the status of the tiger is becoming critical in India; in Pakistan it has already been largely eradicated except for a few in the eastern part of the country.

The nominate race, which is the tiger of South Asia, has thus far avoided being placed in the *Red Data Book*, but its status is deteriorating so rapidly that the time is not far distant when it will have to be added to the endangered list. Recent estimates by Gee (1964) and others placed the number of tigers in India at about 2500 to 4000 animals and in Nepal at about 250 animals.

Although the tiger is a highly adaptable animal, its range has been greatly reduced. It still occurs in most of the larger forests, except in the states of Punjab and Kashmir, but only sparsely. Even in the forested Himalayan foothills, once renowned for the number of tigers, the remnant is widely dispersed. The species is represented in only a few sanctuaries, such as Kanha, Kaziranga and Corbett.

An estimated 400-500 tigers are killed each year in India. One taxidermist alone is known to have handled over 100 skins in 1968. Since 1955 there has been increasingly widespread destruction of carnivores by pesticides—notably endrin and folidol issued by the Indian Department of Agriculture—a system that kills indiscriminately. Control over the use of such poisons is essential.

A further important cause of scarcity of tigers has been uncontrolled hunting, not least

by government officials, military personnel and others who frequently resort to reprehensible practices such as shooting from jeeps at night with the aid of spotlights.

The governments of both India and Pakistan have wisely prohibited the commercial export of tiger and leopard skins. However, the authorities do not have the fur trade within the country under control and tourists are still allowed to take skins out of the country. Most fur shops have tiger skins for sale—even in Kashmir where the animal does not occur. Laws are needed which require each skin to be stamped by the government, thus simplifying the detection of illegal skins, and which prevent all trade in endangered species or products made from them.

## RESERVES AND SANCTUARIES

It is gratifying to see that most of South Asia's endangered species are represented in areas which have been designated as sanctuaries or national parks. These reserves are doubly important, since they preserve a broad spectrum of the countries' fauna and flora as well as provide a haven for the rare species. Kaziranga Sanctuary in Assam, for example, is a principal remaining stronghold of the Indian rhinoceros, Asiatic buffalo and swamp deer. In addition, it typifies a marsh habitat that once covered several thousand square miles along the Brahmaputra and Ganges rivers. Hog deer, elephant, tiger and other species frequent the area together with the less common animals. Unfortunately, most Indian sanctuaries are small—few exceed 200 sq. miles, and most are smaller—not large enough to retain within their boundaries such wide-ranging creatures as wild dog *Cuon alpinus* and gaur.

Furthermore, the establishment of a sanctuary is not in itself enough; it must be properly maintained. Some sanctuaries contain villages, and virtually all permit the grazing of livestock, sometimes controlled but more usually not. Many sanctuaries, particularly in Rajasthan and other arid areas, are usually so overgrazed that the habitat has degenerated. This factor, together with constant disturbance by herdsmen, the danger of transmission of disease from livestock to wildlife, and the loss of aesthetic value to the visitor, combine to make the grazing of livestock within a sanctuary a highly undesirable practice. It is realized that in some areas, such as the Gir Sanctuary, it would not be feasible to eliminate all villages and livestock. But it should be possible for the government to set a realistic limit—based on the optimum carrying capacity of the land—to the number of animals that may use an area. This would be a distinct advance on the prevailing practice of overstocking, exemplified by the 11 sq. mile Keoladeo Ghana Sanctuary in Rajasthan which is obliged to support some 5500 cattle and buffalo (Schaller *et al.* 1966), a gross misuse of a superlative area.

Many sanctuaries are also subjected to timber extraction programmes. In some states with limited land under forest a certain amount of lumbering may be necessary. If done in a controlled fashion the elimination of some tall trees may actually be beneficial to wildlife, because most species prefer secondary to primary growth. However, the recent trend in south India of cutting out the indigenous forest and planting the exotic *Eucalyptus* is to be strongly deprecated.

A serious danger to wildlife in most sanctuaries is from poaching. The amount of illegal hunting, whether for meat, for certain parts of the animal (such as rhinoceros horn), or for sport, is so extensive in some sanctuaries that the future of the species they are designed to protect is problematical. In several of the Uttar Pradesh sanctuaries, for example, swamp deer have been virtually wiped out, even though the reserves were established for the particular purpose of preserving them. Evidence of poaching is abundant away from the main roads, as the following experiences by one of us (GBS) show:

- (a) On the first morning of a visit to the Dachigam Sanctuary a site was found where a Kashmir stag has been butchered the previous day.
- (b) On the first day in the Keoladeo Ghana Sanctuary a muzzle loader was confiscated from a poaching villager.
- (c) During the first few days in the Kanha National Park dozens of snares set to catch deer were collected.

The institution of a system of daily foot patrols by a small number of dedicated forest rangers would speedily bring poaching under control. Although the forest departments

responsible for the sanctuaries have substantial staffs at their disposal, virtually no sustained attempt is made to curtail poaching.

Because of apathy and political expediency, the wildlife in the few sanctuaries of South Asia is threatened. The surface area of India alone is 1.26 million sq. miles. According to the United Nations list, 14 areas in India qualify for the status of National Parks and Equivalent Reserves, totalling 1974 sq. miles (Appendix B.) Other Indian reserves of varying status raise the overall figure by about 4,120 sq. miles. Expressed in terms of percentage of the total land surface area, and in comparison with most other countries, the figure is low. This insufficiency enhances the significance of each sanctuary out of all proportion to its size and serves to underline the need for those few areas to be administered in a way that will measure up to the aspirations on which they were established—as inviolate sanctuaries for the perpetuation of a selection of the country's indigenous fauna and flora under natural conditions.

One of the fundamental problems in India is that the central government has no administrative control over the preservation of wildlife and the management of reserves. All sanctuaries and so-called national parks come within the absolute jurisdiction of the respective state governments—which can establish, modify or even abolish them according to whim. A uniform policy for all states, co-ordinated at the federal level, is urgently needed if this national heritage is to be preserved.

## THE FOREST ESTATE

In the South Asian countries most forest land belongs to the central or state government, rather than to private persons. This is advantageous in the sense that there is thus reasonable assurance that much of the habitat will not be brought under immediate cultivation. However, excessive livestock grazing in the forests, as in the sanctuaries, is causing deterioration through erosion and lack of regeneration. The forest departments are not politically powerful enough to curtail this grazing in most areas, even though some of the livestock consists of useless animals, old, diseased or unproductive.

In another respect, however, the forest departments' responsibility for wildlife is less fortunate. Most departments do not recognize wild animals as a valuable natural resource, and, with a few notable exceptions, foresters show no concern for or interest in the wild fauna under their jurisdiction: the emphasis is almost exclusively on producing the largest number of board feet of timber. Little effort is made to prevent poaching, which is practised not only by villagers but also by government officials, including some in the forest departments. Culprits, although known to the local forestry staff, are seldom apprehended and still more rarely prosecuted. Fines, when they are levied by the judiciary, are so low that they do not deter poaching. As a result, wildlife has become sparse in most forests.

In many countries there is now a growing realization that the maintenance of well-managed wildlife is not incompatible with the interests of forestry. This broader concept has yet to be accepted in South Asia, but in the countries' long-term interests it is important that wildlife management should become an integral part of forest department policy. In addition there is an urgent need for the governments to initiate conservation practices in the forests to prevent further habitat deterioration. The ultimate goal should be a land use policy satisfactory to man, to his livestock and to wildlife; one in which forest products, both plant and animal, are harvested on a sustained yield basis without further harming the land.

## TOURISM

Attention has already been drawn to the loss of valuable potential revenue from hunting. Similarly, the South Asian governments have failed to appreciate the even greater unrealized potential inherent in wildlife as a tourist attraction. In Kenya, for example, tourism—which is based almost exclusively on the attractions of wildlife—has progressed during the last two decades to a position of the country's second most lucrative revenue-earner; if present trends continue it will soon top the list.

The need to encourage tourism has been officially recognized in South Asia, but efforts have been concentrated on historic and religious edifices and other cultural attractions, almost to the total exclusion of the wildlife. For example, in India one of the main tourist circuits, between the cities of Delhi, Jaipur, and Agra, touches on both the Sariska and Keoladeo Ghana sanctuaries yet most visitors remain unaware that in them they can view such uniquely Indian species as axis deer, nilgai and blackbuck, as well as many birds. The natural heritage of South Asia is as important and interesting as the cultural one, and visitors to that part of the world should be helped to become aware of it.

It would not be in the least difficult for tours to become as successful and as remunerative in South Asia as elsewhere in the world, but only if the basic amenities are available. A few national parks and sanctuaries have established rest houses, but in most of them the accommodation and particularly the food are of an inadequate standard.

## RESEARCH

Sound solutions to any country's conservation problems are dependent upon adequate research and efficient management. It is impossible to establish a viable reserve unless one knows the requirements of the species it is designed to protect, and in any conservation programme the need for an accurate inventory is basic and self-evident. What does the animal eat? How far does it roam? Accurate and regular censuses are essential to find out if the animal is increasing or decreasing. What is the optimum carrying capacity of the forest lands in terms of livestock and wildlife? Virtually no research is being done on this crucial subject in South Asia, and little or nothing is known about most species inhabiting the sub-continent including the entire Himalayan complex. In India, the forest departments and the Zoological Survey of India, the two organizations which could be expected to undertake wildlife research, do not have an ecologist on their staffs. Intensive investigations on particular species have been limited to several primates (Simonds, 1965; Jay, 1965; Sugiyama, 1967; Ripley, 1967), and to the current studies of the Ceylon elephant and the lion, done mostly by foreign researchers.

Each forest department, whether state or federal, requires a separate wildlife branch with a small staff trained in wildlife techniques whose principal function would be field research. Such persons would of necessity have to be trained in Europe or North America, since most South Asian universities neglect to teach even a course in basic ecology, although a start has been made at Benaras Hindu University which holds a diploma course in ecology. Furthermore, each forest officer should be exposed to an intensive field course in wildlife management, which could best be held at the Dehra Dun Forest Research Institute. This course should be taught each year by an experienced authority on the subject, seconded from an overseas university through one of the technical assistance programmes.

It is important that the central governments, particularly in India, should take a more positive role in conservation, both with grants to establish and maintain sanctuaries, as well as by sponsoring research projects.

The time has also come for the world's conservationists to show more active interest in South Asian wildlife problems. A simple example will suffice to illustrate the imbalance: 15 foreign scientists are currently working on wildlife and habitat problems in the Serengeti National Park of Tanzania—more than in the whole of South Asia.

South Asia is presented with an urgent choice. Either poaching, over-stocking by domestic animals, and environmental degradation can continue as at present, with ultimate loss of some of the most valuable natural resources, or, through introduction and implementation of scientifically sound conservation programmes, the forests and wildlife can be retained for the benefit of this and ensuing generations.

## RECOMMENDATIONS

Adoption of the following basic proposals would help to remedy the situation in India outlined in this paper. Broadly similar measures require to be taken in the other South Asian countries.

(1) *At the federal level:* The introduction, implementation and sustention of a dynamic conservation policy requires a legally constituted framework within which executive action can be taken. In the United States, for example, the Department of the Interior provides the broad umbrella under which conservation measures can be advanced. In the absence of an equivalent Ministry of Conservation in India, the appropriate agency at the centre is the Ministry of Agriculture, and, more specifically, the Department of Forestry.

A meeting of representatives of the Planning Commission, the Ministry of Agriculture and the Indian Board for Wildlife, held in April 1965, recommended the creation of a wildlife wing within the Department of Forestry, both at the centre and in each state. In August 1968, it was announced that an Assistant Inspector-General of Forests (Wildlife) had been appointed. This represents a highly significant advance.

The imperative need for centralized co-ordination of conservation policy could be further assisted by broadening and strengthening the authority and the effectiveness of the Indian Board for Wildlife by the appointment of a full-time Executive Officer, having the rank of at least Joint Secretary. This appointment would enable the Board to take its rightful place as a major driving force in matters pertaining to wildlife conservation in India. The Board itself should also appoint a small Executive Committee from among its members, which would meet more frequently than the full Board. At the same time arrangements should be made for the Board to submit an Annual Report to Parliament.

Without some such organization there is little prospect of introducing and implementing a dynamic country-wide conservation policy. Such an arrangement would also greatly strengthen the links between the Federal Government and the State Authorities.

(2) *At the state level:* The detailed work of implementing the policy agreed at the federal level will devolve on the states. Within the broad guidelines mentioned in the preceding Recommendation, the task of each state should be to make an assessment of its own wildlife resources and conservation problems, with federal aid in the form of funds and technical assistance where necessary. This would involve undertaking detailed surveys of all forests to evaluate their status and potential; drawing up a comprehensive wildlife management and conservation programme (a) for all forest areas in the state as a whole and (b) for each reserve; investigating the prospects of establishing additional reserves to ensure that a sample of each state's fauna and flora is protected; introducing any new laws that are desirable in furthering this objective; and ensuring that the agreed policy is vigorously enforced.

## REFERENCES

- Dang, H. (1967) The snow leopard and its prey. *Cheetal* 10(1): 72-84.
- Daniel, J. C. and Grubb, B. R. (1966) The Indian wild buffalo, *Bubalus bubalis* (Linn.) in peninsular India: a preliminary survey. *J. Bombay Nat. Hist. Soc.* 63(1): 32-53.
- Gee, E. P. (1963a) The brow-antlered deer of Manipur. *Oryx* 6(2): 103-115.
- Gee, E. P. (1963b) Report on a brief fact-finding survey of the Indian wild ass: prepared for the Survival Service Commission of IUCN. *Oryx* 7(1): 9-21.
- Gee, E. P. (1964) *The wild life of India*. London.
- Gee, E. P. (1966) Report on the status of the Kashmir stag: October 1965. *J. Bombay Nat. Hist. Soc.* 62(3): 379-393.
- Jay, P. (1965) The common langur of North India. pp. 197-249. In: *Primate Behavior*. I. DeVore, ed. New York.
- Mountford, G. and Poore, D. (1968) Report on the Second World Wildlife Fund Expedition to Pakistan. Cyclostyled.
- Ripley, S. D. (1967) Intergroup encounters among Ceylon gray langurs (*Presbytis entellus*). pp. 237-253. In: *Social communication among primates*. S. Altmann, ed. Chicago.

- Schaller, G. B. (1967) *The deer and the tiger: a study of wildlife in India*. Chicago.
- Schaller, G. B. (1969) Observations on the hangul or Kashmir stag (*Cervus elaphus hanglu* Wagner). *J. Bombay Nat. Hist. Soc.* 66(1): 1-7.
- Schaller, G. B., Spillett, J. J., Cohen, J. E. and De, R. C. (1966) The status of the large mammals in the Keoladeo Ghana Sanctuary, Rajasthan. *IUCN Bulletin*, N. S. 1(20): 7.
- Simon, N. M. (1966) *Red Data Book*, Vol. 1, Mammalia. IUCN, Morges.
- Simonds, P. (1965) The bonnet macaque in South India. pp175-196. In: *Primate Behavior*. I. DeVore, ed. New York
- Southwick, E., Beg, M. and Siddiqi, M. (1965) Rhesus monkeys in North India. pp. 111-159. In: *Primate Behavior*. I. DeVore, ed. New York.
- Spillett, J. J. (1966) A report on wild life surveys in North India and southern Nepal, January-June, 1966. *J. Bombay Nat. Hist. Soc.* 63(3): 492-628.
- Spillett, J. J. (1968) A report on wild life surveys in South and West India, November-December 1966. *J. Bombay Nat. Hist. Soc.* 65(1): 1-46 and 65(2): 296-325.
- Sugiyama, Y. (1967) Social organization of Hanuman langurs. pp. 221-236. In: *Social communication among primates*. S. Altmann, ed. Chicago.
- Sugiyama, Y. (1968) The ecology of the lion-tailed macaque (*Macaca silenus* (Linnaeus))—a pilot study. *J. Bombay Nat. Hist. Soc.* 65(2): 283-292.

## APPENDIX A

Mammals of South Asia Occurring on the International List of Rare and Endangered Species as at January 1969

\* Status discussed in detail in text

<i>Rhinopithecus roxellanae</i>	Snub-nosed monkey
<i>Caprolagus hispidus</i>	Hispid hare
* <i>Selenarctos thibetanus gedrosianus</i>	Baluchistan bear
<i>Viverra megaspila civellina</i>	Malabar civet
* <i>Panthera leo persica</i>	Asiatic lion
<i>Panthera uncia</i>	Snow leopard
<i>Acinonyx jubatus venaticus</i>	Asiatic cheetah
* <i>Elephas maximus maximus</i>	Ceylon elephant
<i>Dugong dugon</i>	Dugong
* <i>Equus hemionus khur</i>	Indian wild ass
<i>Equus hemionus kiang</i>	Tibetan wild ass
* <i>Rhinoceros unicornis</i>	Great Indian rhinoceros
<i>Rhinoceros sondaicus</i>	Javan rhinoceros
<i>Didermoceros sumatrensis</i>	Sumatran rhinoceros
* <i>Sus salvanius</i>	Pygmy hog
* <i>Cervus duvauceli</i>	Swamp deer
* <i>Cervus eldi eldi</i>	Manipur brow-antlered deer
<i>Cervus elaphus wallichii</i>	Shou (or Sikkim stag)
* <i>Cervus elaphus hanglu</i>	Hangul (or Kashmir stag)
* <i>Bubalus bubalis</i>	Asiatic buffalo
<i>Bos grunniens mutus</i>	Wild yak
* <i>Hemitragus hylocrius</i>	Nilgiri tahr
<i>Capra falconeri jerdoni</i>	Straight-horned markhor

## APPENDIX B

### South Asian Sanctuaries Recognized by the United Nations List as National Parks or Equivalent Reserves

INDIA		<u>sq. miles</u>
Assam	Manas Sanctuary	106
	Kaziranga Sanctuary	167
Bihar	Hazaribagh N. P.	73
Gujerat	Gir Sanctuary	489
Kerala	Periyar Sanctuary	301
Maharashtra	Taroba N. P.	46
Madhya Pradesh	Kanha N. P.	124
	Shivpuri N. P.	62
Mysore	Bandipur Sanctuary	22
Rajasthan	Sariska Sanctuary	192
	Jaisamand Sanctuary	21
Tamilnadu (Madras)	Mudumalai Sanctuary	125
Uttar Pradesh	Corbett N. P.	205
W. Bengal	Jaldapara Sanctuary	41
	<b>Total</b>	<b>1974</b>
PAKISTAN		
	Chittagong Hill Tracts N. P.	101
	Madhupur N. P.	40
	<b>Total</b>	<b>141</b>
CEYLON		
	Wilpattu N. P.	254
	Ruhunu N. P.	90
	Wasgomuwa Nature Reserve	109
	Yala Nature Reserve	107
	Ritigala Nature Reserve	6
	Hakgala Nature Reserve	4
	Gal Oya N. P.	98
	<b>Total</b>	<b>668</b>
NEPAL		
	Chitawan Rhinoceros Sanctuary	313
	Sukha Phanta Sanctuary	49
	<b>Total</b>	<b>362</b>
BHUTAN*		
	Manas Wildlife Sanctuary	162
	Laya Wildlife Sanctuary	500
	<b>Total</b>	<b>662</b>

\* (Note: Bhutan's two sanctuaries were recently established and have not as yet been included in the U. N. List).

## Conserving the Asiatic Lion

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### INTRODUCTION

The only remaining population of Asiatic lions (*Panthera leo persica*) is in the Gir Forest in Gujarat State in India. Estimates have been made of their numbers with five counts between 1936 and 1968. These range between 290 in 1955 and 177 in 1968. The problem is whether these figures represent a real decline, and if so, to find why it has occurred and recommend how it can be stopped. This paper gives preliminary results of a current research programme.

### Study area

The Gir Sanctuary covers 1265 km<sup>2</sup>. It encompasses the Gir hills which rise above the flat, arid agricultural lands of western Gujarat State. These hills are covered predominantly with a dry mixed deciduous forest, most of which is teak (*Tectona grandis*) and *Acacia* spp.

The climate is strongly monsoonal, with winds off the Arabian Sea bringing wet weather, usually from June or July through September or October. The rainfall during this period is low, with approximately 64 cm typical for the Gir as a whole. A dry cool season follows extending to February or March, and this is followed by a hot season with desiccating winds from the north.

Most valley floors along the periphery of the sanctuary are under cultivation, extending in some cases deep into the sanctuary. Agriculture is a continuous threat to the forest. Encroachment of cultivation has been particularly apparent within recent years with the advent of cash crops, namely sugar cane and ground-nut. Such encroachment limits the distribution of wild and domestic herbivores, especially in the critical dry part of the year when the natural forage is in least supply.

As well as cultivators who live along the periphery of the sanctuary, there are also graziers or 'maldhari', who live on both sides of the boundary, with about 5000 within the sanctuary. These 'buffalo breeders' are believed to have settled before the turn of the century, and now, having established themselves, they are opposed to any threats of moving them elsewhere.

With cattle (cows, bullocks and buffalos) densities varying from 0.2 to more than 0.4/ha and the intense competition for forage which has resulted, it is not surprising that wild-life has suffered. All wild ungulates in the Gir, namely chital *Axis axis*, sambar *Cervus unicolor*, nilgai *Boselaphus tragocamelus*, chinkara *Gazella gazella*, four-horned antelope *Tetracerus quadricornis* and wild boar *Sus scrofa*, are rare.

The dominant financial interest within the Gir is forestry, providing a net return in the order of five or six lakh rupees (approx. £28,000-£33,000) annually. The principal species harvested is teak which is intensively managed on a 40-year rotation. This interest conflicts with the cattle graziers because domestic stock damage the regeneration of trees.

Tourism is a recent development within the sanctuary. At the moment lions are the only attraction and specially conducted tours are arranged for the tourists. During the last five fiscal years (April to March) the number of visitors per year has increased from