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Observations on the Wildlife Sanctuaries of India¹

BY

R. H. WALLER

INTRODUCTION

The report attempts to combine personal observations with certain scientific facts about ecological conditions and animal populations. For this purpose I covered India from Kerala to Kashmir and from Assam to Rajasthan between March and August 1970, most of which was spent in the jungle—mainly in the sanctuaries and parks—with two weeks at the end of intensive talks in Delhi with all those concerned with Wildlife Conservation.

Fifteen sanctuaries were covered. In all of these the excellent cooperation and help from the staff of the Forest Service, from Chief Conservator to Forest Guards, is gratefully acknowledged.

The original report was about 40,000 words so this account can only include parts which are thought to be of particular interest with a brief summary of others.

The description of habitat, area and position will be omitted from every sanctuary or reserved forest area described since it is assumed that Indian members know these details or can readily look them up.

PART 1

OBSERVATIONS ON SOME INDIAN WILDLIFE SANCTUARIES AND RESERVED FOREST AREAS

Nilgiri Plateau

The main purpose of my camp at Bangi Tappal was to view and photograph the Nilgiri Tahr. In four days I and my two shikaris criss-crossed the area west of Bangi Tappal, walking ten to fifteen miles a day. This area is totally uninhabited.

¹ Excerpts from a report submitted to I.U.C.N. and W.W.F. in November, 1970

In the four days we saw 195 separate individuals, and in one single day 115 in herds of 44-41-30. All were seen on the highest, usually rocky, slopes of the open grassland at about 2250 m (7500 ft) grazing and resting in the sun or the shade of the rocks ; two herds were watched going warily down to water, always where the stream was clear of forest. Tahr are seen in the open at all hours of the day.

The approximate composition of the herds seen and the situation was :—

(1) 45 head ; of which 16 were kids and 4 or 5 young bucks, the remainder does. It is difficult to distinguish young bucks from does as both are grey, whereas older bucks are brownish black. This herd got our wind when it changed, and was off across the valley at great speed.

(2) 35 head ; of which 12 were kids and 2 young bucks ; the remainder were does. They passed us, when hidden behind rocks, going down to water.

(3) 30 head ; of which 8 were kids and the rest does. There may have been some young bucks, but this herd was seen approaching water from some way off.

(4) 44 head ; of which 14 were kids, 4 or 5 young bucks and one old buck or 'saddle-back' (so called from the light patch on the dark back acquired with age). The 'saddle-back' was lying apart from the rest of the herd, with his own sentinel doe guarding him. After a long and painful stalk, it was she who saw me, not the sentinel of the main herd, and thwarted my photo. Their sight is excellent and in marked contrast to that of the sambar, which can be stalked quite easily in similar open country, provided one is approaching 'up wind' and movements are slow.

— During the season of hot weather the 'saddle-backs' are mostly separate from the herds. We searched for them to the south-western edge of the hills but were unlucky.

(5) 41 head ; of which 10 were kids and 3 or 4 young bucks. It was with this herd that I had the fascinating experience of them all moving towards me from some danger below. I had approached from above, between rocks, and was precariously hanging on a small cliff when, to my annoyance, I heard their alarm call—a curious snorting whistle—and knew the wind must have changed. But, as the position of the alarm signal remained static, I edged along the cliff to see the herd moving towards me over a grassy slope, while the sentinels continued to call, looking downhill. Following their line of sight I saw a light-coloured movement on the edge of the shola about 100 metres below which was almost certainly a panther abandoning his stalk. There are no people in this area and my two shikaris had remained where I left them, on the far side of the hill.

Panther are the main enemy of the tahr. Tigers, even when more

abundant here, were not a great danger to them, being too heavy to move swiftly in steep places as the panther can.

The panther is certainly not common in this area, but is not as rare as the tiger. In the four days, we saw only two separate sets of tiger pug marks made, according to my shikaris, within the previous three days.

Three weeks before my visit, one of the shikaris had seen a tiger walking up a valley about three kilometres from our camp. But, he added, this was now a rare occurrence and we would count ourselves very lucky if we saw one ; whereas only five years ago he reckoned a visitor would be unlucky *not* to see a tiger within four energetic days in this area. I found a similar rapid decline in tiger numbers over the last five years in other parts of India.

Only 14 Sambar were seen : 2 were solitary stags, still in hard horn at the end of March, 2 were fawns and 10 hinds. The increase of sambar is essential if tiger is to make a come-back in this very promising, untouched and uninhabited area. The sambar is, at this height, almost his only prey. Wild Boar tend to remain at lower levels near cultivation and I saw no evidence of gaur.

This area is, to my knowledge, almost unique in India in having great wildlife potentialities and at the same time being completely free from habitation, cultivation, grazing by domestic stock and forestry operations. The meagre top soil on the lateritic rock makes it unsuitable for cultivation ; and the Forestry Dept. already have over 1000 sq km for their eucalyptus and wattle plantations in a wide circle round Ootacamund. Shooting and fishing are at the moment allowed but all licences are strictly controlled by the excellent Nilgiri Wildlife Association. There are threats of more reservoirs, H.E. projects and plantations, so the sooner a sanctuary for the tahr is declared the better. Controlled shooting of 'saddle-backs' by licence-holders could still continue, acting as a form of cropping.

Sigur Reserved Forest

The Elephant (*Elephas maximus*) is not only common in this area, it is a menace which needs attention. There are too many and they are bad tempered and dangerous. A German photographer was killed here two years ago, and two or three Indian peasants are victims each year. There seems no system of control until an elephant has killed at least one man and is prescribed as a 'rogue'. Only then can it be shot.

Their bad tempers are a direct result of their uncontrolled numbers. They raid the neighbouring crops, having destroyed much of their own habitat, and then get peppered with shot from ancient guns or have burning flares thrown at them. One I saw was pock-marked with little

bumps where the shots had lodged and festered. It is most unpleasant operating in jungles infested with such elephants and even my well-experienced shikari was nervous when walking. At intervals along some of the rivers, where the elephants come to drink and to eat the bamboos, the villagers have put notched poles or primitive ladders against the bigger trees for quick retreat to safety !

The Wildlife Officer for Mysore is well aware of this state of affairs, but rightly asks for help with an elephant census before starting any culling. There is an urgent need for an elephant census in Bandipur and Mudumalai sanctuaries and the reserved forest bordering them.

The Wild Dog or Dhole (*Cuon alpinus*) are numerous, and are partly responsible for the decline in numbers of the Sambar. Early one morning from the top of a hill we watched a tragedy unfold, from the first encircling by wild dog of three sambar hinds to the final destruction of one of them beside the river. We were too far off to effect any rescue. The tragedy was not the killing but the method and the apparent resignation of the sambar to its fate ; and the consequent feeling that with large numbers of wild dog in the area the rather stupid sambar, in contrast to the alert chital, is doomed here to a fast decline in numbers.

We first spotted the three sambar hinds about 500 metres down the steep grassy slope, grazing peacefully ; then we saw a single wild dog jump on to a rock only 100 metres below, quite unaware of us and looking intently at the sambar. Soon we picked out another ten dogs in similar attitudes forming a large semicircle on the upper side of the hinds. One of the dogs had eight little cubs, almost orange in colour, sitting behind her, presumably to be taught the technique of the game.

The ring of red dogs then moved downwards and inwards silently and steadily, tightening the half circle. The sambar were now aware and looked uphill but made no attempt to escape. As we watched the net tighten, two dogs suddenly went in to attack, and with a single high pitched excited yapping, separated off one of the hinds. One dog went for a back leg, presumably biting the tendon, and got kicked away—the only action she ever took to defend herself. The other jumped at her nostrils and tore them with his teeth and the blood flowed freely. The two dogs then sat down in the grass, making no attempt to pursue her while she limped rather slowly about 100 paces downhill. Here she stood dejectedly, with blood dripping from her nose, not making the slightest attempt to escape and apparently accepting the inevitability of death as the end to this grim drama. Equally the wild dogs were in no hurry. They knew the conclusion with certainty ; that they would be eating her shortly.

The other dogs, including the cubs, now moved down through the burnt grass and fanned out below the sambar hind. No communicating signals were heard ; perhaps because the ground was open with only an

occasional tree and the dogs could always see each other and their prey. When the rest were in position below, the two dogs which had made the first attack, drove the hind downwards into the semicircle of those waiting below. All dogs now closed in with little noise and tore her to bits. This is by no means an isolated incident. I came across similar cases in other parts of India ; it is most necessary to shoot wild dog and so give sambar a better chance to increase.

Mudumalai and Bandipur Sanctuaries

No animal census has been taken in either sanctuary and only a few estimates are available. Elephant and Chital (*Axis axis*) are common and probably need cropping but a census must be taken first. The estimates of the large cats of Mudumalai are vague. They keep a 'Tiger/Panther sighting' register, started on 1-xi-69, which showed for the first five months :—

Panther	..	14 sightings (5 of which were cubs).
Tiger	..	2 sightings (second one on 3-iv-70 when I was there and saw the pug marks).

Estimate on other animals :

Gaur	..	34
------	----	----

Estimate for Bandipur gave :—

Panther	..	8-10
Tiger	..	5

(2 males, 1 female, 2 three-month-old cubs in April).

These two sanctuaries were formerly famous for their Bison or Gaur. The present very low numbers of 50-60 are the result of a tragic outbreak of rinderpest, between August 1968 and February 1969, when 90% of the gaur died—probably about 1000 animals. Skulls now litter the two sanctuaries as a reminder of what can happen when there is no control of cattle infiltration—the undoubted spreaders of the disease.

The real cause of the rinderpest outbreak was not infiltration, but the regular driving each week of 100 to 120 head of cattle on a road through the middle of both sanctuaries, leading to their destination at Ootacamund. This practice was still continuing in August 1970, though proposals for trucking them or driving them through troughs of disinfectant have been put forward ; as well as a suggestion for teramycene powder to be added to 'salt-licks' as a form of inoculation for the wild ungulates.

Besides Gaur (90%), Sambar suffered a 50% reduction, about 100, and Chital 5%, about 500. This state of affairs shows how necessary it

is for the Central Government to take over all parks and sanctuaries and place them under a central Wildlife Department and Service.

The tiger figures need little comment. It is the same tragic state of affairs throughout India—poaching the tiger for the high price of skins—though the use of toxic pesticides, especially the colourless and odourless 'folidol', seems greater in the south where there appears to be less control of distribution to the farmers. The big drop in tiger figures has been over the last five or six years and the whole State of Tamil Nadu is estimated to have only about 15 to 20 tigers.

Neither Bandipur nor Mudumalai has a 'Management Plan' to refer to. Such plans are one of the most urgent needs. Poaching is difficult to control with so many villages in the vicinity, but the staff do their best.

Ranganathittu Bird Sanctuary

April was not the best time to visit. However some of the nesting species were starting to assemble and the variety was rewarding. In a row boat or coracle one approaches silently and good photos can be taken. More could be done to popularise this beautiful little sanctuary which is unknown to many tourists staying in Mysore City.

Periyar Sanctuary

No animal census has been taken but these estimates were given to me : Elephant 600 ; Gaur 500 ; Sambar 200 ; Pig 2000 ; Panther 15-20 ; Tiger 3 or 4 (the Asst. Wild life Officer saw one last in December 1969) ; Nilgiri Black Langur frequent.

This is one of the most splendid sanctuaries in India both scenically, with its combination of lake, grassland and forest, and zoologically as a viable eco-unit. It holds the greatest potential of all India's sanctuaries for a future first-class national park. But sadly it reflects in its administration the turbulent politics of Kerala with ever changing governments.

Tourist management is good with ease and comfort of viewing animals, especially elephant and gaur, from the motor launches which take visitors round the lake.

It is questionable whether any tiger remain, but Periyar could be a perfect situation for the re-introduction of this species. His natural prey is here—pig and gaur are plentiful and sambar would increase if allowed. It all depends on protection. Poaching is controlled with difficulty, due to few roads in hilly terrain and insufficient staff.

Grazing is minimal, being confined to a few cattle near the Tourist Lodges at one end of the lake. The whole sanctuary is therefore vir-

tually free of the scourge which afflicts most of India's wildlife sanctuaries. There is no habitation, no cultivation and now no forestry operations. Some eucalyptus were planted near the dam but the Forest authorities have promised to do no more. Even the present plantations are not, to my mind, harmful as the trees are well spaced with plenty of grass beneath them, where I saw a group of elephant grazing.

The happy situation on grazing, cultivation and forestry operations in Periyar points again to its possible potentialities for the future. It is the largest of all Indian parks or sanctuaries and approaches nearest to the requirements of a true National Park. The situation is there, what is needed are the right men for the job.

Jaldapara Sanctuary

No animal census has been done, though Spillett (*JBNHS* 63, 1966) did a count with estimates of most species. Since then Rhino have increased, though 1970 saw some unfortunate losses from poaching. This has at least had one good effect in that the administration has allotted seven more elephants around the sanctuary for both patrolling and sight-seeing. (Chief Conservator, West Bengal, Jan. 1971).

Present estimates for animals at Jaldapara are :—Great Indian One-Horned Rhinoceros 74 ; Elephant 3 ; Gaur 8 ; Swamp Deer 3 ; Hog Deer 158 ; Sambar 34 ; Tiger 2 ; Pig 119 ; Muntjac 160.

This sanctuary, with the forest interspersed by typical riverine habitat of tall thick grass, is the perfect habitat for rhino and hog deer and protection should be concentrated on these herbivores. The tiger could never thrive in such a small curiously-shaped sanctuary.

There are no forestry operations, and there are no villages or cultivation within the sanctuary area. However there are many villages and a dense agricultural population bordering much of the sanctuary ; this results in considerable illegal grazing of cattle and buffaloes, and cutting of firewood and bamboo for hut construction. Law enforcement presents great difficulties for the sanctuary staff, especially in West Bengal with its high population density and political turmoil. However, they do a good job under trying circumstances and it is good news to know that more elephants for patrol work have been sent to help them.

The old Tourist Lodge at Baradabri is now largely ruined by the presence of noisy Army and Air Force personnel. The new Tourist Lodge at Holong, in the middle of the sanctuary, is beautifully designed and situated, built of wood and very comfortable.

Betla Sanctuary (Palamau National Park)

The small area of Betla (26 sq km or 10 sq miles) is the operative part of this proposed National Park. There is a high concentration of animals here, as shown by the figures of the census taken in May 1970 :— Chital 421 ; Sambar 38 ; Gaur 26 ; Pig 91 ; Muntjac 11 ; Tiger 2 (fresh pug marks) ; Panther 0 ; Hyena 1 ; Peafowl 48. The number of Chital is probably excessive for this area and culling will be necessary to prevent destruction of their own habitat.

In May, at the time of greatest heat and drought, there tends to be a concentration in Betla where better water holes, several of them man-made and maintained, attract animals. Population dynamics in Palamau as a whole have yet to be worked out, but the trend is migration into Betla in the drought and dispersal to other parts of Palamau and even out of the protected area in the seasons of more grass and water. The aim is to do a census in January and in May and so obtain a picture of seasonal movements. This is excellent and puts Betla well ahead of most Indian Wild Life Sanctuaries where the lack of regular censuses, if any at all, is regrettable.

Elephants are here in small numbers and their whereabouts is comparatively easy to determine in this open type of deciduous jungle. Their movements are the opposite of many other species between dry and wet season. They leave the Betla area in March or April to travel longish distances to the south in search of shade and water, returning north between July and October. Water they can get in Betla, but not the shade they need at the time of greatest heat.

The animal overcrowding in the Betla area when the heat is greatest is unhealthy and dangerous on two main counts : soil erosion and poaching. Provision of water holes in the areas adjoining Betla should be given high priority. Mrs. Anne Wright of Calcutta, who represents W.W.F. in Eastern India, has done excellent work in Palamau as a whole and Betla in particular. It is to be hoped that W.W.F. can find the money to assist in the making of several maintained and protected watering places, so dispersing the animals and minimizing possible soil erosion and poaching. In the disastrous drought of 1967 many animals were killed by poachers. Now the Forest Service has an efficient system of regular patrols by Forest Guards combining anti-poaching measures with fire protection. This has proved effective in the Betla area where poaching is now minimal, but should be extended further in the other areas of Palamau.

There is no Management Plan for Palamau and one for the small area of Betla would have little validity since it is not a viable eco-unit. However recommendations have been made by Dr. Holloway (1970) of I.U.C.N. and hopefully one will be made.

Forty-three villages are situated on the borders of Palamau and, although all cultivation is outside the perimeter, 15,000 head of cattle graze legally within the sanctuary. The authorities, however, are fully aware of the danger of disease and have managed to have 13,000—all except young and pregnant cows—inoculated against rinderpest.

The cutting of bamboo, which goes on in many parts, undoubtedly causes much disturbance. Every night I spent in the forest I have notes of the noise of lorries and men's voices starting at 04.30 hours !

The Chief Conservator, who is a keen naturalist and photographer, is doing his best to find alternative resources of revenue for the State Forestry Dept. Contractors pay much money for this concession and, although the Forest Guards are vigilant, guns are sometimes found in the lorries. The forestry operations cannot be suddenly terminated, but the authorities are hopeful of gradual elimination. Equally they are trying to find alternative grazing areas for at least some of the cattle. Some eucalyptus have been planted, but this practice is now discontinued and only indigenous species will be planted in future.

A modern tourist lodge has recently been completed at Betla with four double rooms and bath, dining hall and lounge and catering facilities. When I was there at the period of greatest heat the electricity failed permanently resulting in no fans. Unless electricity can be assured it is better to have the old high-roofed Forest Rest House, one of which is available nearby. There are another four in other parts of Palamau. Two Mughal forts add to the beauty of the scenery. Several observation machans and hides are well placed near water holes. A jeep is available for visitors but one or two working elephants would be an asset.

Manas Sanctuary

This is a wild and beautiful sanctuary with great potential for future development. It has very few roads or even tracks and there well may be parts of it almost unknown. No census has been done and the following estimates must be viewed in the light of the statement above. The buffalo, rhino and elephant figures are probably fairly good estimates but others tend to exaggeration :—Wild Buffalo 400+, Elephant 350-400 ; Rhino 30-40 ; Gaur 150+ ; Tiger 35-45 ; Panther 2 or 3 ; Hog Deer common about 2000 ; Sambar 300 ; Barking Deer or Muntjac 500 ; Swamp Deer—a few remain, perhaps 20 ; Golden Langur 35-40 (mainly on the Bhutan side) ; Pigmy Hog 10-15.

Rhino have increased in the last five years. Poaching is minimal except along the southern borders of the sanctuary—the only part that borders on cultivation. The tiger figures seem high, but I was assured that they believe it could well be fifty, as they consider the tiger has increased in recent years ; this is quite possible in view of the inaccessi-

bility of this sanctuary. The Pigmy Hog, once thought extinct, is apparently making a slow but steady come-back in this area. It is a shy nocturnal creature and it would be difficult to estimate numbers. Swamp Deer have declined in numbers and very few remain. The reason, other than poaching, is not known. The eastern part of Manas is so short of water in the very dry season that many of the animals leave. A man-made water hole and the reclamation of a silted-up pond near Uchila would be great assets.

There are no villages in this sanctuary, no cultivation and no forestry operations. In theory there is no grazing, but the villager's cattle on the southern boundary do stray into the sanctuary.

Visitors are very few to this superb sanctuary which combines such beauty of river, forest and hills with great numbers and variety of animals. The mahseer fishing is excellent and there is a wealth of bird life. If money could be spent on improving conditions for visitors and building some all-weather roads, this sanctuary could have a great future for wildlife and tourists alike.

Kaziranga Sanctuary

This well known sanctuary is rightly famous for its rhino and wild buffalo. The populations of both species appear to be in a healthy state with a good young : female ratio. E. P. Gee (1964) gave 375 rhino for Assam. The figure is now 450 at least. Considering the area of Kaziranga and the difficulty of any enlargement southwards into the Mikir Hills, it is quite possible that the present figures for these two species represent the maximum that can be carried, and they should not be allowed to increase further. A careful study is needed.

Present estimates of numbers, largely based on a census done on the block system in 1966, is :—Rhino 400 ; Wild Buffalo 550 ; Elephant 375 ; Gaur 20 ; Swamp Deer 250 ; Sambar 300 ; Hog Deer 4000-5000 ; Barking Deer 100 ; Wild Pig 500-600 ; Bear (Sloth and Himalayan Black) 30 ; Tiger 20-25 ; Leopard 12 ; Otter 200-300.

There is a constant danger of poachers for rhino horn, but the present Divisional Officer, who has a real love and knowledge of the sanctuary, takes the poaching hazard very seriously and he and the Wildlife Range Officer have their guards well organised.

The tiger figures are reasonably satisfactory, especially as they have risen slightly in the last few years. Admittedly this has not been proved by another census since 1966, but is the considered opinion of those officers and guards who have recently been observing the species together with a general increase in sightings. It should be a suitable habitat for tiger though more *Arundo donax*, their favourite tall grass, would be an advantage, and there are certainly plenty of pig and deer as natural prey.

Elephant numbers are high and are probably near their maximum for the sanctuary. They migrate, at flood time, into the Mikir Hills and cross the Grand Trunk Road on the southern edge of the sanctuary at points where it runs through continuous forest.

There are no forestry operations and no cultivation within Kaziranga, but the question of grazing still hangs in the balance. The situation has improved greatly since Spillett's survey in 1966 (*loc. cit.*). When I was there in May 1970, there were still about 2000 cattle and domestic buffalo grazing over about 3 sq km on the edge of the sanctuary in the Kaziranga block. The Divisional Officer was hopeful of finding alternative grazing for them but, as so often, political forces may find such an arrangement inconvenient and the true National Park may never materialize. It is pointless to have the name without effective legal power to operate it.

But this is a magnificent sanctuary, and nothing should detract from the splendid work done in the past (Assam Forest Records show that a Rhino Reserve was first formed in 1907 when rhino numbers were down to 30), and the present by a handful of dedicated men. The Divisional Officer, most ably supported by his Wildlife Range Officer, is carrying on in the tradition of a famous predecessor, R. C. Das, who in the early fifties with P. D. Stracey at the top as Chief Conservator, and E. P. Gee at hand to advise, put Kaziranga on the map, controlled poaching and greatly increased the numbers of all animals in the sanctuary. India was lucky to have such men at that critical time for the rhino and Kaziranga. It still has them, and the present staff overall are the keenest and most dedicated I have come across in India.

Kaziranga can have a great future and, by reason of its habitat and species, can combine most happily wildlife orientation and development with tourist attractions. Animals can be seen easily and comfortably in their natural surroundings, and although the sanctuary itself is flat, the backdrop of the snow-covered peaks of the Himalayas in the cold season gives a fabulous setting.

The tourist facilities at Kaziranga rank with Periyar and Corbett as the best in India's Wildlife Sanctuaries.

Kanha National Park

The wildlife management at Kanha is good. The same cannot be said of the tourist management ; in fact the less said about it the better. The authorities concerned at Kanha and in Delhi are now well aware of the situation and I feel sure some radical improvements have been made since the disastrous state of affairs which I encountered in June 1970.

Kanha alone of National Parks and Sanctuaries has carried out a regular yearly census of animals. The figures for 1970 (June), done on

the block system, are given without comment : Gaur 478 ; Chital 4035 ; Sambar 235 ; Barasingha 66 ; Muntjac 105 ; Mouse Deer 12 ; Blackbuck 78 ; Four Horned Antelope 8 ; Nilgai 6 ; Tiger 34 ; Panther 13 ; Hyena 22 ; Sloth Bear 23 ; Wild Pig 497 ; Porcupine 14 ; Wild Dog 28 ; Jackal 45 ; Fox 90 ; Jungle Cat 30 ; Peafowl 639 ; Hare 66 ; Python 1.

The visitor probably has more chance of seeing Tiger in Kanha than in any other park or sanctuary in India, with the probable exception of the Corbett Park in Uttar Pradesh. Here in Kanha the average density is one tiger to 3.5 sq miles, in Corbett 1 to 4.5, in Kaziranga 1 to 8.5 and Palamau 1 to 16. So not only is the density greater but the forest, especially the Sal, is fairly open with little undergrowth, so tiger can be seen in daylight.

There are no forestry operations, and no cultivation after the successful removal of a complete village to a new site outside the park. This is a considerable triumph of persuasion and administration.

The amount of grazing is not serious and consists mainly of cattle and buffalo belonging to the Forest Guards and their relatives living near the main entrances. Nevertheless these total about 2000 head, admittedly on the periphery of the park, but many of the herbivores leave the grasslands in the rains and barasingha might pick up disease by contact with these cattle.

The easy viewing of animals on the open grasslands is ideal for the average tourist. The dry weather airstrip at 1000 metres, sufficiently on the edge of the park not to cause animal disturbance, could be a great asset to this otherwise rather inaccessible park, whose future can be great given a strong hand on the administrative rudder.

Sariska Sanctuary

Sariska has great potential for an excellent National Park with easy accessibility from the capital, Delhi, which makes it unique.

But India's foremost problem—the cow—is more in evidence here than in almost any other sanctuary. If this major problem could be solved Sariska could carry larger numbers of wildlife than it has today, in spite of over half the area being rocky barren hilltops with little or no soil and precipitous cliffs. Scenically however, these add to its beauty and their ruggedness is a splendid contrast to the better watered green valleys.

No census has been done but these are the estimates for 1970 :— Nilgai 375 ; Four Horned Antelope 170 ; Sambar 350-400 ; Chital 100+ ; Indian Gazelle 6 ; Wild Pig 250 ; Tiger 12 ; Panther 14 ; Caracal 7 ; Hyena 10 ; Jackal 150 ; Peafowl 2000+.

The number of tiger is small, but in the very dry weather there is a good chance of seeing them as they are localised near water. In five

days I had evidence of 4 separate animals. A nilgai killed by a tiger had been eaten normally from the hindquarters, but also quite separately from a flank. This could indicate a tigress and cubs.

Four nights were spent by a water hole which is man-made and maintained. The Khalighati Observation Tower is certainly one of the most fruitful and effective, especially in the hot, dry weather, of any in India.

Exploitation of the sanctuary's forests continues ; mainly *Anogeissus pendula*, *Boswellia serrata* and *Acacia nilotica* bring in considerable revenue to the Forest Dept. which it cannot at present forego.

One village has been completely removed outside the sanctuary, but there are still several small ones with little patches of cultivation around. There are public roads through Sariska but poaching is not a big problem.

Grazing is easily the worst scourge. Cattle, buffalo and goats are everywhere in the valleys. These are not just the animals of a few villagers or dependents of the sanctuary staff ; they belong to professional graziers who pay up to Rs. 10 per head in certain areas. The sanctuary is badly overgrazed by many thousands of cattle.

In the ancient geological series of the Aravalli there are bound to be mineral deposits. Often they are too dispersed for mining to be an economic proposition ; but copper veins are already being worked on the edge of the sanctuary and nickel has been discovered.

Good mineral deposits in economic quantities are bound to have preference over wild life and a part of the sanctuary will have to be shifted if such deposits are found. This could be done without too much harm and is inevitable, but the question of leasing the sanctuary to professional graziers is surely something that could be gradually phased out.

This sanctuary could then have a great future with easy access from Delhi.

Dachigam and Desu

The main purpose of my visit to Kashmir was to get some information on the Hangul or Kashmir Stag. It is estimated that there may be about 200, plus or minus 30, in Dachigam, with perhaps 100 elsewhere in Desu in the Bring valley, and Chumkai, Overa and Khiram in the Liddar valley as well as in some of the valleys between. These last three are very small sanctuaries (5-15 sq miles each).

The Sheep Research Station, started in 1962, whose headquarters is situated right in Lower Dachigam sanctuary, take their sheep to the upper pastures from mid-June to the end of September. This inevitably causes disturbance to the hangul as there were about 1200 sheep grazing over Upper Dachigam when I was there. The superintendent of the Sheep Research Station maintains that his men do not poach (they are better paid than the Forest Guards) and even form a buffer zone of protection

for the hangul against the lawless 'bakrewallas'. I think there is some truth in this, but it is unfortunate nevertheless that a Government Sheep Research Station should have been deliberately sited in the best part of the lower sanctuary. It would be possible to shift their summer grazing grounds to other suitable alpine pastures on the plateau of Sangergulu in the same area, but outside the sanctuary. This would have the double advantage of leaving Upper Dachigam free for the hangul and acting more effectively as a buffer zone against many 'bakrewalla' villages.

If this could be done it would be a great step to conserving the hangul's habitat. At present the deer are being driven higher up than they usually go and even out of the sanctuary by the disturbance of the sheep, the shepherds in their tents and their dogs. Even so, some hangul come regularly to the stream in this upland valley and I saw twenty to thirty recent tracks leading to water.

In Desu, there is a similar situation with experimental potato plots at intervals up the valley in clearings between the conifers and the river. It appears that the potato experiment has not been successful and it is probable that the land will be handed over to the Animal Husbandry Dept. for a Sheep Research Station, similar if smaller to that of Dachigam, to be sited within the sanctuary.

At the moment there seem to be a fair number of hangul for such a small area (Desu—52 sq km). From observation of tracks and information I would make a rough estimate of 30-35. The future however for this beautiful little sanctuary is not bright. 50+ cattle were seen one morning through field glasses at about 3000 m (10,000 ft) and on questioning I was told that they often stray from villages outside the sanctuary and what can be done about it with only two forest guards available!

So with sheep in the valley and cattle on the heights there will not be much room for hangul. The economics of the situation has got to be accepted; one hangul earns nothing, unlike one tiger in Madhya Pradesh or one rhino in Assam, whereas one sheep earns much for the Government of Jammu and Kashmir.

Cattle, sheep and hangul may well have to live together. If they cannot, it is clear which has the precedence in an overcrowded country with an expanding economy. In Dachigam it is different; there the hangul are concentrated in a comparatively small area on the valley floor of Lower Dachigam in the winter months, and tourists can drive out the short distance from Srinagar to view the deer from several well-sited observation towers. Desu should still remain a sanctuary with such protection as is possible given to the animals (e.g. musk deer and marmots at higher levels), but would become more like the National Parks of the UK, places of great scenic beauty with their flowers, trees and birds, where the tourists can come for day trips to picnic or stay in a hotel.

Bharatpur Sanctuary

This sanctuary is best known for its birds, and is one of the finest waterbird sanctuaries in India. It is often not realised that it also carries a fair number of chital, blackbuck, nilgai and a few sambar. These mammals are found in the thorn forest and grassland region which covers roughly half the area.

The numbers of water birds are enormous at nesting time (August, September) with a rich profusion of species, well known to all those interested. Many birds, especially openbill storks, will not nest until they feel the safety of water around the base of their tree. Small man-made islands are now being built with an acacia tree on top of each to facilitate the safe nesting of more birds. This is an excellent idea and demonstrates the care and interest with which the sanctuary staff and the D.F.O. look after the birds.

This small sanctuary is surrounded by villages and, although there is no cultivation within the sanctuary, the villagers graze 6000 head of cattle and buffalo there; the consequent overgrazing and erosion by trampling is very bad indeed. There are even 80 feral cattle and some of the bulls have become quite fierce. Nothing can be done about this as no one may touch the 'sacred cow' and no one will drive them out as they are too wild. Poaching is considerable as the cultivated land comes right up to the sanctuary boundary.

In spite of all these difficulties, Bharatpur remains a magnificent bird sanctuary and very accessible from Delhi; the journey by train takes only three hours to Bharatpur. With this ease of access it could become a great tourist attraction. If grazing could be controlled or better still eliminated, then this sanctuary could carry many more herbivores and, in turn, attract more tourists and more money.

Corbett National Park

Elephant and crocodiles are the only animals covered by a census, in 1967 and 1969 respectively. The rest are *estimates* by the park staff:— Elephant 38; Crocodile 29; Gharial 15; Chital 8000; Hog Deer 200; Sambar 500; Muntjac 500; Tiger 40-50; Panther 50; Himalayan Black Bear 20; Sloth Bear 30; Wild Pig 2000; Goral 50.

The Inspector-General of Forests kindly arranged for me to visit it in the monsoon, when visitors are not normally allowed; two elephants were made available to carry our party, consisting of the Wildlife Warden Park Officer, myself and servants and equipment, the 30 kms from the entrance to Dhikala Tourist Rest House. Apart from being the only visitor, the advantage of going in the rainy season is the ease with which indirect but substantial evidence can be gained of tiger from the very clear fresh pug marks after a rain shower.

The Warden estimates that as many as 10 to 12 of the park's 40 to 50 tiger can usually be found within a radius of 8 kilometres (5 miles) of the Rest House at Dhikala. He told me that live bait are tied up during the tourist season, but that beats for tiger by elephant are not normally held more than twice a week to avoid too much disturbance. Even so he reckons 25% of tourists to Corbett saw a tiger in the last two years, based on numbers of visitors in their books ; but of course many only stay two or even one day. Assessing this another way, I would put the chances in Kanha at 10% (i.e. if a visitor stays ten days he would be very unlucky not to get one viewing), while those in Corbett I put at 20% (i.e. if a visitor stays for five days he would be unlucky not to view once).

Panther are estimated at similar numbers to tiger (40-50) and appear to co-exist satisfactorily. Indirect evidence from pug marks was obtained near the Tourist Rest House and one afternoon I disturbed a panther stalking chital only half a kilometre from there.

The Kalagarh or Ramganga Dam is certainly a threat to some of the species in the park, notably chital and hog deer. The reservoir will cover 83 sq km (32 sq miles) of which 46 sq km (18 sq miles) are within the park boundary. 46 sq km is not a large slice out of the Corbett Park as a whole, but is much more serious when it is realised that the water will submerge nearly all the riverine habitat where most of the hog deer are found and tiger often seen, while a large proportion of the rare grasslands to be found in the park will also be lost. It is on these grasslands near Dhikala that visitors are shown regularly from observation towers large herds of chital as well as sambar, hog deer, pig, elephant and sometimes tiger and panther. Two-thirds of this excellent viewing area will be lost ; in all 900 acres of grassland out of a total 2000 in the park. It was estimated (Spillett 1966) that 2300 chital use the area to be submerged.

The reservoir is already gradually filling and it is therefore fruitless to dwell too much on the disadvantages. It will be full sometime in 1972. Let us consider instead some advantages that may be gained. From the tourist point of view it will undoubtedly add to the scenic beauty of that part of Corbett and the view from the Dhikala Tourist Rest Houses, already magnificent, will be enhanced by a great sheet of water, only 25 metres below the Rest House parapet, encircled by forested hills. This, in my opinion, will be the finest panorama to be seen from any Tourist Rest House in an Indian park or sanctuary, not excluding Kaziranga backed by snow mountains or the lake of Periyar.

Perhaps the greatest advantage will be the facilities afforded by this great sheet of water for viewing animals from tourist launches as in Periyar. At Corbett the authorities have benefited from the experience at Periyar and are felling the trees before submersion takes place. This

will wisely avoid the unsightly tree trunks which now project from the water all round the Periyar lake when the level is low.

The animals to be viewed by this method in Corbett may not be so varied or numerous as in Periyar ; elephant are few and there are now no gaur, but sambar and pig would be seen as well as chital, while crocodile and gharial might be viewed when sand banks appear at the upper end of the reservoir as easily as crocodiles in the Murchison Falls Park in Uganda.

As regards the grassland area or 'chaur', attempts will be made to compensate for the loss of much of this valuable viewing area by clear felling stands of poorer sal mixed with less useful trees on flat land, thus creating new pockets of grassland. Preferably this will be done on the forest edge of the remaining grassland so that eventually the area of this habitat will be no less than it is at present. Pockets of such grassland extending into the forest might be even better for animal viewing than the existing area since the shy animals, if attracted by salt licks and water, will more readily come into a relatively small open area with the forest cover nearby.

A 30 km fair weather road connects the main tourist centre at Dhikala with the park entrance at Dhangadhi. This road is cut by the arrival of the first heavy rains in mid-June. It has to be re-made after the rains have stopped in September ; this takes at least a month of much labour by many workmen and no tourist can be admitted until November. The suggestion for tarmacing this road is, to my mind, unnecessary and involves an astronomic cost.

The road was motorable between the torrents and these need only Irish bridges, which could be built at a modest cost, to keep it open for part of the monsoon. There had been no rain for several days when we entered the park and, if the torrent beds had had the concrete causeways suggested, then I consider we could have got through by jeep with only the occasional large boulder to be cleared from our path. The rocks could be cleared with the minimum of labour as soon as the torrents had ceased to be violent at the end of August or early September, thus facilitating an earlier opening. With such causeways it would not be necessary to close the Corbett Park for the whole 5 months from June to November.