

Hornbill

1992(1)

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BOMBAY NATURAL HISTORY SOCIETY



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EDITORIAL

Flames of the forest

The Nagarhole national park, along with Mudumalai and Bandipur, is — or was — the last large chunk of protected forest in the southern Western Ghats. But two days of violence and flaming torches have set back wildlife conservation in the area by two decades, and probably more.

On 12th March this year, a suspected poacher (he was carrying flashlights and a gun, and had a previous record of poaching) was found shot dead in the park. There is circumstantial evidence that neither the police nor the forest department were involved; it was probably a dispute between rival gangs of poachers. Inevitably, local politicians stepped in. The forest department was responsible, they said, and in particular the park ranger, M.K. Chinnappa — who, not coincidentally, has managed to sharply reduce poaching and unauthorised cattle grazing in Nagarhole.

Two days after the incident, a 500-strong armed mob stormed the park headquarters. Forest department staff were assaulted, property (including Chinnappa's house) destroyed. And 80 sq km of prime forest were totally burnt. The price of honesty today, particularly in forest areas, can be frighteningly high. Only a few months ago, a ranger was hacked to pieces in Bandipur; and in Manas and Kanha (where there was large scale burning last year) forest guards live in perpetual fear of militants and local thugs. The blame lies with a system where political interference in administration is so widespread, and so blatant, that it is no longer worthy of comment.

But surely, some of the blame must be shared by wildlife policy makers and administrators. Situations like Nagarhole do not develop overnight. There are local grievances, some of them genuine; resentment builds up against the sanctuary and its staff, and one day explodes into violence. It is not hard to find out well in advance where trouble is brewing, and why. That is when problems should be defused, with suitable palliative measures; not after matters have come to a head.

Obviously, you cannot reason with someone who trades in tiger skins, and has the right connections. But take the issue of compensation for example. Less than 15% of our national parks have schemes to compensate villagers for crops or livestock lost to wild animals. And compensation, even when paid, is almost always inadequate — Rs 25 for a buffalo killed outside a sanctuary in some areas. If this is increased to reasonable levels, it would make life easier for both villagers and the forest department.

We are not for a moment suggesting that Nagarhole was burnt because crop compensation was inadequate; but only that warnings about potential trouble spots be taken more seriously, and solutions — worked out with as much local participation as possible — be considered at least for the most critical areas. This would certainly not end the threats to our wildlife, but at least it would buy time till a comprehensive policy is framed to make our sanctuaries safer for both animals and the men who protect them.



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COVER

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POISONING THE SARUS

S. MURALIDHARAN

It was an early winter morning in 1988, and the sun was taking its own time to show up. Eddies of mist had reduced visibility to a bare few metres. Geese which had spent the night elsewhere were circling overhead, some of them already lowering their landing gear; ducks and coots were busy probing for food, and from deep inside the wetland in Keoladeo National Park, Bharatpur, came the calls of Bharatpur's visiting VIP, the Siberian crane.

MY FIELD ASSISTANT and I were just setting off on our daily visit to the aquatic area for collection of biological samples. Our boat was missing from the place where we had left it the previous evening (not an unusual occurrence, particularly in the tourist season), and we set off in search of it. A pair of crows was cawing loudly and almost continuously, as if to draw our attention to something out of the ordinary. A few metres further, a row of ants cut across our path in solemn single file that was somehow reminiscent of a funeral procession. We followed them; they led us right to the missing boat and its occupant — a sarus crane which we guessed had been dead for at least 12 hours.

A pair of dancing sarus cranes is a beautiful sight, and the recollection made the sight of the dead bird even more painful than it would otherwise have been. We left the crane to the care of the ants and went into the aquatic area. Normally, when I find a dead bird of manageable size, I would put it into a plastic bag, wind a rubber band around it, bring it to the laboratory and freeze the body until I had gathered enough bodies to allot a day to cut them open and examine the body tissues.

This seemingly grisly pastime was the core of my work — a study on heavy metal contamination in birds and fishes. Tell-tale traces of chemicals in animal tissue provide clues to the presence of potentially dangerous elements in the ecosystem. Concentrations as low as one part in ten million can be detected in the purified tissue sample, which could correspond to still lower levels in the system.

But the sarus was too large for us to conveniently carry back, so we cooled our heels till the BNHS jeep arrived, with its load of scientists returning from their respective study plots in various parts of the sanctuary. The post-mortem was done the same day. This bird was a male. We kept track of its mate, which remained inactive, without feeding, for the next three days, and died on the fourth day.

ONE YEAR later almost to the day, I saw a pair of sarus behaving in an unusually listless manner. The next day I found the male dead in the same place. The female kept herself aloof, and we were not able to see her feeding for the following four days. It was mobbed by crows and also by another sarus pair. We have often seen crows mobbing sarus, but aggression by another sarus pair was

almost surely a sign that something was seriously wrong. Probably it took place because the afflicted bird was too weak to defend itself.

Several times on the fourth day we noticed unusual nodding and bobbing, side-to-side movements. These are recognised symptoms of aldrin poisoning, as has been proved elsewhere by both observations and experiments. On the fifth day one of our field assistants claimed to have seen the bird dancing with a fumbling gait. Surprised, I went to the park immediately, only to see the bird making circles, beating its wings violently and jumping intermittently, never reaching higher than half a metre. It stumbled around within an area about 10 m across, failed in several attempts to take off, and finally collapsed. This would be post-mortem number seven.

TISSUE ANALYSIS is a tedious job. I would start with a sample, usually 10-15 g, extract the tissue, remove the fat and other impurities and then, several hours later, begin the actual estimation using a gas liquid chromatograph. This sophisticated (and costly, at over Rs. 5,00,000) instrument works on the principle that different compounds move at different rates through a column which, broadly speaking, consists of a mesh of resin. It detects the presence of a very wide range of organic compounds; about the only time it doesn't work is when the sample is so heavily contaminated that the column becomes 'poisoned.'

The deaths coincided with the application of aldrin, an organochlorine pesticide, by farmers in the fields around the park to treat soil and seeds (especially wheat) against termites. Categorically relating the cause of death to contamination is difficult, because a number of factors are involved, all of which may vary widely between dead birds. But of all these factors, pesticide residue in the brain is probably the most critical. The symptoms in each case also pointed in the same direction. I felt safe to conclude that aldrin poisoning was the cause of death in the cranes as well as in some other graminivorous birds such as the ring dove and blue rock pigeon.

A dead bird in a forest is not particularly significant, unless the bird is rare or the number of deaths unusually high. But between 1988 and 1990 Keoladeo National Park lost no less than 18 sarus cranes — and that is cause for serious concern.

There is a common belief that cranes mate for life

(the bird is a symbol of conjugal happiness). Certainly the female partner of each of the two stricken males had starved to death, but it was not because of grief. The reason, I am fairly sure, was again pesticide poisoning. I was not able to analyse the tissues of the first female, but the second had as high residue levels of dieldrin as its partner. Dieldrin (a by-product of aldrin), even at sublethal levels in the fat, can cause a bird to stop feeding, and eventually starve to death.

I SPOKE TO A local farmer while he was busy treating his ailing wheat saplings. The apparatus he used was highly ingenious, and he was rather proud of it. He had taken an empty saline bottle from the local dispensary, filled it with a mixture of aldrin and water and tied it to a pole at the point where the water entered the field. His saplings got just the right amount of pesticides (he could even regulate the speed of the drip). He seemed genuinely concerned when I told him about the effects of his pesticides on the sarus; but he knew no other way to keep his pot boiling.

If our farmers are told how pesticides can affect non-target organisms like the sarus, and are offered alternatives in the form of harmless but reasonably effective methods of treating their crops, I do not

believe they will have the slightest objections. Sarus normally feed on the fallen grain after harvest and do not damage crops to any great extent. Consequently they are not looked upon as enemies by the farmers; and neither are they poached or otherwise persecuted within or just outside the sanctuary.

Aldrin and dieldrin are known to be highly toxic and have reportedly caused mortality in several species of wildlife (snow geese, whistling ducks, bald eagles) in the U.S.A. and U.K. They were banned in those countries in the early '70s. But in India, while the use of dieldrin is restricted, aldrin is abundantly available in the market — in spite of a supreme court ruling to ban it.

THE 29 SQ KM Keoladeo National Park has a boundary all around, but this doesn't help the birds. They go out to the fields and waterbodies adjacent to the park and feed on pesticide-treated seeds. The sarus crane is the worst affected, but other graminivorous birds also suffer. The Siberian crane, which winters in India only in Bharatpur, has started moving out of the park during the past couple of years, perhaps in search of better habitats. But the use of pesticides is widespread, and the consequences on the population of this highly endangered bird could be disastrous.



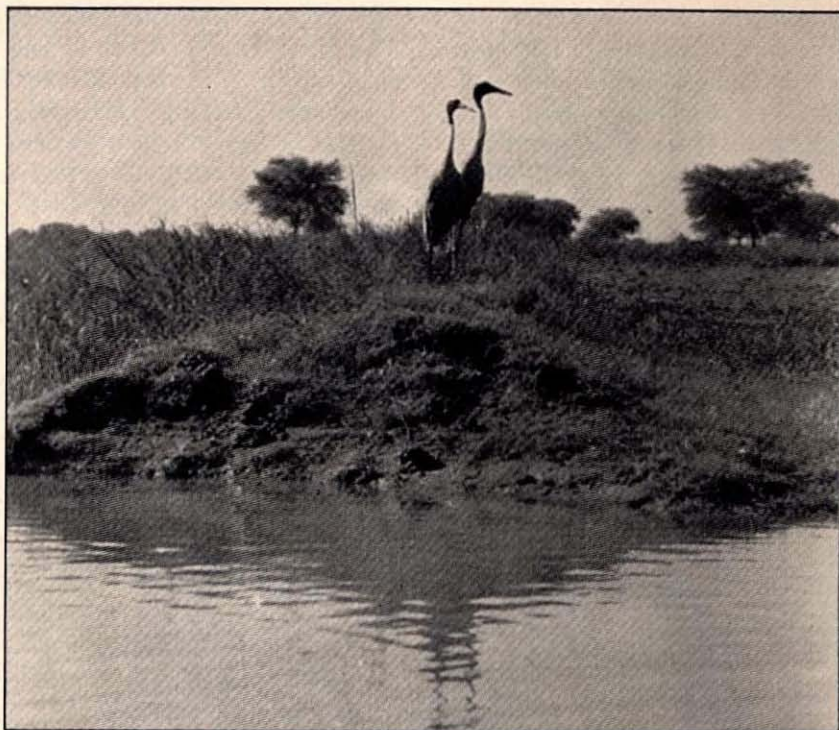
Fancy footwork — most birds display during courtship, but very few as exuberantly as the sarus crane.



Ring dove — graminivorous birds are usually the first ones to be affected by pesticides. But few farmers will have any sympathy, because such birds cause considerable damage to standing grain.

Sarus crane nests are usually built on a slightly raised area (a patch of thick grass) surrounded by water. Mating begins towards the end of summer, and chicks hatch in October-November. If conditions remain favourable during January-February, a few pairs breed.

Photos — Loke Wan Tho



THE DECLINE in the number of sarus breeding pairs inside the park (27 in 1973, six in 1990) reflects the general trend in its population in the park and adjacent areas. During my five years at Bharatpur, I realised that a considerable amount of pesticides enters the park each year along with the water from the Banganga and Gambhir rivers through Ajan Bund, a temporary reservoir. The eggs of some species of herons, egrets, storks and cormorants have high levels of persistent or-

ganochlorines such as DDT and dieldrin, which are known to reduce eggshell thickness and impair reproduction.

Pesticides do not remain in the place where they are applied; they travel hundreds of kilometres through air and water, contaminating even remote areas. Residues have been detected even in Antarctic snow. Once they get into a food chain, they remain for long periods, moving up the food chain, and getting accumulated at each step.

Pesticides in general can affect wildlife more subtly than by outright killing. Consumption of very small amounts of certain pesticides may cause delayed effects. Birds and mammals can store sub-lethal doses in their body fat and accumulation can cause poisoning later, when fat reserves are utilised. There need not be any immediately apparent effects on many adult birds, especially on fish-eating birds and raptors, but reproduction and fertility of eggs and survival of young ones will be significantly reduced.

BY AND LARGE the yard-stick for application of pesticides among Indian farmers is not the degree of infection in the crop, but the cost, and how much the farmer can afford to spend. More often than not the crop does not get the required dose — there is hardly any impact on the pest, but lots on the environment. At the same time overdose and improper treatment are not uncommon. The number of pesticides and other chemicals (such as PCBs and other hydrocarbons which are used in industry) available in the market keeps building up. But a question for which we cannot give a satisfactory reply is, do we have toxicity data for all these chemicals?

I would like to hear from colleagues who have seen such cases of mortality (in sarus cranes or any other birds in India) due to pesticide poisoning, so that we can build up a larger data base. A data base is the first step. What must follow — and quickly — is coordinated effort from agricultural extension officers, farmers, wildlife managers, pesticide regulators and conservation organisations to reduce the potential hazards to wildlife and natural habitats. We need more work on biological control methods, and aggressive propagation of the use of highly biodegradable compounds.

We know that 18 sarus cranes died; how many more died without our knowledge is anybody's guess. Seven out of the world's 15 species of cranes are already in danger of extinction. And left to its course the sarus, sooner rather than later, may join them. The sarus already faces serious threats from loss of wetland habitats. Pesticides and other agricultural chemicals may be the last straw.

S. Muralidharan is a field biologist at the BNHS. He has worked at Bharatpur for the past five years, studying heavy metal contamination in birds and fishes for his Ph.D.



Illustration by Carl D'Silva

THE SARUS (*Grus antigone*) is India's largest crane; males are nearly 160 cm in height, females slightly smaller. It is found, usually in pairs (the bird pairs for life), throughout northern India, from the terai southwards — there is even a sighting at 1700 m in the Kashmir valley — and in its largest numbers in Gujarat, eastern Rajasthan and the Gangetic plain. Almost everywhere, fortunately, it is protected by popular sentiment.

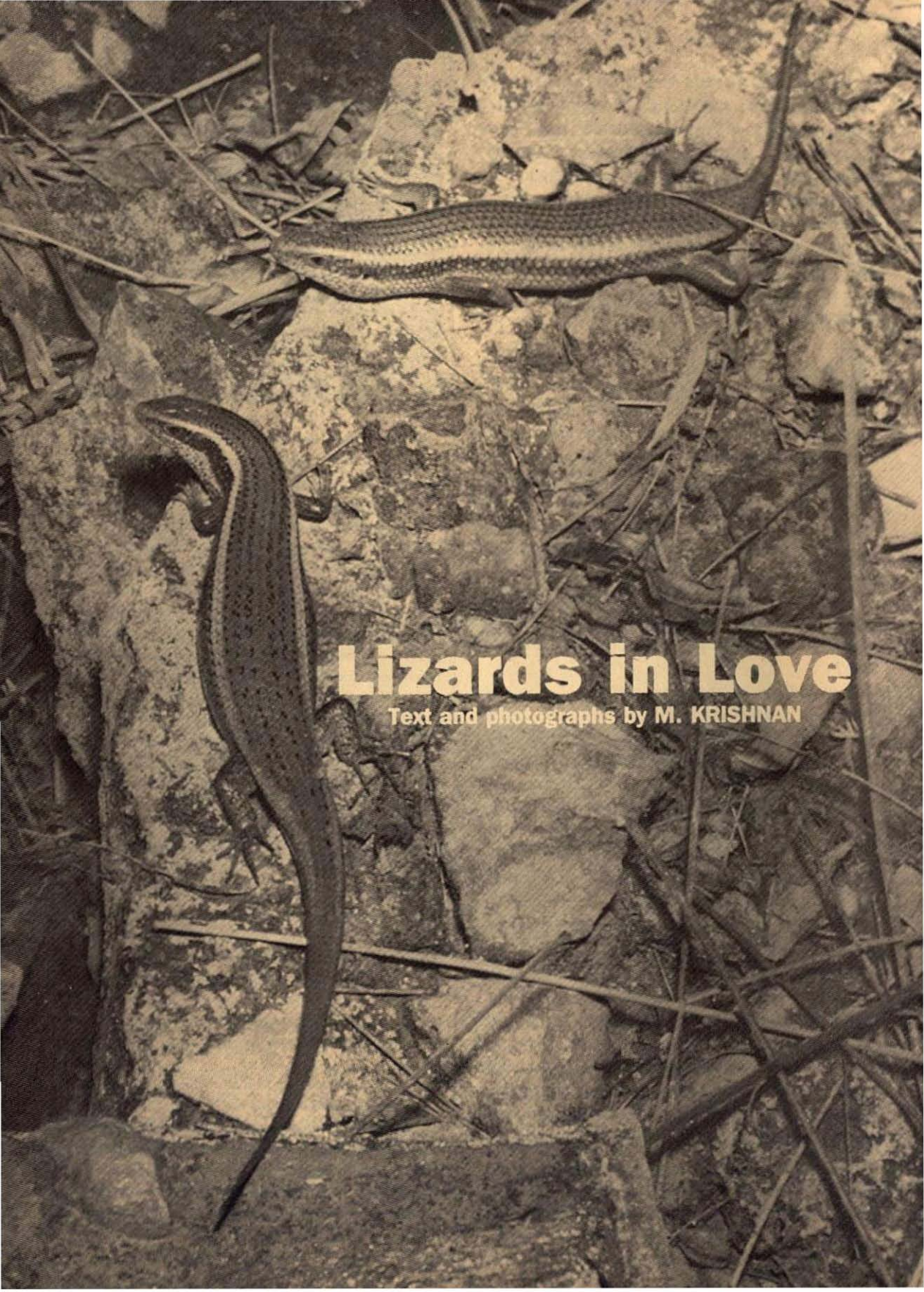
It is primarily a fish eater, less vegetarian than other Indian cranes. Frogs, crustaceans, lizards and insects are also welcome, particularly when fish are in short supply. Other diet supplements include grain, tubers and groundnut pods.

The sonorous, far-carrying, trumpeting calls of the sarus are unmistakable. As soon as one bird starts its mate invariably answers, and the duet proceeds for half a minute or more. Both birds have their necks fully upstretched, bills pointing skyward and body feathers fluffed and shuffled. The calls are made both on the ground and on the wing, and serve several functions — alarm signals, calls of greeting, or a means of maintaining contact between distant pairs.

Courtship displays are even more spectacular: the pair curtsies and prances about, leaping wildly at, around, and away from each other as if completely demented, duetting all the time.

There are two populations of the sarus crane at Bharatpur — a floating population whose numbers change with the seasons, and a much smaller resident group (possibly breeding pairs) which remains inside the park throughout the year. Populations remain almost constant except during spring (March-April) and summer (May-June).

From the end of March, when water bodies outside the park begin to dry up, birds from neighbouring areas aggregate in large numbers and the population swells to 250. The numbers drop during summer, when most birds leave the park to feed outside. Once the monsoon sets in, only around 25-30 resident or breeding birds remain in the park.



Lizards in Love

Text and photographs by M. KRISHNAN

ON THE EVENING of 21st July 1955, I was in my backyard with an old friend (the late K. Krishnamoorthy), watching a pair of common skinks (*Mabuya carinata*). My permanently untended backyard, overgrown with weeds and cluttered with broken masonry, stones, deadwood and leaf litter, is ideal skink ground, and holds three large trees that cast a dense, patchy shade. What made these two skinks interesting was not only their appearance but also their behaviour.

Both were full grown and attractive, with a rich, pale lavender bloom to their glossy olive backs, bordered on either side with dark-rimmed off-white stripes, and they were going slowly round and round in tandem. The one in front was specially handsome, with a full tail and the back marked longitudinally with hyphen-like red-brown dashes, as can be seen even in a monochrome photograph. The skink following was paler, thicker set in the body and had a short, regenerating tail. It never hustled or pressed its mate and was solicitous rather than urgent.

This unhurried, ceremonial promenading suggested a courting couple, and we thought the short-tailed skink the male — a presumption subsequently proved correct. I wanted to get my Leica and 135 mm Hektor lens to photograph the pair, but Krishnamoorthy challenged me to try and get clear pictures with the 6x6 cm folding camera I had in my hand, a Super Ikonta with a 75 mm normal lens. I accepted the challenge.

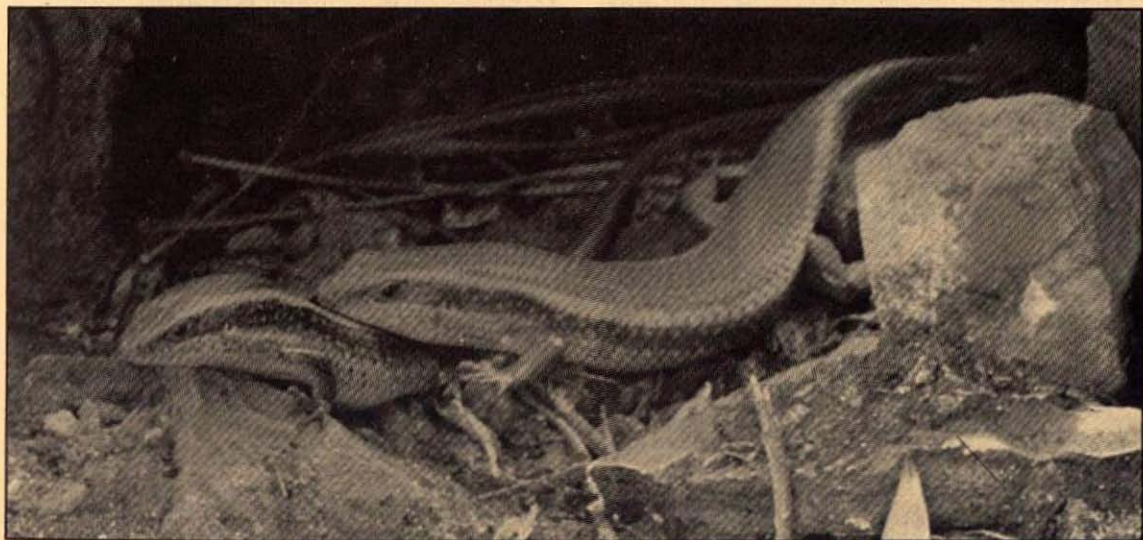
This rambling and seemingly irrelevant prelude

is quite necessary, because of the photographic restraints imposed on me. The Ikonta could not be focused nearer than about 2 m, and at that distance the image of a small animal with the 75 mm lens would be almost microscopic.

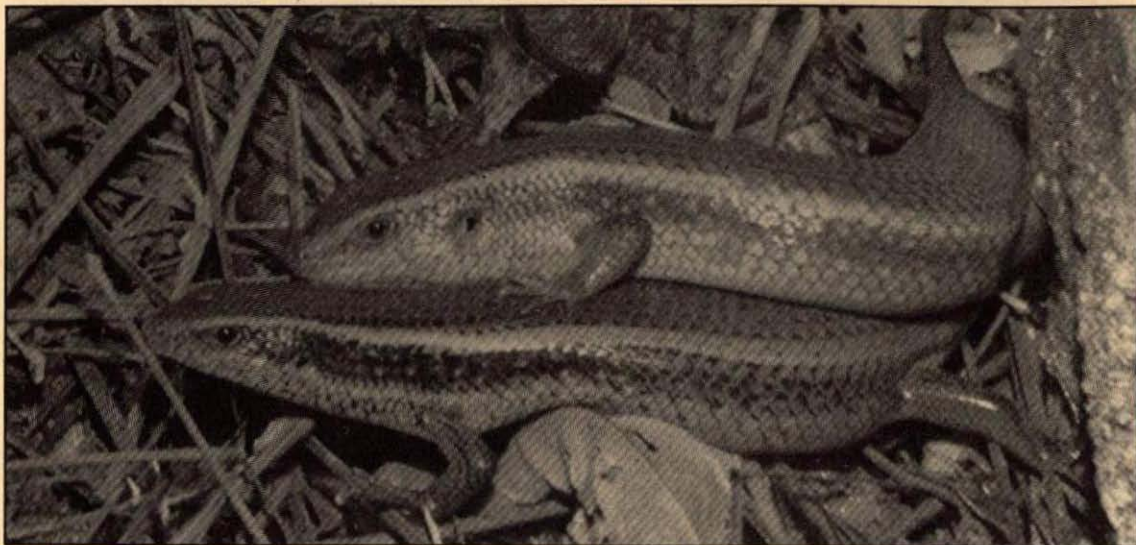
Therefore I decided to set the lens at infinity and fix a Proxar (a supplementary short-focus lens) over it so that focus would be at 1 m from the subject. Never in the course of over five decades of observing wild animals have I had to be so close to my subject. Further, in view of the heavy shade a fill-in flash was necessary, and this had to be adequately diffused with tissue paper to ensure that no unprintably contrasty negatives resulted.

I decided on a shutter speed of 1/100 of a second and an aperture of f.5.6. Today I know that with the subject so slow moving and even immobile at times, the ambient shade so heavy, the flash duration so brief and the depth of field so cripplingly shallow at f.5.6, I should have opted for 1/25 s and f.11 — but all this was in 1955.

THE NEXT MORNING I found that however gradually and unobtrusively I made my approach, the skinks panicked when I got to within 4 m of them, and it was vital not to scare them. Obviously I had to adopt what politicians term a low profile, and not move in on my feet but sit on the ground and shuffle in. Anticipating their circular path, I seated myself at its centre, and this was successful — they circled me, but still never closer than



Bodily contact — there's plenty of it during the prolonged courtship that precedes actual mating.



Mating lasts about half a minute. The season is July-August, and eggs hatch two months later.

2 m. By bending forward slowly, planting my elbows on the ground, and then leaning still farther out, I could gain a metre, but what was important was to keep still so that they could be induced to accept my proximity. I spent the whole day doing just that.

The next day I had my reward. I was able to reach to about a metre from the stone on which both were, and in spite of the discomfort of my position and abraded elbows, spent about 20 minutes in exposing a whole roll. Then I retired to my darkroom in excitement to develop the film. Every single frame was fuzzy, but in the last three negatives the grass at the foot of the stone was in sharp focus. I had to gain only another 10 cm.

MEANWHILE, I learnt some things about these skinks. Unlike many other lizards, their courtship is prolonged and gentle, and soft bodily contacts apparently led up to the mating. The male never made a dominating or aggressive move, but when the two were very near, he would just lean against the female or brush by her. Twice that evening they rubbed noses, in the approved manner of African tribals, but I could not record the action as they were beyond the reach of my lens.

At sunset they separated and went their different ways — the female to retire into the Mangalore tiles of a very low-roofed kennel that had once housed my bull-terrier, and the male into the rubble heaped along the compound wall. Apparently they have territorial impulses and are strictly diurnal.

ON THE afternoon of 21st July I got my first printable pictures, only 3 out of 12 exposures. Later I got another picture of these two, showing bodily contact (previous page). That evening they mated, but I wisely did not try to get close enough for a picture: the actual mating took about 25 seconds and was preceded by much gentle bodily contact.

The following morning they mated again, and this time I got a picture — unavoidably in the very corner of the negative on account of my cramped position. I then decided to give up trying for more pictures, having won my wager, but to watch them closely from a less close distance — and on this pious resolve was telegraphically summoned away from my home. When I returned two days later, they were no longer together. I found the male near the rubble heap and in the evening saw the female scramble up the yard-high wall of the kennel to reach its tiles.

I had no idea of the period of gestation, but know these skinks are ovo-viviparous and bring forth their young alive. I was keen on photographing the next generation when it arrived, but was again called away for a much longer period. And when I did get home at last, neither skink could be seen, though I searched assiduously for both.

M. Krishnan is the doyen of Indian naturalists. For close to 50 years, he has studied and documented wildlife (particularly mammals) all over the country, from south India to the Kumaon Himalaya.

LETTERS

Sir,

During May, at the peak of summer, we visited Vansda national park in the Dangs forests in Gujarat. This park holds large mammals like panther, wild boar, chital, four-horned antelope and barking deer and many species of smaller mammals such as blacknaped hare and porcupine. A wide variety of birds occur here; and among reptiles the Indian rock python is common.

When we were out birdwatching we crossed a forest patch where there was a strong decaying smell of some dead animal. At first we thought it was the remains of a panther kill. We moved cautiously in that direction and to our surprise we came across a dead python about 2.5 m long, smelling badly. It was severely mauled around the mouth, and almost the entire body was covered by scratches made by the nails of some animal. Near the python were scattered feathers of a peahen. A drag mark led from the python's body to a bush about five metres away. Under the bush we found a heap of peahen feathers with their ends bitten.

We inferred that the python had caught and killed a peahen, and then had been discovered by a panther. Presumably a protracted fight ensued, during which the python was mauled badly on its head and received major injuries on the rest of the body, and succumbed. The panther then dragged the peahen to the bush, and ate its fill.

We saw no pug marks, but still concluded that a panther was responsible, because of the nail marks on the python, and because it would be a formidable animal that would attack a python — and there is no animal in Vansda more formidable than the panther. Survival of the fittest is indeed the law of the wild.

Asif R. Khan
Surat, Gujarat

Sir,

We were driving to the Bhimashankar sanctuary in Pune district, Maharashtra, on 23rd December '89. At about 9 p.m., some 3 km before the sanctuary, we saw a tiger emerge from fairly dense undergrowth on our left and cross the road, approximately 15 m from our jeep. It was a full grown, well-striped animal.

We stopped the vehicle and watched the tiger in

the powerful headlights of the jeep; there were four of us, and none had any doubts about the animal's identity. It had crossed about half the width of the road, moving slowly, when another jeep approached from the opposite direction, with headlights on. The tiger turned around as if to go back the way he had come, but suddenly changed his mind and leapt forward, into the bushes on our right.

I had visited Bhimashankar four times before this incident and heard from local people that the tiger does occur in the sanctuary. Others who have visited it more often, and are familiar with its wildlife, agree that the local people often talk about having seen the big cat; but there is so far no published record of a tiger sighting at Bhimashankar. This, we believe, is the first.

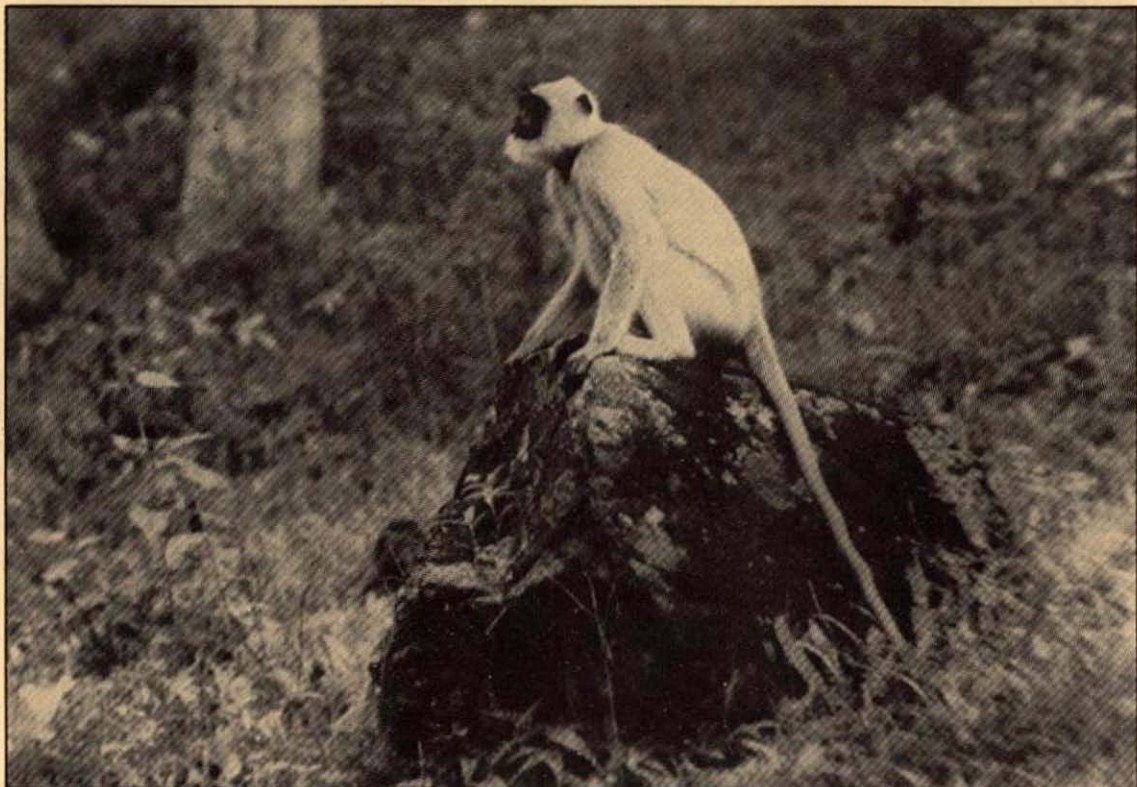
V. K. Paralkar, S. P. Bavadekar
Sunil Bavadekar and Ajit Oak
Bombay

Sir,

The city of Bombay has its share of curses and blessings. Whether we have more curses or more blessings is a matter for debate. However, one indisputably big blessing is the 104 sq km Borivali National Park. The park is one of Maharashtra's four national parks, and contains the scenic Vihar and Tulsi lakes, and the 2000 year old Kanheri caves (at 486 m, the highest point in Bombay). The fauna includes a large number of bird species, 33 species of reptiles, 9 species of amphibians and a large variety of fishes, insects and other life forms, according to a State Government Forest Dept. report of 1974.

The picture today will surely be far less rosy. Regular tree-felling for firewood, encroachment of land, year-round bootlegging and lack of funds for scientific management are only some of the many problems that threaten the long term existence of this naturalist's El Dorado.

The BNHS as a non-government body or its members as individuals find it almost impossible to address these problems. However, through this letter I wish to highlight an area where the BNHS has failed miserably — after a century in Bombay, we still have no comprehensive data bank on the park. For scores of years BNHS members have been rambling through the length and breadth of the park,



Mihir Devare

Pondering the future? Langur sightings at Borivall are not uncommon, but there is too little recorded data to accurately estimate populations or long term trends.

returning home personally enriched. But their contribution to science through regular documentation of sightings and observations has been almost non-existent, because there is no effective system to collect and disseminate such information. Miscellaneous notes in the *BNHS Journal* and articles in *Hornbill* once in a while are not enough to gain an overall view of the fauna, or gauge long term trends.

When was the palm civet last sighted in the park? Does the hyaena still exist here in the wild? How many deer were released in the park by the Forest Department in the last three years? Has the population of ducks migrating to the Vihar lake dropped sharply in the last five years? etc. etc.

To find answers to any of these questions one has to search painstakingly through over 250 issues of the *Journal* and 60 issues of *Hornbill*. Even a search for the last 25 years of data would mean going through 135 issues of reading material! Is it at all practical or humanly feasible? What level of efficiency can be expected from a scientist who has to spend most of his time in just trying to locate reference material?

In this computer age, where even our famous politicians find it worthwhile to maintain a voters' data bank on computers, absolutely up-to-date, is it that we find the data collected over the period of years too trivial to record and maintain? Lack of funds or shortage of manpower is no excuse — any time and money invested in such an activity is bound to fetch valuable long term returns.

Is it that we are going to let the park be raped and strangled to death right under our noses? Seeing the shoddy treatment given to the park by the state government, are we going to return to our cosy armchairs and fall asleep, assuming that someone, somewhere will soon make a change? Our founder members in 1883 have clearly defined one of the objectives of the Society as to "promote the knowledge amongst the public of Natural History in all its branches." And data which has not been maintained scientifically cannot promote any knowledge.

I suggest that a person be identified as early as possible, whose sole responsibility will be scientific documentation of the past and future data of all wildlife aspects of the park. Besides recording, the



Anil Patel

A colony of social wasps — this cluster was built on a mango leaf about 10 m off the ground.

person should also continuously interpret the data and identify trends which can be used as the base for any further action. In reality such a task calls for a cell, and a staff of certainly more than one. But we have to make a beginning somewhere.

Navroze Behramfram
Bombay

Sir,

It was interesting to read Mr. Chaturvedi's note on the Indian house crow in legend and myth (*Hornbill* 1991(4)). It tempts me to narrate my experience in reality with the bird.

A medium-sized mango tree was standing outside my flatlet. Its top was level with my second-floor window, and each year a nesting crow pair used to raise its family thereon. During their nesting, I used to keep meat scraps on my window sill for the toiling couple. This induced the crows to be friendly to me. And each year, the more I pried into the crow couple's nest, the more inquisitive I got.

The foliage around the nest, I thought one season, hampered me from having a clear look into the nest. To overcome this, I got fitted an adjustable mirror on to a pole long enough to reach the nest through the window. And when the nesting pair was away I used to thrust the mirror through my window and get a clearer view of the nest contents.

One day, however, one of the pair surprised me by flying on to the nest tree as I was in the act of prying. My action was something the bird could not

reconcile itself to. Soon the air was filled with its cawing. A rabble of crows from the vicinity gathered together to provide succour to their kin in distress. I withdrew myself from the sight of the offended bird, and as the din and bustle abated and died off, I thought the matter was closed and forgotten.

However, it was not to be so. I locked my flatlet the next morning and left for work. But when I returned in the evening, I found my chairs and work table plastered with crow droppings. The crows did not stop at that. They were much too affronted with my sly behaviour. They went to my books, pecked at their dustjackets, and tattered them. And such of the books as did not bear a jacket, bore peck marks on their spines. Even after the windows were securely closed, the crows managed to push in through the ventilators. And their destruction continued. Then on, whenever a crow spotted me in the open around the building I lived in, it would cry blue murder, summon its tribe, and lead them in darting at my head. The 'vendetta' continued for a year or so, when I finally left the area.

J.S. Serrao
Bombay

Sir,

Arun Joshi's article on the potter wasp in *Hornbill* 1991(2) was enjoyable. My observations of these nests on mango trees in my compound may be of interest.

On one leaf 3 m above the ground there were 10 different sizes of clustered nest cells; the smallest was of four cells and the largest of 19 cells. The colony (which was extremely busy) disappeared from the tree shortly after I first saw it, and one week later I found the dried leaf in a hedge nearby with 10 nests empty but intact.

On another mango tree leaf 5 m above the ground were two long nests with two cells in each row. One was about 18 cm long and the other 5 cm long; they were positioned one above the other. I have often seen 4 to 5 cm long nests on the yellow keran plant and on twigs of the satur (or sator) tree. These nests usually disappeared after about a month.

At my village in Gujarat, I have seen a large cluster of nest cells about 15 cm in diameter on a mango twig about 3 m above the ground; I first mistook it for a honeycomb. These might be the work of three different species of paper wasp.

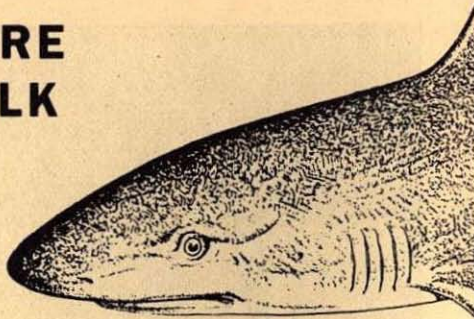
Anil B. Patel
Bombay

SEASHORE LORE

9* — BODY TALK

BEEFSEA

*There was a young lady from Guam,
Who said, "The Pacific's so calm.
I'll swim for a lark",
She met a large shark,
Let us all sing the 93rd Psalm.*



WEHAVEALL seen couples in the park, cuddling in the moonlight. Not a word is spoken, but each one knows what's on the other's mind. That is body language. Animals use body language too, as anyone who has tried to get past a guard dog would know. As you approach, the dog utters a low, rumbling growl. If you persist in going ahead, the growl turns louder, and changes to barking. If you still do not heed this warning, you do so at your peril; you are likely to be bitten.

In human terms, we think that the dog is guarding his master's property. Actually, the dog believes that it is *its* territory, and guards it against intruders. Many animals, birds, and even fishes establish and guard a territory. A fish's territory may range from a few centimetres to many metres.

Sharks also have a territory, but, as they are swimming all the time, their territory also moves with them. Before we studied sharks' behaviour and their motives, it was assumed that all shark bites were made by hungry sharks wanting to feed. In many attacks, however, the shark only bit once and then swam away. Gradually, over the years, the body language of sharks has been better understood. They were merely trying to express their annoyance at being approached; it was just that we could not 'read' their language and suffered due to our ignorance.

When a scuba diver suddenly approaches a shark, and the latter feels threatened, two modes of warning behaviour are expressed. One is posturing display. The shark lifts its snout, bends its head upward and arches its back like an angry cat does. The normally horizontal pectoral (front paired) fins drop vertically, and the tail is bent to one side.

APART FROM posturing, the shark also changes its way of swimming. The bending of the tail on each side leads to a laterally ex-

aggerated swimming. This is accompanied by rolling or spiral looping, a spiral up-and-down movement through the water. The normal, straight path changes to an S-shaped path. If the swimmer continues to approach the shark, the S becomes more compressed, culminating in a figure-of-eight pattern. This is the shark's limit of patience, and if we are foolish, or ignorant, enough to swim still closer, an attack follows. And then we blame the shark for attacking us, and, like giving a dog an ill name and hanging it, call the shark a cold-blooded man-eater.

Various strategies have been devised to keep sharks from attacking human beings. An obvious way is simply to build a fence around an area frequented by swimmers. But this is expensive and needs constant maintenance; a hole in the fence is enough to let sharks in.

In Australia and South Africa, meshing has proved successful. Nylon gill nets 150 m long and six metres deep are strung 300-500 m away from the shore, and kept in place for at least 24 hours, four times a month. The net does not stretch from the sea surface to the bottom, nor does it cover the entire length of the beach; but it works.

FOR UNDERWATER observation in shark-infested waters, the diver sits inside a shark cage, suspended from the boat by a strong cable. The cage is made of stout steel bars spaced closely enough to prevent a large shark from poking its snout in.

Copied from the chain-link armour used by medieval knights is one designed for scuba divers. It extends from neck to wrist and ankles, and has a hood for the head and gloves for the hands. While it protects the diver from being bitten, the crushing power of a large shark's jaws could lead to fractures or bruises. Suits made from Kevlar (used in bullet-proof vests) are *not* proof against shark bites.

THE ELECTRIC HUNTER

It has long been debated whether sharks hunt their prey by sight or smell. But, until two decades back, no one imagined that a third, very ingenious sense is used — detection of electric currents.

Animals (including man) emit direct current (D.C.) into seawater, because of a voltage difference between body fluids and the sea and between different parts of the body. In addition, alternating current (A.C.) is produced by the beating of the heart, muscle contraction and slow movements of the body.

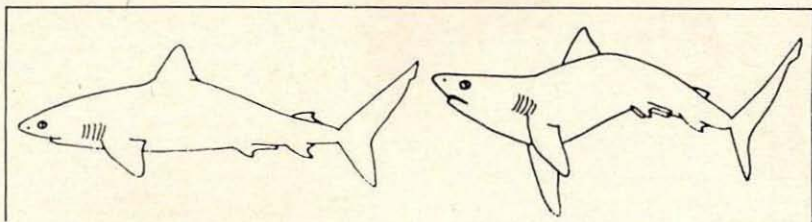
The organs for detecting these low-frequency electric currents, situated on the skin of sharks and rays, are called ampullae of Lorenzini. And they can detect electric disturbances as small as 0.1 microvolt per centimetre — equivalent to the current given out by an electric torch battery cell at a distance of 1500 km.

Anyone who has seen a shark locating a sole fish buried below the sand in an aquarium tank must have noted how unerringly the shark senses it. If the sole fish is covered by a plastic sheet (which prevents the

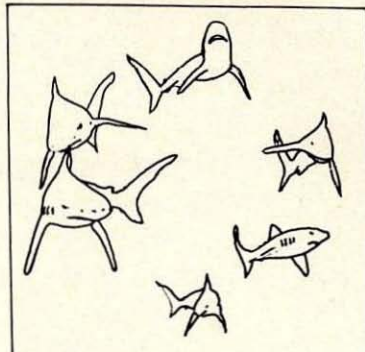
electric current from leaking into the water), the shark has to hunt by smell. But if the sole fish is covered by a sheet of agar (which can conduct electric current but prevents the shark from seeing or smelling its prey), the shark will still go straight for its prey.

Even a minor scratch on the skin can double the voltage gradient, and so can vigorous movements. So while swimming in shark-infested seas, don't splash about, and leave the water at once if you get a cut that bleeds.

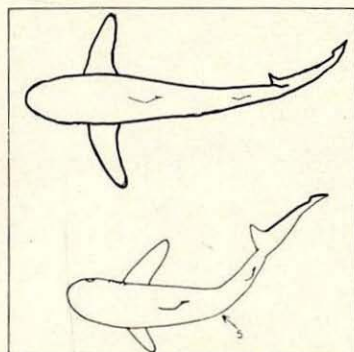
THE WARNING SIGNS—



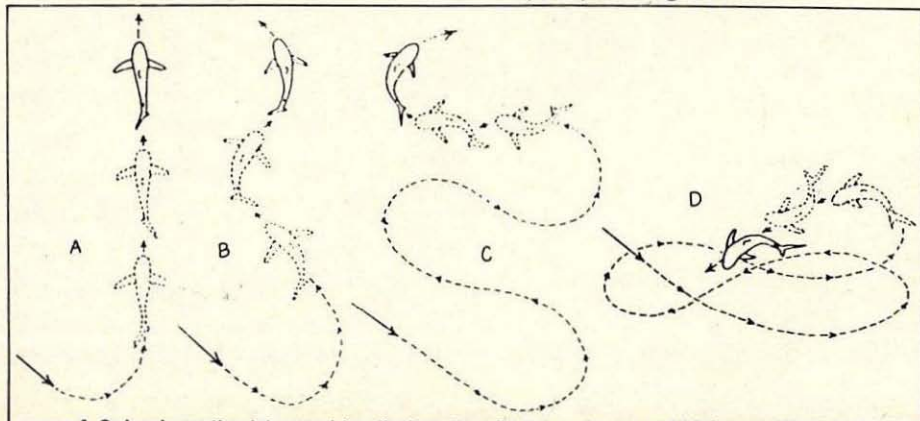
1. Posture of (left) normal, and (right) angry shark. Note the bending of the tail on one side in the latter.



3. Spiral looping, as seen from front.



2. Normal (above) and laterally exaggerated (below) swimming in a shark.



4. Swimming paths: (a) normal (no display), (b) mild, (c) moderate, and (d) intense displays.



NEWS NOTES COMMENTS



Batmen to the rescue

A number of European bat species regularly undertake long distance migrations. Nathusius's pipistrelle (*Pipistrellus nathusii*), for example, moves from Estonia to the Netherlands, and the noctule (*Nyctalus noctula*) from northern Germany to Switzerland. Others move shorter distances, such as the bats that spend the summer in Germany and winter in Poland's Nietoperek Bat Reserve.

The Bonn Convention, set up for the conservation of migratory wildlife, has yielded fairly good results on many species, but not so far on bats. At the September 1991 meeting of the Convention, an agreement was concluded between 11 European countries which could make bat conservation considerably more effective. Discussions on an international agreement first began in 1985. Finally, after several rounds of meetings and draft agreements, and then the 1991 meeting, the formal agreement was signed in December 1991. It will become effective from March 1992.

A number of specific, detailed steps have been proposed. These include total prohibition of deliberate capture, keeping or killing of bats (except under permit); identification and protection of sites important for bat conservation; even a research group to study bats in buildings. Studies are being taken up on the potential effects of pesticides, and the development and popularisation of alternatives to timber treatment chemicals, many of which are highly toxic to bats.

Very little is known about the biology of the 70 odd species found in the Indian subcontinent. Some common European bats like the serotine (*Eptesicus serotinus*), the long-eared bat (*Plecotus auritus*) and the barbastelle (*Barbastella barbastellus*) are found in the temperate levels of the Himalaya; other European species like the pipistrelles have close relatives that occur in India. While studies under the Bonn Convention agreement will focus exclusively

on European species, the results will be useful for bat conservation in India as well.

Hatching new plots for cranes

The Siberian crane *Grus leucogeranus* breeds in Russia in summer. Different populations migrate to their wintering grounds in various parts of the world; in India, the species is seen only at the Keoladeo National Park, Bharatpur. The Bharatpur wintering population has declined over the past few years — only six were seen last winter — and there are fears that the species may desert the park altogether.

But the species is precariously placed even in Russia. Although more than 2500 cranes survive in the far eastern Soviet Union, the western population numbered only 14 in the 1990-1991 season. In 1991, in the Siberian village of Gorki, six chicks were hatched artificially from eggs flown in from the U.S. and Germany. One chick died and in June that year the five survivors were flown to the territory of one of the only two known wild pairs of cranes in western Siberia. A researcher from the International Crane Foundation, dressed as a crane, taught them to feed and protected them from predators. The chicks will be fitted with radio-transmitters and tracked along their migration route to India or Iran.

Protecting the pitta

A combination of development projects and extensive timber exploitation has ravaged most of Thailand's lowland rain forests. One of the few remnants is the Khao Pra-Bang Khrum Non-Hunting Area, where the endangered Gurney's pitta (*Pitta gurneyi*) was rediscovered in 1986. Ever since, the government as well as local conservation organisations have worked to conserve the area, with only partial success. A new project may give better results.

The focus will be on rural development initiatives to enlist the support of villagers, some of whom are now benefiting from tourism income. Native trees

are being provided free for fruit and construction materials, and forest regeneration is being hastened by planting hardwood trees. Illegal clearance is still a problem: at least three pairs of pittas lost their territories in the 1990-91 season and there have been reports of these birds being trapped for trade.

Effective conservation is difficult in any area, because it involves both socio-economic and wildlife criteria, which are not always compatible. In a rainforest, which is simultaneously more diverse and more fragile than most ecosystems — and development programmes are needed because local incomes are low — the task will be more difficult still. Several south-east Asian countries face similar problems, and some have begun to consider the environment as an integral part of development policy.

Apart from this realisation at the governmental level, what is required is more cooperation and more prompt and complete exchange of information between conservation teams in different parts of Asia. This will help to avoid repeating mistakes made earlier in other areas, and save money and time — and there is an acute shortage of both.

Victoria Park

Victoria Park in Bhavnagar is in trouble for the usual reasons — wrong-headed policies, and the machinations of politicians and land sharks. The park was created in 1888 by Maharaja Takhasinhji of Bhavnagar on 450 acres of land on the outskirts of the city. Tree cover was increased by plantations and an artificial pond was built inside the park, filled by the seepage of water from Gaurishankar lake. A small island within Krishnakunj pond, and the partially submerged trees growing from the pond bed, still provide suitable nesting areas for a variety of waterbirds.

The situation now is ugly. The boundary wall of the park is breached at several places and cattle graze freely; illegal tree felling continues, and the damage will be compounded by the decision of the Forest Department to go in for community forestry within the park, with standing trees being cut down and replaced by mango and other fruit trees.

The park already contains a housing colony that started as an encroachment but may shortly be 'regularised'. More construction is under way in the seepage area of the Gaurishankar lake. This last step will significantly reduce the water availability and therefore the amount of suitable bird habitat. Even

before the construction boomlet, nesting activities had dropped sharply because of lower water levels in Gaurishankar lake (and therefore in Krishnakunj pond), and construction activity in the grassland adjoining Victoria Park. Further damage may cause some species to permanently abandon the area.

A proposal to declare the park as a nature education sanctuary has been hanging fire for some years, although the State Forest Department officials had accepted it in principle.

Forest patches in urban and semi-urban areas obviously cannot match undisturbed natural areas for diversity or abundance of birds. But they are still important repositories of natural wealth, and must be preserved wherever possible.

Wetland restoration

Twenty years of bombing during the Vietnam war, followed by conversion of forest to crop fields, destroyed most of the vast swamp forests around the Mekong river in Vietnam. In 1987, Vietnamese ornithologists discovered a remnant population of 100 eastern sarus cranes (*Grus antigone sharpii*) in the area — the first report since 1972 of the bird from Asia (the only other known population was in Queensland, Australia).

The Tram Chim (meaning 'bird forest') Nature Reserve was planned in the mid 1980s, and enlarged to 90 sq km after the discovery. Conditions in the sanctuary are still far from satisfactory, because of the extent of war damage. A new restoration project has been taken up recently, funded by the American MacArthur Foundation and the Germany-based Brehm Fund for International Bird Conservation (which already has an environmental education centre there), and managed jointly by U.S. and Vietnamese scientists. Land-use zones are being established, with the emphasis on restoration of the original wetlands in the core area, and 'eco-friendly' development of the remaining area to benefit both wildlife and people.

One hopes that the project not only succeeds, but is also extended later to cover the nearby Tonle Sap (= Great Lake) area in Kampuchea, where the cranes are thought to breed.

Thinking big

The president of Venezuela has announced the establishment of the world's largest rainforest conservation area — 83,000 sq km — encompassing all the

headwaters of the Orinoco river. The area will be called the Orinoco-Casiquiare Biosphere Reserve and will contain within it the Parima-Tapirapeco National Park. Barely a month passes without conservationists calling for the establishment of new protected areas. What makes this one different is that it was created largely due to the efforts of the local Yanomami and Yekuana Indians.

For some years now, the Indians had been protesting about disturbance to the forest, and their lifestyles, by commercial interests. Development projects in Venezuela and across the border in Brazil, primarily an extensive road-building programme, have destroyed huge swathes of forest, and brought settlers and gold prospectors into the region. In Brazil, for instance, a road was constructed through the Neblina National Park, ostensibly to help the Yanomami get their crops to market — even though the tribe grows no crops.

The sheer size will obviously mean that there will be large areas where the law will not reach, and destruction of forests will continue. But if even a part of the reserve is effectively protected and managed, South America's beleaguered rain forests may gain some respite.

Net profits to fall

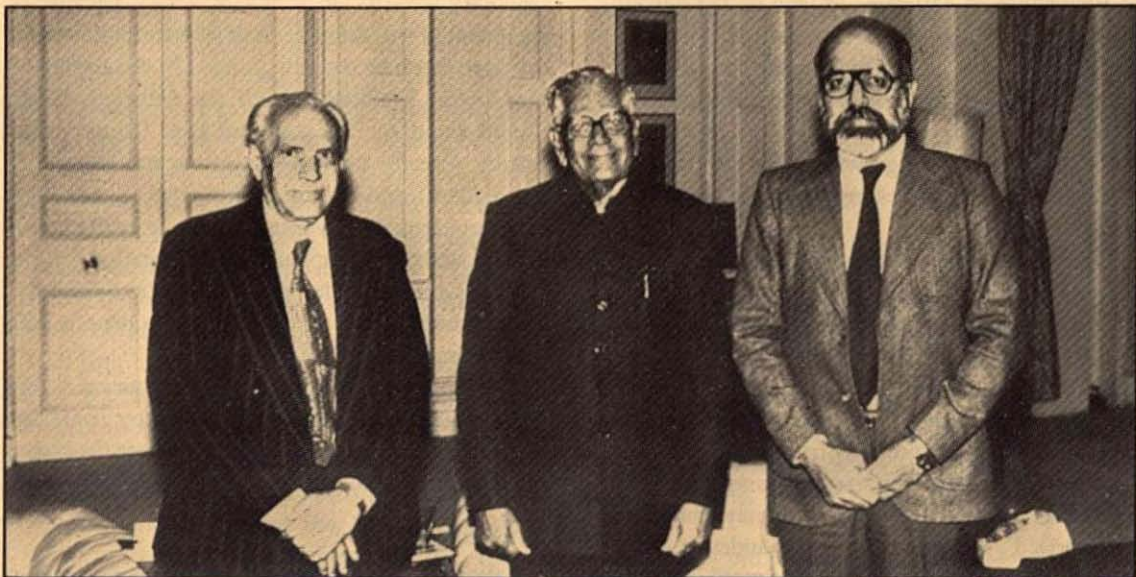
Technological advances in fishing methods have helped to improve catches around the world. But

some advances cause damage out of all proportion to the benefits they generate. A good example is the drift net. Suspended from floats on the water surface and kept roughly vertical by weights at the other end, the nets are trawled by several ships working together — some nets are 65 km long.

They are known as 'walls of death', because they indiscriminately kill non-target species of fish, sea turtles, marine mammals, and seabirds. In addition, the nets are often lost at sea — where, because they do not easily rot in sea water, they continue to catch fish and other animals for years. According to the U.S. National Marine Fisheries, in 1990 just 10% of the Japanese fleet killed over 1700 whales and dolphins, 250,000 tuna, 80,000 blue sharks, 30,000 seabirds and over 3 million other non-target fish.

In 1988 the U.N. General Assembly passed a resolution (mainly at the initiative of the World Wide Fund for Nature) calling for a worldwide moratorium on the use of drift nets by a deadline of 30 June 1992. Under threat of U.S. trade sanctions, Japan, Korea and Taiwan (the heaviest users of drift nets) agreed in 1990 to withdraw their drift net fleets from the South Pacific and, except for some violations, have actually done so.

The Japanese government, which was at first averse to the moratorium, has now decided to go along, from end 1992. That is six months behind the U.N. deadline, but nevertheless a positive step con-



Welcome to the fold — President R. Venkatraman, Patron of the BNHS, flanked by the BNHS President (left) and Director.

sidering the likely reduction in fish catches using alternative methods.

With Japan having fallen in line, it remains to convince the other culprits. Marine wildlife is little understood. We have no way of quantifying accurately the long term effects of such fishing methods. One can only hope that the vast size of the habitat, and the capacity of several species to multiply quickly, will prevent (or at least reduce) long term damage to marine populations.

Rare books

The BNHS has a substantial collection of old books on wildlife. These include 19th century classics like John Gould's *Birds of Asia* (six volumes, containing over 500 paintings), James Forbes's *Oriental Memoirs*, J.D. Hooker's *Illustrations of Himalayan Plants* and *Game Birds of India, Burma and Ceylon* by Allan Hume who, apart from being a BNHS founder member and a noted ornithologist, also founded the Indian National Congress.

These, and other, books were on display during a four day exhibition at Hornbill House. The response was excellent; and if a fraction of those enraptured visitors who left the exhibition clutching membership forms do sign up, the Society will be much the better for it.

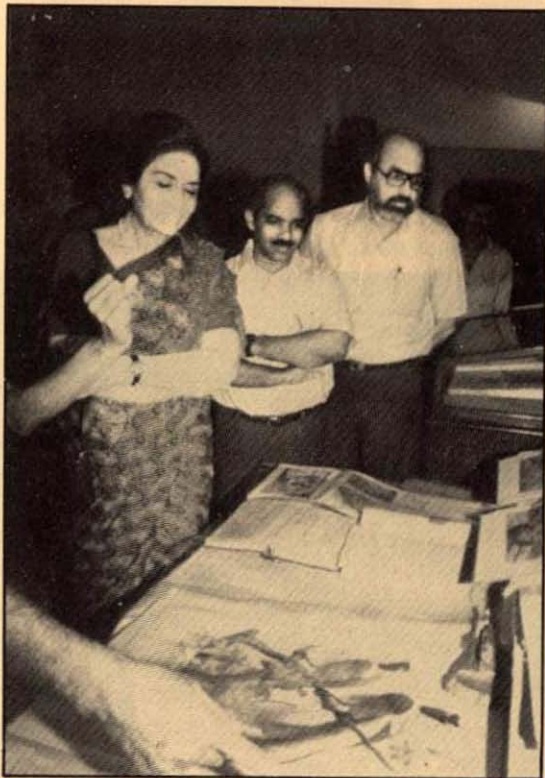
Friends in high places

The president of India, R. Venkatraman, is a Patron of the BNHS. Our president, Prof P.V. Bole, and Director Dr Jay Samant called on him at Rashtrapati Bhavan in January to acquaint him with the Society's work in recent months, particularly the research projects and education activities.

Working in conservation is sometimes frustrating; many good ideas fail simply for the lack of powerful allies to push them through. Not just the BNHS, but the conservation movement as a whole, will benefit from having a sympathetic ear in government circles.

The environmental army

The association between BNHS and our armed forces dates back over a century. A large part of our collection of specimens, and some of the finest natural history accounts of the 19th and early 20th century, published in the Society's *Journal*, were the work of army officers. Today, the army provides



Sheriff Bakul Patel at the exhibition of rare books

help and sometimes logistic support to BNHS field biologists in remote areas (Kutch and Ladakh, for example).

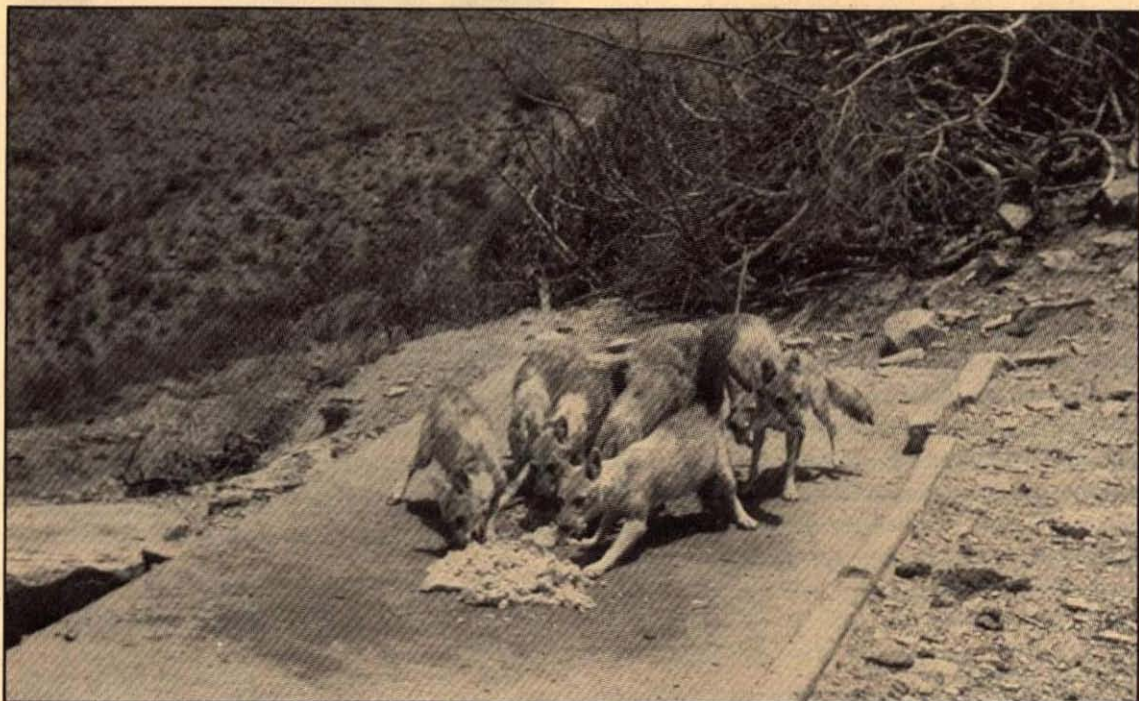
Gen. S.F. Roderigues, Chief of Army Staff, visited the Society on 20th December 1991, renewing and strengthening ties. He recounted some of the army's efforts in conservation — education programmes for army personnel, and the creation of a three battalion Ecological Task Force that has done extensive afforestation work in arid areas.

Over the past four years the BNHS has been conducting education and training courses for army officers, and will now broaden and intensify these efforts. The recently constituted Armed Forces Cell of the BNHS, in collaboration with the Military Training Directorate, is preparing guidelines and syllabi for regular environmental and conservation training courses for services personnel. Five such courses, one for each command, are planned each year.

With the Society's technical expertise and the army's manpower and organisational strength, conservation programmes which were earlier not considered practicable can now be taken up in critical wildlife areas.

THE JACKALS Of Kala Dungar

S. ASAD AKHTAR AND J.K. TIWARI



Asad Akhtar

THE STENTORIAN VOICE of the priest of the Dattatreya temple rang out across the Kala Dungar, and an incredible scene unfolded before us. First in ones and twos, then in threes and fours, jackals emerged from behind the numerous *Euphorbia* bushes that surrounded the platform on which the priest stood, with a *thali* of freshly prepared *prasad*, under a blazing afternoon sun.

As he called out Long! Long!, the numbers of the jackals steadily increased. Their impatience to get at the food which was being thrown around on the platform often verged on the comical, as they jostled and bumped into each other. In their eagerness, they even tugged at the priest's dhoti and knocked against him as he handed out small lumps of rice cooked in jaggery. Each morsel was quickly gulped down, the dominant ones snarling viciously whenever a younger, more impatient animal tried to butt in. We watched the proceedings crouched behind a nearby

wall. The moment we rose to get a better view, they would turn towards cover, bouncing back into the fray as soon as we concealed ourselves properly.

As the feeding progressed, 15 jackals were crowded around the priest, who kept up a persistent, and obviously persuasive, Long!Long! His voice seemed to cast a spell on the normally shy and wary animals, who trotted boldly out of cover towards the feeding spot. This unusual behaviour set our minds working. How did they learn to associate the priest's voice with food? From how far away would they respond to his calls? How often in a day did they respond? Did they have any particular feeding schedule?

WE SOON learnt that the jackals had two regular feeding sessions, one early in the morning and the other late in the evening, though they do respond to calls at other, non-

regular times. But their numbers are highest — up to 25-30 — at the regular sessions. The jackals take between two and five minutes after the priest's calls to begin assembling. The usual *prasad* consists of rice cooked in jaggery, though anything edible is gulped down eagerly.

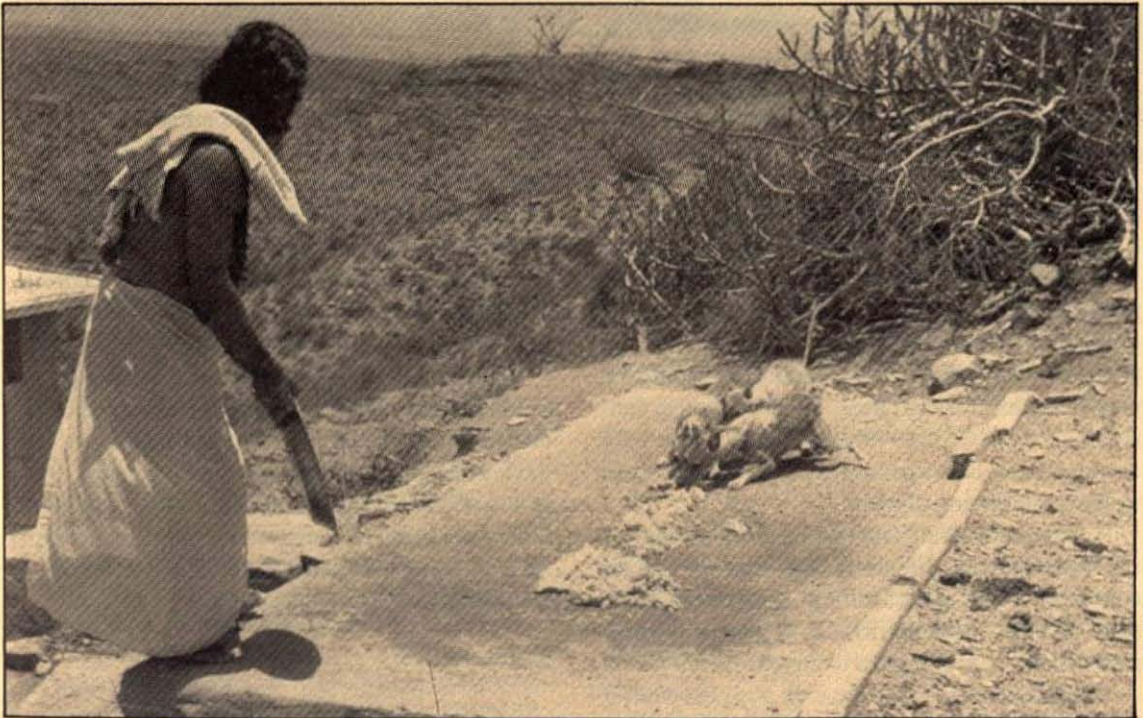
The feeding spot is located in the precincts of the Dattatreya temple on the peak of Kala Dungar, reportedly the second highest in Kutch. The temple is reached via Dhrobhana village, which lies a few kilometres off the Bhuj-Kuarbet state highway. A little beyond Dhrobhana, the *kutch* road takes a steep incline, and at many places the slope and hair pin bends give one the jitters. But the view, as you approach the peak, is breathtaking.

The vast expanse of the Rann of Kutch is spread out below for miles around, the shimmering salt flats somehow complementing the scorched, dusty landscape of the dungar. The sparse, tinder-dry vegetation dotting a boulder-strewn landscape assumes a dark hue; the mountain is aptly named. And the grim view becomes grimmer still when you realize that there is little or no drinking water available within a two hour drive.

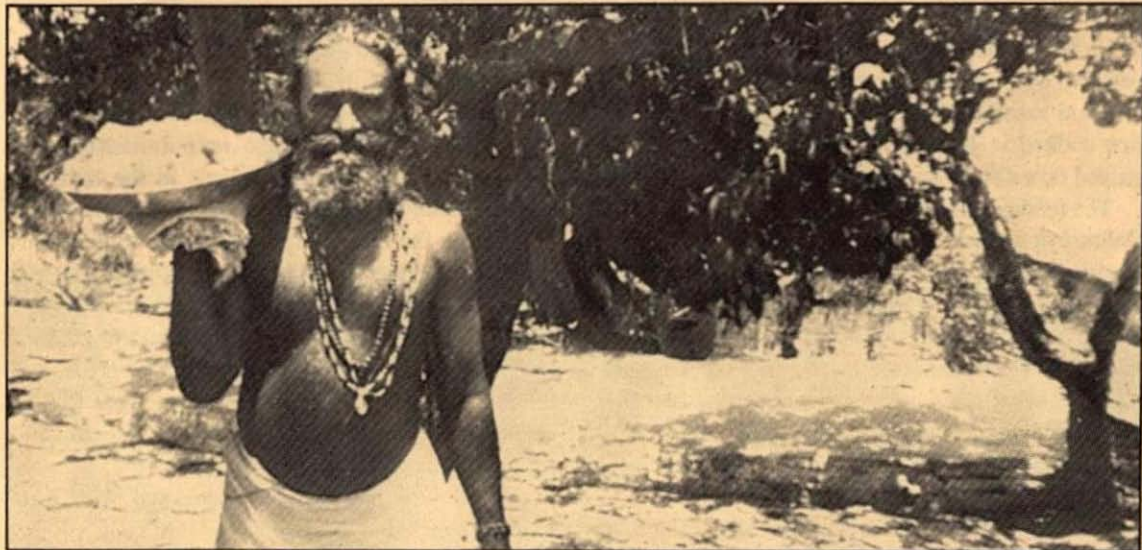
EVER SINCE we set up camp at Chhari Dhandh, in the Banni, our naturalist friends had been advising us to visit this place. Unaware of the proper feeding time, we reached the temple at noon. Thinking that our torturous trip was a waste, we settled down to rest in the temple's dharamshala. But, sensing our eagerness and disappointment, the *mahant* (priest) of the temple, Shri Laxmandasji, very kindly suggested that he could still call the jackals, though their numbers would be smaller than usual. We gladly accepted the offer.

The *mahant* ordered the *prasad* to be made, and while it was being cooked over a slow wood fire, he told us about the temple's hoary past — this ritualistic feeding is considered to be about 750 years old — and how it had become associated with Kala Dungar's jackals.

The temple takes its name from Guru Dattatreya, who conducted a *yagna* at the spot where the temple now stands. He was followed by another sage, Guru Dharamnath, who conducted a *tapas* (religious penance) for twelve years. A pack of jackals frequented his hermitage, and the kindly sage would feed them twice every day.



Snacking between meals — the number of jackals is far larger during regular mealtimes, and the gathering correspondingly more bolsterous.



J. K. Tiwari

Food for thought — the temple mahant, his thali loaded with rice cooked in jaggery. Jackals are adaptable in their diet, and this group obviously has a sweet tooth.

One day, the legend goes, the sage ran out of food. But the jackals turned up as usual. Their hunger was too much for him to bear.

Without hesitating for a moment, he started slicing off the flesh from his limbs, and fed the chunks to the hungry jackals, saying Lo-ang! Lo-ang! (take my body! take my body!) in a persuasive tone. The term Lo-ang Lo-ang soon became associated with Dharamnath's hermitage, and over the years became corrupted into Long Long.

THE NEWS soon spread far and wide; but generated more disbelief than wonder. The Maharao of Kutch challenged the temple priest to call the jackals in a place far away from the usual spot. The challenge was accepted, and the priest and a crowd of cynical onlookers assembled near Bhuj. At the usual time, the priest began calling. And even as his voice rang out in the hilly countryside around, a pack of jackals trotted towards the priest for their daily feed.

Another interesting fact that emerged during our conversation with the priest, was that the jackals responded to the calls of Long! Long! even when made by a new priest (a priest is appointed only for a limited period), but never to anyone else.

Only adults respond to the call; pups have never been seen to accompany them. As soon as the feed is over, the jackals retreat into cover in the vicinity of the temple. They supplement their diet by prey-

ing on small rodents and other prey species. The animals maintain a distance of at least 4-5 metres from the visitors, who come there regularly and from large distances to witness this strange behaviour.

THERE ARE other examples of similar behaviour, the most striking being a pair of scavenger vultures (*Neophron percnopterus*) at a temple at Thirukalikundram, some 55 km from Madras. Punctually between 11 a.m. and noon every day, the vultures arrive at the temple to be fed by the presiding priest. This is alleged to have been going on for 'centuries' and the birds are said to commute daily from Banaras (the Himalayas, according to some). The feast consists of balls of rice and wheat flour mixed with sugar and ghee.

Biologists would call this learned behaviour, and a number of classic experiments have been conducted (most notably by Russian ethologist Ivan Pavlov) to show that animals can be 'taught'. But a strictly technical explanation is always incomplete. It does not begin to convey the sense of wonder that such a spectacle evokes. We must have science — but mystery can sometimes be more fun.

Asad Akhtar and J.K. Tiwari are BNHS field biologists with the Society's Bird Migration Project. For the past two years they have been stationed at the Chhari Dhandh in Kutch, ringing birds and documenting the area's vegetation and wildlife.

Nature Alive



M. Krishnan

THE SAMBAR (*Cervus unicolor*) is India's largest and most widely distributed deer, found in forested areas (almost never in grassland) from the southern reaches of the Western Ghats to the Himalayan foothills. Full grown stags stand close to 150 cm at the shoulder, and weigh some 300 kg; females are appreciably smaller. The coarse, shaggy brown coat (paler in females) darkens with age, turning almost black in old stags.

There are three races in south-east Asia. The Indian *Cervus unicolor niger* is found west of Assam, while *C. u. equinus* with its smaller, more closely set antlers (large antlers are a liability in very thick forest) occurs further east, up to the Philippines. The nominate race, *C. u. unicolor*, is found in Sri Lanka.

The three tined antlers that stags bear take up to four years to reach full size; but once fully grown, they are shed each year and then regrown for the breeding season in winter. This periodic shedding and regrowth, common to almost all deer species, has still to be satisfactorily explained; but the antlers, apart from their use in defence, play a major role in competition for hinds.

The newly grown antler is encased in skin, densely covered with fine hairs that look and feel like velvet. Once the 'velvet' dries out (because blood supply is cut off), some weeks before the rut, stags hasten its removal by rubbing the antlers against smooth-barked trees, often returning each night to a favourite tree..

Stags are usually solitary except when young, and associate with hinds only during the mating season. Though essentially nocturnal, sambar are now seen with increasing frequency during the day in some national parks, probably because of better protection.

Sambar in parts of Rajasthan, Madhya Pradesh and Karnataka sometimes have prominent sore patches on the throat. Both stags and hinds are affected, and the size of the patch apparently increases during the monsoon. The condition has not been fully studied, but is believed to be due to a viral infection.

Sambar are quite at home in water; herds have been seen standing in water for long periods on extremely cold days, simply to keep warm.

FOLKLORE

Kalidasa, Kamadeva and the Koel

NARESH CHATURVEDI



Illustration by Carl D'Silva

THE FOREST IS aflame with red — the Indian coral tree and the flame of the forest are in full flower. The migrant birds, after their winter sojourn in India, are gradually winging northwards to their breeding grounds. And the calls of the ubiquitous koel announce that spring has arrived. According to the Ramayana,

भास्करोदय कालोऽयं गता भगवती निशा ।
असौ सुकृष्णो विहगः कोकिलस्तात्कूजति ॥

*It is dawn; the goddess of the night has departed
To the songs of a host of different birds, including
the koel.*

Indian literature is replete with references to the bird and its voice. Kalidasa says, "The snowfall has stopped, the branches of the mango are loaded with fragrant flowers, and the same gentle breeze that shakes the branches to disperse their fragrance, carries the sweet calls of the koel far and wide."

The koel's peculiar charm is described in the Padma Purana.

कोकिलानां रतैः पुण्यैः सर्वत्रमधुरायते ॥

*It is the season of spring, and every place is
sweetened by the calls of the koel.*

Or, as Kalidasa says in Raguvansha,

कुसुम जन्म ततो नवपल्लवास्तदनुषटपद कोकिल कूजितम् ।

*New leaves, new flowers appear, and with them, is
the voice of the koel.*

Douglas Dewar writes in his *Bird calendar for northern India*,

*The breeze moves slow with thick perfume
From coral tree to parrot bloom.
The black bees questing rove,
The koil wakes the early dawn.*

— Waterfields, Indian Ballads

In Europe, too, the cuckoo appears in spring. It is sometimes called the Welch Ambassador. This name

arose perhaps from the fact that, each spring, Welsh labourers would appear in neighbouring countries in search of employment.

IN ANCIENT literature the koel is considered to be the messenger of Kamadeva, the god of love. Spring, after all, is romance, and the call of the koel is a stimulus to love. According to Kalidasa in *Ritu Samhar* the inflorescence of the mango are the arrows of Cupid, *tesu* or the red flowers his bow, and the line of bumble bees, the bowstring. The wind blowing from Malayachal is his musth elephant, the moon is his crown, and the song of the koel, his incantations.

In fact, the koel is more Casanova than Cupid; birds do not pair for the breeding season, and males are usually promiscuous. According to the *Mahabharata* a man who has insulted his brother's wife will be reborn as a male koel so that he may suffer the torture and humiliation of seeing his sweetheart being pursued by others.

The Muslim poet Jamal wrote of a lovelorn young woman who employed witchcraft against her tormentors — the cuckoo, the bright moon, the gentle breeze, even Kamadeva himself.

She drew figures on the ground of the crow, the planet Rahu, the python and Lord Shiva. And why? asks Jamal. The figures were meant to spite her enemies — the crow to silence the cuckoo, Rahu to swallow up the moon; the python to suck up and absorb the breeze, and Shiva to suppress Kamadeva. But the moment she completes the figures she realises her folly, and rubs them off — her husband would be returning home soon, and she would presumably need the help of her former tormentors to make up for lost time.

THERE ARE proverbs too, for example, *Koel boli, Sebundi doli* — the cry of the koel is the grief of the *sebundi* soldier. *Sebundi* (a corruption of *Sipahi Hind*) were armed soldiers employed by the Moghuls for revenue collection; once the koel began singing, they would disband, and apparently feel sorry about it. But there is another school of thought which believes that the proverb should be *Koel boli se bandi doli* — with the koel's call begin preparations for marriage (the bride sets off for her new home on a *doli* or palanquin). In other words, romance again, nothing martial or military.

Contrary to popular belief, it is not the female koel which sings, but the male, advertising his presence and calling for a mate (Kalidasa, in *Kumar Sambhava*, specifies that it is the male which sings). In very few Indian languages is the distinction clearly made between the male and female: *kokil* (male) and *kokila* in Gujarati, *punsu kokil* for the male and *kokila* for the female in Sanskrit.

THE KOEL is also known as *Parabhrat* (biologists would translate that as parasitic) since the Vedic era, from its habit of laying eggs in a crow's nest rather than building it own. The bird is also referred to by Kalidasa in *Vikramorvarshya* as the crow's aunt — it being no mean feat to hoodwink a bird as intelligent as the crow, generation after generation, into incubating your eggs, leaving you free to go balladeering.

According to Vajsaneyi and Martrayuni *Samhita* the koel is also known as *Anyavaap*, referring to the deity of the same name, who controls the phases of the moon. The reference is probably to the fact that the deity ignores half her work, leaving the moon to shine brightly for only half the month; similarly the koel, by declining to incubate, performs only half its part in reproduction.

The koel is more often heard than seen. Wordsworth calls it "No bird but an invisible thing of voice, a mystery." And after summer, when its breeding notes cease, it is usually overlooked. The absence of its calls during the monsoon is used by poets like Rahim and Tulsidas to describe an unfavourable period.

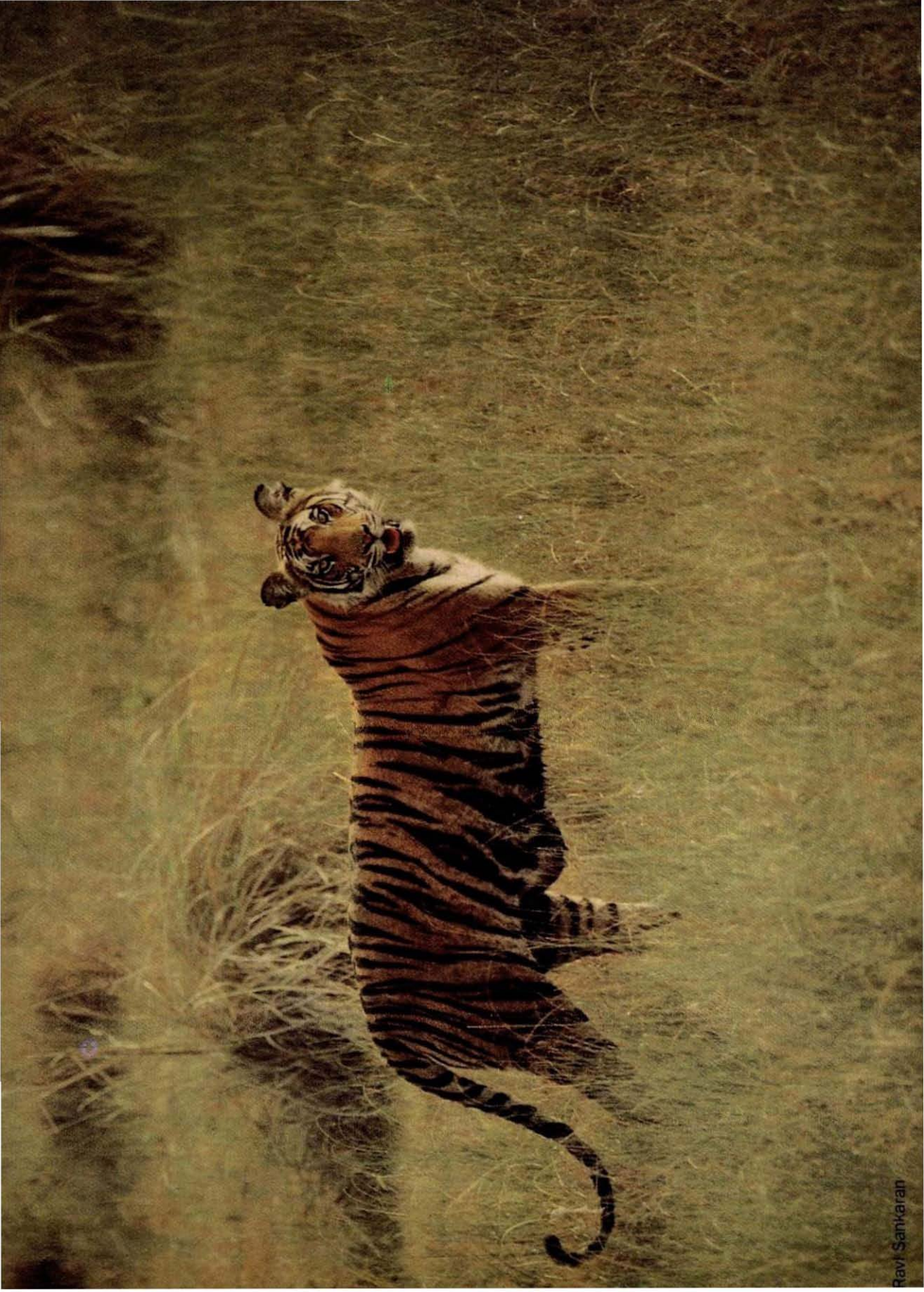
पावस देख रहीम मन कोयल साधे मौन ।
अब दादुर वक्ता भये हमको पूछति कौन ॥

*When it sees the rain the koel falls silent.
For this is the season of the frogs; who will listen to the koel?*

John Heywood (*Epigrams*, 1587) merely notes the phenomenon, without venturing an explanation:

*In April the Coocoo can sing her song by note
In June off time she cannot sing a note.*

Narsh Chaturvedi, an entomologist by specialisation, is Deputy Director (Collections) at the BNHS. He also collects references to natural history (particularly birds) in mythology and literature.



TIGER TRACKS

F.W. CHAMPION

The tiger has an aura about it that no other animal can match. Even fifty years ago, there was a bewildering amount of literature available on the big cat: tales of adventure, straightforward, unembellished records of observations and technical accounts written by serious naturalists for other serious naturalists. This is one of the technical ones, published in the Society's Journal in 1929.



E.P. Gee

I QUOTE BELOW a statement made in an old, and at one time popular, book on tiger shooting: "When moving at either a slow crouch or a walk the hind feet of a tiger usually exactly cover the spot vacated by the fore-feet, but crosswise, because it stands to reason that an animal must have at least one leg on the ground simultaneously on either side to preserve its balance; thus the right hind-foot takes the place vacated by the left fore-foot and then the same with the other two feet.

In a feline, of course, this is a provision of nature to aid the animal in performing a silent stalk; the eyes being over the fore-feet, the animal is able to pick the spots on which to place its fore-feet where they will make the least noise, that is to say, to avoid placing its fore-feet on a dry stick or leaf that might crack and so betray it.

There being no eyes in the rear portion of the animal to guide its hind-feet in a similar manner, it instinctively conveys the hind-foot to cover the exact spot that has been chosen for, occupied, and then vacated, by the fore-foot, thus avoiding the risk of accidentally putting its hind-foot on a rolling

stone or a dry stick which would make a noise.

Thus a tiger usually leaves only a double trail as if it had only two feet instead of four, after the style of the trail left by a man walking, though the prints of the hind-feet will usually be found overlapping slightly to the rear of the prints of the fore-feet, perhaps half an inch or more. It is only when the tiger is standing or moving fast that the prints of all four feet will be seen on the ground. These facts serve to show the manner and pace at which the animal was travelling, and also the temper or state of mind of the animal at that time."

THESE PARAGRAPHS — if one can master the involved English — give the opinion of a man with vast experience of the Indian jungles at a time when tigers were commoner than they are now, and I hesitate to criticize statements made by a man who was obviously more qualified to speak than I am. Yet I have been giving the matter my careful attention for some years and I find that I cannot agree with either of the main points advanced, which, put briefly, are:

Firstly, that a walking tiger usually puts his hind-feet exactly over the spots vacated by his fore-feet; and secondly, that he brings his feet forward crosswise.

AS IS WELL known, there is usually a considerable difference between the shape of the fore-feet and that of the hind-feet of a tiger, the fore-feet being larger, rounder, and more splayed out. The difference is much less marked in the case of a tigress: the fore-feet of a tigress often bear a great resemblance to the hind-feet of a tiger. These differences, although usually quite clear, are not by any means without their exceptions and I have known cases where, from the tracks, I should have been quite convinced that a tigress had passed, yet a flashlight photograph taken of the animal in question has proved that it was in reality a tiger.

I mention this point because, the more one studies natural history, the more one realizes how dangerous it is to make a definite and positive statement about any animal. After all animals vary among themselves, both in shape and habits, just as much as human beings, the variations among whom are infinite.

FOR PRACTICAL purposes, however, we can take it for granted that, in the vast majority of cases, it is quite easy to pick out the fore-feet and the hind-feet among the tracks left by tigers and tigresses. On this assumption, I have found that in the vast number of cases, the marks of all four feet are generally quite distinct — i.e. a tiger usually leaves a double track on either side and the tracks of the hind-feet generally lead. The distance between the edge of the back pad of the hind-foot (leading) and the tip of the toes of the fore-foot (following) may vary, but is often some two or three inches.

At one time I used to think that almost all tigers walking at a normal pace on level ground left a track of this type, but I have since found that there are a number of exceptions. Indeed, I know one tiger — still alive, I am glad to say — who habitually puts the hind-foot almost exactly on the spot vacated by the fore-foot. His track is a single one, where in almost every case — I have followed his tracks for miles — the hind-foot has been placed more or less over the spot vacated by the fore-foot.

Yet I have known some *shikaris* to state quite positively that a tiger never leaves a single track, and others, such as the author of the above-quoted

paragraph, who are quite positive that he nearly always does so!

I do not claim to be an authority on the subject, and I would ask others to ventilate their opinions in the *Journal*; but my experience has been that the ordinary tiger or tigress usually leaves a track showing an average of about two inches clear space between the tracks of the two feet, on either side, with the hind-foot leading in each case.

I THINK THE hind-foot track leads because the hind-leg of the tiger is longer than his fore-leg and thus has to be brought further forward to ease the action of his walk. The cases I have known where the tracks more or less coincided have usually been of big old tigers and it may possibly be that they have become stiff in the joints and thus bring the hind-leg less far forward than do younger tigers.

Undoubtedly a lot depends upon what the tiger is doing at the particular moment he makes the track, and the same tiger seems to show most extraordinary variations, which would tend to suggest that his motion at night when on the prowl must be somewhat jerky. Yet when seen by moonlight this does not appear to be the case.

I made a series of observations in Lansdowne Forest Division on May 27, 1928, of a fairly large tiger which had passed during the night along a sandy path across a very open, dry area. Out of approximately 400 clear tracks (those which were not clear were not measured), 234 (nearly 60 per cent) touched. I did not record the number of tracks which were completely overlapping (showing only the track of the hind foot on each side), but I would estimate it at 25 per cent of all the touching cases, or 15 per cent of all the observations made.

In cases where the tracks were separate the average distance of separation between the edges of the tracks of the two feet on either side (i.e. the distance between the back edge of the leading hind-foot and the tip of the toes of the fore-foot) was 2.5 inches. I would emphasize, however, that the tracks of this tiger touched more often than is usually the case.

I HAVE records of other cases in which nearly all the tracks were separate, the average distance of separation being about 4.5 inches, and of yet others where the vast majority touched. It will thus be seen that the statement quoted at the beginning of this article will not hold as a general rule.



Ambika Singh / Sanctuary features

TRACK RECORD

Animals, particularly those which are solitary or prefer dense cover, are often difficult to spot. Their tracks, however, can be found, and if they are reasonably clear, deciphered. Different species (even different birds) make tracks which, to the trained eye, are clearly different (though closely related species of similar size are a problem).

Identifying an individual of a species from tracks alone is far more difficult, because the tracks may vary widely, depending on the gait (whether walking, when the entire foot presses against the ground, or running, when only the toes do so), the condition of the ground (hard, dusty, muddy) etc. The same animal will make larger prints on soft ground than on a

harder surface. In many animals, they were made on hard ground and remain reasonably distinct.

the sex and age (juvenile, sub-adult or adult) can be inferred even from old tracks, provided

Tracks and pug marks are an important tool for wildlife censuses. Particularly for large carnivores, they provide not only population data but a variety of other information as well — age composition and adult sex ratios, longevity of individual animals, habitat use patterns, and territorial and ranging behaviour.

Tracks and pug marks are usually recorded by placing a glass sheet over the track (supported by a frame, so that the track is not distorted), and tracing out the details. Another, less useful, method is plaster casts. Plaster of paris is poured into the depressions made by the animal's feet; once it hardens, the cast is removed and preserved.

The pugmarks of a tiger show only four of the five toes, because the fifth is well above the pad, and does not touch the ground while walking. The claws are normally retracted, and leave no imprint either, except sometimes on slushy ground.

Claw marks are a characteristic feature of the prints of some animals, particularly tree climbers and animals that dig for food or to make burrows. Animals that stalk their prey by and large place their hind feet in the steps of the front feet, which makes for a silent tread, and the prints are in an almost straight line.

Animals with long hind legs, such as squirrels and rabbits, move in a series of bounds, the hind feet usually coming down together and touching the ground ahead of the front feet. Their prints therefore fall in groups. Animals with short legs and wide, heavy bodies have a tendency to toe-in. Those with long, slender bodies bound along when in a hurry, producing a track with groups of four prints. Both groups when not in a hurry leave a track with many prints rather close together.

Prints provide insights into animal behaviour too. Dogs, for example, are less suspicious than wolves or jackals. Dog tracks will show a more or less direct approach to an object that may have aroused the animal's interest, whereas wolf or jackal tracks, while fairly similar in appearance, show a much more circumspect approach.



Jackal



Hyaena



Tigress



Tiger



F.W. Champion

The tiger on his beat, photographed with a trip-wire flash in 1920. Note the position of the feet in mid-stride, with the near fore-foot just about to be lifted.

I have not studied the question to any great extent with regard to the tracks left by leopards, but my general observations tend to show that the leopard, like the tiger, usually leaves a double track on each side with the hind-foot leading.

NOW AS regards the second statement — that a tiger usually brings his feet forward crosswise, as it stands to reason that an animal must have at least one leg on the ground simultaneously on either side in order to preserve its balance.

I would say at once that I believe this statement to be quite wrong. Why, birds can stand and even go to sleep on one leg, and there is no reason whatever why an animal in motion should not be able to keep his balance with only one leg on the ground at a time. A study of the photographs of galloping giraffes in Mr. Maxwell's fine book (*Stalking Big Game with a camera in Equatorial Africa*) will clearly show that it is not necessary to have even one foot on the ground when moving rapidly.

Also, for an animal to cross his legs in the way suggested seems to me to be an extraordinarily un-

natural and uncomfortable method of progress, which is in no way compatible with the graceful movements of all the cat tribe.

The photograph above represents a tiger going on his ordinary nocturnal rounds. The near hind-foot is right in the air and the near fore is just about to be lifted. It will certainly be off the ground before the hind-foot has reached its new spot in front of the mark left by the fore-foot, so that the two near-side legs will certainly be off the ground at the same time. There is also no suggestion whatever of any crossing of the legs.

If anyone interested in this matter will examine some of the other photographs of tigers in motion, which have been included in my recent book *With a Camera in Tiger-land*, they will find no sign of crossing whatever and I cannot understand what led Mr. Hicks to make this (to me) astounding statement.

F.W. Champion, apart from being an eminent naturalist, was among the pioneers in wildlife photography. He introduced the trip-wire flash, with highly successful results, to photograph nocturnal behaviour in various species, most notably the tiger.

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