

1990 (4)

Hornbill



BOMBAY NATURAL HISTORY SOCIETY



COVER PICTURE

Sambar (*Cervus unicolor*), by Ravi Sankaran

India's largest deer, the sambar is widely distributed in forests throughout most of southeast Asia, but is rarely seen in open grassland. The coarse, shaggy brown coat (paler in females) darkens with age, and may be almost black in older stags. With the onset of the breeding season, the coats darken and gain lustre. In addition, some colour variation may be seen between populations in different areas.

Normally, sambar retire into thick cover by day and do not emerge until dusk. However, in areas where protection is adequate, they have become easier to see by day. Stags are usually solitary, associating with hinds only during the mating season, which peaks in November-December. Adult stags — the largest are close to 150 cm high at the shoulder and weigh 300 kg — are usually preyed upon only by tigers and wild dogs, rarely by leopards.

Over the past few years, sambar in parts of Rajasthan, Madhya Pradesh and Karnataka have been seen with prominent sore patches on the throat. Both stags and hinds are affected and the size of the patch apparently increases in the wet season. The condition has not been fully studied, but is believed to be due to a viral infection.

ACKNOWLEDGEMENT

We are grateful to Seth Purshotamdas Thakurdas & Divaliba Charitable Trust for financial help in the publication of *Hornbill*.

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 advancement of the study of zoology and botany in the Oriental region. The Society also promotes measures for conservation of nature. Membership is open to persons of either sex and of any nationality, proposed and recommended by one or more members of the Society; and also to persons in their official capacity, scientific societies, institutions, clubs, etc. in corporate capacity.

Members receive during a year four issues of *Hornbill*, the Society's popular publication. Life members receive, in addition, three issues of the *Journal of the Bombay Natural History Society*, now in its 87th volume.

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Hornbill

CONTENTS

2

Editorial

3

Seashore Lore

Beefsea

8

A Reptilian Repast

Ajay Desai

10

Butterflies: Early stages in the life cycle

N. Chaturvedi & I. Kehimkar

12

Wildlife Photography

T.N.A. Perumal

18

Ranthambhore

Shahid Ali

26

News, Notes & Comments

32

Folklore

J.S. Serrao

EDITORS *J.C. Daniel, I. Kehimkar, A. Varadachary & B. Bhushan*

LAYOUT *M.O. George*

EDITORIAL

The good earth

The Indian National Trust for Art and Cultural Heritage recently circulated a note on the creation of a 'Centre for the Management of Natural Resources' to combat the disastrous decline of the country's basic life-support systems of land, water and forests, which have now been depleted below the minimum needs of an exploding human population. The facts they have quoted are worth repeating:

- The per capita production of foodgrains is only around 200 kg per annum as against 300 kg or so in China. There is no basis for the claim that India has achieved self-sufficiency in food—this claim is based on the market demands for foodgrains, ignoring the fact that a large part of the population lacks the purchasing power to buy all the food that they need.

- The country's total resources of land which has any potential for biotic production amount to only around 264 million hectares (mh). However, as many as 175 mh out of this area stand degraded, 90 mh so badly that they are officially classified as 'waste lands'. The principal causes of degradation are soil erosion by water (around 120 mh), soil erosion by wind (around 23 mh), water-logging (around 9 mh) and salinisation (around 9 mh).

- Of the 140 mh or so of lands which are under agriculture, around 85 mh are suffering from soil erosion. Of the 70 mh or so of lands classified as 'forests' only about 25 mh are under good natural forests.

- Although the per capita availability of agricultural land will reduce to around 0.14 h in the year 2000 (as against 0.48 h in 1951) there are as yet no satisfactory mechanisms to prevent the diversion of good agricultural lands to urban uses including such avoidable uses as farm houses and villas in the suburbs of big towns.

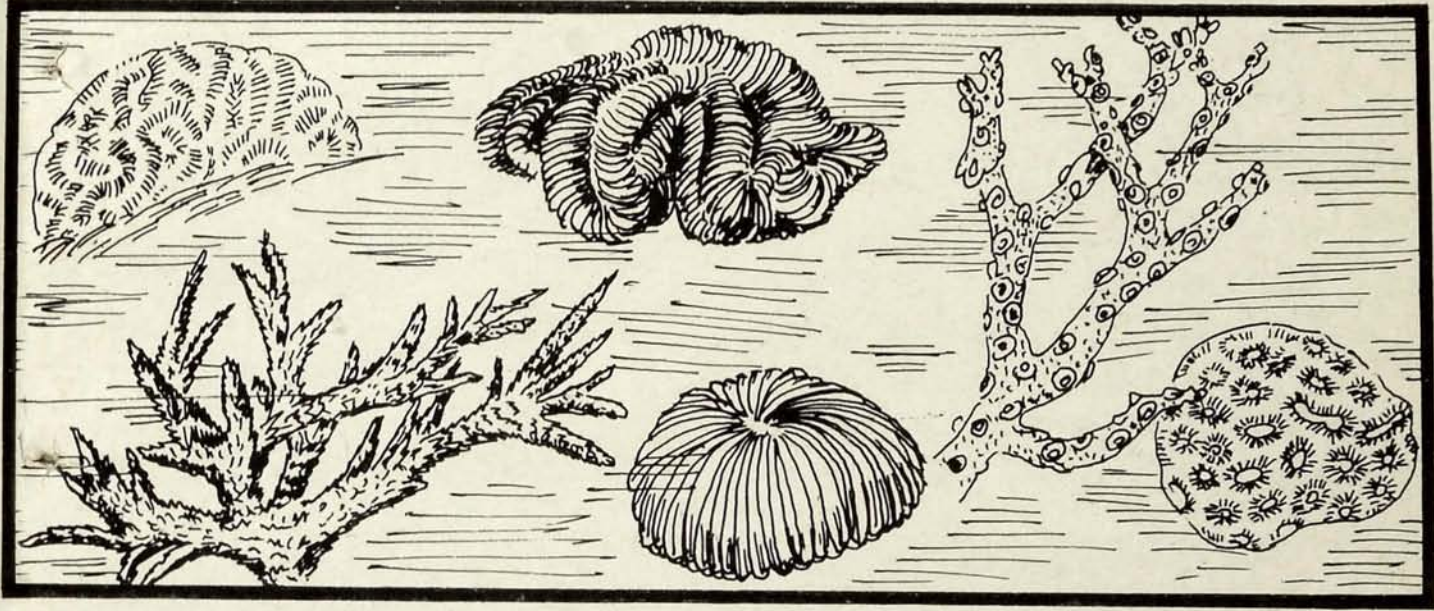
- Sufficient attention has yet to be given to the maintenance of the health of our most productive soils which are cropped two or even three times a year and receive heavy doses of chemical fertilizers and pesticides. Such soils are facing deterioration in many ways including the depletion of micro-nutrients and trace elements.

- The concept that the small watershed should form the unit for the integrated management of forests, soil and water resources has yet to be accepted and operationalised.

The key to the problem is soil management. In spite of the late Mrs Indira Gandhi's personal interest, bureaucratic lethargy has killed every effort to give the soil of the country the attention it deserves. The extent of neglect can be gauged from the fact that in the last 40 years Rs. 28,000 crores have been spent on large dams as against about Rs. 5,000 crores for rehabilitation of the 175 mh of degraded lands.

SEASHORE LORE

VIII: Flower Power



BEEFSEA

*And if ye doubt the tale I tell,
Steer through the South Pacific swell;
Go where the branching coral hives
Unending strife of endless lives.*

— Rudyard Kipling

If you are taking a walk on a mudflat at low tide, you might come across a pink 'flower' on the surface of the mud. If you dig it out, you will find an orange-coloured cylindrical body with the petals of the 'flower' being its tentacles, with the mouth at their centre. The sea anemone, together with its cousins which we shall see below, belongs to the sub-group Anthozoa of the Coelenterates—a vast assemblage with one common feature, in that all of them possess stinging cells,

The illustration above shows some of the bewildering variety of marine corals.

tiny capsules containing a coiled capillary tube which, on being touched, turns inside out and injects a paralysing

poison. (For an illustration of stinging cells, see *Hornbill* 1990(3), page 27).

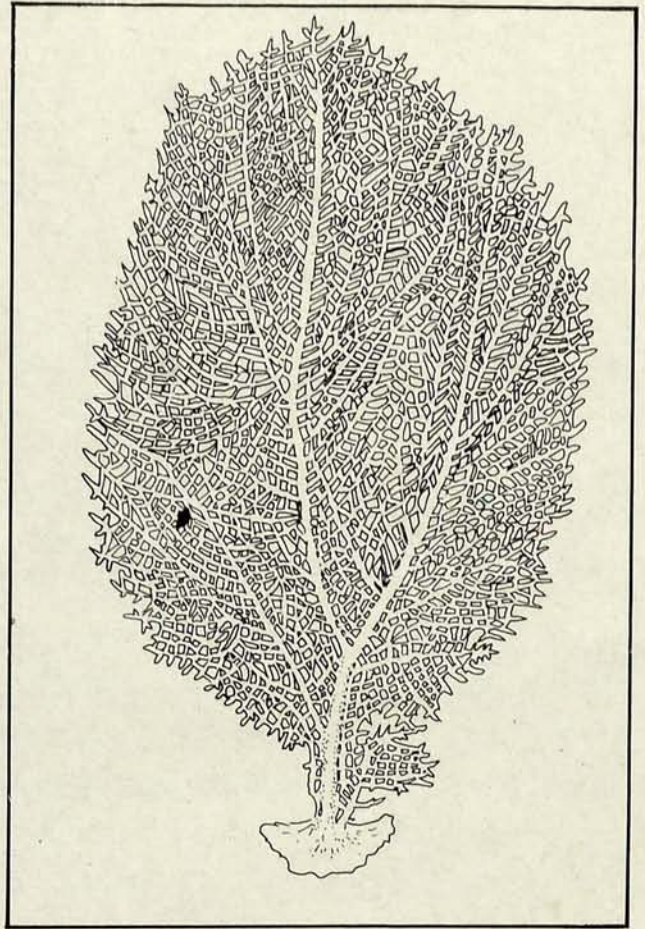
Depending on whether the tentacles number six or eight (or, sometimes, ten) the Anthozoa are divided into the Hexacorallina (Zoantharia) and the Octocorallina (Alcyonaria). The latter have feathery tentacles, and eight partitions project inward into the hollow body. All of them live as colonies of many individuals connected to each other. We shall not deal with the organ-pipe coral, blue coral, or the precious red coral, none of which are found in our seas.

Sea pens (*Virgularia*) have a fleshy, quill-like body, with a long central axis, on each side of which are a succession

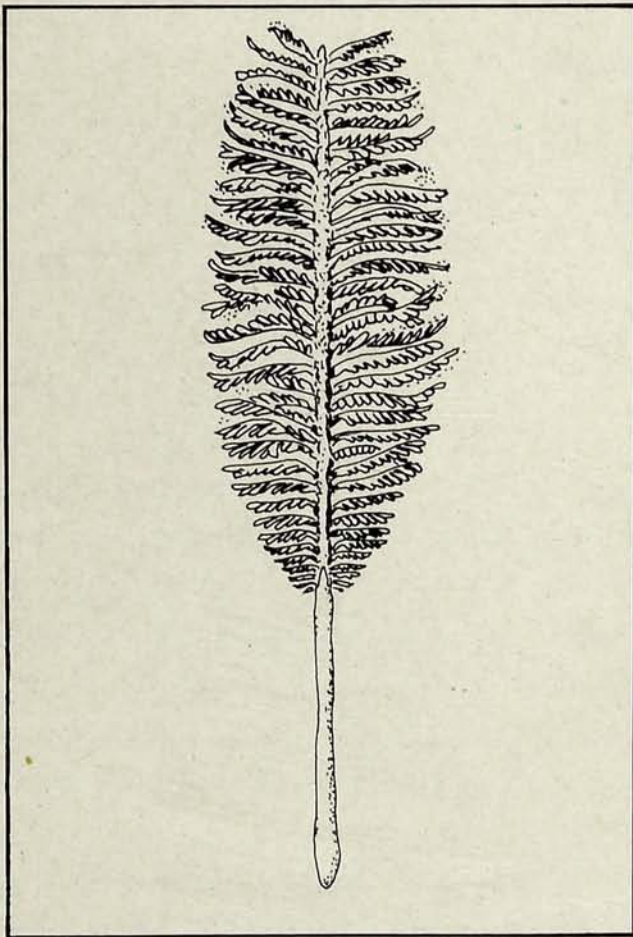
of flattened, fleshy, leaf-like polyps. Sea pens are found erect in soft mud, where they dig in with the help of the enlarged end bulb. They may be from a few to 60 cm long, and are coloured yellow, orange, red or purple. Some of them emit a blue or violet glow when touched at night.

Related to them is *Corymorpha*, which looks like a 5 cm long white lily. Sea pansies or powder-puffs (*Cavernularia*) have a stout, radially symmetrical cylinder over whose entire surface the flower-like individuals are strewn.

Sea fans (*Gorgonium*) are so called because they branch in one plane to form a fan-shaped colony. The branches are often united by numerous cross-connections. Their skeleton is made of



Common sea fan (*Gorgonium*)



Sea pen (*Virgularia* sp.)

keratin, a substance also found in our hair and nails. Sea fans may be yellow, orange, red or purple, and grow in vast stretches of the sea bottom to form veritable submarine flower gardens. Twined around their branches are admirably camouflaged tiny brittle stars of the same colour, and the cowry-like snail, *Ovulum*, also lives on them. Elongated forms with only one or a few branches are called sea whips.

In the Zoantharia, which include sea anemones and true or stony corals, the partitions inside the body are never eight. The hollow tentacles may be in one or several circlets, and the tentacles may number from a few to hundreds or even a thousand or more. In sea anemones, each circlet from inside outward has 6,6,12,24,48, etc. tentacles,

the innermost being the oldest and largest.

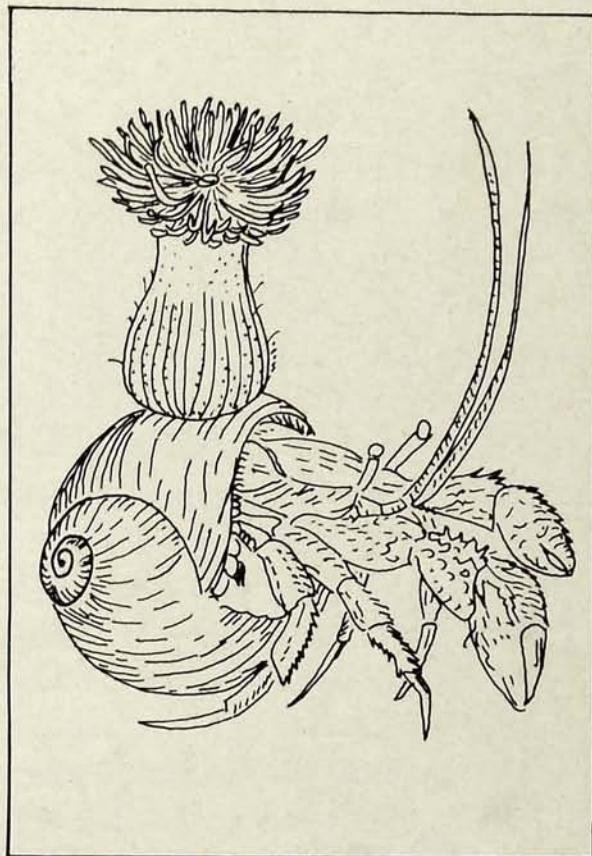
Sea anemones adhere to the bottom (mud or stones) by slime and muscle power, but can move 8 to 10 cm per hour by crawling. They may also move in a variety of other ways, e.g. by walking about inverted using the tips of their tentacles, somersaulting, reaching the sea surface and floating head downwards or inflating their body and rolling about in the waves. Some sea anemones can live for 50 years.

Multiplication (of the animal) is by division, by rupturing horizontally or vertically. In some, the base of the body puts out lobes which get constricted and are torn off as the animal moves about. The torn edges unite, new tentacles develop, and soon complete little sea anemones are seen.

Hermit crabs recognize particular kinds of sea anemones and when they come across one, massage it with their claws so that the sea anemone detaches. The hermit crab now holds the anemone against the shell in which the hermit crab lives, until the anemone attaches itself. Some crabs clasp small sea anemones in their claws and when threatened, hold them out.

Around sewage outfalls, where the sea water is diluted and at the same time rich in organic matter, you will find vast carpets of *Zoanthus*, which look like colonies of soft sea anemones connected together by a common fleshy base, with polyps of about a centimetre diameter shooting vertically up.

Corals are the builders of reefs. Except for a few solitary forms like *Fungia*, most are colonial. The individual



Sea anemone on hermit crab

polyp of a coral is like a tiny skeleton-building sea anemone. The skeleton, called a corallite, is a cup containing vertical ridges radiating from centre to periphery. The wall of each cup is called a theca. The skeleton is made of lime (calcium carbonate) which the animals extract from sea water. The skeleton is white, but the live polyps may be yellow, brown or green.

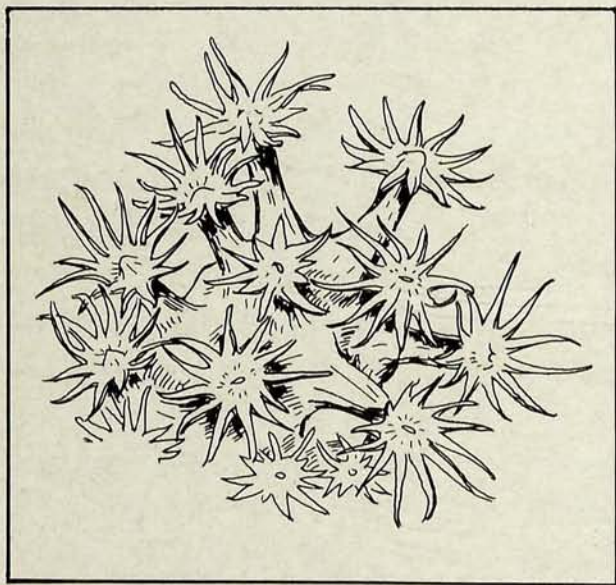
Coral colonies form low, flat plates, or cushion-like or spherical masses, or vases or cups, or they may be branched, with short stout or long slender, or flattened plate-like or leaf-like branches. Only the surface is occupied by living tissue. Reef corals live in warm (less than 22° C), shallow (less than 30 metres), clear (sediment-free) sea water undiluted by flow of fresh water from rivers, but non-reef building corals occur down to 8,000 metres.

Coral polyps with long tentacles feed like sea anemones, by paralysing small prey with their stinging cells. Those with short tentacles capture food by entangling it in slimy threads, which are then wafted towards the mouth by currents made by tiny, hair-like cilia. The polyps expand at night to feed, but retreat into their skeletons during daytime. Many corals, when exposed at night to ultraviolet light, glow in the dark.

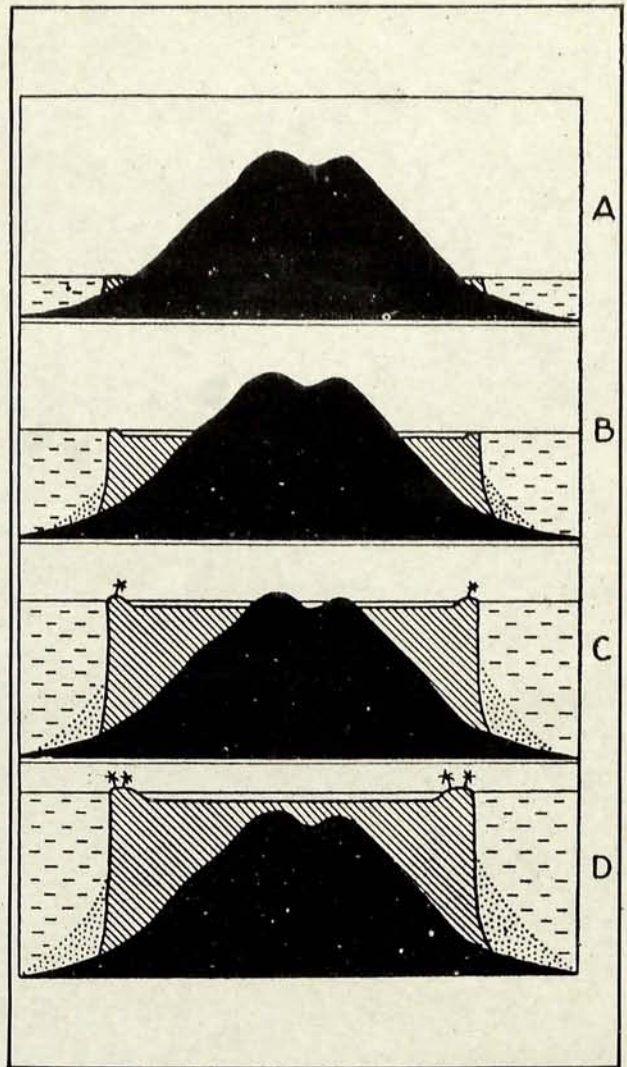
Corals grow by about 10-20 cm per year for the faster growing branching types such as staghorn corals, where growth means only increase in length at the tips; the dome-shaped forms, which increase in all directions simultaneously, grow by 5 mm per year.

Small, single-celled plants called zooxanthellae, occur abundantly in the tissues of reef-building corals. In sunlight, they utilise the carbon dioxide and waste products of the coral polyps; that is why such corals are not found in deep water. When the corals do not get enough food, they eject the plants.

A coral reef has one of the richest



Coral polyps

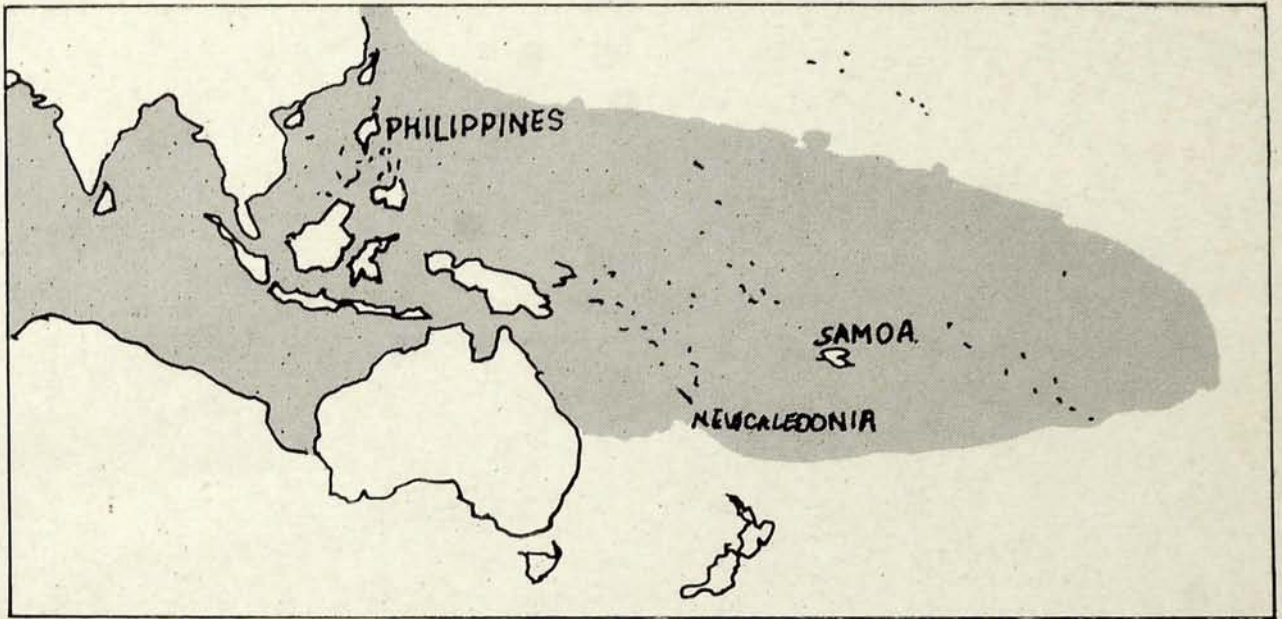


The birth of an atoll

A. Mountainous island, with fringing reef (diagonal lines). B, C. Mountain sinks, reef grows upwards to form a barrier reef. Fragments of corals broken off by waves form a 'talus-bank' at the foot of the reef (dotted). D. Newly formed atoll.

ecological diversities, sheltering and providing food for a large variety of encrusting or branching limy algae (seaweeds but which look like corals), sponges, sea anemones, tube-dwelling worms, crabs, snails and bivalves, starfish, sea urchins and sea cucumbers and fishes.

Gall crabs live imprisoned in the cavities of branching coral. The female baby crab settles in a growing fork of coral branches and by constantly blow-



Distribution of the major coral reef zones

ing water on it, causes the young branches to broaden and curve around it so as to leave a chamber in which the crab is permanently (but voluntarily) imprisoned.

Every one knows Charles Darwin for his theory of evolution and the origin of species, but not many know about his theory of the origin of coral reefs. The reefs are of three types. **Fringing reefs** extend from the shore a few metres to half a kilometre out. **Barrier reefs** are separated from the shore by a lagoon 18 to 90 metres deep and from 800 metres to 16 km wide. (The Great Barrier Reef off eastern Australia is over 1,920 km long and, in some places, 145 km from the shore.) **Atolls** are more or less circular or horseshoe-shaped reefs not enclosing any island but encircling a lagoon which varies from less than a kilometre to 60-80 km across.

Darwin theorised that coral reefs begin as fringing reefs on a sloping shore. By sinking of the land they become barrier reefs, with water between

them and the land. If the land is an island and sinks out of sight, the barrier reef becomes an atoll. His theory has since been proved right.

Cerianthus, which looks like an elongated sea anemone to the casual observer, is more closely related to corals. It lives inside a tube formed of hardened slime secreted by its skin, in which are embedded shed stinging cells, sand grains and other foreign objects. The animal grows to 35 cm, but its tube may reach a length of a metre. It may live from 10 to 40 years.

One source of danger to coral reefs at Lakshadweep is from the crown-of-thorns starfish, which feeds on the coral polyps, leaving behind a bleak white swathe of dead corals. The population of this starfish has grown rapidly over the past few years, probably because its main predator, the triton, has been over-collected by souvenir hunters. At other reefs in the Pacific Ocean, the starfish population has fortunately declined of its own.



Pythons kill by suffocation. The prey is trapped within the coils, which tighten each time it exhales, until the victim's lungs can no longer expand. Prey are usually swallowed head first, so that the legs fold back naturally and do not hinder the swallowing. The entire animal, except for the hooves and a small amount of hair, is digested. After a particularly heavy meal, it may be 3-4 weeks before the python hunts again.



A Reptilian Repast

Text and photographs by
AJAY DESAI

Four o'clock on an August evening. A light drizzle had forced us to quit field work early, and we headed back to camp. As we were passing the elephant camp at Tappakadu in Mudumalai Wildlife Sanctuary, a mahout waved us to a stop. An hour earlier, he had gone into the forest to fetch his elephant for the evening bath, when he saw a python (*Python molurus*) that had caught a chital (*Cervus axis*) doe.

We had seen pythons quite often in the course of our work, but had never actually watched one in action. We rushed to the spot. If the python was half the size he claimed it to be, it would be worth the trip in the rain.

The mahout also told us that a pack of wild dogs (*Cuon alpinus*) was in the area and that he had seen them tearing at the rump of the chital while the snake was trying to kill it. Not wishing the snake to be disturbed, he had driven the dogs away.

As we moved through the damp vegetation, the evening light and the rain made us feel that we had been transported back in time, to the period when reptiles ruled the earth. Presently we sighted our quarry—and almost reeled in shock. The mahout was not exaggerating. The snake was over 5 metres long, and in its coils lay a nearly full grown chital doe. The snake had al-



ISAAC KEHIMKAR

ready swallowed the head and neck. On the rump of the deer some flesh was missing—evidence that the wild dogs had indeed managed to steal a few bites. The dogs themselves were about 60 metres away, watching us. Apparently they had returned to see if they could steal the python's kill (they are known to steal kills from tigers and leopards). How successful they would have been in this case if the mahout had not driven them away, is hard to say.

We had reached the spot just before 5 p.m., by which time the python had already swallowed the entire neck. It took the snake another 36 minutes to swallow the rest of the deer. The entire sequence, from ambush to swallowing, had taken a little over 2 hours.

It was a sight that continues to haunt me; and as for our trackers, they fear snakes more than anything else. When I went to locate the snake the next day, the trackers refused to come along. They said they would not be able to work in the tall grass if they kept thinking of the snake. I can't blame them. Every time it rains, I too remember the giant snake in the tall grass. I'm sure it's out there somewhere on the prowl, looking for its next meal.



BUTTERFLIES

Early stages in the life cycle.

BY NARESH CHATURVEDI & ISAAC KEHIMKAR

SWALLOWTAIL BUTTERFLIES Continued from *Hornbill* 1990 (3)

This group contains some of the largest and most spectacular butterflies. In most species the hindwings are extended into tails like those of swallows; hence the popular name. However, some swallowtails like the common lime are tailless. India's 105 species of swallowtails range from the 22 centimetre birdwing to the quaint little dragontails of the northeast, with their transparent, black-banded forewings and enormously long tails. Most are forest dwellers, but some are seen in city gardens.

Their eggs are smooth and spherical. The caterpillars are never hairy, but may have fleshy spines or tubercles and always have a gland called the osmeterium. This is a forked scent gland which protrudes from behind the head whenever the caterpillar is disturbed or attacked. The gland secretes a strong smelling secretion containing two organic acids (isobutyric and 2-methyl butyric), which the caterpillar tries to rub against the attacker. This defence is extremely effective against ants, parasitic wasps and flies.

COMMON LIME *Papilio demoleus*

Larval foodplants Bael (*Aegel marmelos*), ban-nimbu (*Glycosmis pentaphylla*), kadipatta or curry leaf (*Murraya koenigii*), lime, orange and other citrus species.

Egg Spherical, pale yellow, darkening as hatching approaches. Laid singly on the upper or underside of growing shoots of the foodplant.

Larva The hatchling has soft spines which progressively disappear in subsequent instars. From the second instar onwards, caterpillars resemble bird droppings. When not feeding, they usually lie motionless on the middle of a leaf. In the last instar the caterpillar is bluish to yellowish green with false eyes on either side.

Pupa Often pupates on other plants away from the foodplant. Among green leaves and in the wet season the pupa is green, but in dry situations it is mottled brown to appear like a dry twig. When disturbed, it produces a hissing sound by moving its rear segments.

Facing page: caterpillar disguised as bird droppings; final instar caterpillar; pupa just before emergence, with wing colours showing through the pupal case; newly emerged adult.

PHOTOS BY ISAAC KEHIMKAR

Wildlife Photography

T.N.A. Perumal

WHEN AN ANIMAL PRESENTS ITSELF, STOP AT A RESPECTFUL DISTANCE. Allow it to settle down and get the feeling that you are not to be feared. Soon the animal will relax and behave naturally, and provide opportunities for interesting pictures.

The longer a photographer stays in the field with the animals, the better his chances of good photography. One should learn to brave the weather and long waits: some unusual aspects of animal behaviour can be seen (and photographed) only in inclement weather.

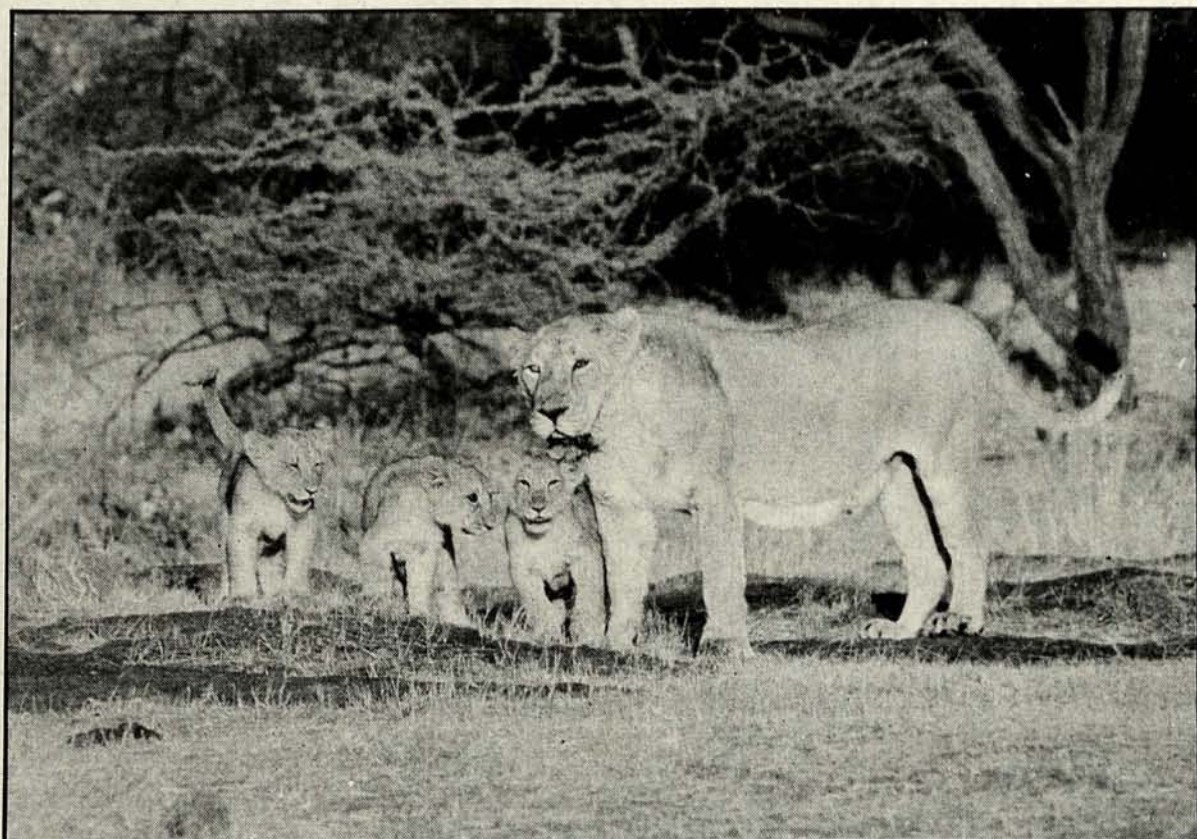
While on a riding elephant, especially a tusker, a close approach to a male tiger is best achieved without giving the feeling of confrontation. Make the elephant turn around instead of facing the animal head-on, and approach the animal in reverse. As long as the back of the elephant is towards the tiger, it will respond favourably and not get annoyed or alarmed. Similarly, to photograph a wild tusker in the forest from a car, the approach can be maneuvered by taking the car in reverse, so that even if the animal means business and charges, you can get away quickly.

Do not disturb or frighten an animal in order to get action pictures; don't surprise or corner an animal, or follow it for too long. Do not place yourself between a mother and baby or be in the direct path of an animal on the move. Avoid being placed in the middle of a herd of elephants. Don't stare directly at an animal when close. Please don't shout or wave at animals. It is unwise to approach an animal directly. Move in a zig-zag fashion and slowly get closer to it. Stay still and do not make unnecessary movements when the animal is watching you. Be alert; and watch for alarm signals, and warnings given by animals while taking pictures, and immediately withdraw if the animal shows annoyance and moves towards you.

Wildlife are less shy of a riding elephant. It can take one quite close to animals even in impenetrable tracts, but the chief drawbacks are the steep angle of view one gets from the elephant's back and the element of camera shake due to the movements of the elephant. To counter these problems, shoot more frames to increase the

Courting cattle egrets
Photo: T.N.A. Perumal





chances of getting a few sharp pictures; and shoot from a distance to reduce the angle of view or wait for the animal to move to a better location (or persuade it to do so).

Lioness and cubs
Photo: E.P. Gee

For taking pictures from a riding elephant, it is better to use a minimum of $1/250$ th of a second shutter speed. Follow the rhythm of the movements of the elephant and click when the animal is steady, or in a phase of least movement. The only snag is that the best action of the subject, and the moments when the elephant is steadiest unfortunately do not always coincide.

Never get down from a vehicle to approach an animal on foot in the hope of getting closer to it. Animals flee at the sight of moving humans, but in many cases are unconcerned at the proximity of a vehicle. Be judicious in using a long tele lens, as the foreshortening effects with such lenses can give a 'cut and paste' effect in a photograph.

Though a solitary animal in a characteristic pose, in action, in pictorial light and in proper relation to its habitat can make an evocative picture, two animals in company, in courtship or in combat has additional plus-points. Likewise, a small group or a large herd of animals in their various activities, in a peaceful setting and in interesting light definitely makes a much better wildlife photograph.

But, technically, to include more than one animal in the picture poses a serious problem because of the shallow depth-of-field of a long lens; as it will focus sharply on only one animal and throw the

other completely out of focus, unless of course all the animals are in one plane of focus (like two animals fighting and in broadside). That apart, the problem of animals grouping in discord and disharmony is always greater in bigger groups of animals. One has to be sufficiently close to the animals and use a short focal length lens to cover the group and use a smaller aperture on the lens to achieve better depth-of-field to render all animals in sharp focus. Therefore it may be simpler to concentrate on single animals, and attempt to photograph groups only in an ideal situation.

Avoid taking pictures from extreme angles or in harsh light or in the dappled light and shade conditions that prevail in the jungle between forenoon and afternoon. If unavoidable, and when monochrome is being used, expose for the shadows and develop for the highlights to soften the extreme contrast. Better still, use a two-bath developer formula for retrieving the results.

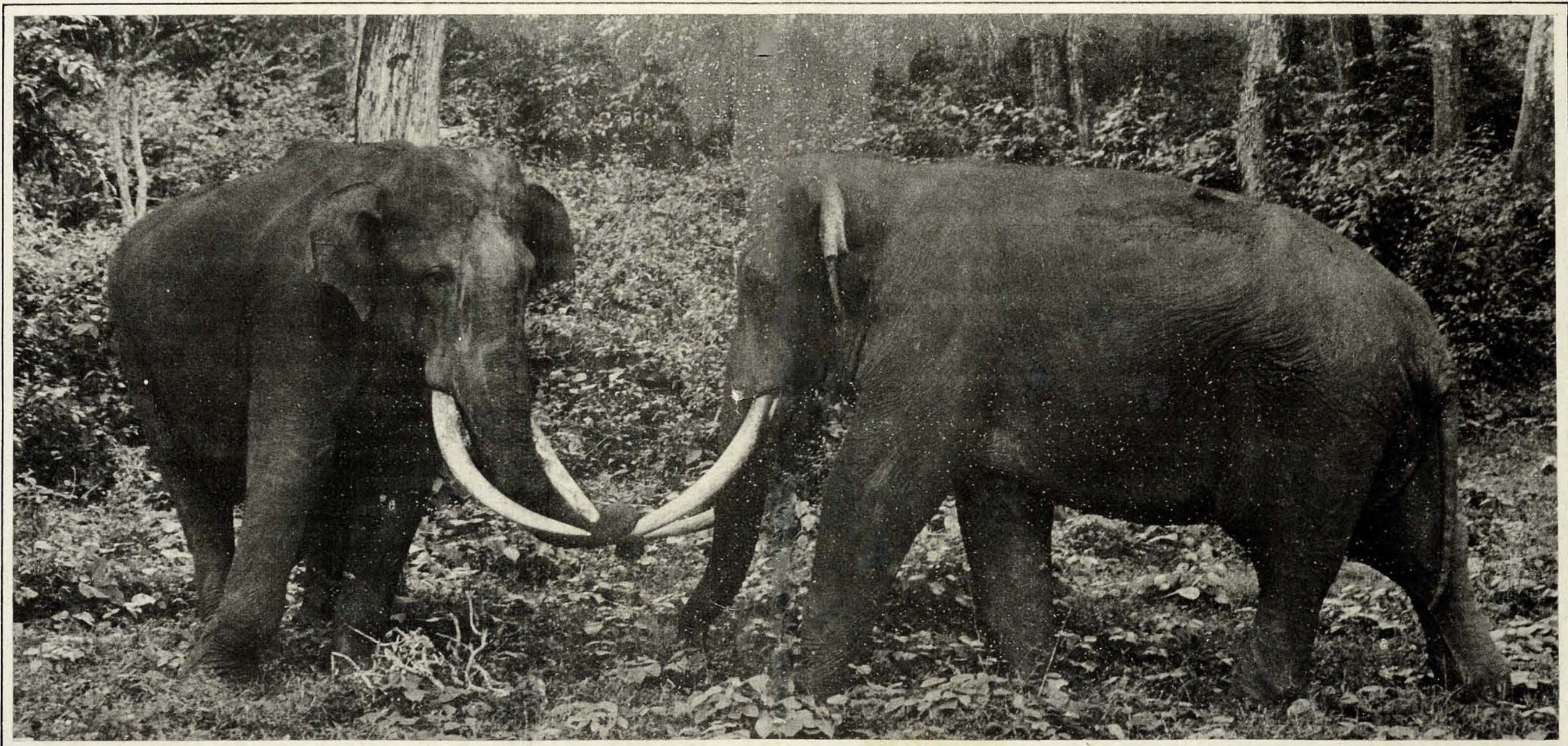
For both B & W or colour, medium speed fine grain films of 100-200 ASA give the best results. Of course, the faster 400 ASA Kodak Tri-X-film (B & W) and Fujichrome 400 D film (color slide) will come in handy under low light conditions.

Standardize your technique by using one type of equipment, film and the worked-out combination of exposure and development. This will ensure consistently good results. It does not pay to keep experimenting all the time with different combinations of equipment, film and processing: lost opportunities can never be repeated in wildlife photography.

For monochrome work, slightly generous exposure and slightly curtailed development yields good results. However, over-generous exposure will increase grain, reduce contrast and result in loss of definition.

Half-a-stop over exposure is recommended for best results when negative colour films are used. Colour slide or transparency films require optimum exposure, or perhaps $1/3$ stop less or $1/3$ stop higher rating than the (rated) ASA of the film used, for better saturation and sparkle. But too much underexposure will give muddy slides lacking in shadow detail.

The technique of 'pushing' films to gain extra film speed with the use of special developers or increasing development time and such combinations do not give satisfactory results. Correct exposure and the use of a standard fine-grain developer formula with time and temperature method of processing is strongly recommended for monochrome.



Different colour films have slightly different colour balance, characteristics and responses. The small shifts in colour balance due to the colour quality of light prevalent at different times of the day need not be taken seriously because this aspect is really a matter of personal preference (or prejudice!). The shifts in colour balance due to improper, inconsistent processing can be solved by custom processing at a reputed lab or home processing.

Please do not try to conserve on film; shoot enough and more at every opportunity. Film is the least expensive item on the budget for a wildlife photography trip, and it is criminal to waste an opportunity by not shooting enough. Situations permitting, try bracketing of exposures (half a stop), although one rarely gets a long enough chance to do it.

I feel that the main motivation for being in jungles with our cameras

is to be at one with nature, far away from the maddening rat-race, pollution and cacophony of modern life, and to renew our spiritual relationship with our beautiful forests and animals—the 'beautiful people'. Let us enjoy their company and not disturb them unduly in our over-enthusiasm to get 'great' pictures. Let us make it a sport and not introduce unwanted pressures, interferences and cause unnatural 'conditioning' on animals that may unduly modify their normal lives.

Let our tribe of wildlife photographers increase. More wildlife and camera enthusiasts would mean more concerned people championing the cause of wildlife preservation, and augur well for the safe future of our sanctuaries, national parks and our wildlife. Perhaps even for the future welfare of man himself.

Tuskers greeting (f 4 at 1/60th of a second)
Photo: T.N.A. Perumal



An adult tiger can carry—not drag—a 500 kg buffalo up a steep, rocky incline. This 150 kg sambar doe is obviously no problem. The tigress makes her kill in a *nullah*, then drags it (top) across the track (above) into denser cover. Left—screened by a *Carissa* bush, she watches the author watching her.

SHAHID ALI

RANTHAMBHORE

Nature's balance in a changing ecosystem

SHAHID ALI

The abrupt metallic alarm call of a sambar, immediately followed by a long drawn strangled sound, snapped our attention towards a dry stream bed. Manoeuvring my jeep over jagged rocks and through the tall yellowing grass, I tracked the now subsiding bellows to a portion of the dry *nullah*: 150 metres away stood the Bakola tigress (named after the stream bed in which she was now standing), astride an adult sambar doe she had just brought down. Blood still dripped from her canines, and she was panting, tongue hanging out, after her exertions during the energy-intensive ambush.

We reckoned she would drag her kill to the closest thicket in the proximity of water. Judging from the lay of the land, a clump of bushes next to some standing water 200 metres away down a perpendicular jeep track, seemed ideal. We cautiously moved to this track, carefully scanning the gaps between clumps of grass and some large boulders to catch any movement we could; no luck.

We drove on, eyes peeled. If we had read the situation correctly, we would get a closer glimpse as she crossed the track separating the relatively open tall-grass vegetation in the river bed from the denser deciduous woodland where we expected she would eat her fill and then lie up for the rest of the day.

Five minutes later, in a largely despondent state of mind, we came round a shallow bend in the track, and it was with utter disbelief and a thundering heart that I jammed on the brakes— at the very instant that we rounded the bend, the tigress had walked out on the track, not six metres in front of the jeep. She was holding the limp sambar in her mouth as effortlessly as if it were a large clumsy rag! Letting her move a few metres ahead, Colli (a German conservationist-photographer friend who was having a hard time keeping his exclamations to himself!) and I followed this magnificent tigress. Apart from an occasional disdainful look when she stopped to adjust her grip, she did not show the slightest resentment at our presence.

After 15 minutes or so, without a break in her step —this terrain she knew as intimately as her paws— she walked through a small parting in a large thicket. By the sound of the dry leaves on which the sambar's hind feet dragged, and occasional glimpses of the tigress through breaks in the vegetation we continued to track her, walking parallel to, and about five metres off the track.

About 50 metres later, sound and sight of her suddenly ceased. We listened and peered for several minutes, straining our every sense, with a growing uneasy feeling of being watched, baffled at how a creature so large, and so close, could suddenly vanish. Exhilarated, but still more than a little puzzled, I turned the jeep around and

started driving slowly back, still peering through the bushes. A few metres beyond the point where we had lost her, my senses were again jolted by the peculiar combination of awe and fear that is invariably associated with an unexpected tiger sighting.

Behind the thorny screen of a *Carissa* bush, and not two metres from where we sat in the open jeep, stood the tigress, more forceful and majestic than ever, one large, bright yellow eye peering motionless back at us, framed within the criss-cross network of the thorny bush. A few seconds of watching transfixed, a quickly taken photograph, and we knew that nature, 'red in tooth and claw', had provided us a generous glimpse into one of her most secretly performed acts by the most secretive of its actors, the tiger: a predator-prey interaction at the apex of the food chain.

I have visited Ranthambhore several times after this incident in March '87, and find it of immense value to perceive the experience as the basis for understanding this unique south Rajasthani ecosystem. The forests of Ranthambhore National Park, and many square kilometres besides, were formerly the private hunting preserve of the erstwhile ruling family of Jaipur. Many are the fabled records of tiger, bear, leopard and other big game shikars that were arranged, using elephants both to transport the hunters in style and to flush game.



Though tigers will take a variety of prey, sambar are often the first choice. Scars on the shoulder are evidence of an unsuccessful tiger attack

SHAHID ALI

Sher Jung, who arranged many of these hunts, vividly sketches these extravaganzas in his book, 'Rambling in Tigerland': a mini bazar would spring up around Jogi Mahal; merchants would set up temporary shops under a huge *shamiana* to cater to the fancies of the princely hunters and their guests. Scouts would be



Normally found in drier areas, small numbers of chinkara are found in Ranthambhore. SHAHID ALI

despatched on elephant back and on foot to locate game, and meanwhile the guests would take their leisure, or play croquet on the immaculate palace lawns.

Today, Ranthambhore stands as one of the few reminders of what a large part of central India must have been like, not a hundred years ago. If our goal is to keep it that way, we must attempt to understand and continually monitor the ecological processes that keep it ticking, both in time and space.

My first sight of the dry deciduous forest of the Ranthambhore National Park was in the dry season. Driving through the massive stone wall that once guarded the 11th century fort which still commands a vulture's-eye view of the reserve, I was immediately struck by the thought that *this* dry scrubby forest certainly did not look like the typical tiger habitat one sees in most other tiger reserves in north and central India. These are typically characterised by lush bamboo thickets in a generally much wetter forest type, interspersed with streams and ponds with a year-round, well distributed water supply. But perhaps there was a common denominator, a suite of basic elements in the environment which, if represented in the right proportion relative to one another, would prove adequate for an animal as highly adaptable as the tiger.

Food and cover could almost be considered two sides of the same coin; the type and distribution of the prey base determines such essential elements in the life history of their predators as the most effective hunting strategy, and social organisation — i.e. how many and what age and sex classes of the animal would most efficiently exploit the given prey, distributed in a particular manner. This matrix is of course determined by cover, and the density, height and other characteristics of the constituent vegetation.



A tigress and her family —tigers in Ranthambhore have been observed to sustain kinship links for unusually long periods.

VALMIK THAPAR/FATEHSINGH RATHORE/SANCTUARY

It is worth pausing to consider that plants themselves are prey to the multitude of herbivores that feed on them, and as such have evolved ingenious strategies ranging from simple mechanical barriers like thorns and a thickened bark in trees, to the production of complex chemical compounds in a highly seasonal cycle.

In an evolutionary sense these strategies of plants are not very different, and serve exactly the same function as say, the alarm call of deer. Plants, by deploying their own set of strategies for survival, actively determine the time and place where a given complement of the tigers' prey is likely to be. Moreover, by determining such basic ecological parameters of an area as biomass (the weight in kilograms of a particular species in unit area) and density of herbivores, plants are primary determinants of the *carrying capacity* of a given area.

Cheetal, sambar, wild boar, langur, and occasionally females and fawns of the nilgai distributed around the three major lakes in Ranthambhore provide an abundant food base for their major predator, the tiger, and a variety of ways in which to procure its prey. One innovative hunting strategy was pioneered by

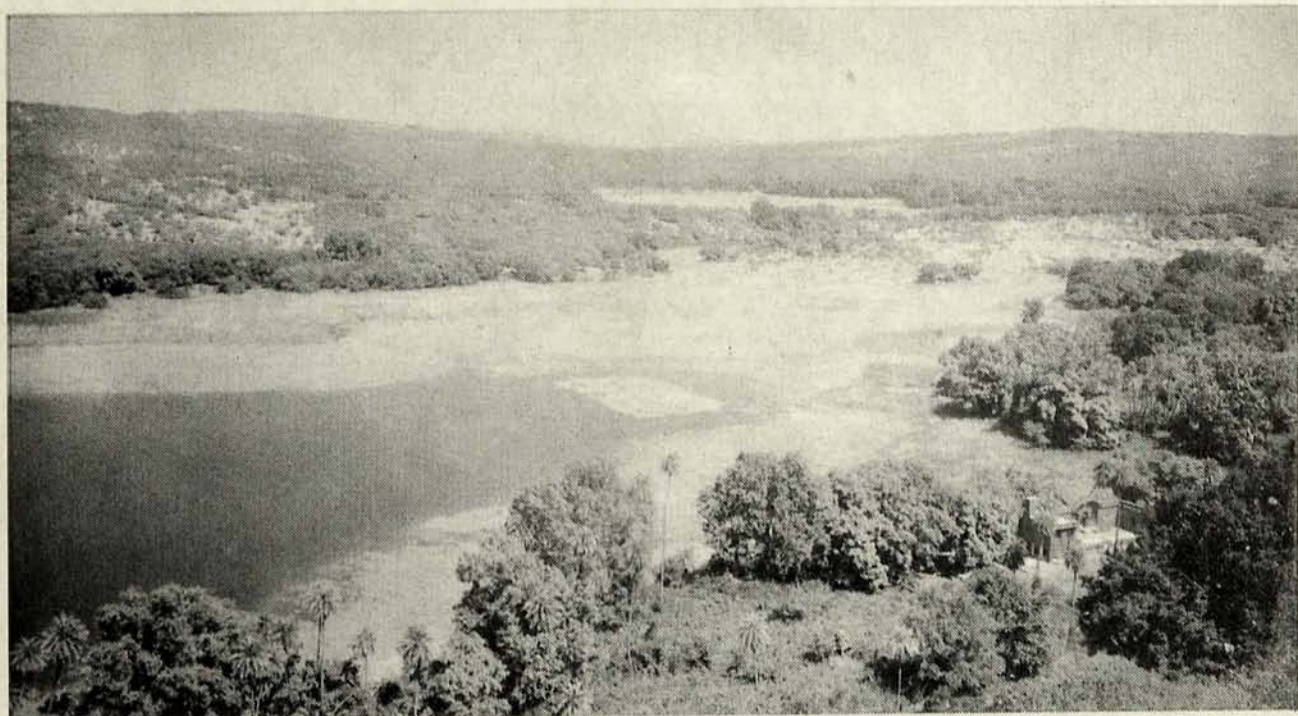


A tiger (partly hidden by the spray) charges into the lake, scattering a sambar herd, then singles out an individual for pursuit.

VALMIK THAPAR/FATEHSINGH RATHORE/SANCTUARY

individually known male tigers in the lake area during the early 1970s. They would charge into a lake where sambar would be feeding on aquatic vegetation, frightening and confusing these animals so that individuals scattered in different directions, isolated from the protection of the herd and thus becoming very vulnerable to attack. Some spectacular charges were seen in broad daylight from the enchanting verandah of Jogi Mahal, the forest rest house located on the shores of Padam Talav, one of the two perennial lakes. While this hunting strategy has not been seen for some years now, variations of it have been manifested by many of the progeny, and the resident females that associated in the past with some of these pioneering males.

The charged atmosphere on the shores of the Ranthambhore lakes particularly at dusk, and the tension among the animals feeding, is an indicator of how well predators and prey have, in a remarkably short span of two decades, adapted to the nuances of the present conditions. As recently as 1979, five years after Ranthambhore came under the protection of Project Tiger, there were still remnants of human settlements within the 400 sq. km area of the park. The park authorities sought, with skilful management and continuous



Ranthambhore's mosaic of grassy patches, dense woodland and open water supports a diverse prey base for the tiger.

SHAHID ALI

monitoring of the behaviour and numbers of both tigers and their prey, to strike an optimal balance between the needs of the human population and the desire to allow the ecosystem, left to itself, to respond to the changes, driven by the forces of competition and predation. This, in its truest sense, was the mandate of Project Tiger.

One of the management's most challenging tasks was to relocate the 16 villages that lay within the park, and whose livestock competed with wild ungulates for food and threatened them constantly with disease. This was finally accomplished in 1980, with the villagers being compensated for the loss of their ancestral lands by large areas of cultivable land, and social amenities like schools and dispensaries.

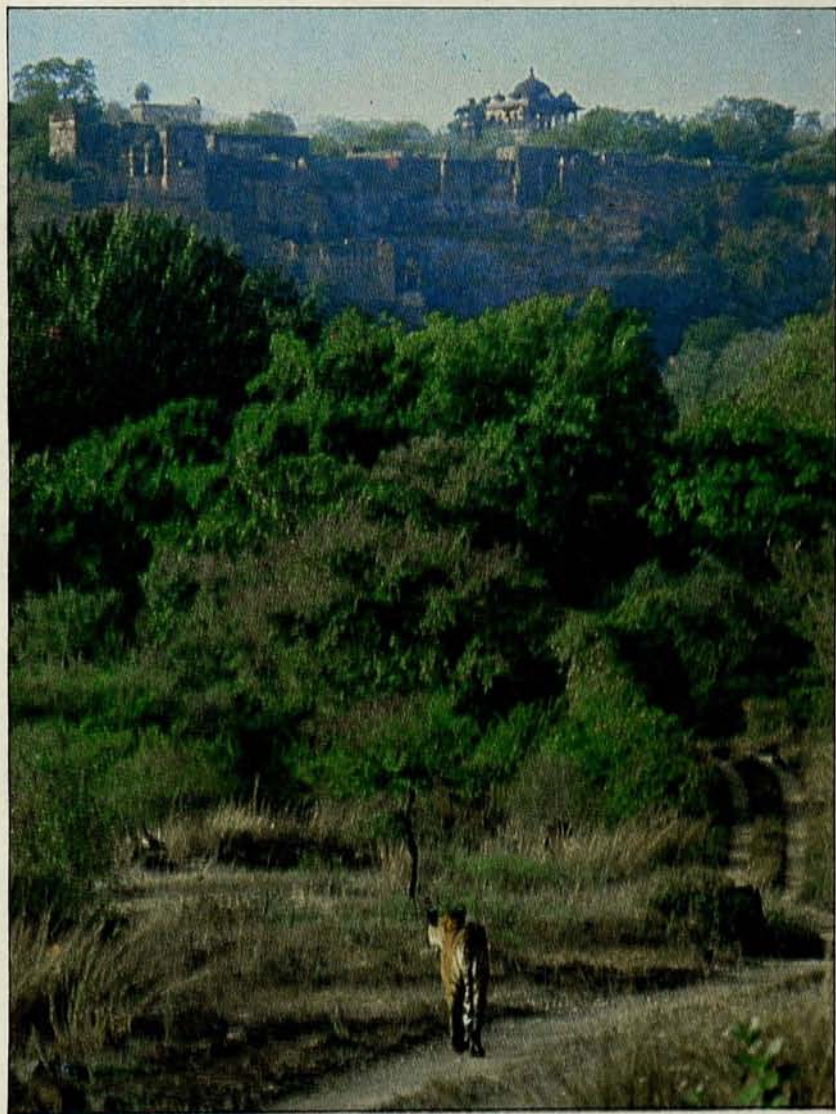
With the decreasing human presence within the park, tigers and their prey began moving into the areas abandoned by the villagers, as documented through careful and prolonged observation (and breathtaking photographs) by Valmik Thapar and Fatehsingh Rathore, in their two books on Ranthambhore. Both predators and prey responded to the changes in the environment by increasing their reproductive output—tigers increased from 14 to 40 in fifteen years. Other pronounced adaptive changes included the increasing tendency of tigers in this area to be diurnal in most of their activities, including hunting, eating and mating. If we are to keep our fingers on the pulse of the park, we must understand, and continuously monitor, these changes. Techniques like telemetry and modern censusing methods that incorporate many aspects of an animal's natural history, are now available, and could be put to good use. So too can concepts like biomass and carrying capacity, which are relatively easy to measure — and critical to a better understanding of this complex

web of adaptation.

Increased tiger sightings in broad daylight have resulted in the inevitable—an influx of tourists in noisy jeeps, all wanting an audience with this beast of fabled powers. The network of jeepable roads was carefully planned a decade ago, so as to make inaccessible large areas of prime habitat. Here the fauna could live their intricately interconnected lives away from human disturbance. But the mounting tourist pressure (promotion of tourism in the park is geared mainly towards providing tiger sightings to visitors) is bound to take its toll.

It cannot be overemphasised that the behaviour of a predator like the tiger is the product of a multitude of environmental factors that make it imperative for it to be as secretive as possible. Tiger sightings in Ranthambhore are already more frequent than have ever been recorded in the wild. Creating an environment (and this includes the schedule and activities of tourists) where the tiger is forced to become still more visible is tantamount to reducing the species' behavioural responses to those of a semi-captive, completely unnatural population. This, surely, is an undesirable situation, and against the ethics of our national park system.

The need then is to emphasise the idea of a holistic environment—one in which the tiger, and other predators like it, are at the apex of a pyramidal food chain, in which every healthy glade of grass, the browse of forest vegetation, and all the animals that compete with each other, while preying and being preyed upon, are vital links. The chain *cannot* exist without its individual links.



The uses of history—tigers use parts of the fort as vantage points and day shelters.

VALMIK THAPAR/FATEHSINGH RATHORE/SANCTUARY

NEWS NOTES COMMENTS

Brown bears

The brown bear *Ursus arctos* was once fairly common in the islands of Japan. Today the species survives only in part of the Hokkaido island in northern Japan, and the population is declining fast.

The native Ainu tribe, who ruled Hokkaido until 1869, believed that the brown bear was the reincarnation of god, and performed ritual ceremonies centred on the bear. In the last 100 years, colonization, growth in human population (now 5.7 million) and development have severely eroded the bear's habitat.

Bear populations, according to researchers from the Historical Museum of Hokkaido, have dropped from 4500-5000 a century ago to below 2000 today. Hunting is an additional problem. The bear is considered a harmful animal because it damages crops (particularly corn and beet), and occasionally attacks cattle and horses. It is not even officially protected. Between 1978 and 1988, 2080 bears were hunted and killed, and 155 more last year.

Unless parts of the remaining forest in Hokkaido are set aside as a sanctuary for the species, further development of the area might mean that the holy bears of Hokkaido would, in the not too distant future, be found only in zoos.

Too many tigers?

The populations of the Amur or Siberian tiger (*Panthera tigris altaica*)

in the Soviet Far East has increased to about 430 individuals from a low of 30, after hunting was banned in the 1940s. Soviet biologists are concerned that this increase is affecting other species. Wild boar, the tiger's major prey, are already declining because of forest fires and logging. A balanced tiger/prey population would need an estimated 300,000 prey animals for 430 tigers; only about one-fifth of that number exist. The tigers are likely to turn to hunting domestic animals as a result. Soviet biologists believe that it is practical to preserve only 200-250 tigers and that some female tigers and cubs will have to be removed, mainly from unprotected areas.

Vanishing otters

The otter *Lutra lutra* has now been declared extinct in Switzerland, according to the IUCN's Otter Specialist Group. A reintroduction programme in 1975 had failed, and in 1989 there was only one free-living individual in the country. Good habitat still exists in several places. The only possible explanation seems to be pollution—trout in the best otter habitat show levels of PCBs well above the levels known to affect otters.

Elsewhere in Europe, the future of the species is somewhat less bleak. A recovery programme is under way in the Netherlands, involving habitat protection, restoration and management, con-



Indian otters are relatively better placed than those in Europe

ASAD RAHMANI

trol of pollutants and the promotion of the use of stop-guides in eel traps. In Friesland, one of the core areas for otters, the government has already financed a restoration project. Others are planned, as are reintroduction programmes when water quality has been improved.

Reptile skin trade

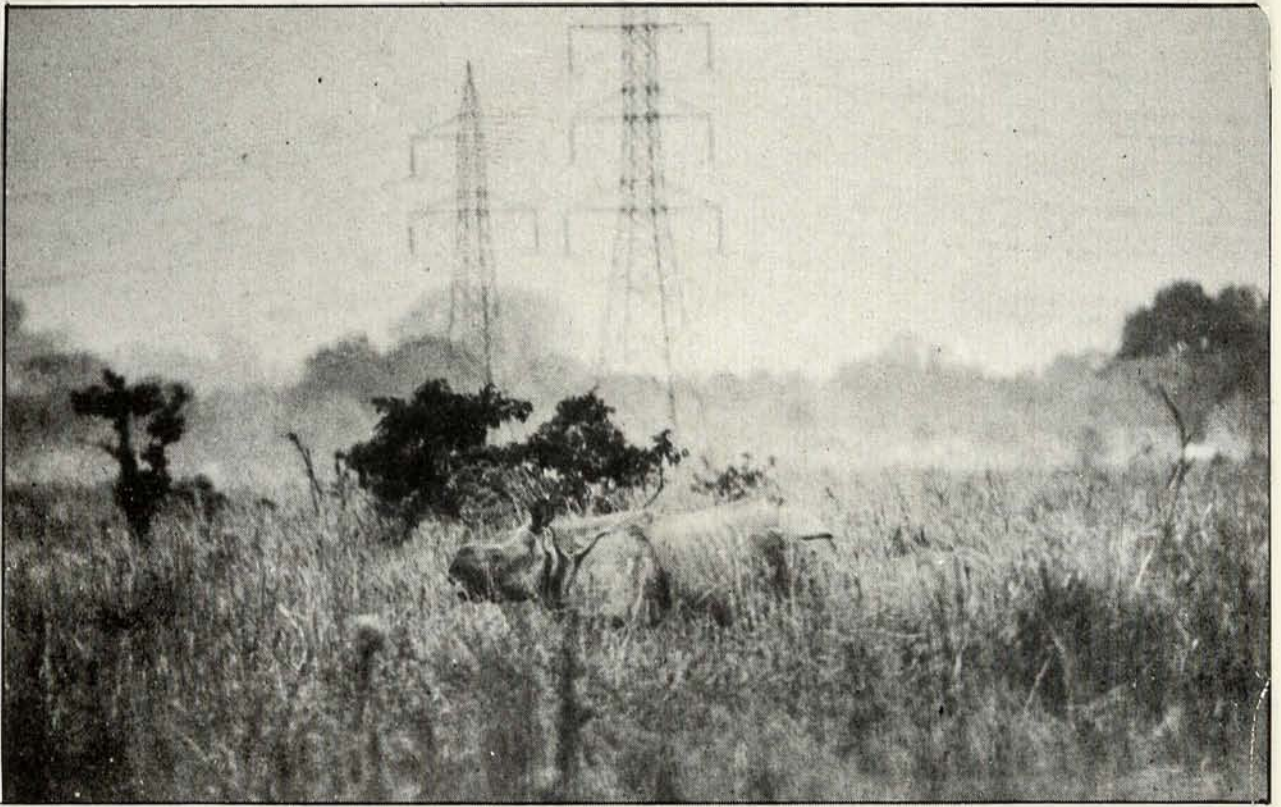
In 1986, the Government of India, on the recommendation of the Indian Board for Wildlife, amended the Wildlife Protection Act to abolish the skin business in certain species of reptiles. Taxidermists and dealers in reptile skins filed a writ petition in the Madras High Court challenging the amendment, because their licenses were invalidated, and their stocks of snake skins confiscated without any compensation. The government held that the amendment was constitutionally sus-

tainable because it sought to carry out a directive principle of state policy, namely the protection of wildlife.

Fortunately, the court agreed; in early November the petition was dismissed. While this by itself is no guarantee that the trade will stop, a clear-cut directive from the court will go a long way towards bringing errant dealers to book. Unless the dealers feel, as they probably will, that there is always the Supreme Court.

Remembering a genius

Few men have been as instrumental in the field of conservation as was the late Dr Salim Ali. His 94th birth anniversary was celebrated at the BNHS on the 12th of November. A quiz on the Forest and Wildlife Protection Act was organised on the occasion in order to help increase public awareness about the problems faced by our wildlife and



A grisly new method of poaching

GOUTAM NARAYAN

natural areas. At the function, a resolution was also passed regarding the conservation action needed to preserve India's swiftlets.

The resolution stated "...that the Swifts and Swallows do not appear in any schedule of the Indian Wildlife Protection Act (1972); and realizing the importance of the preservation of these species, particularly the Edible-nest Swiftlets of the genus *Collacalia*, especially those from the Andaman and Nicobar islands whose nests have been exported in large numbers, this meeting strongly recommends that the concerned authorities should take immediate steps to accord necessary protection to them under the Wildlife Protection (1972) Act."

Shocking news on rhinos

With rhino horn costing Rs. 10 lakhs per kilogram in some export markets

(Taiwan, for example), poaching continues to be rife. A shocking new addition to the poachers' bag of tricks is the high-tension wire. 11,000 volt power cables are strung across rhino tracks and the animals, unable to see them in the thick foliage, blunder into the cables. At least seven rhinos fell victim to this method this year, and the unofficial toll may be far higher.

The Assam forest department (the state's sanctuaries hold 80% of the world's one-horned rhinos) has cleared the undergrowth near electric pylons and stepped up night patrolling. But with a woefully understaffed anti-poaching squad, the added danger of the guards themselves being electrocuted during night-time patrols, large-scale forest encroachment and political uncertainties to boot, Assamese wildlife authorities will have their hands full.

Antarctic conservation

The vast stretches of the Antarctic represent the world's last unspoiled natural habitat. In addition to harbouring a large number of plant and animal species, many of them endemic, the Antarctic ecosystem—both the land and the oceanic waters around it—functions, in ways that scientists are still trying to understand, as a regulatory mechanism for maintaining the earth's climatic cycles.

Many of the world's governments have staked a claim to the vast reserves of minerals, oil and natural gas that lie beneath the ice, and conservationists fear that this wilderness will soon be overrun. It is unlikely that commercial exploitation of the area's natural resources, no matter how carefully regulated, will allow local species to survive without extensive modification of behavioural patterns and almost inevitably a sharp decline in populations. Perhaps the only answer is a complete ban on commercial activity (even research stations have done their bit towards despoiling the environment).

In October 1989, at the Antarctic Treaty Consultative meeting, the Australian and French governments had jointly proposed a comprehensive environment protection convention which envisaged the protection of the whole of the Antarctic as a natural reserve, with a total ban on mining activities. At the UN General Assembly in early December 1990, member nations were called upon to nominate their Antarctic territories, including sub-Antarctic islands, for listing as World Heritage

sites.

The political nature of the problem will require a great deal of maneuvering, as well as an intensive conservation education programme, to overcome. Countries with a stake in the economic development of the continent may not lightly surrender it. There are other difficulties too—how the region would be administered, were it to be declared a natural reserve (essentially, property common to all nations); even the lack of quantified data on the effects that commercial activity will have on the world's environment. How successful we are in resolving these problems will determine whether the world's last large nearly virgin natural area will remain so, or go the way of once magnificent wildlife habitats around the world.

Mediterranean mayhem

Pollution in the Mediterranean sea is ravaging populations of the striped dolphin. Dead dolphins, victims of pneumonia and liver damage, began washing up on Spanish beaches in August. The toll has risen to 250 in the past three months. In France, where about 50 are washed ashore every year, 50 were discovered during a two week period. The actual toll may be far higher, since only a few of the dead animals may have been swept onto the beaches.

The source of the infection was a strain of morbilli, the same type of virus that killed 20,000 seals in the North Sea in 1988. While viral epidemics do occur in nature, this outbreak is believed to have been aggravated by severe water pollution. The tissues of the dead dol-

phins were found to contain high levels of metals and toxic PCPs, which weaken the animals' immune systems, making them more vulnerable to natural diseases.

In 1988, nearly 10,000 dolphins off America's east coast fell victim to a bacterial infection that overwhelmed their pollution-damaged immune systems. The Mediterranean case is potentially more even serious, since it occurred during the main dolphin breeding season. The disease could also spread to other marine mammals such as monk seals, pilot and sperm whales. There is no known cure for the virus, and pollution levels in Mediterranean have reached such alarming levels that even drastic clean-up measures may be too little, too late.

Marine Biology Workshop

A four day workshop on marine life was organised under the Nature Education Scheme in November. Participants were given an insight into the richness of marine ecosystems, and their importance to mankind, with a combination of practical field demonstrations, lectures and films.

Some of the topics covered were seashells, marine birds and animals, the ecological role of estuaries, Indian fisheries, the history of oceanography and scuba diving. The response to the workshop was so enthusiastic that the Society is considering holding an advanced course in marine biology.

The last macaw

Conservationists are making a last

ditch effort to save the world's rarest bird, the Spix's macaw —only one individual survives in the wild—from trappers attempting to capture it for the live bird trade.

The lonely parrot, sought after because of its lustrous blue plumage, has paired up with a single blue-winged macaw, a quite different bird.

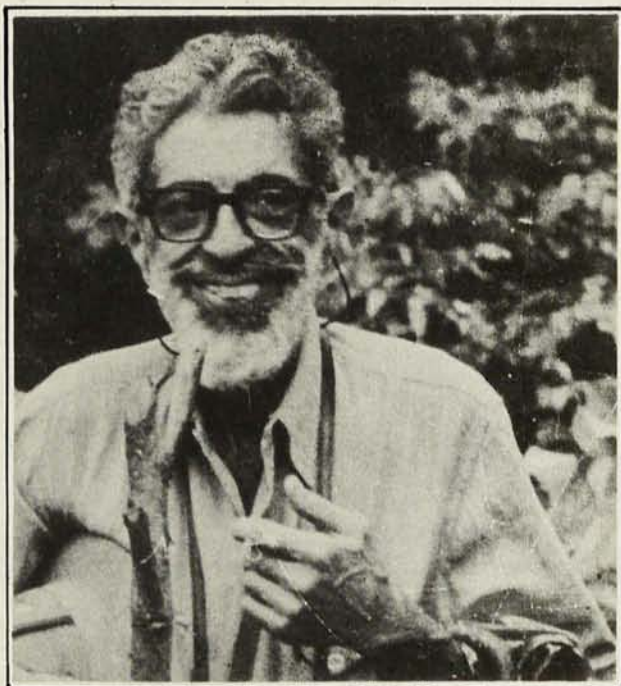
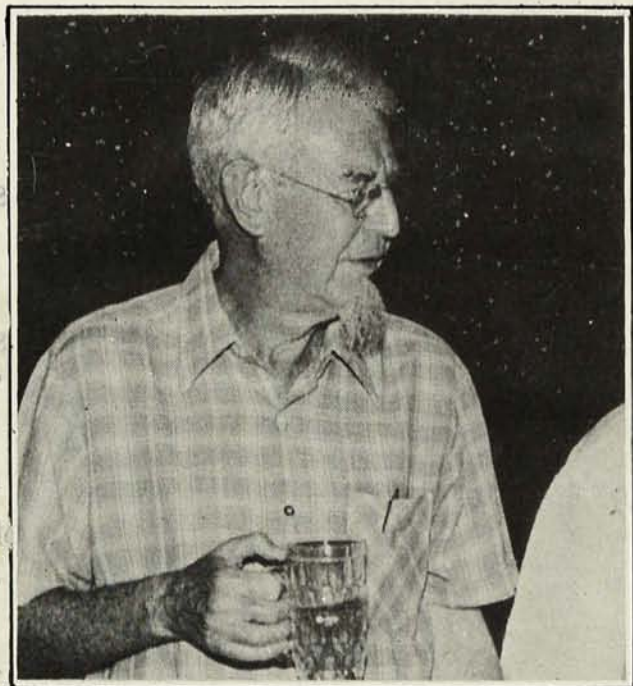
The news of the bird's plight was reported recently from a remote area of Brazil, by a party of Brazilian and British scientists on an ICBP-sponsored expedition. All remaining areas of suitable habitat were searched, but only a single bird was found.

The reason for the catastrophic decline of the Spix's macaw is the live bird trade. This species has been held in bird collections for many years, and astronomical prices paid by rich bird collectors (up to US\$ 58,000 for a single bird) have led to all but one of the parrots being trapped.

WWF-TRAFFIC and CITES have been working closely with Brazilian authorities in order to bring a few captive birds together for a breeding programme, but without result to date.

Eight birds are being held in captivity in the Sao Paulo Zoo as part of a breeding programme. Eight more have been found in captivity in Brazil, and others are being sought outside the country. South America's wildlife has suffered much at man's hands. If (or more likely when) the Spix's macaw passes into extinction, we can ponder at leisure on yet another example of the vandalism that we have perpetrated on the world's tropical rainforests.

OBITUARIES



Mr Ralph Hawkins (left), Mr Dinshaw Panday

The BNHS was saddened by the loss of two of its stalwarts, Mr Ralph E. Hawkins and Mr Dinshaw J. Panday, both former Vice Presidents of the Society. Mr Hawkins passed away on 13th October 1989, and Mr Panday on 4th February 1990. Both Mr. Hawkins and Mr. Panday were deeply involved with the Society's functioning for many decades and were devoted to the Society's well-being.

Mr Panday joined the BNHS in 1947 and served on the Executive Committee from 1952 to 1978, when he took over as Vice President of the Society. He retired from the post in December 1986. A keen amateur naturalist, he often accompanied Dr Salim Ali, members and staff on field trips.

Mr Hawkins' association with the Society goes back even earlier; he was a BNHS member from 1938 until his death. He was for many years, the General Manager of the Oxford Univer-

sity Press (OUP). After he retired from the OUP, he brought to bear his considerable skills in publishing and his vast experience, on developing the Society's publications. He was Chairman of the Society's Publications Sub-Committee for many years; producing and editing the monumental 'Encyclopedia of Indian Natural History' was just one of his many contributions to the Society's efforts to popularize natural history through its publications. Mr Hawkins' hallmark was an uncompromising commitment to quality and accuracy. He was also Chairperson of the Salim Ali Loke Wan Tho Ornithological Research Sub-Committee for many years.

Mr Panday and Mr Hawkins embodied the finest traditions of selfless service to the Society. Their modesty, their integrity of purpose and their devotion to the Society was both an inspiration and a model for others.

FOLKLORE *By J.S. Serrao*

Why do owls hide by day? The answer goes back to those once-upon-a-time tales. The owl, it is said (it would have been more correct to say the ancestor of our various species of owls), was thrown upon bad days, and could not keep body and feather together. So it went to all its avian friends with its tale of woe, seeking solace.

The friends were helpful, and parted with some of their feathers to clothe the distressed owl. (That accounts for the motley collection of feathers that its descendants now wear.) And to all his benefactors the owl made the solemn promise to return their feathers once its days took a turn for the better. However,

once it luck turned, the owl forgot its promise. Its creditors, on the other hand, did not, and would confront it every now and then to demand their feathers back.

The owl kept putting them off on one pretext or another. Finally, tired of the constant demands for repayment, it decided that the only way out was to hide from its creditors. It selected a hole in a tree and crawled inside. And that is why its progeny, the owls of today, hole up in some dark cranny during the day, emerging only when troublesome creditors are safely in bed.



Hornbill publishes features on any aspect of natural history or environmental conservation; accounts of their work by field biologists are particularly welcome.

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