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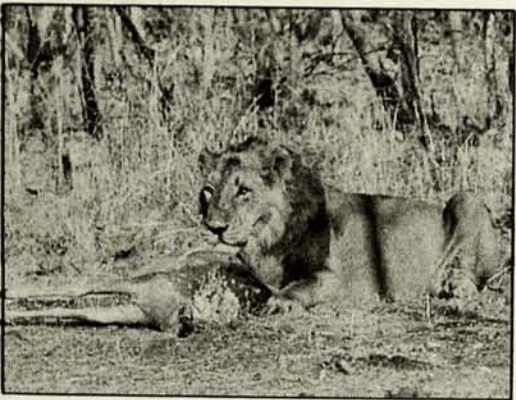
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► **2** The Pied Harrier

It visits India in winter, but does not breed here — or so we thought. Now, after more than a century, there is evidence to the contrary.

By Goutam Narayan



► **10** The Kathiawar Lion

Lions in the Gir — and the men that followed them. A shikar story by a wildlifer of the old school.

By L.L. Fenton

26 Folklore — Telling tales about the crow

Pest or prophet? The bird is a sombre black and grey; the stories about him are a lot more colourful.

By Naresh Chaturvedi

28 A Shola In My Backyard

High in the Western Ghats, an ecosystem so rich that the smallest patches harbour a myriad list of species.

By Vidya and Ramana Athreya

18 Letters

25 Nature Alive

20 News, Notes and Comments

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The Society was founded in 1883 for the purpose of exchanging notes and observations on zoology and exhibiting interesting specimens of animal life. Its funds are devoted to the study of natural history in the Oriental region, and to measures for nature conservation. Individual membership can be in either personal or official capacity. Membership is also open to scientific and educational associations and institutions as well as companies.

Ordinary members get *Hornbill* free, and can subscribe to the *Journal of the BNHS* (now in its 88th volume) at concessional rates. Life members receive both publications free.

Membership fees and annual subscriptions

Ordinary, individual Rs 100. Life Rs 3000
Institutional Rs 500. Corporate (one-time) Rs. 10,000

For more information on the Society and its activities, write to The Honorary Secretary, Bombay Natural History Society, Shaheed Bhagat Singh Road, Bombay 400 023. Tel.: 243869, 244085

EDITORIAL

Have grant, will travel

An American biologist, now awaiting sentencing, recently chose a decidedly original route to turtle conservation. According to an A.P. news dispatch, he first plotted to eliminate the Alabama red-bellied turtle from the wild. Once that succeeded, he hoped to get a \$ 25,000 government grant to re-introduce the species.

Fortunately, he represents a very small minority. Most conservationists are driven by a genuine concern for the environment, but there is still a disturbing proportion of people whose motives are a trifle suspect. They may not be charlatans, but they are not above a little self-promotion, or taking up a cause with one eye on the newspaper headlines. This is true of any field, and generally does no great harm.

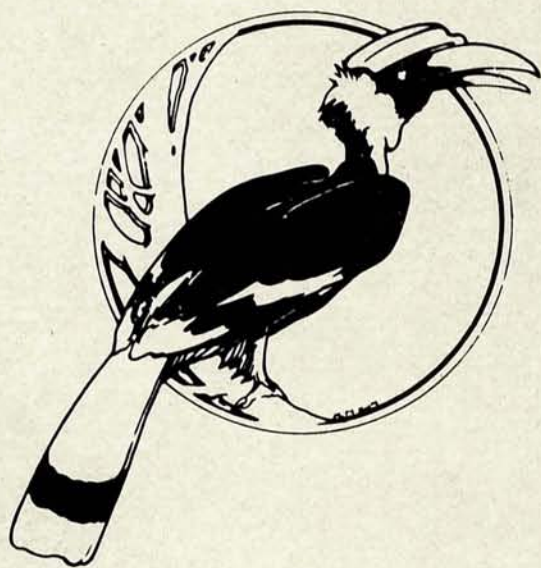
But consider for example a development project which will cause serious environmental damage. Someone meets the bureaucrat concerned — who is already hostile towards environmentalists — to plead the case. If he is what we would call intellectually dishonest, and the bureaucrat sees through him... a noting on the file, and *phut* goes a campaign that was put together over months of painstaking effort.

Over the past few years the environment has become a fashionable cause in India. There is more money available, and more people scrambling for it. And the ones that succeed are not always the ones who can best utilise the money. Apart from study tours and conferences (preferably international), there is another even more interesting way to spend the loot — 'status surveys'.

You visit an area at someone else's expense and pronounce judgement on its health and its prospects for the future. And if you aren't able to decide, all is not lost. Another trip one year later (in the same month, because that is more scientific) will help you make sure.

Surveys, when undertaken by a good biologist, are a means of quickly and cheaply assessing the environmental worth of an area — the condition of the habitat or trends in the population of a species. Even if no definite numbers are thrown up, the results will — or should — provide a basis for further research. But left to anyone who is less than thoroughly knowledgeable, surveys are a waste of time. And worse, the surveyor is rewarded with another survey grant. It is curious but true that if someone pays you for one such junket, he is more likely to pay you for another.

Money for the environment is still in short supply. Let us be careful about how we spend it.



Published and printed quarterly by Ulhas Rane for the Bombay Natural History Society. Printed at Conway Printers, Bombay. We welcome contributions on any aspect of natural history or conservation. Articles can be up to 3,000 words in length, and must be accompanied by clear, sharp photographs (prints or transparencies, either black and white or colour). Copyright for photographs used will remain with the photographer. Suitable payment will be made for any material accepted. Reg. No. R.N. 35749/79, ISSN 0441-2370.

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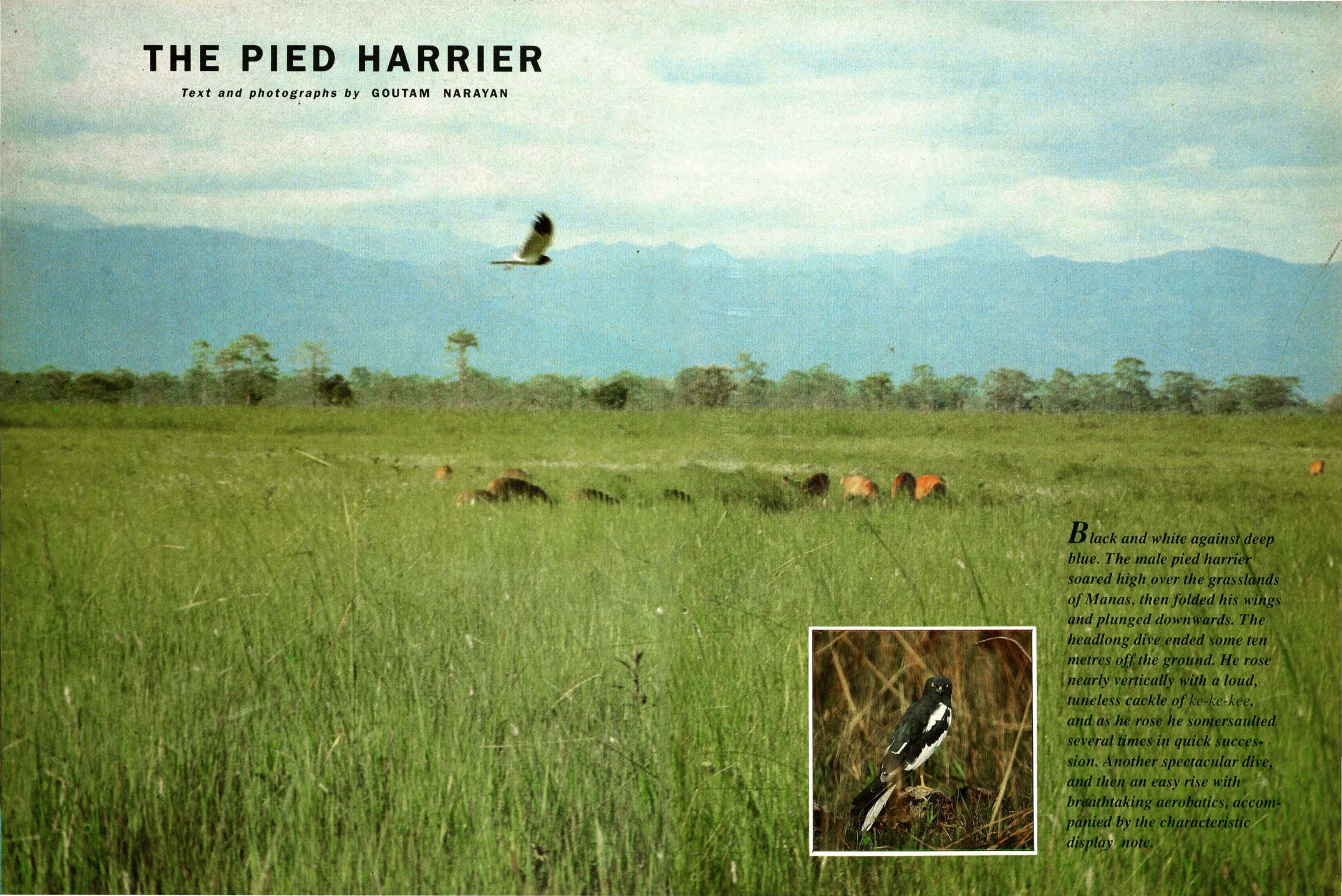
COVER

Asiatic lion (*Panthera leo*)

This picture by Sunjoy Monga won second prize at the 1991 British Gas — BBC Wildlife photographer of the year contest.

THE PIED HARRIER

Text and photographs by GOUTAM NARAYAN



***B**lack and white against deep blue. The male pied harrier soared high over the grasslands of Manas, then folded his wings and plunged downwards. The headlong dive ended some ten metres off the ground. He rose nearly vertically with a loud, tuneless cackle of ke-ke-kee, and as he rose he somersaulted several times in quick succession. Another spectacular dive, and then an easy rise with breathtaking aerobatics, accompanied by the characteristic display note.*



I WAS SEATED ON a warm jeep bonnet in the grasslands of the Manas wildlife sanctuary in Assam, watching enthralled. It was late May, and the pied harriers should have all left for their breeding grounds in Russia. This striking black and white bird, one of the most graceful of our raptors, is not uncommon at Manas, or indeed in many parts of eastern India. But it is a winter migrant, arriving in India around October and leaving in April. What was unusual was its presence so late, and the breeding display behaviour.

There has been no record of the pied harrier (*Circus melanoleucos*) breeding anywhere in the Indian subcontinent for over a hundred years. The last confirmed observation was in 1885, when two nests were found in Dibrugarh district in Assam. And even on that occasion there was some doubt about the species of harrier, because no specimens were collected, but only eggs, which eventually broke.

This male was displaying alone; the female waited below, hidden from our view in the tall grass. The male landed briefly, picked up a twig in his beak and took off again. The twig was deftly transferred from beak to claw; then he glided low over the area where the female sat, and dropped the twig. The offering was accepted. The suitor sank to the grass, clucking encouragingly, and the female responded with a shrill whistle. Perhaps she was saying yes, perhaps merely asking for an encore — at any rate the male took off once more, and resumed his display. This particular male seemed rather proud of his skill in the air. He continued to perform long after he had won his bride — during nest-building and even after the first egg was laid.

The displays begin after mid May. Usually only the males perform, but sometimes a female, after being won over, joins her mate. If the weather is fine and windless, the displays begin at sunrise and continue through most of the day. We even saw males that had already paired off with their mates displaying simultaneously before one female — showing off, not competing for her favours.

THE FLAT, ALLUVIAL grasslands of Manas constitute prime harrier habitat. Besides the pied harrier, there are the marsh (*Circus aeruginosus*), hen (*C. cyaneus*) and pale (*C. macrorurus*) harriers. All four are wintering migrants; but in 1987 we noticed that at least some pied harriers remained in the sanctuary during summer. And when

we saw a male picking up dry grass stalks and flying into a large patch of tall grass, we were convinced the species bred there. We saw displaying males, and heard both males and females calling, but could not locate a nest.

But over the next two years we saw at least three pairs breeding successfully. We located our first nest in March 1988, in the open grasslands of Kasimdaha in the Manas sanctuary. Flimsy and haphazardly built (the nesting material kept slipping out), it was still under construction: a very shallow cup, almost a plate, some 70 cm off the ground, supported easily by the tall, dense grass.

Nest building, apparently, is never really over until the nestlings fledge; from time to time the female would add a bunch of dry grass or some twigs, making eggs and nestlings ever more secure against moisture that might soak into the nest from the grass. Two months later, the nest was 15 cm thick and 25 cm in diameter. And with the grass sagging under the weight of two growing nestlings, the height stood at 45 cm above the ground.

THE MALE PLAYED a dominant role in selecting a place for the nest and in the collection of materials. The site is usually in the midst of a sea of metre-high grass, away from the tracks used by most of the large grassland mammals (rhino, buffalo, elephants), so that the nest will not be trampled. Some days before nest building began the male could be seen dumping twigs or blades of grass on the nest site. The female showed absolutely no interest in the proceedings until sufficient material had been gathered. Then she got to work. Bigger twigs for the bottom and outer borders of the nest, thin twigs and grass straws for the walls, and fine leaves of sedges and soft parts of other plants to line the cup. Three days later, the nest took a definite shape.

The nests at Manas were considerably smaller and less bulky than those found in the harrier's main breeding ground in Russia. The Russian nests are built on hummocks as protection against flooding; weight is therefore not critical. At Manas they are built on grass clumps or thickets in areas which are usually not flooded till the nesting is over, and since they are supported on grass stems, they must be relatively light. Another major difference is the temperature — the bulky Russian nests provide extra insulation against the cold.

ABOUT A WEEK before the nesting period the females nearly stop hunting. From the end of May onwards they live solely on the food provided by males. Females would be seen very rarely in flight, but more often seated with ruffled feathers on a tree near her future nest. Each harrier nest was built fairly close to a small tree (or sapling), which was usually the only tree for some distance. It served as look-out post and a place where the pair could preen themselves or rest. The male, in fact, rarely alighted on the ground after a flight, but almost invariably on this tree.

The moment the female saw the male she would swiftly fly out to meet him, and sometimes beg for food, but more often snatch it from him. The pattern of behaviour is interesting. The male brings the food by instinct. Once he has possession of the food, however, he appears reluctant to hand it over. The female then employs force. As is the case with most raptors, she is larger and heavier than he is, and chases him, hounding him till he is forced to drop the food, then plucks it out of the air as it falls.

Rather than go back immediately to the nest, she would always fly to a small clearing and eat some of

the prey. Only then would she take the remainder back to the nest, for the nestlings. When the weather made it inadvisable for the female to leave the nest, the returning male would circle lower and lower, and finally drop the prey into the nest.

The pair spent the nights on the ground, several metres apart. The male roosted at more or less the same spot throughout the summer, very close to the nest, and once the eggs were laid the female stayed on them at night. When the sun came up, both would fly to the top of their 'look-out' tree to sun themselves. For an hour or so they would bask, silent and motionless. The male would fly off first, to hunt, while the female continued to preen for another hour or so before settling once more on the nest.

THE HEN OFTEN sits in the nest as soon as it is built, even though she may lay her eggs only four or five days later. Now she rarely strays far from the nest, chasing away other raptors and potential predators like crows and coucals which come anywhere near the nest.

The eggs, which are the size of a village hen's egg, start off pure white, occasionally bluish-white.



Eggs are usually laid on alternate days, and may hatch over a period of 8-10 days. The size difference between the first and last nestlings can therefore be substantial.



Finding a harrier nest was hard enough; photographing the egg laying, incubation and development of chicks would be even harder. Shortly after the nest site was located I planted a stick on the ground close to the nest, on the side where the grass was thinnest. Gradually I tied grass leaves to the top of the stick, in the shape of a ball. A week later, part of the stick was replaced by a camera monopod, crowned by the grass ball. By this time the female was so comfortable with the structure that she would sometimes perch on top of it.

Finally, a suitably camouflaged camera replaced the ball of grass. The female continued to perch, now on the camera (left). I took pictures by remote control from a hide erected about 30 metres away.

Although the sound of the shutter was muffled by wrapping the camera in several layers of cloth, the female's ears were sharper than I had thought. She initially attacked the lens (it was the only open spot in the grass ball, and glinted when it caught the light). Later she accepted the lens and the camera noise; she would still glare at the lens each time I took a picture, but would not react further. The photographs of the nest (below) were taken with this arrangement.

The female with the younger of the two nestlings, less than 3 weeks old. It has just emerged from the shade of its mother's wings. Its older sibling is a week older but nearly twice as large — too large to shelter in this manner. It spends most of the hot part of the day shaded under the grass just outside the nest



But the female's feet are constantly stained with blood from its prey, and after a few days the eggs are streaked with reddish brown.

The first egg was laid on 3rd April, and the clutch of four was completed six days later. Three nestlings hatched about a month later (the fourth egg had become addled), out of which one died. It probably fell out of the nest and was unable to climb back in because of the thickness of the grass. There is another unusual cause of mortality — parental clumsiness. The female, if she is surprised at the nest, sometimes takes off in such a hurry that a small chick nestling under her wings may be thrown out of the nest.

Usually, however, she is a lot more careful. Before taking off she gently raises herself, ruffles her belly feathers, carefully tucks up her wings, and generally ensures that she is well clear of her brood. The two surviving nestlings took to their wings about six weeks after they hatched. By the beginning of July they were fully fledged and were seen only infrequently.

THE DUTIES OF the parents were sharply differentiated. The male hunts, supplying his mate and later the nestlings with food. The hen incubates the eggs and later broods, and feeds the nestlings. But successful single parent families have been recorded, when the male provided food and care — even incubating the eggs on at least one occasion — after the female was shot.

The male takes his duties as provider seriously — but not always seriously enough for the female's liking! After each hunt he rests for a while on the 'look-out' tree. When his mate thinks he has rested long enough, she begins calling to him, presumably urging him to get to work again. Frequently he ignores her, whereupon she will fly to him, dislodging him from the branch and then actually chasing him away.

When seated on the 'look-out' tree, and sometimes even while circling over his territory, the male is on sentry duty. As soon as he spots an intruder, he raises an alarm, and flies towards the enemy. The female joins him and they begin circling above the intruder, uttering the characteristic alarm notes. Once the nestlings hatch both parents become progressively more aggressive in defense of their nest, diving at a great speed at the intruder.

Female harriers (in the absence of the male) at their eggs reacted quite differently to human in-

JUMP JETS IN THE GRASSLAND

Harriers are essentially raptors of open country, such as marshes and grasslands. Their method of hunting is characteristic — sailing low and slow over the ground or water, wings held partially open in a wide V, flying repeatedly over an area. Harriers look somewhat similar to kites, but are slimmer and more elegant, with narrower wings and longer, rounded tails. Their faces are somewhat owl-like because of the unusually large ear openings which are covered with facial feathers.

Of the world's 10 species of harriers, five breed in Asia and all of them can be seen in India in winter (the other five are found in Africa, Australia and South America). The marsh harrier (*Circus aeruginosus*) is the most widespread: its nominate race is found in marshes, jheels and flooded paddy fields throughout the country in winter; the eastern subspecies *C.a. spilnotus* visits only north-east India. The hen (*C. cyaneus*), pale (*C. macrourus*) and Montagu's (*C. pygargus*) harriers are birds of drier country — undulating plains, grassy foothills and often cultivation.

The latter two are fairly widely distributed in India. The pale harrier is found throughout, including Lakshadweep, Andamans and the Maldives. Montagu's is relatively uncommon in eastern India, while the pale harrier, the rarest of the three, winters only in northern India and Assam. The pied harrier (*C. melanoleucos*) is primarily a bird of eastern India, though it has been recorded elsewhere in the country as well.

The harriers stay in India from September to April, and then move northwards to Europe and central or northern Asia to breed. All five are ground nesters, but may build their nests on a hummock or grass clump in flood-prone country. During winter they often roost communally, in groups sometimes of over 200; more than 500 have been counted at night at the Rollapadu sanctuary in Andhra Pradesh.

Females and young (except in the marsh harrier) are brown with light brown streaks, and all the species look very similar. Adult males, however, can easily be told apart. The pale harrier is the palest, with black tips to the primary feathers. The hen harrier is more greyish, with almost two thirds the length of the primaries being black. The male Montagu's is dark grey with chestnut shaft-stripes on the underparts, black primaries and a characteristic black wing bar. The marsh harrier male is dark brown with a pale rufous head, neck and breast, and silvery grey tail and wings. Females and young are rather like a slim, dark chocolate brown pariah kite with a cream-coloured cap.

With wetlands and grasslands shrinking, wintering harriers will find their natural habitats reduced, and use cultivated fields more heavily, in the process ingesting pesticides along with their prey. Long term pesticide absorption is known to reduce the thickness of eggshells, and therefore the breeding success.

trusion. Some took wing when we came within five metres of the nest, while others waited till we had almost trod on the nest before rocketing upwards, calling loudly while circling just above us (but not attacking). If the male is within earshot, he joins her.

In contrast to raptors which nest high above the ground and can therefore quickly spot intruders, harriers nest in grass and shrubs and may see an enemy only at a short distance from the nest. The pied harrier hen sitting on eggs (or nestlings) is alert to the slightest rustle in the grass. She hears danger long before she sees it, but flies off only when the enemy is actually in view. Together the pair can create enough of a racket to dissuade even large mammals from walking over the nest.

PIED HARRIERS ARE born cold-blooded; their thermo-regulation mechanisms take about two weeks to develop. Till then the female almost never leaves the nest, brooding the nestlings almost constantly. During the afternoon, when temperatures in the grassland can hit 35°C, she stands over the nestlings with wings extended, protecting them from direct sunlight. They gradually become less dependent, remaining alone in the nest for longer and longer periods; the female still remains nearby, perched on the 'look-out' tree.

By the time the nestlings are three weeks old the female broods them only at night or in rainy weather or during a sudden fall in temperature. Now the female begins hunting again, but in a desultory fashion and only in the immediate vicinity of the nest.

Her mate, meanwhile, is having a hard time finding sufficient food, even though many small birds such as larks and weaver birds breed at this time and their young are easily available prey. Ten days after the nestlings had hatched, we rarely saw him stop for rest between hunting trips.

THE RANGE OCCUPIED by a pair of pied harriers depends largely on the density of population. In Russia nesting territories are no more than 2.5 ha in area. At Manas, where far fewer birds breed and nests are always more than a kilometre apart, a pair will defend an area of up to 10 ha, males chasing away other males who came within half a kilometre of their nest. In addition to this nesting territory there is a much bigger hunting territory that is defended far less aggressively, with

those of different pairs often overlapping. While the open grasslands were the principal hunting territories, we often saw the harriers skimming low over the thatch fields or cultivation in search of prey.

Pied harriers can hunt in poor light, in the early morning and late evenings. They fly very low over the ground (at 1.0-1.5 m) systematically quartering an area. They look down at the ground when they fly, so intently that several times a hunting male has flown to within three metres of me before looking up, panicking and swerving wildly away. They take prey almost equally well off the ground, in mid-air or in swampland.

On discovering the prey the harrier stops for a moment as if hanging poised in mid-air, long legs dangling, balancing with wings and tail, and then sinks quickly down onto its prey. If it misses, it sometimes lands under its own momentum, but more often it easily picks up altitude and continues its hunting flight. Sometimes a pied harrier resorts to other (less advantageous) means of hunting. It may perch on a stone or a tree stump (in full view, not in ambush) and wait for small animals walking on the ground. When it sees one the harrier will attack at once, either trying to take it unawares (which rarely succeeds), or pursuing it with agility on the ground.

Their main food at Manas consisted of small birds like warblers, larks, pipits, button quails, munias and weaver birds, most of which nest in grassland. Sometimes they take rodents, lizards, frogs and large insects such as grasshoppers and locusts. In Burma they have even been known to catch crabs.

At Manas a favourite hunting tactic was to create a commotion in a nesting colony of Finn's baya; once the birds began to scatter the harrier would pick off weaklings or newly fledged birds. Systematic nest raiding too was common. Quail nests, for example, contain up to eight nestlings. The harrier would locate a nest and descend upon it; the parent would escape, and the harrier would pick up the hatchlings one at a time, raiding the nest repeatedly.

THE PIED HARRIER is fairly common in winter over much of eastern India: Manipur, Assam, Bangladesh, West Bengal, Bihar, Orissa and decreasingly so down the eastern side of the peninsula. It occurs in small numbers up to Sri Lanka. During the past few years there have been sightings

(by BNHS biologists) in places well outside its earlier known range — at the Karera Bustard Sanctuary in Madhya Pradesh, and a few birds every winter at Bharatpur in Rajasthan.

Outside India, its winter range extends eastwards in an arc that spans much of eastern and central China and south-east Asia: Burma, other countries of Indochina, Borneo and the Philippines (where it possibly breeds) — any large, open area with grassland or marsh.

The departure dates from their various wintering grounds vary with latitude and temperature. For example, they leave their winter quarters in early April in south India, mid April in north-east India and Thailand, end April or later in parts of China.

The pied harrier's main breeding grounds are the vast swamps of south-eastern Russia, north-eastern Mongolia and parts of China; and perhaps North Korea too. Throughout its range the pied harrier is a migratory bird. A part of the southern population may be resident but more probably they undertake short distance regular seasonal movements.

We have seen both adult and young pied harriers in the breeding season at several places in Assam apart from Manas: Orang and Laokhowa sanctuaries, Kaziranga national park and the Majuli islands in the Brahmaputra valley. We now know that this raptor does breed regularly (though in small numbers) in the Assam *duars*, or the alluvial grasslands between the Himalaya proper and the Brahmaputra, and probably in suitable habitat just south of the river as well.

BUT THE BREEDING areas in Assam and Burma are nearly 3000 km from the main breeding areas in Russia, Mongolia and China. Why the huge gap? Two major factors are probably responsible — the mountains of central China, which present a formidable physical barrier to

migrating harriers, and the densely populated 'rice-belt' of eastern China.

Perhaps harriers once bred in the vast plains of central and southern China too; but these have been cultivated for thousands of years, and the breeding areas destroyed. The expanses of flat, treeless, well-watered grassland may be ideal for harriers, but rice farmers find them equally attractive. It is probable that since suitable breeding areas extend over large parts of southern China, not all have been destroyed, and that relict populations of the species still breed — perhaps even live year-round — in remote areas. Certainly, not all the plains of southern and central China have been surveyed for wildlife.

What is most likely is that the pied harrier, like scores of other migratory birds, has two separate

breeding populations: a small population which is resident in a part of southern and south-eastern Asia and a larger one that is a winter visitor from central Asia. Assuming this is true, how are these two populations related?

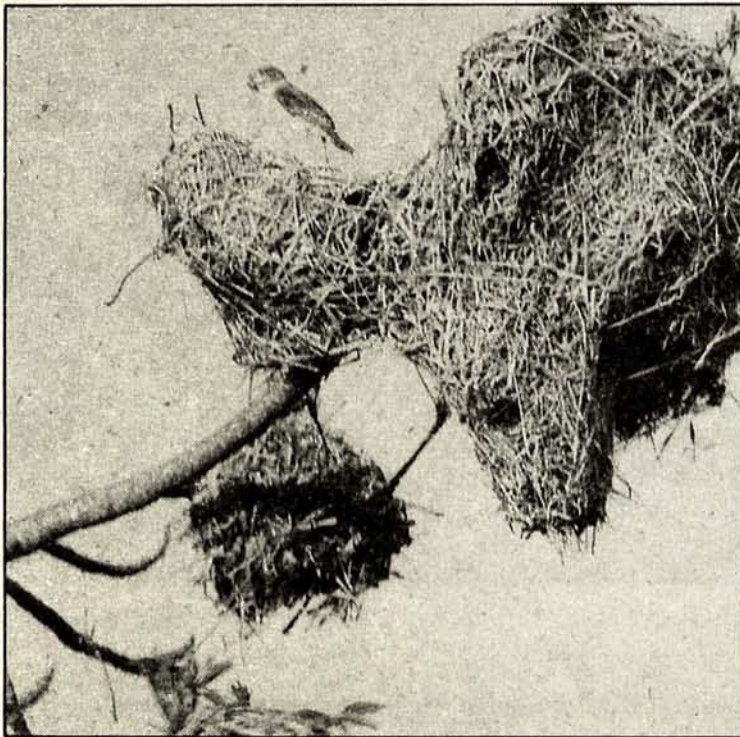
Were they originally a single group that was split when man took over part of their habitat? Since they have apparently been evolving in separate areas for hundreds of years, perhaps longer, to what extent are they morphologically different? Could they be considered as separate

subspecies, or at least separate races of pied harrier? It is a fascinating puzzle, with large chunks of data missing.

Detailed studies in north-east India, Burma and southern China — thorough surveys, ringing and measuring birds of both populations in breeding and non-breeding seasons, genetic analysis of blood samples — could provide some of the answers. Till then, we can only watch this hunter of the air, and wonder.



Goutam Narayan is a BNHS field biologist. After 12 years of studying vultures, blacknecked cranes and floricans, he is now the Society's Conservation Officer, working on broader environmental issues.



Finn's baya colonies, usually found on silk cotton trees at Manas, are frequently raided.

The Kathiawar Lion

L.L. FENTON



E. P. Gee

Big game hunting is obviously quite unacceptable to anyone interested in conservation today. But eighty years ago, times were different; most shikaris were naturalists who loved wildlife and the thrill of the hunt equally well. Much of our information on Indian wildlife has come from people like these, and from others who traded the rifle for the camera or field diary. This article was published in the Journal of the BNHS in 1911, and should be read in the context of that period.

IT IS MANY YEARS now since I shot my first lion, viz. in 1886, when I first went to Kathiawar. The Gir was then at its best for game of all kinds, and a *terra incognita* to all except a few local European and Junagadh State officials. Having obtained the permission of the Darbar to shoot a lion, I moved my camp to the Talala *ness* (hamlet), about 14 miles north of Veraval. Besides being close to the lion country, Talala has a good pitching ground under a magnificent grove of banyan trees which afford perfect protection from the sun during the day. Our *pagis* or trackers had already been sent out to mark down the lions some days previous to my arrival.

A few days before, lions had been heard close to Talala, but they had moved away. On the day following my arrival, I heard that there had been a 'kill' at Borwao, a *ness* about 8 miles from Talala, and that the *pagis* were tracking up the lion or lions which were responsible for it. I may mention here that the Gir lion rarely if ever returns to its 'kill', probably because its food is so plentiful. Two days later the *pagis* sent in word to say that there had been a fresh kill near Borwao, and that two lions had been marked down in an adjoining jungle, about 10 miles away from my camp.

The *khubber* reached us at about 11 a.m., and a few minutes later we were on our way. After a scorchingly hot one hour ride, we reached Borwao, to find the beaters and *pagis* quite ready for an immediate start. Leaving our horses at the well, we all started together. After accompanying the beaters for about a mile, Mukhbul Mia (the then Superintendent of the Gir, who was accompanying me) and I left them to take up our position for the drive.

I had been accustomed to use a bamboo ladder with broad rungs for sitting upon, when tiger shooting in North Kanara, and had brought one with me on this occasion, but owing to the trees being small and stunted, it could not be used, and we had to be content with sitting on the sloping trunk of a tree with our feet resting on the ground.

WE HAD NOT very long to wait before the drive commenced. The lions were lying under a *wadh* or banyan tree, about two hundred yards distant from our tree. (Owing to the shade they afford, lions are very partial to these trees in the hot weather.) The beaters know beforehand exactly where the lion is lying and keeping fairly

close together do not utter a sound, as a rule, until they are pretty close to its lair, when they shout for all they are worth. On the present occasion, almost immediately after the first shout, the lions made their appearance, going through the jungle one behind the other at full tilt.

I let them each have the contents of one barrel at about 80 yards distance, before they were out of sight. Neither of them gave tongue or seemed to flinch at my shots, and I was sure I had missed; but almost immediately afterwards Gunoo, an old Mah-ratta retainer of mine, who happened to be seated in the direct line of flight of the lions and only just managed to escape being knocked over by them, by hastily clambering up a tree, shouted out that the leading lion was wounded with a large patch of blood on its side.

After waiting half an hour we commenced following up, and very soon came upon the lion lying dead, which was a relief, as I had some difficulty in keeping the men quiet, and the Darbari sepoy who would keep their muskets on full cock, were just as much a source of danger as the wounded lion!

A FEW DAYS LATER, I moved my camp to Sasan, about 12 miles north of Talala and the headquarters of the Gir officials, whose offices are contained, for the sake of safety, in a kind of miniature fort on a commanding position. There is no village to speak of, only a few woodcutters' and Rabaris' huts erected just outside the fort walls.

My *pagis* were out every day, but ten days later had not succeeded in locating any more lions. The season was advancing; there had been some heavy rain, which was followed, as usual, by a good deal of fever amongst my followers. Moreover, with fresh water in all the *nalas*, the lions moved about more than they would otherwise have done, and were in consequence difficult to mark down.

So giving up all hope of another lion during this season, I issued instructions for an early move out of the Gir, when luck befriended me again. I had arranged to stalk sambur and spotted deer, and to finish up with a drive for anything that would turn up in the middle of the day. Although I saw a good deal of game, it was difficult to get a shot, owing to the dead leaves and the dryness of the jungle.

Several hours later Hebat, who was leading in his capacity of guide, suddenly stopped and drew my attention to a crow, which seated on the topmost bough

of a tree near the summit of a low wooded hill, was cawing as if something out of the common had attracted its attention.

"Perhaps a lion, saheb," remarked Hebat — and he was right, for the words were hardly out of his mouth before a fine lion sprang out of the jungle, on to a large rock below the tree, and then as suddenly disappeared with a bound into the jungle beyond, and was almost immediately followed by two others. The lions had not seen us, and as it was almost mid-day, it was unlikely that they would travel very far, especially as it was more than probable that they had been feeding off a recent 'kill.'

The tracking turned out to be a longer job than I had anticipated, owing to the ground being baked quite hard. There was nothing whatever to guide the men except the slight disturbance made by the lion's feet amongst the dead leaves which was quite unnoticeable to ordinary eyes. It was wonderful how the men were able to make any progress at all, but they did do so slowly but surely.

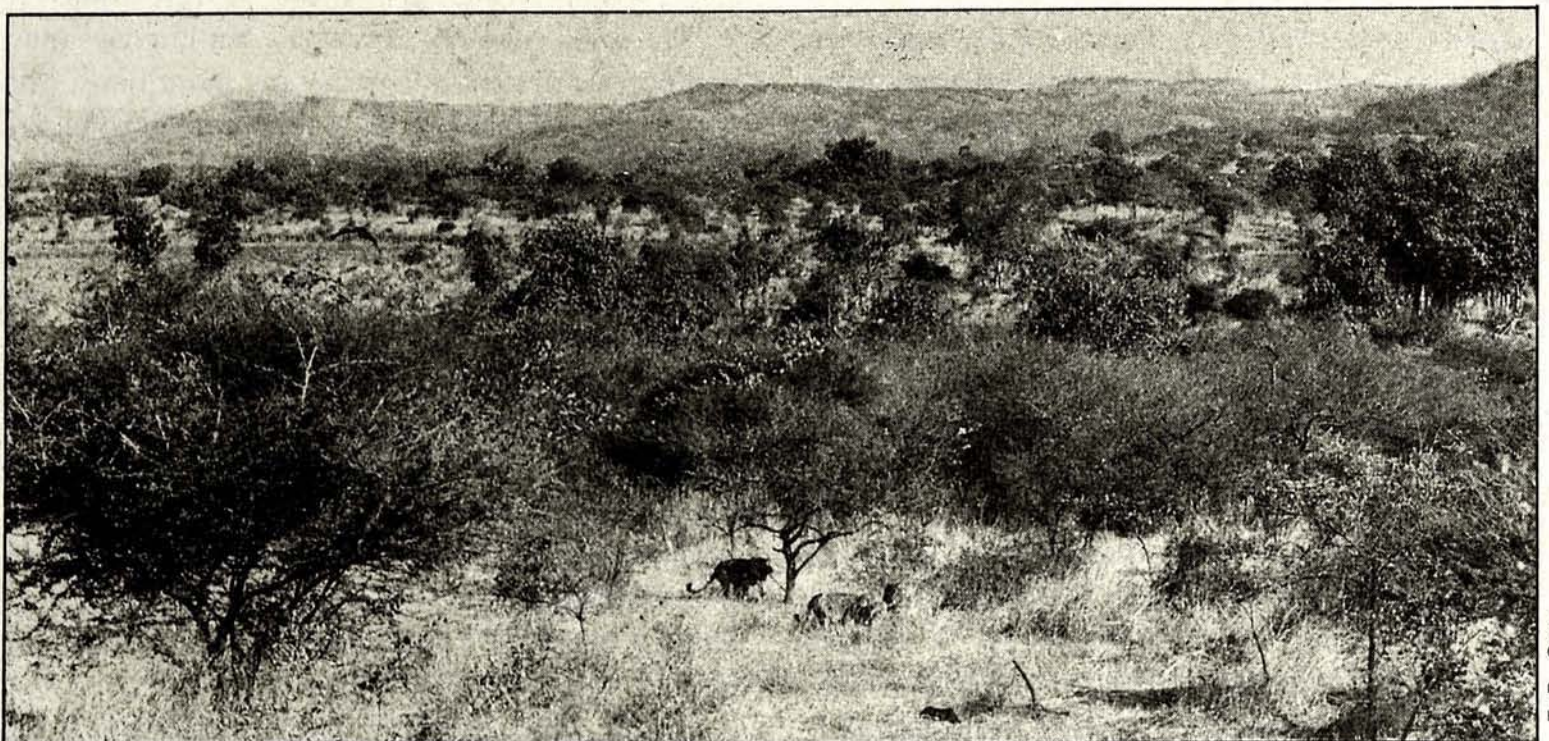
AFTER KEEPING UP the tracking for a good two hours without success, we got into more open country. Down in a valley below us, we could see a large banyan tree towering above its neighbours, and Hebat at once declared that, if the lions were in the neighbourhood, we should find them under that tree. We made a bee line for it, and the lions were there sure enough! As we cautiously

approached the tree, Hebat's keen eyes spotted them lying in some coarse long grass at the foot of it, and of almost the same colour as themselves. We could just make out the form of one of them, but the others were certain to be somewhere near.

The intervening ground was quite open and devoid of jungle, but about 50 yards on our side of the banyan, stood a small mimosa bush. Keeping this between us and the lions Hebat and I managed to crawl up to it without attracting their attention, although the one we could see was apparently quite wide-awake. After a rest of a few seconds to steady myself, I rose to my feet and fired with the 8-bore.

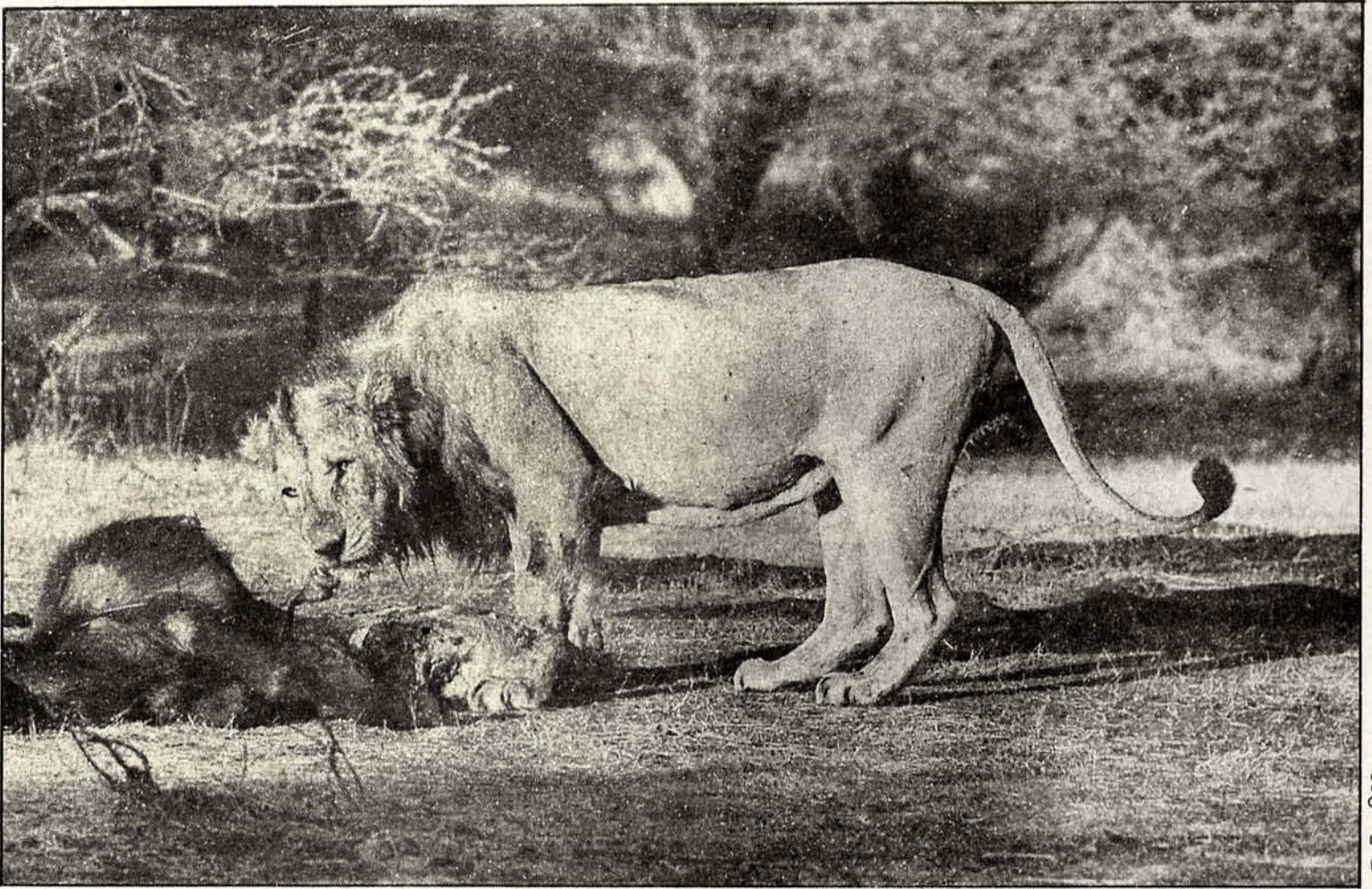
She rolled over, but recovered herself immediately and was off. With the left barrel I rolled her over again, but she got to her feet once more, and was out of sight before I could get in another shot. Then, I heard several shots accompanied by excited shouts in the direction she had gone.

Thinking some one was being mauled, I reloaded as I ran along and then exchanged the 8-bore for a lighter 500 express. I soon found myself in the middle of all the excitement. I had only time, however, to see the lioness growling ominously at the foot of a tree, and on the point of charging a *passaeta* or village policeman, who was doing his best to fire off a rusty old matchlock at her. I ran up, he stepped aside, and taking his place, I fired at her chest; but struck her only in the muscles of her shoulder.



E. P. Gee

Much of the 1300 sq km Gir sanctuary is dry deciduous forest, with a low range of hills (150-600 m) of volcanic origin. Temperatures rise to nearly 40° C in summer.



E. P. Gee

Lions take a variety of prey — wild ungulates, langurs and occasionally even hares. But livestock, because of their easy availability and the lack of large hunting areas, form a major prey item.

She did not wait for more, but charged at once with the usual short angry cough — they cannot be called roars. I kept her covered with my rifle as she came on and gave her the contents of the left barrel when she was about twenty paces off. Immediately after firing I turned round for my other gun, when to my horror, I saw my man Kutchra running away with it. I flew after him expecting at every moment to be pulled down by the enraged lioness. It was a welcome shout, indeed, from one of the men which stopped me: 'Mar gaya saheb, mar gaya!'

She was a full-grown lioness, but not an old one, judging from the spots on her flanks. We later found the remains of a buffalo, the lions' 'kill' in fact. It had, evidently, only been killed on that very morning, which would account for the lions being on the move so late in the day, long past their usual hour.

I BELIEVE IT IS a general idea that, as a rule, tigers avoid attacking a full grown buffalo. My experience of tigers is somewhat limited; but I can safely state, as regards the lion, that it has no hesitation in attacking a buffalo, when it comes its way. I was once shown a huge buffalo, which had been at-

tacked by a solitary lion, springing upon it from behind. The buffalo had succeeded in shaking it off, but the poor beast was dreadfully clawed and slowly dying when I saw it.

I had several other encounters with lions in these same Khokra jungles a short time afterwards. I came upon one by the merest chance one morning. We were first made aware of its presence by its suddenly starting to roar, not one hundred yards from us. Thinking, quite wrongly as it turned out, that it was roaring over a 'kill,' I tried to stalk it, the *pagi* following me; but we had not advanced very far before the latter pointed in the direction of a thick clump of bushes not twenty yards away.

It was all very fine of him to whisper "Maro, sahib!" I could see nothing until there was a rustle, and the lion was off without giving me a shot. I ran after it, but the chance was gone, and I never saw it again. There was no 'kill.' It was probably calling to its mate, but its roar had the effect of attracting all the animals in the jungle to the spot, for spotted deer and sambur were calling in every direction!

On another occasion, I chanced upon two lions in much the same way. My attention was attracted by

the belling of a sambur. Thinking that it must have seen a panther, I was peering about the jungle, looking for the latter, when up got a couple of young lions from under a large corunda bush, and trotted away quite unconcernedly, stopping every now and again to have a look at the intruders. It was with difficulty that I resisted the temptation of shooting one or both, but I had shot my share of lions for the season and besides, these animals were hardly more than half grown.

A MONTH LATER I moved my camp to Moduka, a more pretentious *ness* than the generality of them, in the very heart of the lion country. As I was leaving Sasan, I heard a lion roaring in the distance which I hoped portended good luck! My men had some difficulty in finding a suitable tree for my camp, owing to the best site being so overgrown with jungle, and when I arrived I found I had to share my camp with the grave of a Mahomedan Pir, which almost blocked up one of the entrances to my tent.

An ancient worn-out black goat, which some days before had been dedicated as an offering to the departed by some devotee, was quietly grazing outside, and soon became very tame. A few days afterwards it was carried away in broad day-light by a panther. I was busily engaged at the time inside the tent, when I heard a suppressed gurgle from the goat just outside, but thought nothing of it until a short time afterwards, the servant came running in to say what had happened. True enough the handful of black hair and the patches of blood told their own tale — the goat had gone — bodily carried away. I followed up the track until we lost them on the hard ground, and save for hearing it calling that evening, I never heard of it again in the neighbourhood.

THE *PAGIS* HAD been looking for lions ever since my arrival at Moduka, and finally they sent in *khubber* to say that they had found one. Several of us (including a brother officer and his friends who were then occupying my old camp at Talala) met at Khokra, where the lion or lions had been marked down. It was not certain how many there were, but only one had been actually seen.

My friends had quite an army of Darbari sepoy with them, all armed with antiquated muskets, besides the usual paraphernalia of swords, knives, daggers, etc. It certainly would have been *safer* to have

left them all behind, but we did not wish to hurt their feelings; they were all so eager to come with us, so we allowed them to follow close behind us, on the express understanding that they were only to fire in the event of being charged, not otherwise.

All being ready, we commenced our stalk, under the guidance of the *pagi* who had last seen the lion. We reached the top of the hill in dead silence, and I caught sight of our quarry. Signalling to the others to be on the lookout, I fired from a sitting position, the only one in which I could see the lion from where I happened to be. This was the signal for everyone, including the sepoy to empty their rifles! How any one escaped being hit was a wonder.

The lion, in the meantime, was bolting away, though not at any great pace, as my first shot had struck it in the body. My second went anywhere, but I managed to finish it with a third shot with the 8-bore. While we were all re-loading, a second lion, which must have been lying somewhere near, suddenly appeared and stood growling at us for a few seconds but followed in the wake of its companion before anyone was ready to fire. All this took place within the space of a few seconds.

A few mornings later, I found the tracks of a lion just outside my tent. It had sauntered up during the night with no evil intentions I am sure, and then turned abruptly off into the jungles. We tried but did not succeed in finding it. The next day, however, *khubber* came that four lions had been tracked into a *bhoira* or water hole nearby. This *bhoira* had two entrances, about fifty or sixty yards apart. I rode out and took up my position in a tree over one entrance, while my friend guarded the other. We waited on patiently until it was too dark to see anything, much less the sight of our rifles.

Then I heard a yawn below me followed by the rustling of dead leaves; the lions were out and apparently lying at the mouth of the *bhoira*, with no intention of moving away at once; but of course, it was impossible to see anything, although they were so close to me. This went on for some time, and as the lions gave no signs of moving and nothing was to be gained by remaining any longer up in my perch, I precipitated matters by firing off my rifle with no results of course, beyond driving the lions away.

BAD LUCK ON the whole so far, but I had not long to wait for better! Only two days in fact, when my men sent in word to say that they



E.P. Gee

The average litter is 2-3 cubs, though up to 5 are sometimes seen. A large proportion die before they are a year old, probably from disease or starvation.

had found the remains of a freshly killed buffalo, and were following up the lion which had killed it. The following day a *sowar* came galloping into camp; the lion had been marked down and the *pagis* were keeping a watch over it from a distance. It was a long ride to the spot, but I reached it at the very best time, viz., at the hottest part of a very hot day.

The lion had not moved and was lying down under a shady tree on the top of a small conical hill where the cool breeze direct from the sea could reach it. The ground all around was very rough and hilly, covered with small loose stones, so in order to run no risk of disturbing the lion, we left our boots at the foot of the hill. Fortunately we had not a long climb.

When we were about 25 yards from the top of the hill, the *pagi* pointed, and I soon made out the contour of the upper part of its body through the bushes — the lower part of it not being visible owing to the slope of the grounds. It seemed hardly possible to advance any more without disturbing the lion, which might discover us at any moment and be off down the opposite side of the hill for ever.

By good luck, however, just at my side, there happened to be an old stump of a tree about a yard high and with a flat top. Once on that it would be all plain sailing. The only difficulty was how to mount it without making some slight noise and disturbing the lion in its slumbers, but the *pagi* was equal to the occasion.

It was all done by signs — he stooped down; I stepped on his back, and as he gradually raised himself, I was able to step off on to the stump without the lion being a bit the wiser!

There was no difficulty about a shot now. The lion was lying on its side with its legs towards us. The others were very quickly behind me, and when my *pagi* nodded to show that he was quite ready I fired. I only just had time to get in a second shot, which I think must have glanced off a bough as I could find no signs of it afterwards on the lion, before the latter was charging down upon us.

I could of course do nothing with an empty rifle in my hands. But fortunately for us, one of Hebat's two shots, fired at uncomfortably close quarters, flew true and the lion instead of charging home, swerved, and just missing us, went tearing down the hill. Its race was however run, for as I looked round to watch it, it turned a complete somersault and after rolling over and over again lay perfectly still.

It was an old lion with a total length of 9 feet 5 inches, the length of its tail being 2 feet 11 inches. It was also the last lion I shot, although I have since assisted others to get one.



Lt. Col. L.L. Fenton was a British army officer posted in India, and one of the Society's earliest members. He has published several papers in the BNHS Journal, including the earliest comprehensive account of the Gir lion.



MERIND — IN SUPPORT OF CONSERVATION

Sambar (*Cervus unicolor*)
Photo: Ravi Sankaran

LETTERS

Sir,

Sunday started with my usual trip to the Sanjay Gandhi National Park. I walked up to a pre-determined spot where I planned to do an illustration of a prostrate creeper. This was a clearing about 10 m across, in rocky ground, with limited vegetation within the clearing and sufficient vegetation around it. To the south is a higher, much bigger rocky surface. I have often sat at this spot (which is barely a three minute walk from the Kanheri Caves bus stop) as it provides a fairly good view and also gets pleasant breezes from the west.

I couldn't have been sitting and examining the plant for more than two minutes when I heard the sound of an animal running through the vegetation. By the time I looked up the sound of running had got closer and was now accompanied by some disapproving animal sounds. My first thought was that it might be a dog running ahead of its master. When the animal became partly visible in a clump of dry grass about six metres away there was no mistaking the contours of a leopard. And it was rushing straight at me!

Thereafter things happened so quickly that only a couple of well-positioned movie cameras could have recorded the action satisfactorily. I sprang to my feet, and the leopard abruptly pulled up and sprang to its left with a snarl. I do not recall my exact reactions, but my stretched-to-full-height posture apparently gave the attacker a bit of a scare. It ran off at increased speed at right angles (westward) to the direction from which it first came, and disappeared over the broad hump of rocky ground. I stood there motionless for a while, trying to comprehend what was going on, until a sense of disappointment took over that this may have been my last glimpse of the big cat.

So I stepped forward gingerly and stood on my toes for a better look. I must not have covered more than two metres when the snarling bundle of fury burst right back on the scene with a few quick lunges at me. Don't ask me where it had been crouching or how far away. This time I think I made some vague threatening gesture which made it rush off behind the bushes. However, by now the beast had given up any attempt at silence. On the contrary, it

kept on producing a variety of growling and coughing sounds, making sure I knew it was very much there although out of sight.

There followed a short period of uneasy silence and then I saw the tops of some dry grass move unnaturally. Sensing that the leopard might be making a fresh approach I trained my eyes on the bush from beside which I expected to see its head appear. Sure enough, there was the panting face again, this time about 10 m away.

The master of stealth and camouflage was visibly annoyed at being spotted so promptly. Now I saw the long tail twitching. Letting out a series of fearsome snarls she rushed at me for a third time and again backed off on failing to intimidate me. By now it dawned on me that I had stumbled upon a leopardess with cubs nearby. Nothing else can explain such persistent, determined aggression from an animal which would otherwise not only not seek a confrontation but actually slink off before being sighted.

The fact that she aborted her attack thrice was, needless to say, a source of great relief to me. But it was equally clear that this was a precarious balance between threats and all-out attack. For here was an animal fully capable of backing up its threats with canines and claws. I would have liked to see some more of this magnificent animal which most people only dream of sighting, but I concluded that it would be imprudent to linger, so I quietly picked up my bags and left.

Thus ended a truly memorable experience. My only other sighting of leopards in this forest was on 2nd September 1981, when I saw a pair from a distance.

Oscar Fernandes
Bombay

Sir,

I was delighted with my copy of *Hornbill* 1991 (2). There is a great deal of interesting reading matter and some lovely photographs. It is indeed a bumper issue. Thank you.

I have visited Mudumalai at least once a year for the past several years, mostly in September, when everything is lush and green, the Moyar at its most turbulent and the falls spectacular. But as age advances (I am now 72) and arthritis catches up with one's

knees, the journey becomes too long (and too expensive these days) for two visits a year, as my busing days are now over; but I look forward with anticipation during the next 11 months, to my next trip.

I would like to add my own observations in connection with Mr Krishnan's letter. A couple of years back, I saw a chital being swallowed by a huge python, just off the main motorable road from Thappakadu, very close to the elephant camp. There were herds of tourists, spilling out of buses, poking the python with sticks and pelting it with stones, while the python was helplessly trying to swallow its kill. It actually had to be dragged farther into the jungle by the Forest Department staff with the help of ropes and tame elephants, to save it from its human tormentors and allow it to digest its food in peace.

Mr Serrao's article 'The Tiger in Bombay', intrigued me. My grandmother used to tell me when I was little that a hundred years back tigers used to come down from the thick forests of Malabar Hill to drink at Gowalia Tank, which lay just outside her father's property.

The reference to the tiger running uphill, between the Hermitage and Prospect Lodge, when disturbed, fascinated me, as I knew both these bungalows before this madness of high-rise buildings took our once beautiful Bombay in its strangle grip! My mother was born at Prospect Lodge in 1889 and I used to often visit the Hermitage with my grandfather to see his friend, who resided there, between 1925-30.

I recall that another friend of my grandfather, Mr Phipson (in whose premises the BNHS earlier functioned), kept a huge python in a cage behind his wine shop, further along your road. Perhaps these old facts may interest some of your readers.

Mrs. M.R.B. Jeejeebhoy
Bombay

Sir,

I have commenced a two-year Ph.D. project on the conservation ecology of the great pied hornbill in the Western Ghats of south India, establishing a base camp at Top Slip in Anamalai.

This is an appeal for information. I want to know the exact distribution of the bird in the Western Ghats, and the status of the species in different areas. Even reports of stray sight records are welcome.

My project involves three important areas of investigation: monitoring of the fruit resource base for the bird, study of nest-site characters and the current

GIANT SQUIRRELS

The Wildlife Institute of India in collaboration with the United States Fish and Wildlife Service has initiated a 5-year project on the status, ecology and conservation of giant squirrels and associated forests with particular emphasis on the Malabar giant squirrel (*Ratufa indica*). Status data will also be compiled for the southern grizzled giant squirrel (*R. macroura*) and the north-eastern pied giant squirrel (*R. bicolor*). Any observations on the occurrence of giant squirrels will be greatly appreciated. Kindly use the following format.

Name and address of sender; Month and year of observation; Name and location of forest; Type of habitat; Any other information (including observations on other arboreal herbivores in the same area — civets, flying squirrels, bats, primates, etc.).

Kindly send this information to
Dr Renee M. Borges,
Principal Investigator, Giant Squirrel Project,
104/C Aradhana, G.D. Ambekar Road, Naigaum
Bombay 400 014.

availability of those parameters within the range, and a quantification of its foraging habitat. If you have known the bird to nest in any locality please write to me, giving date, exact location, tree involved etc. Information about persecution of the bird (especially by tribals) will also be important.

The bird is obviously rare and declining in numbers and in range. A project of this sort, involving a rare and nomadic frugivore, can only be successful in doing something concrete for the bird's survival if it encompasses a large area. Hence it is important for me to pool information from a very wide range. Every contributor will be gratefully acknowledged in the dissertation and publications to follow. On behalf of the great pied hornbill, thanks for your help.

R. Kannan

Hornbill Project

Indira Gandhi Wildlife Sanctuary
Top Slip 642 141, Via Pollachi, Tamil Nadu

The tone of a magazine is in many ways set by the response it gets from its readers. We would of course like feedback on what you think about *Hornbill*. But in addition, the Letters column should reflect the purpose for which the BNHS was originally founded — as a forum for exchanging notes on natural history and conservation. If you have any interesting observations (with or without photographs) about wildlife, or feel strongly about a conservation issue, or about an area you have visited, please write to us so that it can be shared with other readers. We will pay for any photographs that are reproduced.

NEWS NOTES COMMENTS



Mangrove conservation

Reclaiming land from the sea is hardly a human invention; nature has been doing it for aeons, using mangroves where man uses concrete tetrapods. Mangrove forests are the backbone of most coastal wetlands; they provide a bulwark against erosion by the sea (through tidal action or storms), and allow less hardy species to take root and spread, eventually forming a densely vegetated area that can support wildlife as well as human needs such as timber and fuelwood.

Mangrove-dominated wetlands in various parts of the country (perhaps the most famous is the Sunderban in West Bengal) harbour a variety of wildlife species — deer, the ubiquitous wild boar, hyenas, otters, lesser cats like the leopard and jungle cats and large predators like tigers and leopards. Mangrove birds usually include both forest-dwellers and waterfowl. The amphibian and reptile fauna, however, is rather more limited, probably because the high salinity levels in the soil and water demand a degree of specialisation among species which spend a major part of their time in water.

Unfortunately, mangrove areas have been severely damaged in many parts of the country, and completely wiped out in some areas. Orissa is a case in point. The dense mangrove forests which covered vast areas of the state a century and a half ago now occupy only 226 sq km on the coast, in Cuttack, Puri and Balasore districts. Just over half this area lies within the Bhitarkanika national park, where 62 species of mangroves (out of the 67 Indian species) occur. Another chunk (about 50 sq km) is in the Mahanadi river delta, particularly the islets near the river mouth.

The assault on Orissa's mangroves began as early as 1840, when the then Maharaja of Burdwan cleared about 120 sq km to rehabilitate immigrants from West Bengal. The process has continued ever since, gradually at first, and with increasing rapidity

during the last 30 years, with mangroves making way for settlement, cultivation and prawn fisheries. Satellite imagery shows that since the '70s about 2 sq km are being lost each year. Our planners, apparently, remain unconvinced that not just wildlife but people, too, will benefit from mangrove conservation.

During the last 30 years Orissa has been battered by 10 major floods and six storms; the 1971 storm, with 150 kmh winds and enormous waves, cost over 10,000 lives. And a major cause of the increasing frequency of storms and floods is the loss in mangrove cover. There are similar lessons from other states too, but precious little action.

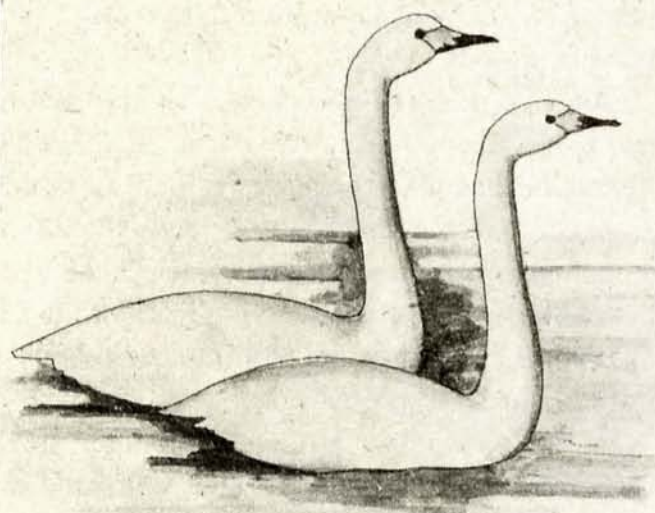
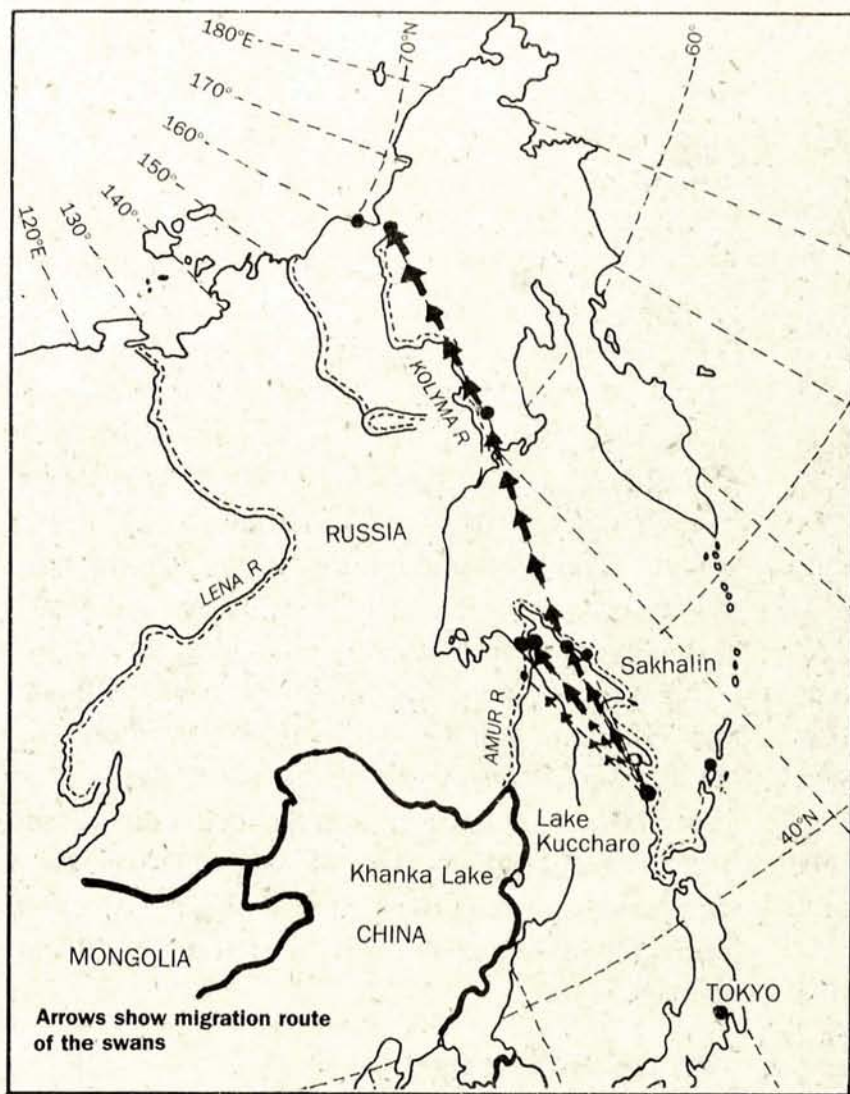
Economic development of rural coastal areas and mangrove conservation are not mutually exclusive. It is possible to have both; but unless mangroves get the attention they deserve, we will end up with neither.

Of swans and satellites

Each winter, some 15,000 whistling swans (*Cygnus columbianus*) arrive in Japan from their breeding grounds in northern Russia. There ought to be many more; the swan's habitat has been decreasing in size and deteriorating in quality both in Japan and in many parts of eastern Asia, and the (former) U.S.S.R. government has listed it as an endangered species.

Before conservation schemes can take off, a more complete knowledge of the species' biology is required. One major grey area is migration. Information now available is fragmentary, based on observations of a small number of collar-marked birds in Japan. The answer was satellite tracking, a technique that has been used with some large birds (most recently the wandering albatross), but had never before been tried successfully on swans.

Japanese researchers 'followed' four whistling swans on their return migration from Lake Kuccharo in northern Japan, in April and May 1991. The 14 sq



km lake at the northern tip of Hokkaido island is something of a swan watcher's paradise. No swans overwinter there, but thousands stop over in spring and autumn.

Small (112x35x19 mm) battery-powered transmitters weighing about 80 g each were attached to the neck (using collar bands) or the back (using small leather harnesses or glueing them directly on the back with epoxy adhesive). The extra weight (150 g with the harness, 130 g with the collar band) was roughly two percent of the swan's body weight, which is small enough to cause no hindrance even on long distance flights. The four birds were released about three and a half hours after they were captured.

The signals emitted by the transmitters were bounced off a satellite to a receiver in France, from where the birds were tracked during their 3000 km journey. One problem was the cold weather, which reduced the life of the transmitter batteries from the expected 60 days to 30-45 days.

Three of the swans were tracked part of the way and the fourth till the breeding grounds in the Russian tundra. All four migrated along similar courses, flying northwards up to near the mouth of the Amur

river in Russia (see map), where they stopped for between two to three weeks before leaving for the arctic tundra to breed. Lakes, marshes and river mouths are believed to be the key habitat component for the species, functioning both as breeding grounds and as resting areas during migration.

Invading the Anamalais

If forests are your cup of tea, be warned. A decision taken in May 1990 by the Tamil Nadu government to set up extensive tea plantations over large areas in the Anamalais will severely degrade one of the country's best wildlife areas, besides damaging the water resources of an ecosystem that is driven by rainwater.

The Tamil Nadu Chincona Department (TNCD) owned or controlled large forest areas in the Nilgiris, Anamalais, Kodai hills and a few other places in the southern Western Ghats. Only a small fraction of these areas were commercially exploited, and the rest remained as forest and natural grassland. TNCD produced mainly the anti-malarial drug quinine, as well as spices and some products from eucalyptus, geranium and lemon grass.

From the mid '60s, however, quinine was gradually replaced with more effective drugs (which the department did not manufacture), and TNCD began running into very heavy losses. It was then decided to merge the department with the Tamil Nadu Tea Corporation (TAN TEA), and convert *all* TNCD land — not just the areas earlier planted over — into tea gardens.

At one level, the decision makes sense. Political unrest in Sri Lanka and Assam (the main producers) has caused production to fall and prices in the international market to rise; and the Tamil Nadu government expects to make substantial profits from the new plantations.

But if the economic costs of deforestation are taken into account (though such calculations are often controversial), the decision makes no sense at all. And even planners who remain unconvinced about how much a tree is actually worth would agree that when an area is as ecologically rich as the Anamalais, we must be willing to forego some profits in order to preserve it.

In the Anamalais alone, the merger involves about 3600 ha of land. TAN TEA will hand over a token 10 percent of this area to the state Forest Department, continue with chincona in 160 ha, and plant tea over the remaining 2640 ha. With the merger, TAN TEA also acquired TNCD's 950-strong work force, which will be used on the plantations.

This is where the calculations become interesting. According to tea industry norms, 2.5 labourers are needed per hectare of plantation, which means that these 950 men can handle less than 400 out of the 2500 ha. The solution? Hire 5000 more people so as to completely utilise the land.

The effects of human ingress on so large a scale can well be imagined. Firstly, a 1600 ha area now under dense tree cover and a further 800 ha of grassland will have to be cleared before tea is planted, devastating the major catchment area for many of the area's perennial streams. Reservoirs in the Perambikulam/ Aliar irrigation-cum-hydel project will also suffer, both from reduced water inflow and from increased siltation due to soil erosion.

Large scale tea plantations require the heavy, long term use of weedicides, pesticides and artificial manuring; pollution and potentially drastic changes in the ecosystem are likely to follow. Roads, buildings and processing sheds will have to be built, and,

irrespective of the official view, fuelwood will come from the forest. This in turn will mean clearing of more wooded areas, and a widening circle of destruction.

There *are* practical alternatives available. Since the TNCD workers must continue to be gainfully employed, tea plantations could be limited to about 400 ha, which would require no additional labour. The necessary infrastructure such as roads, buildings, etc. already exists. Perhaps another 50 ha could be cleared for construction. The forests would then remain largely intact. Whether they will in fact remain so will depend on how much pressure conservationists can exert; it is useless to expect the state government to see the light on its own.

One way to begin the lobbying process would be for NGOs and wildlife groups to take up short term rapid assessment studies of the area. Quantitative data on the impact of large plantations would considerably strengthen the environmentalists' case, and perhaps even convince the state government to scale down the project to minimum-ecological-damage levels.

Natural Sciences

Two new journals are being launched, and have circulated requests for contributions, preferably original research work. The half-yearly *Journal of Natural Sciences*, published by the Centre for Nature Studies, Dhaka, will deal with all aspects of natural science. Write to Dr Md. Anwarul Islam, Centre for Nature Studies, c/o Zoology Division, Institute of Life Sciences, Jahangirnagar University, Savar, Dhaka.

The quarterly journal, *Sustainable Development*, will deal with sustainable development and environmental conservation. Write to Hari Dang, Sustainable Development, B-17 Ansal Chamber-I, Bhikaji Cama Place, New Delhi 110 066.

Your money or your wildlife

Wildlife conservation requires not just commitment but also hard cash. And frequently, countries with seriously degraded wildlife habitats have equally serious financial problems. Debt for nature swaps offer a way to at least partially get round the problem.

The mechanism is simple in principle. A generous benefactor offers to pay your debts (he 'purchases' your debt at a discount from your



Captive breeding programmes for the Siberian tiger, in operation since the '60s, were among the earliest examples of successful coordination between zoos around the world to ensure genetic purity.

Courtesy Zoological Soc. of San Diego

creditor, or pays you the money directly), provided you spend some part of the money on conservation.

Large scale swapping is obviously best done at governmental or U.N. level, but private bodies, particularly in the U.S.A., have funded a number of effective conservation schemes for specific areas. In early 1991 for example, Nature Conservancy bought more than \$ 500,000 of Argentine debt. The money was converted into local currency to fund conservation efforts in the Patagonian Andes.

Conservation International went a step further. In one of the largest private swaps to date, they will take over \$ 4 million of Mexican debt from international creditors. In return the Mexican government will spend roughly three fourths of that amount (in Mexican pesos) on environmental projects. The main beneficiary will be the Lacandona rainforest, which is home to some 3000 species of plants, 306 of birds, 84 of reptiles and over 700 species of butterflies.

Perestroika and conservation

The U.S. and U.S.S.R. (when it was still the U.S.S.R.) have agreed on a three year joint study of Siberian tigers (*Panthera tigris altaica*) in the wild. The project will combine the animal-tracking expertise of the Russians with American telemetry and computer technology to study range, diet, habitat

preferences and reproduction. The U.S. Fish & Wildlife Service and the National Geographic Society are supporting the project.

The study will take place in the 3,500 sq km Shikote-Alin Biosphere Reserve north of Vladivostok, which holds approximately 20 tigers. The animals will be snared, tranquilised and equipped with a radio telemetry collar. Blood and skin samples will also be taken for more detailed biological studies.

Since the area of study lies entirely within Russia, one hopes that the recent political events will not pose problems for the project. What is more likely, however, is that there will be a delay while the new government ratifies decisions made by the old one.

Hornbill Series

The BNHS, in collaboration with the National Council for Science and Technology Communication, is planning a series of booklets on wildlife and the environment. We plan to publish the booklets in English and a number of regional languages. Would you like to help?

We are specifically looking for people who can translate English manuscripts into regional languages. If you're interested, please write to the Publications Dept., BNHS, Hornbill House, S.B. Singh Road, Bombay 400 023.



Isaac Kehimkar

Salim Ali Chowk — tribute to a genius. Mayor Raote performs the honours while BNHS staff and members watch; Mr and Mrs Godrej are at extreme left.

Remembering Salim Ali

The traffic island just outside Hornbill House will now be known as Padma Vibhushan Dr Salim Ali Chowk. The Old Man, as he was fondly known at the BNHS, would no doubt have objected furiously to the proposal. But it is a very small measure of tribute to the person who placed the Society, and indeed Indian ornithology, on the world map.

Scientist, writer and visionary, he was largely responsible for initiating many of the Society's research projects, and for building up a team of biologists to complete the tasks he had begun. BNHS has been trying to spread the idea that his birth anniversary be celebrated each year as National Bird Day.

The Chowk was inaugurated on 12th November, his 95th birth anniversary, by Diwakar Raote, Mayor of Bombay. The traffic island has been spruced up and landscaped, the entire cost being borne by the Godrej group of companies (Mr S.P. Godrej is Vice President of WWF-India and a long-time supporter of the Society).

The inauguration function was followed by the Salim Ali Memorial Lecture. It was delivered by one of the country's best known plant taxonomists, Fr.

Cecil Saldanha. He spoke about the Andaman and Nicobar islands, whose natural history and people he has studied for many years. The man-induced changes forced on the ecosystem (and its original human inhabitants) is cause for serious concern. A resolution was passed after the lecture, reading as follows.

"The BNHS appreciates and values the rich diversity of natural resources in the Andaman and Nicobar islands. We express our concern for the preservation of these resources. In particular we recommend that

▽ The Great Nicobar Biosphere be set up as early as possible.

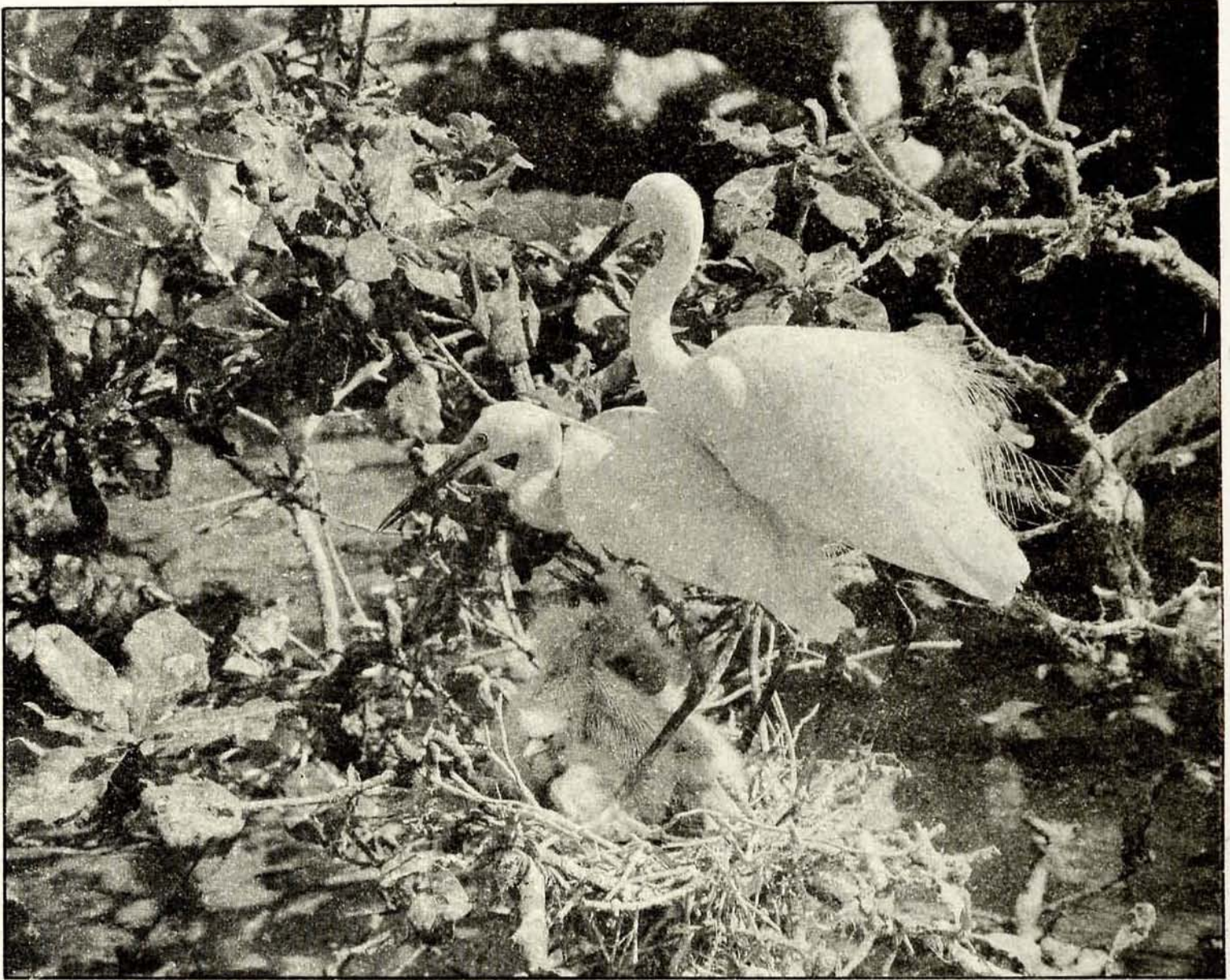
▽ The development strategy for the islands should shift from exploitation of land resources to sustainable use of marine resources such as fish.

▽ The continuous increase of the population in the islands is a matter of concern and measures should be taken to control further immigration.

▽ Priority should be given to conservation of genetically rich and diverse but severely endangered forest and coastal resources.

▽ The services of BNHS staff and members may be used for research and planning of conservation measures on the islands."

Nature Alive



Loke Wan Tho

THE LANKY, SNOW WHITE little egret (*Egretta garzetta*) is a familiar sight. But especially in non breeding plumage, one egret looks pretty much like another, and this often causes confusion. The little egret is smaller than the large and median egrets, and can be differentiated from the cattle egret by its black bill (yellow in the cattle egret) and its black and yellow feet. In the breeding season, two long narrow plumes develop on the back of the head, and filamentous ornamental feathers on the back and breast.

It is usually found in flocks on the edge of water or wading in the shallows, looking for fish, frogs, crustaceans or water insects. It may stalk its prey, stepping carefully through the water, but more often still-hunts, waiting till the prey moves within range and then uncoiling the long, flexible neck to strike with the bill.

The breeding season varies widely with the local availability of water. The nests are flimsy, and crowded together in large, noisy mixed heronries.

The plumes were valuable in the 19th and early 20th century, and egret farming was common in some areas, particularly in Sind (Pakistan). Local fishermen penned them within jheels in groups of about a hundred. The birds were fed and cared for, and even provided with twigs for nest building. Nestlings were removed from the nests about a week after hatching, and hand reared. The parents would lay a second clutch almost immediately, sometimes hatching four or five clutches a season.

The dorsal plumes were removed from mature birds. Each bird provided 10-15 g of feathers per year which, eighty years ago, were worth about a rupee a gram in India, and half a pound per gram in Europe.



FOLKLORE

Telling tales about the crow

NARESH CHATURVEDI



Illustration by Rita Ganguli

*If the crow could hold his tongue while he ate,
He would have much more dinner and less debate.*

I WAS SITTING ON my balcony with the morning newspaper and a cup of tea. And as usual, someone from one of the upper floors threw down a few pieces of dry bread. Almost as if it had been waiting (and perhaps it had been), a house crow flew in, picked up the pieces and tried to break them into more manageable bits. The bread was too dry, however, so it dropped the pieces into a pool of water nearby. A few minutes later the bread had softened, and the crow began dining. But promptly two more crows appeared and began fighting for possession of the bread. Several noisy minutes later, the victor was left clutching two small pieces, which hardly seemed worth all the bother. Odgen Nash's lines are quite appropriate.

For some reason, crows are considered unintelligent in the west. On the contrary, they are probably far more intelligent than most other birds — and, in my opinion, have a better sense of humour as well. Probably because it has lived in such close proximity to man, the crow features in any number of legends and folktales, some religious, others precepts disguised as stories. From south India to Ladakh, this familiar bird has been the subject of song and story.

THE CROW IS almost as important as the priest during a *shradh* ceremony. As part of the ceremony, a *pidam* made of cooked rice is prepared, which the eldest son offers to the crows. If they do not feed, the *shradh* is believed not to have been properly performed; the wishes of the dead man will remain unsatisfied. If the crows after repeated attempts fail to eat the rice, the person performing the rituals assures the departed soul that he will in fact satisfy his or her last wishes; upon which the crow is supposed to eat the rice ball.

Among the Uralis of Tamil Nadu, the crow even has the power to rescind an excommunication. An Urali who has been so punished (according to a 1901 census report) must sacrifice a goat and place some of the cooked meat on the roof of his house. If the crow eats, the man is welcomed (perhaps a trifle grudgingly) back into the caste.

There are no crows on Kavaratti island in Lakshadweep. The reason, according to local legend, is that one bird fouled a Mappilla *thangal* (priest) with its droppings. The priest cursed not just the offending bird, but others of its kind as well, and ever since then crows have vanished from Kavaratti.

The Kois of the Godavari district believe that hell is the abode of an iron crow, which feeds on all who go there. The Skanda Purana says

कार्णलोहमयोध्वाङ्क्षो यमस्याभून्महाध्वजः
— *The flag of Yama is an iron crow*

The Khond tribals of south India are hunters; but they do not kill crows as this would amount to the killing of a friend. According to Khond folklore, there was once an old couple whose four children died one after the other. Their parents were too feeble to take the bodies for cremation, so they left them on open ground. God appeared in their dreams and promised to ensure that the bodies would not be left in the open, and defiled. So he created the crow, which devoured the children's bodies.

FEW PEOPLE HAVE seen crows mating. There is a popular (and incorrect) notion that crows mate lying on the ground with their vents opposed. They actually mate in the usual avian fashion. But the very rarity of such observations, perhaps, has led to yet another belief — that a person who has caught them in the act will die soon.

Albino crows are not unknown. But the simple matter of lack of pigmentation (something which affects birds, animals as well as people) is suffused with a deeper meaning. According to the Matsya Purana,

काको मैथुनसक्तश्च श्वेतस्तु यदि दृश्यते ।
राजा वा म्रियते तत्र स च देशो विनश्यति ॥

— *The sight of a white crow, or of crows mating, portends the death of a king or danger to the nation.*

Our poets have long admired the crow for its many qualities — wisdom, keen eyesight, even the gift of the gab. Even the king has something to learn from the wily, sagacious crow. The Rajadharma chapter of the Agni Purana says,

“काकशङ्की भवेन्नित्यम्”

— *The king must always be as suspicious as the crow*

In Vedic India the crow was considered inauspicious, and offerings contaminated by it were never used for ceremonial or religious purposes. But over the years, as the ‘science’ of augury developed, popular opinion about these birds changed.

Some south Indian communities believe that should a crow come near the house, and caw in its usual rapid, raucous tones, it signals impending calamity. But the peculiar prolonged guttural note means that happiness will ensue. A crow cawing incessantly foretells the arrival of a guest; this belief is so strong that some women prepare extra food in anticipation.

JUST AS THE crow and the koel, which look so similar, can be differentiated from their voices, similarly two persons may be similar in many ways but could be differentiated by their tongues.

काकः कृष्णः पिकः कृष्णः को भेदो पिक काकयो ।
वसन्त समये प्राप्ते काकः काकः पिकः पिकः ॥

— *The crow is black, and so is the koel;
what then is the difference?*

*Autumn comes; the koel is unmistakably a koel;
the crow, merely a crow.*

In a well known Rajasthani folk song, a wife awaiting her husband begs the crow to go out and bring back news of his arrival. She resorts to bribery — “Bring back good news, and I will feed you rice cooked in sweet milk, and cover your beak with gold.” Even in the Ramayana an anxious Kaushalya enlists the crow's help to seek information about Lord Rama's safe arrival.

References to the crow are not restricted to Indian literature and culture, but are apparently found wherever the bird occurs in fair numbers. English poets from Shakespeare to Poole have written about the bird, often dwelling on its powers of prophecy.

*The om'nous raven with a dismal cheer
Through his hoarse beak of following horror tells,
Begetting strange imaginary fear
With heavy echoes like passing bells.*

Poole, in *English Parnassus*

The Arabs call the raven *Ghurab-al-baym*, or the raven of separation. When Noah sent it forth from the Ark on an errand, it failed to return. Noah cursed it for its disobedience, upon which the bird turned colour from white to black. For this reason it is also known as *Fasiq* or *evildoer*.



Naresh Chaturvedi, an entomologist by specialisation, is Deputy Director (Collections) at the BNHS. He is also interested in mythological references to natural history, particularly birds.

A Shola In My Backyard

VIDYA AND RAMANA ATHREYA



IT WAS AN EARLY morning in the middle of winter; not exactly the best time to visit Ooty, or so we thought. The bus had dropped us a good two kilometres away from our destination, and it was bitterly cold: frost on the leaves, the valleys all around filled with mist. And we had a suitcase each to lug — we couldn't think of a bleaker way to begin a day, nor a trip!

And then the sun came up. As the warmth seeped into us we began to look around. The sun burnt the mist away and we sat down on a boulder to greet an incredibly beautiful winter morning with just the right mix of sun and chill. We could see right across the valley to the distant hills of the Mukurti wildlife sanctuary, and make out the micro-wave tower on Kollaribetta, the second highest peak in the Nilgiris. The air was cold, crisp and crystal clear, with not a cloud in the sky.

We weren't the only ones greeting the morning. The first sun also brought forth a burst of bird song. It took us more than an hour to complete the stretch. Laughing thrushes, bulbuls, blackbirds and flycatchers, all joined in a chorus of ecstatic welcome to the sun. And as we turned the final bend before the guest house we gaped at our first jungle cat as it slithered down a tree, breaking off branches in a hurry to get away.

How wrong we had been in our first assessment of the morning, and in our estimates about the wildlife we would see in Ooty. We had expected a dirty holiday resort with a countryside ravaged by plantations of eucalyptus and tea, with no chance of any wildlife. We had been right to a large extent, but were fortunate to stay at a place which hadn't yet caught up with the rest of the Nilgiris — a small island in time as it were! And there we caught a glimpse of an Ooty that was, an Ooty that should have been.

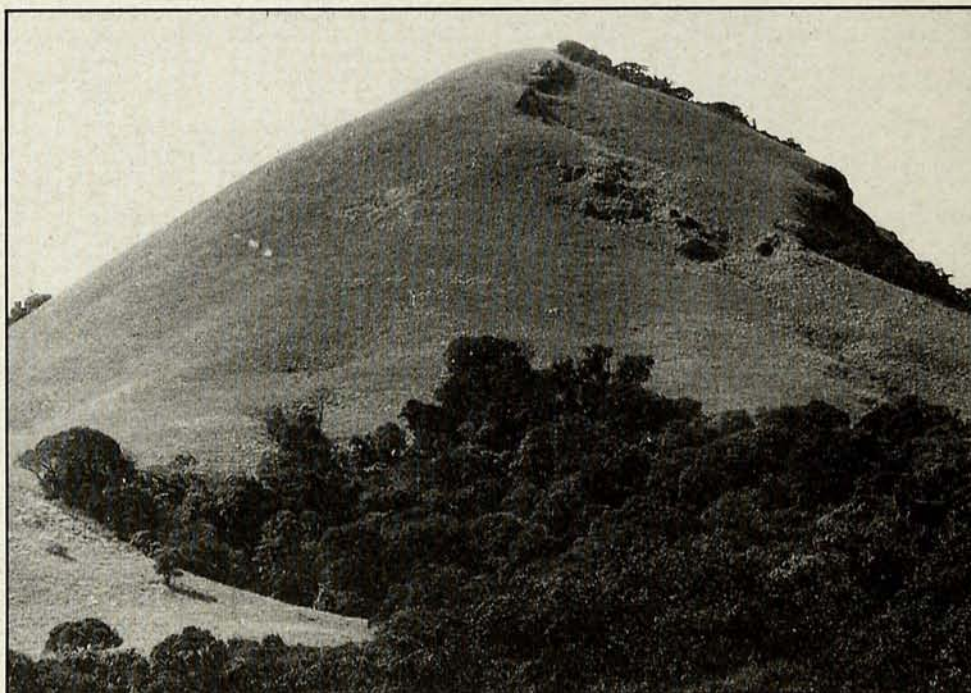
OOTY IS A well known hill station that bustles with visitors during the tourist season; and in recent times even during the 'off' season.

Nilgiri tahr— virtually the entire population is restricted within a 250 km long strip in the Western Ghats, along the Tamil Nadu-Kerala border.

Clifford Rice

The demands of a growing populace, both resident and itinerant, have taken a heavy toll of the original wilderness; a wilderness of grass-clad rolling hills with sholas (patches of evergreen forest) in their valleys and folds. In fact, a tourist can go right across the Nilgiris without once seeing these features that are unique to the southern Western Ghats, and now confined to a few areas where commercial plantations of acacia and eucalyptus failed to thrive because of heavy wind and rain.

20 km from Ooty, at the western edge of the Nilgiris, is the Mukurti Nilgiri tahr sanctuary: the last refuge of the Nilgiri tahr in the Nilgiris, and indeed the last refuge of that unique ecosystem. Grass hills surround you for miles, looking like a carpet of green velvet from the distance, with patches of dark green



Typical shola, with dense forest juxtaposed with grassland.

M. A. Reza Khan

shola in every fold. During and immediately after the rains there is a clear stream every few feet, tumbling its merry way downhill.

But we didn't have to go very far from where we stayed, at the Radio Astronomy Centre, eight kilometres from Ooty town, to see wildlife. We would often awaken to the sounds of Nilgiri langurs thudding onto the roof; or watch them from behind the curtain as they warily came to the ground in search of plants to eat. Nilgiri langurs are black all over, with faces framed with a ring of silver brown. They are found only in the southern part of the Western Ghats in thick forests. An endangered species, they are persecuted for their fur and the supposedly medicinal value of their flesh.



Ramana Athreya

Nilgiri langur

SHOLAS

Along the higher reaches of the southern Western Ghats, usually above 1500 m, is an ecosystem found nowhere else. The rolling hills are covered with grassland, interspersed with dense, isolated, sharply defined and usually small evergreen forest patches known as sholas. Perhaps the most curious feature of these areas is the abrupt transition from short grassland to dense forest, with no 'interface' whatsoever.

Shola patches occur in parts of Tamil Nadu, Karnataka and Kerala in moist, high rainfall areas, mostly in folds in the hills (where they are sheltered from the wind), either at the head of a stream or in depressions caused by landslips on the hill slopes. Even this is not shelter enough: shola trees above 2000 m rarely grow over 10 m in height, and even those at lower altitudes are usually less than 20 m tall.



Digant Desai / Sanctuary Features

Common map butterfly

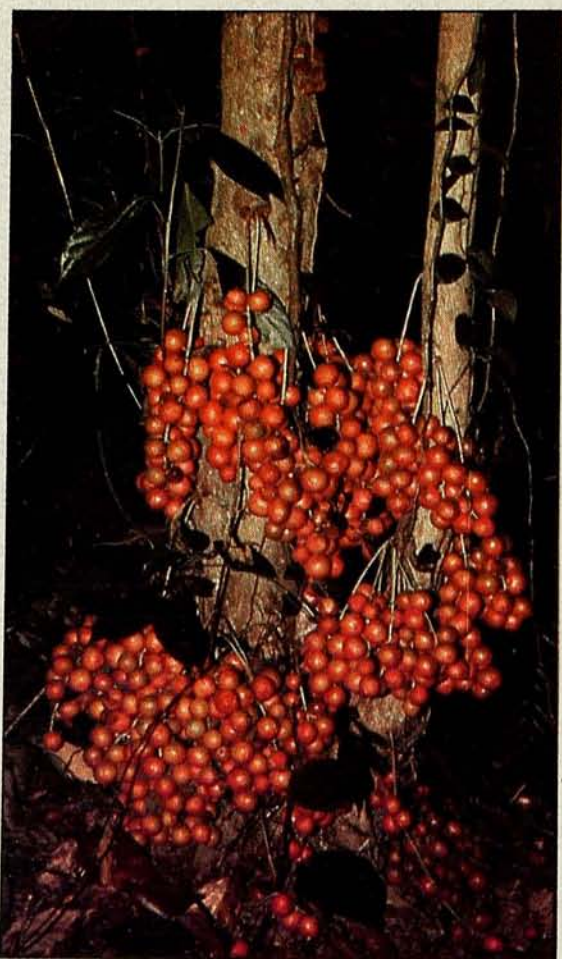


A.J.T. Johnsingh / Sanctuary Features

Slender loris

Because of the varied topography, the geographical location and the diversity of vegetation types, the faunal diversity in a shola-grassland area is out of all proportion to its size. Apart from a substantial number of fairly widely distributed species, there is a high level of endemism, with animals and birds evolving in response to a specific set of environmental conditions.

The evergreen *Baccaurea courtallensis* is known as *muthupalam* (pearl fruit) in Tamil. The bright crimson berries grow on the trunk in great profusion, and are eaten by local villagers as well as elephants, giant squirrels, monkeys and porcupines. The common map butterfly (*Cyrestis thyodamas*) is a typical high altitude species, ranging through parts of the Western Ghats and in the Himalaya. The markings and the manner of flight (slow and jerky, with the wings held horizontal for unusually long) make it quite unmistakable.



A.J.T. Johnsingh / Sanctuary Features

Baccaurea courtallensis

The endemic Nilgiri langur (*Presbytis johni*) ranges between 1000 and 2000 m. Its deep, ringing *hoo, hoo, hoo*, once a familiar sound in the shola, is now rarely heard. It has been hunted, far more so than any other Indian primate, for both fur and flesh. The nocturnal, secretive slender loris (*Loris tardigradus*) is restricted to south India and Sri Lanka. Usually solitary, sometimes in pairs, it can be seen both in dense and open forest. Its diet is extremely varied, with a marked preference for lantana berries.

Occasionally we would see a barking deer nibbling at some shoots in the flower bed or come across one in the middle of a potato field and watch it bounding away into cover on the far side. The signs of wild boar foraging for roots and the quills of the porcupine were the only indications of these mammals.

The handsome painted bush quail with his harem of females, the alarm call of a grey jungle fowl when a Besra sparrowhawk swooped down on a rodent, the antics of the migrant grey drongos as they braved the fury of the honey bees to raid their hives, the Nilgiri salea (a brown and green banded lizard endemic to the Nilgiris) basking in the sun...there was always something or the other to hold one's attention all through the day.

THE PRESENCE OF this host of animals was as perplexing as it was welcome, for RAC itself is a eucalyptus grove surrounded by tea gardens and fields of cabbage, radish and potato. The source of this animal bounty, I discovered, was a shola adjacent to the campus — a shola practically in our backyard — a mere fifteen minutes by walk, and the only shola for miles around. It has escaped the axe as it is a research plot of the Central Soil and Water Conservation and Research Institute. The animals move about in the RAC campus too, as they are undisturbed there.

The campus, though a eucalyptus plantation, has extensive areas without eucalyptus and covered with grass, small plants and dense thickets. Elsewhere in the Nilgiris, land is either farmed or carries dense plantations of eucalyptus; acacia grows so densely that even jungle fowl would find it difficult to go through a patch. This patch of shola is triangular, 200 m long and hardly 75 m at its broadest, and is totally surrounded by plantations of eucalyptus, acacia, pine and silver-oak.

WE WOULD START for the shola late in the afternoon. On the way were the golden helichrysum flowers with camouflaged crab spiders (they look like crabs) of the same colour lurking among the petals, waiting for an insect meal. Floating among these and other flowers were the various high altitude butterflies: red admirals, clouded yellows, the cabbage white (whose caterpillars thrive on the vast fields of cabbage) and many others.

Above us would be the blackwinged kite, checking the area for prospective victims while hovering on rapidly beating wings, and that even more masterful hoverer, the kestrel, perched on top of a girder of the radio telescope. On continuing further, to the top of the hill, we would often see a short-toed eagle sitting high on a eucalyptus.

A five minute walk through an acacia plantation would bring us to our shola. On this stretch were the grasses of some *Briza* species with their seed pods bobbing comically up and down like a yo-yo when a breeze or a hand started them on their way.

We were in the Nilgiris during the monsoon (they are lashed by both the north-east and south-west monsoons) and we literally had to crash through the dense shrubs at the margins of the shola. But once inside, the going was easy. The trees are short (10-12 m high, as the soil is very thin and cannot bear the weight of very tall trees) and fan out to absorb most of the sun's rays, very few of which get past the top canopy.

The premium being on sunlight, most of the shrubs grow tall and spindly in a race to catch more of it, so that there is hardly any undergrowth. There wasn't a single tree with a bare bark, for they were festooned with mosses, creepers, orchids, ferns and other epiphytes. Wild pepper seemed to be the most common creeper around, and it was a delight to chew the leaf, more so due to the fact that it was wild and untainted with pesticides!

VISIBILITY WAS POOR, and it was often frustrating to listen to a profusion of loud and varied bird calls and still not be able to see the callers. After about 5.30 p.m., it was impossible to identify anything except in the few places where a ray of sunshine would peep through. We would pause every few steps and strain to hear the rustle of leaf litter as a bird foraged for insects, or the faint flutter of wings as a small bird flitted through the gloom onto another branch. And then would follow a patient tracking and waiting until the bird crossed a brighter patch. More often than not it would turn out to be the Nilgiri blackbird.

Occasionally we would spot a smallbilled mountain thrush or the Nilgiri verditer flycatcher or, if we were very lucky, the elusive rufousbellied short-wing. The air would be full of calls: the plaintive mew of the black and orange flycatcher, the bubbling notes of the redwhiskered bulbul, the sweet

notes accompanying the fantail flycatcher's little dance and most comical of all, the laugh of the Nilgiri laughing thrush. Their delightful laughter as they start a chorus is so infectious that we could hardly prevent ourselves from joining them. We came across a laughing thrush nest, a delicate cup made of moss tucked into a pepper creeper, with two nestlings.

Then there was a pair of brown wood owls who almost always managed to fly off before we could spot them. They would land low on a tree and sit motionless while we desperately searched for them, and be off the moment we caught sight of them. We would judge their location either by their deep call or by the alarm calls of other birds. We saw one of them being harried by a greyheaded flycatcher — a bird less than a hundredth the size of the owl.

DROPPINGS OF barking deer were strewn all over. We often heard their alarm call — a sharp, loud bark — and would occasionally catch a glimpse of one moving away rapidly in the semi-darkness. Patches of dug-up earth were very common, indicating that the boars had been at work during the night, though we never managed to see any during the day.

Once we came across the scat of a leopard in the shola; a visitor, no doubt, to what had once probably been a regular part of its beat. In fact, a year ago, a leopard had killed a cow very close to the hostel! Giant squirrels and porcupines were the other mammalian inhabitants of the place and now and then we would come across a quill. Looking back, the best part about the little shola used to be the feeling of anticipation; there was always something new in store for us each time.

All this and much more we came across in our little patch of shola — an amazing variety for a place so small and completely isolated. It is a pity that only a couple of such sholas remain near Ooty. Much of the Nilgiris in fact has been devastated by clear felling in the name of progress, and the loss of sholas is particularly serious because they are found nowhere else. We still know very little about the ecology of sholas, and if they vanish at this rate we are not likely to learn much more.



Ramana Athreya is working towards a Ph.D. in astrophysics at the Tata Institute of Fundamental Research. His wife Vidya is doing her M.Sc. in ecology at the Salim Ali School of Ecology, Pondicherry.

Support Conservation

JOIN THE BNHS

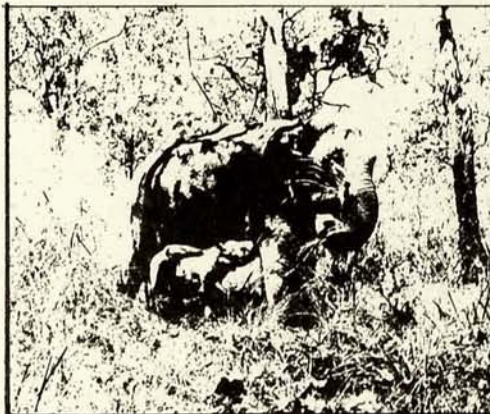
The Bombay Natural History Society was formed 108 years ago, as a forum for exchanging information on natural history. Over the years, its members and scientists have helped document India's diversity of wildlife, studied little-known and highly endangered species, providing critical data for conservation projects, and produced a series of books on natural history, many of which have become standard works of reference. Today, the BNHS is Asia's premier conservation organisation, with members in over thirty countries and an international reputation as an authority on Indian wildlife.

BNHS members enjoy a range of activities—film shows and lectures on natural history, regular weekend bird-watching trips, and the opportunity to participate in environmental conservation campaigns, even field studies in wildlife sanctuaries and national parks.



Close encounters at Kanha—members' trips are as fascinating as they are instructive.

An eight year BNHS study on elephants has provided new insights on the species.



Other benefits include—

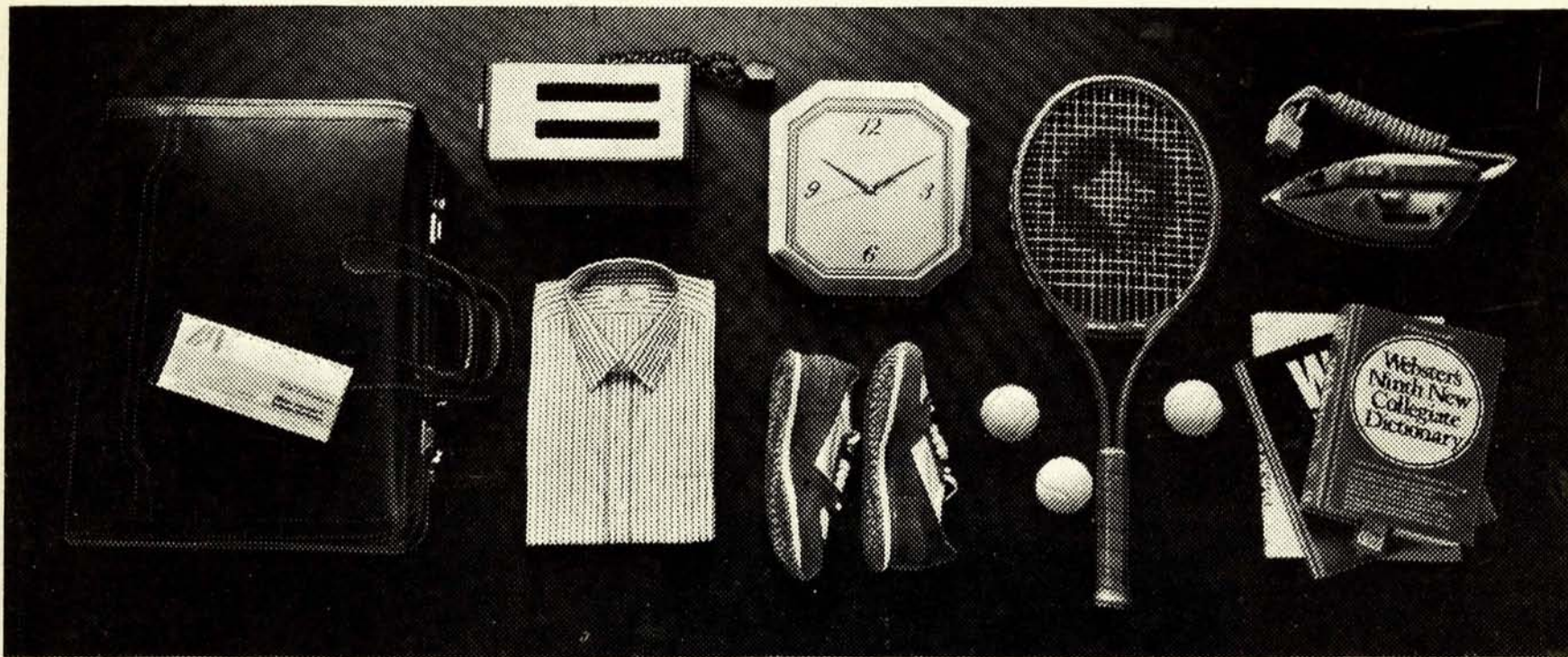
A free subscription to *Hornbill*, and concessional subscription rates (free for life members) for the *Journal of the BNHS*—Asia's oldest scientific journal on natural history, published since 1886

Trips to sanctuaries and national parks at concessional rates. During the past six months, members visited Sikkim, Lakshadweep and the Gir Wildlife Sanctuary.

Access to India's finest library of wildlife and shikar books, including priceless volumes over a hundred years old, and available nowhere else. Outstation members too can borrow books.

The use of a reference collection of specimens of birds, mammals, butterflies and reptiles, built up over more than a century

India's heritage is in danger of being lost to future generations.
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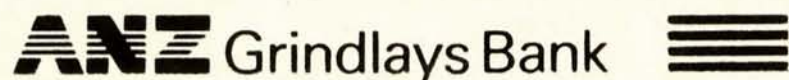


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