

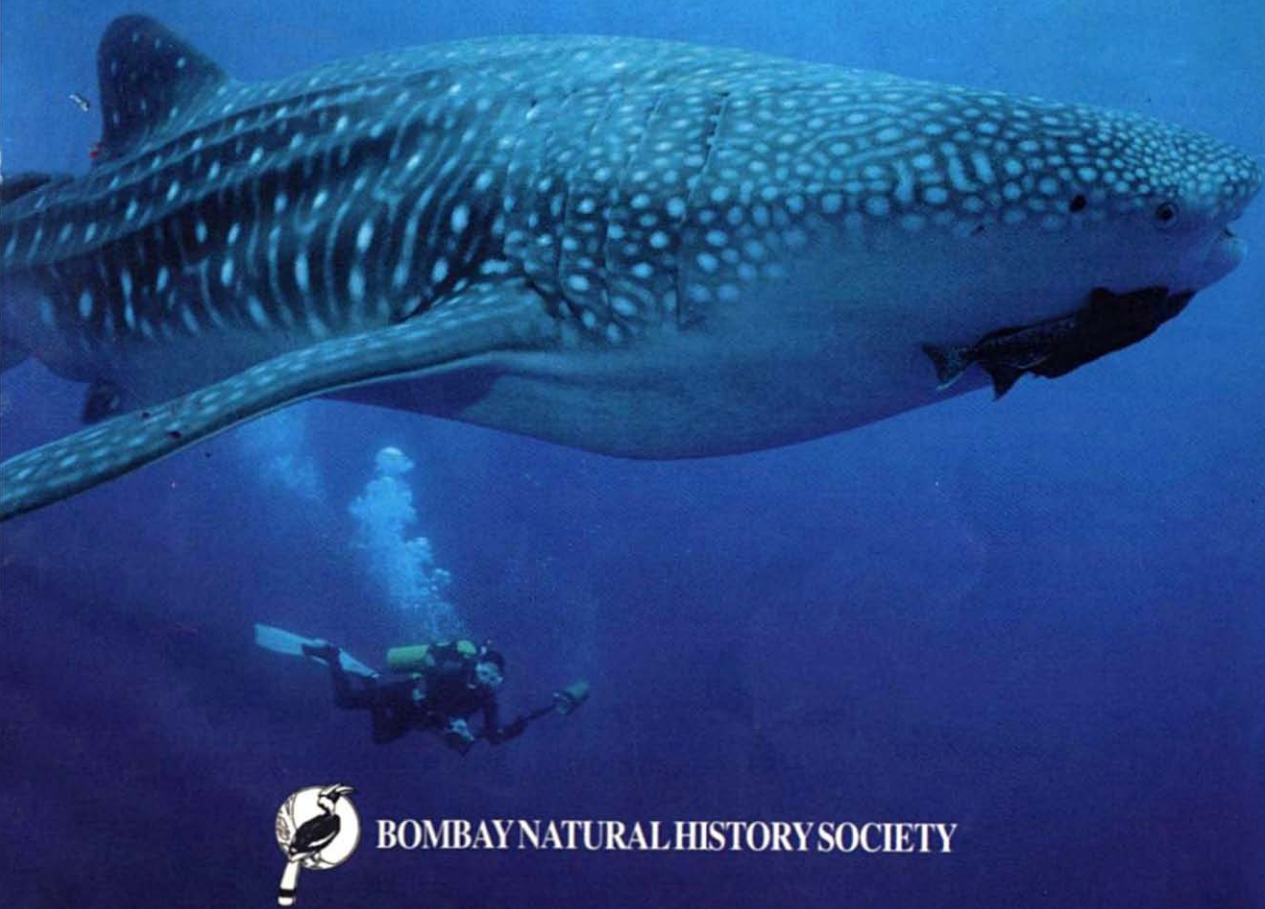
# HORNBILL

ABOUT NATURE AND US

January-March, 2002

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29/5/02



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Whale Shark

Phillip Colla

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by S.H. Prater

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## A bird in the hand

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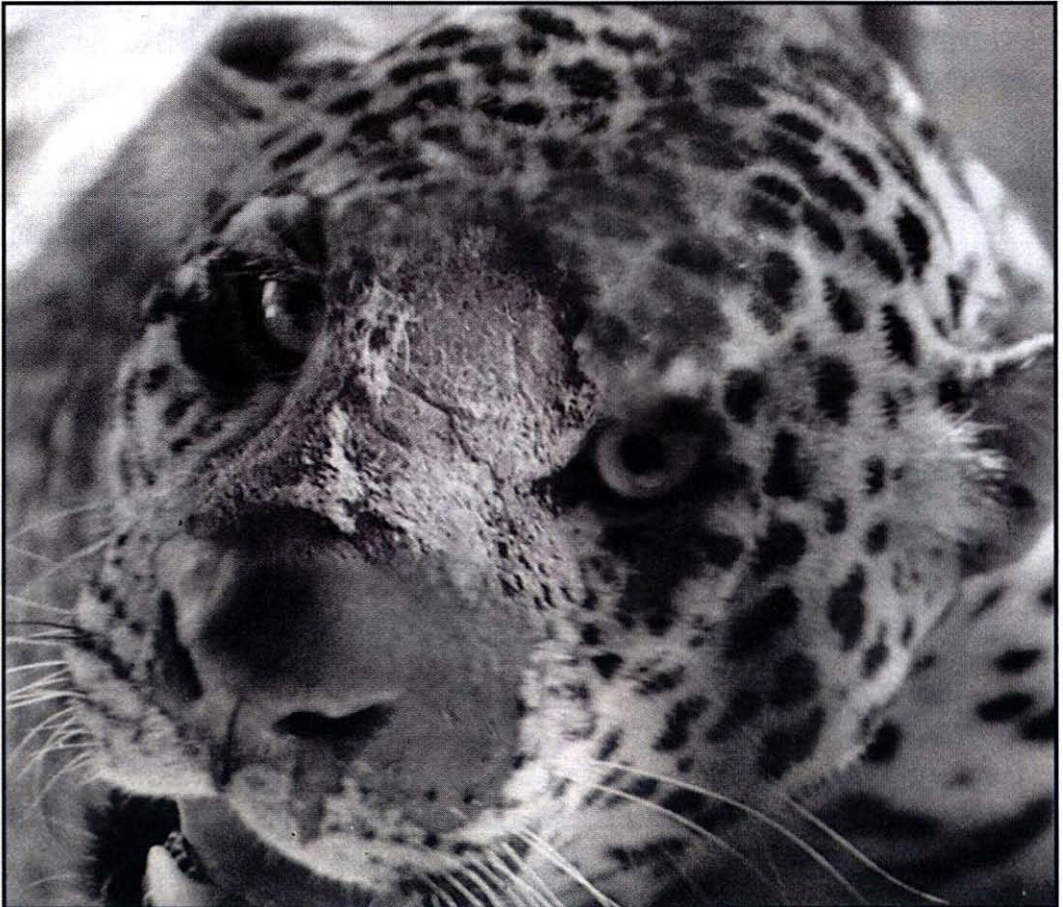
by *Sachin Ranade*

Rubies, emeralds, topaz in the wild! Yes, these precious stones are scattered all around; all that we need is some time to stand and stare at these little jewels — tortoise beetles — that we miss when we look at the more obvious wonders of nature around us.

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VIEW POINT



MICHAEL RODRIGUES / Courtesy: The Times of India

# Crime and Punishment

*Spirit of Night!*

*Out of the misty eastern cave  
where, all the long and lone daylight,  
Thou wovest dreams of joy and fear,  
which make thee terrible —*

— P.B. Shelley

**WHOSE CRIME?** Surely of the governments which permitted people to continue to live in misery in the Core Area of the Park. Undeserved, and terrible punishment for the people who lost their children and for the leopards, that lost their liberty, caught in traps and battering their heads on the unpadded bars, trying to get at their tormentors. The two leopards trapped in the core area of the Sanjay Gandhi National Park, Mumbai are prime examples of areas “where beasts with man divided empire claim.”

Yet, with some forethought and determination, the tragedy of children being killed could have been avoided. The callous culprit is the government, which permits people to live in primitive conditions without protection within wildlife’s limited domain. What happens to the leopards? How do you establish that they are the culprits. Has scat analysis or DNA analysis been done? Surely, if they are the culprits, they cannot be released ever. Shifting the danger elsewhere is not a remedy.

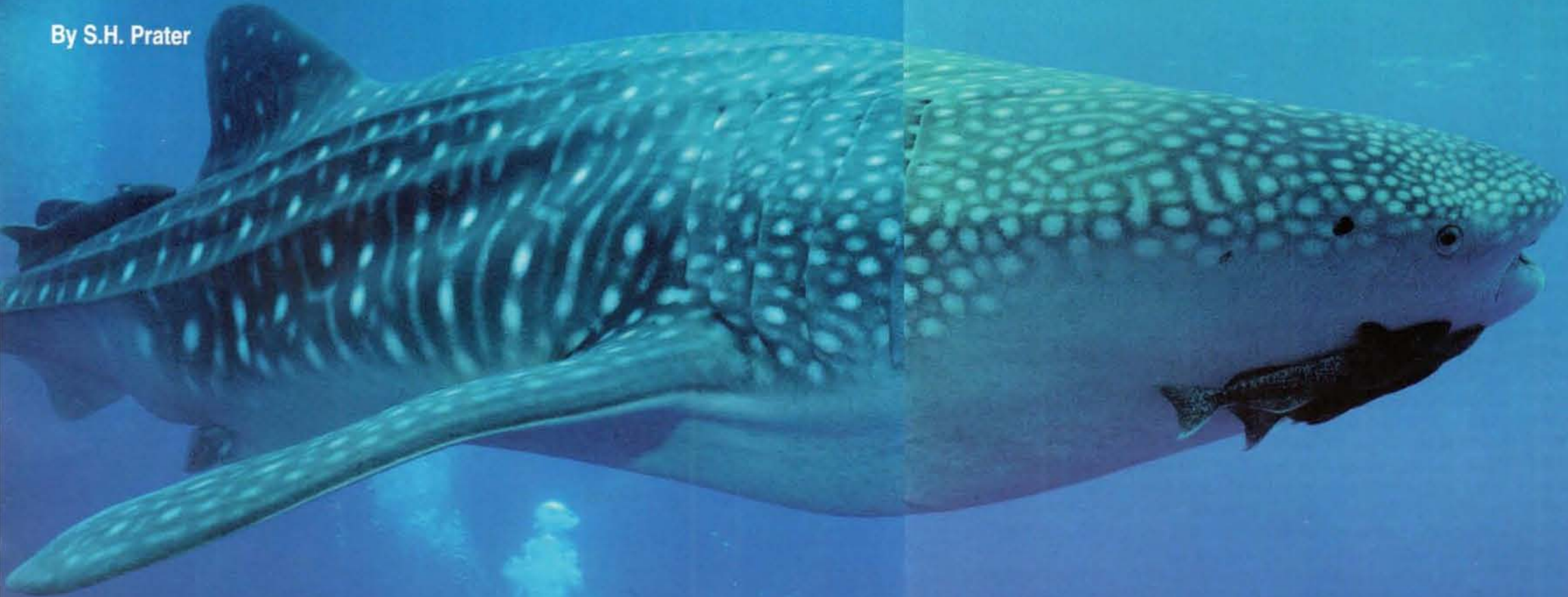


J.C. DANIEL

# The Gentle Giant

By S.H. Prater

PHILIP COLLA



Stanley Henry Prater, whose name was almost synonymous with the Bombay Natural History Society for nearly a quarter of a century before his retirement in 1948, was born in the Nilgiris (South India) and educated at Bombay. Prater joined the Society's services in 1907 and was appointed Curator in 1923. Prater had the rare capacity of picking out the essentials of anything he read and presenting it in simple jargon-free language for the layman. Prater's period of service was one of outstanding progress by the Society.

Philip Colla is a photographer and natural history writer. He has visited many spectacular underwater settings and encountered a variety of threatened and endangered species in the ocean. Mr. Colla's photograph of a mother and a calf blue whale was highly commended in the BG Wildlife Photographer of the Year Contest.

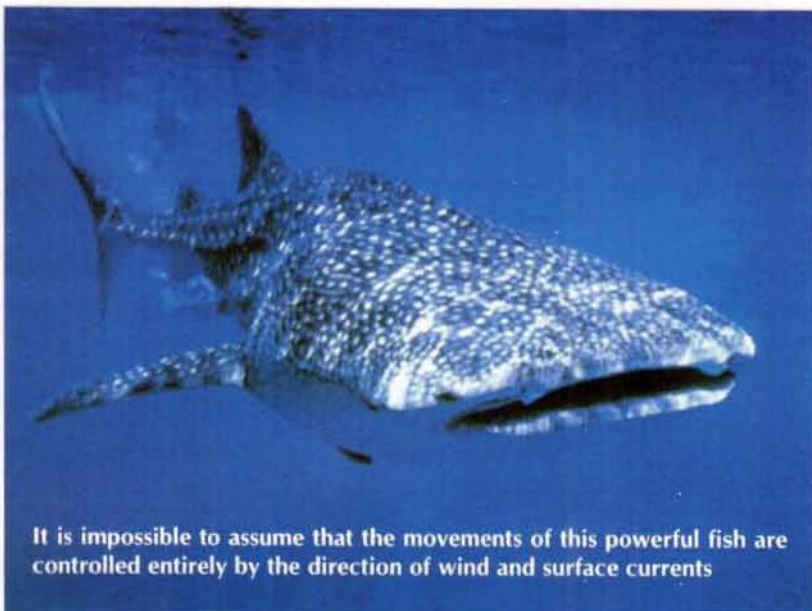
Remoras or sucker fish are commonly known to attach themselves to sharks and other marine animals, or even to floating objects. They do not attach themselves solely to the external surface of the fish, but are often found in the mouth or under the gill covers. With the whale shark, the interior of the mouth is a common place of attachment. There are records of the finding of several remoras adhering to the inside of the mouth of a whale shark taken in the Gulf of Panama. The whale sharks' habit of feeding open mouthed give the remoras an opportunity of freely leaving and returning to their cavernous perch. Remoras in their association with whale sharks obtain comfortable carriage to feeding grounds where there is always an abundance of small fish to prey upon. That they sometimes pay for their temerity in selecting the mouth of the giant as a place of attachment is shown in the finding of a remora in the stomach of a whale shark taken off the coast of Japan. The fish was probably inadvertently swallowed by its 'host'.

## THE WHALE SHARK

(*Rhincodon typus*), the largest existing shark, grows to a length of over 50 ft. It ranges through the tropical and subtropical waters of the Pacific, Indian and Atlantic Oceans.

A study of the occurrence of whale sharks in various parts of the world reveals an interesting fact. These sharks have been observed all the year round only in the island-studded seas of archipelagoes, where alone they are known to be permanently resident. In the Pacific, there are three centres in which whale sharks are known to occur all the year round. These are the East Indian Archipelago, the Philippine Archipelago, and the Islands at the mouth of the Bay of California. In the Indian Ocean, there is but one such area—the Seychelles Archipelago. In the Atlantic—the island studded seas of the Caribbean and the Gulf of Florida are the only areas where these sharks are recorded as being permanently resident. We can then look upon these island seas as productive centres of distribution; centres from which a certain number of whale sharks, driven by exigencies of food supply or other causes, migrate regularly or irregularly into waters where food is plentiful, aided in their migration by favourable currents flowing outward from these sheltered seas.

On October 3, 1936, a whale shark, caught in the



It is impossible to assume that the movements of this powerful fish are controlled entirely by the direction of wind and surface currents

fishing nets near Jaygad, Ratnagiri, about 100 miles south of Bombay, was brought ashore by the fishermen. Mr. P.K. Gogote, the local correspondent of *The Times of India*, sent a photograph of the fish to the paper with a note saying that the fish was over 20 ft in length. The special feature of this fish was that it could not be cut, i.e. the cut effected showed no trace owing to the rejoining of the skin. Owing to the elasticity of the skin and the deep underlying layers of fat, any incisions made in the body of this fish rapidly close up and leave little or no trace. The unexpected result so impressed the fisherfolk that they returned the fish to the sea rather than be held accountable for its life.

On Sunday, February 13, 1938, a whale shark, 21' 6" in length, was caught by fishermen 15 miles from Bombay. It had fouled their nets and was towed into Sassoon Dock, Bombay. I was informed of the capture of



Migration to waters where food supply is plentiful is at times inevitable for this huge fish

Courtesy: Australian Institute of Marine Science

© JAMES D. WAT

this fish by Dr. S.B. Setna, Fisheries Officer, Bombay. When we arrived at the dock a great crowd of people had already assembled round the shark, which had been dragged up the slip way. An enterprising coolly *mukadam* (overseer) had covered it with a tarpaulin and was now demanding a fee of 1 anna from all who desired to see the 'god' under the canvas. To impress doubters, preliminary homage had been paid to the deity, with a sprinkling of flowers and turmeric powder, and the burning of incense sticks. It is a common practice when whales or large fish are cast up upon our coasts or taken out of the sea. The derelict becomes '*massa dev*' the fish-god and receives homage from all believers to the material gain of the presiding genius.

The largest specimen obtained so far off Indian coasts measured 29 ft and the smallest about 13 ft. Captures of still smaller specimens are quite familiar to the fishermen. The whale shark is known to attain a length of 60 ft, this being the dimension of a specimen captured on the east coast of the Gulf of Siam. All examples taken or stranded on our coasts are, then, far from full-grown. The probable explanation is that the smaller sharks enter the shallower waters where they are more likely to be caught or stranded — most of the records from our coasts are the result of captures by fishermen, and fishing in our waters is largely limited to a zone a few miles from the coast. Such large specimens as have been observed on our coasts have been observed from ships at sea. There is the 40 ft specimen, which was run down by a steamer off the Ceylon coast and Captain Foley's observation of a monster, 'as big as a whale' which was seen from a ship approaching Madras. The larger whale sharks avoiding the shallower inshore waters run less risk of capture in fishing nets or of stranding.

Practically all the recorded occurrences of whale sharks in our coastal waters are from the West Coast of India and Ceylon. During the long period over which these records are extended, there are only three records from the East Coast and fourteen actual records from

the West Coast of India and Ceylon, exclusive of references to specimens seen in this area. The second fact, which emerges, is that practically all the records fall between the months of January and April.

It is impossible to assume that the movements of a powerful fish as the whale shark are controlled entirely by the direction of the wind and the surface currents. But knowing the nature of their food, and their peculiar feeding habits, one might say, that these sharks, like some other surface feeding fishes, sun fishes for example, in the calm weather which prevails in our seas during the north-east monsoon, float with the currents in order to follow more easily their drifting food. It is clear that a general convergence upon the coasts of India, from the surrounding seas, would not explain the peculiar and limited distribution of these fish on the coasts of India. The actual distribution of whale sharks on the coasts of India, the concordance of this distribution with the direction and flow of surface currents during the season when they appear, is clear evidence of the influence of current upon their movements. The direction of surface currents explains how these sharks, moving to us with the inflow of waters from the Pacific, converge upon the west coast of India and Ceylon; why they are so rare upon the east coast, and why they have never been recorded from the coasts of Burma and Tenasserim. The purpose of their migration is indicated in the abundance of their food in these waters at this season. It is a time of the year when these waters contain an abundance of zoo-plankton.

Between December and March, the offshore waters of India and Ceylon provide a super-



This gentle giant is indifferent to approach, thus becoming an easy target for hunters

Courtesy: The North Carolina Aquariums



## Trade in Whale Shark

AVAILABLE RECORDS from secondary sources indicate captures of whale shark along the Indian coast since the 1900s. The difference is that during earlier times the capture was accidental while now it is targeted. The fishermen interviewed in the Saurashtra coast of Gujarat revealed that whale sharks were hunted for liver as early as 1955-1960. During the mid-1970's, a small number of fishermen hunted it for its liver as well as fins, but by 1992-93 it was being hunted for almost all its parts.

Unpublished data by the Marine Products Export Development Authorities (MPEDA) reveals that in 1998-1999 revenue around Rs. 2,18,00,000/- (US\$4,84,444) and in 1999-2000 Rs. 3,09,00,000/- (US\$5,86,666) was

generated by the export of whale shark from Veraval in Gujarat alone (MPEDA presumes that all frozen shark meat exported out of India is from whale sharks).

The Wildlife (Protection) Act legislated in 1972 had not identified the whale shark for exclusive protection under this Act. The Govt. of India has, however, placed the whale shark on Schedule I of this Act in 2001, thus making it a completely protected species. Sharks in general grow slowly and mature late and hence take years to recover. One hopes that this timely action taken by the Govt. of India will bring an end to the exploitation of the whale shark population found in the Indian waters.

Source: Gentle Giants of the Sea,  
TRAFFIC-India / WWF-India, 2001


abundant harvest of animal organisms, which become the dominating element in the plankton. The abundance of this drifting food attracts to our coastal waters, during this season, numerous surface feeding fishes, such as devil rays, sail fish and, among them, whale sharks, whose appearance on our coasts between January and April coincides with this season of plenty.

It is now definitely known that the whale shark, like the basking shark, feeds on plankton, strained out of the water by its peculiar gill apparatus. In some sharks, fringe-like structures located on the pharyngeal walls are modified to form what are known as 'gill-rakers'. In the basking and whale shark, the gill-rakers are remarkably specialized to form a highly complex straining apparatus. They are closely set in a row on the inner cleft, leading to the gullet; they function effectively as a strain or sieve to food or water entering the alimentary tract. Their function is thus similar to the function of the long hair-like fringes on the baleen plates of the whale-bone whales, and as such they provide a striking example of parallelism — of the evolution of similar structures, designed to serve the same ends in totally unrelated groups of animals.

The manner of feeding of these great sharks is simple. The feeding habits of the whale shark are similar in every way to the feeding habits of the basking shark. Both sharks swim or float leisurely with the mass of drifting plankton, and with widely open mouth, take in great quantities of water, and with it, the myriads of floating organisms it contains. On closing of the mouth,

the water is forced out through the gill-clefts, leaving the food adhering to the inner walls of the gullet and to the sieve-like gill-rakers. Whale sharks derive their nourishment from minute crustacean and other animal forms, which form the dominating element in the plankton of our off-shore waters when these sharks visit our coasts.

Whale sharks reveal a certain variation in coloration, understandable in a fish of so wide a range. However, the data are too meagre to connect such variation with geographical distribution. But in reading the notes on coloration one is struck by the fact that in all the examples from the Central and Eastern Pacific and the Atlantic, the prevailing tone of the upper surface of the body is described by various observers as brown or some shade of brown. This coloration is noted in examples from Cape Inubo, Japan, the Gulf of Panama, the Gulf of California and in examples from Florida Bay. On the other hand, in colour descriptions of specimens taken in the Indian Ocean, the prevailing tone of the dorsal surface ranges from deep bluish-grey to lavender purple. The colour of the dorsal surface of the Bombay specimen agreed with description of the Cape of Good Hope example.

The whale shark is a peculiarly inoffensive creature. Its only reaction to attack is the effort to escape. Like the basking shark, the whale shark is apparently indifferent to the approach of a boat, thus offering every opportunity for its killing. 

For the original see JBNHS 1940, Vol. 42, pp. 255-279.

# A Bird in the hand



Common teal *Anas crecca*

TEXT AND PHOTOGRAPHS BY  
N. SHIVA KUMAR

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N. Shiva Kumar is a notable birdwatcher and a member of the Society. He is presently Manager, Corporate Communications at the Indian Oil Corporation Ltd.

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**B**ird watching is certainly a wonderful experience, and sometimes a bewildering one, if one encounters difficulty in identifying a bird accurately. The best part of bird watching is the fresh early morning breeze that adds an extra zip to the air, when a birder concentrates on waders that flock by the hundreds and thousands with the aid of his binoculars and telescopes. If using lenses is the norm, then seeing one right there in your hand is a completely different feeling. Thanks to the Bombay Natural History Society (BNHS), a bird-banding camp was finally conducted in the Delhi region. Bill Harvey and Suresh, our resident bird spotting specialists, have had great experiences bird banding at the Basai swamps, close to the Sultanpur Bird Sanctuary. Nik also sent in his report of the banding programme, and along with Pia managed to get permission for banding from the Forest officials.

Basai, located on the outskirts of Delhi, in the Gurgaon district, is a lush wetland created about ten years ago by waters overflowing from an open canal. Deep pools, tall stands of reeds, tiny plots of grass, small hump-shaped pathways, bog and peat at some places, large spreads of water hyacinth and paddy fields make up this wonderful wetland. Villagers from the surrounding area use this wetland for feeding their cattle and harvesting grass. In no way do they appear to be harming the thousands of birds that congregate here. Spread over 100 hectares, this birding paradise was discovered by Bill Harvey during one of his many trips to Sultanpur and the Bhindwas Sanctuary.

However, the man who made it all happen, the man with the magic hand, the ring-master, so to speak, was Dr. S. Balachandran of the BNHS and his able assistants Ali Hussain and Guru who took us on a five day voyage (September 7-12, 2001) of rediscovering birds up close, right in our hands. An experience of not just close encounters, but of touch and in certain cases olfactory sensation, where one feels these bundles of delicately designed feathers.

Delicate and dainty is the word for most birds that we caught in our mist-nets, placed at appropriate spots and carefully ringed with light weight metal strips that fitted perfectly like a wedding



A legend himself, Ali Hussain (black-crowned night-heron in hand) has helped Dr. Balachandran in several bird-banding programmes

ring around the birds' slim legs. Selecting and putting the right-sized ring is an art that does not come easy, as Bala demonstrated to us time and again. Each ring had a legend INFORM BOMBAY NATURAL HISTORY SOCIETY, an English alphabet identifying each size, where 'Z' is the smallest and 'L' is the largest, with a whole range between: 'A', 'AB', 'B' and so on, for legs of varying sizes, and the serial number of the ring. The choice and positioning of the ring varies from species to species. Bala with his experience of over twenty years is a rare professional who is devoted to his birds and the fine art of bird banding. We ringed 311 birds belonging to 42 species



The curlew sandpiper, a rare visitor to this inland wetland was among the many interesting birds that were caught and ringed during the camp

during our stay in the Basai camp (For a complete checklist of the birds banded, select the section on BASAI in [www.delhibird.org](http://www.delhibird.org) as reported by Bill, Suresh and Nik).

The first day saw us ringing ruff and reeve *Philomachus pugnax*, the unique migrating waders. The male ruff is almost double the size of the female. In his lecture session, Bill with the help of good sketches patiently described the duel between the males in the breeding season, and explained why the males are far fewer than the females in numbers. While the male is at 'war' the female eagerly watches and waits for the dominant male that she will finally choose to mate with. Polygamy is the norm in this species, which give birth to more females. Males in the breeding season look handsome with the special ruff that they grow around their neck. Unfortunately, we in India cannot see the male in this attire, as breeding takes place all along Europe and Asia, but not going very far north. The male and female groups arrive separately, and get together only when there is an urge to mate and procreate. In winter, they come in fairly large numbers to the Indian subcontinent, preferring the northern parts.

The other interesting bird that we caught and ringed was the curlew sandpiper *Calidris ferruginea*. Another was Temminck's stint *Calidris temminckii*, a tiny fellow who comes from the cold regions of the northern hemisphere. A pair of painted snipe *Rostratula benghalensis* (male and female) were caught and ringed at the same time and released. Their long bills and large eyes were interesting, while their quills, richly mottled with buff spots as if an artist had dabbed at them with a paintbrush, were bewitching. The hen is the superior sex, with rich chestnut coloration and larger size, but both the birds looked very beautiful. Streaked fantail-warbler *Cisticola juncidis*, a very tiny (10 cm from beak to tail tip), handsome resident, was caught and admired by all. After capturing it in a number of frames, we released it with a ring. Seven red-wattled lapwings *Vanellus indicus*, some juveniles and some adults, and the not so easy to find white-tailed lapwing were also in our bag. They were adorned with the rings and released. Even the common everyday bird, the red-wattled lapwing looked curious to me in the hand. The fleshy red wattle looks like red chewing gum



A delightful pair of painted snipe (male and female) was caught, ringed and released

stuck behind its beak and up on the forehead. Of what use it is to the bird, I can't say!

Two common teals *Anas crecca* and a northern shoveller *Anas clypeata* were also trapped and ringed, so were some black-winged stilts *Himantopus himantopus* that strutted like long leggy models on the ramp. Ali Hussain also deftly caught a white-breasted kingfisher *Halcyon smyrnensis*, but the bird protested, angrily erecting its crest. Its rich red coloured beak was huge at close quarters. The cattle egret *Bubulcus ibis* was calm and cool, ogling at us with its large, popping eyeballs and permitted us to put the ring on with ease. Another beauty was the black-crowned night-heron *Nycticorax nycticorax* with startling red eyes, beautiful black and gray feathers and a lovely pigtail adorning his head. Up close, the house sparrow *Passer domesticus* made a fool of everyone, as most of us do not look at this bird twice when in the field. In comparison, the two red munias *Amandava amandava* with their lovely colours drew some oohs and aahs from the onlookers. On the last day of camp, we sighted a black-winged

stilt and a ruff in one of the many pools of the wetlands, going about their daily chores of feeding and preening with the rings on their legs. Earlier, we had also seen a brown rockchat going about his feeding spree proudly wearing the ring.

But why this fuss of bird ringing and bird-banding? All over Europe, more than 10,000 eager birders are allowed to ring and this community of bird ringers is a good pool of interested people who, in spite of being amateurs, contribute to the fine art of bird watching, bird-ringing and to ornithology. This activity helps in understanding the fantastic nuances of bird migration every year across countries and continents. Birds that are willing to travel without a visa and a passport and not even a map? Unfortunately in India, there are only a few who undertake the task of bird banding and gathering data. One among them is Dr. S. Balachandran who, over the years has ringed more than one lakh birds in our country. He certainly needs a helping hand to further the cause of bird migration and thereby sort out the complex responsibility of Bird Conservation. 🐦

## ANOTHER PLACE, ANOTHER TIME

By MAHENDRA SINGH LALAS



**I**t was a hot and humid morning in Vedaranyam, which made the wait for the bus to Point Calimere all the more desperate. I reached Poonarai-Illam (Forest Guest House) at exactly 9:37 a.m. on March 19, 2001 where the building welcomed me with a sign

UNDER SELF DEMOLITION 6/2000!

I waited for Mr. Haja the forester, expected at 10 a.m., who allots the rooms to people. Surprisingly, unlike other Indian officers, he arrived at 9:50 a.m. and I soon found myself unpacking in 'Flamingo', a room where the legendary Dr. Sálim Ali stayed many times during his visits. I could hear the cries of a brahminy kite (*Haliastur indus*) nesting on a palmyra tree just in front of the room, and smelt a great birding time ahead!

Two days later, we were looking at our first early morning 'catch' of 40 birds in the same premises. I was so thrilled to see a common redshank (*Tringa totanus*) appear from a distance, that when Dr. Bala asked

"Which bird?" I was dumbstruck. Soon, he opened his chaotic briefcase and started bird ringing, while we impatiently waited our turn!

We walked great lengths, fixing up nets for birds returning home after a long day. When we walked back to check our catch for the day, and for another ringing session after a slideshow and dinner, Bill Harvey asked

"Any guesses for the catch?"

"It's windy, not more than seven, I suppose!" said Dr. Bala.

Twenty, ten, were the other guesses.


"Well Bill, to be precise its gonna be eleven". And to everyone's surprise, the number exactly matched my guess. I'm still waiting for the cash award of Rs. 100 promised by Bill for the correct guess. I haven't reminded him; at least I can say that the renowned birdwatcher Bill Harvey owes me one hundred rupees!

We began ringing the birds under the lights of a pump house while the fishermen watched us and whispered about their hero, Dr. Bala. This place is a haven for bird lovers. Even four year olds want to grow up and ring birds. Everybody knows the work done by the BNHS, and respects and loves them for it.

Bill is an amazing birdwatcher; his detailed studies and wonderful post-lunch lectures were a treat. He joined in our jokes without any inhibitions. Dr. Bala is a fun packed person too. One wonders if he really is a scientist! The only time he'd stop joking was when he was ringing birds. But that too was shortlived, as this fun-loving man would show a common redshank and call it common greenshank (*Tringa nebularia*): someone walking into the trap agreed with him, and soon got corrected. And this humble individual, known as the 'wader man of India', has ringed over 100,000 birds!

It's difficult to say what exactly I've learnt from this Bird Banding Camp. But yes, my love for birds has grown! In a world where men live for money, greed and power, there are few who think of some tiny winged creatures coming all the way from the Arctic to our water bodies!

As I board the train from Madurai I smile, remembering a young lady's words to Dr. Bala, "Sir, I'm not married, so I'm putting rings on birds!" and I thought to myself "Yes, we all got engaged to birds; now we are partners for life!"

As the train moves, my smile grows broader and my eyes search the sky for my avian friends. 

Mahendra Singh Lalas is a keen birder and is presently associated with All India Radio, Jodhpur as a broadcaster.

## Bird Banding Training Programme

S. BALACHANDRAN



AT POINT CALIMERE, bird banding is being carried out under four major projects from the 1970s, funded by the Smithsonian Institution and the U.S. Fish and Wildlife Service. Over 2,00,000 birds have been banded to date. Birds banded at Point Calimere have so far been reported or recovered in 11 countries. The Point Calimere field station has also served as the training site for several biologists of the BNHS in wildlife studies, some of who still serve the Society in various capacities, while others have moved on to other organisations. The primary objective of the project was to investigate the movements and migratory routes of avifauna into and from India to their breeding grounds in the Palearctic region.

From the experiences of the earlier studies till 1991, it was evident that with the limited paid staff that could be appointed in projects, the number of birds ringed each year would not provide sufficient feedback of the bird banding operations. For example, around 2,50,000 birds were ringed between 1980 and 1991 under two BNHS projects namely 'Population Structure and Movement of Indian Avifauna' and 'Bird Migration', while more than a million birds each

are ringed each year in the United Kingdom and United States. The difference in the scale of banding operations was mainly because in the UK and USA, there were organised volunteer-based groups of bird banders who carried out a major part of the banding.

The Bird Banders Training Programme (funded by the US Fish & Wildlife Service and sponsored by the Ministry of Environment & Forests, India) was conceptualized with the primary objective of the build-up of a volunteer-based group of bird banders as in other countries, so that bird banding could be carried out on a much larger scale. This on-going project has been imparting training to wildlife and conservation-oriented organisations or individuals through training programmes in different parts of India. To date about 180 personnel have been trained in bird banding and identification at different places in seven states of India.

For details of the training camps on bird banding, organised by the Bombay Natural History Society from time to time, kindly contact: Dr. S. Balachandran, Senior Scientist, BNHS, at [bnhs@bom4.vsnl.net.in](mailto:bnhs@bom4.vsnl.net.in) or Hornbill House, S.B. Singh Road, Mumbai 400 023.



**SPLENDID PLUMAGE:  
Indian Birds by British Artists**

by Jagmohan Mahajan  
with description of birds by Bikram Grewal.

Timeless Books, 2001.

Pp. 148 (35 x 25.5 cm).

Price not stated.


REVIEWED BY ASAD R. RAHMANI

This is a large, coffee table art book, profusely illustrated by some of the most famous bird artists of the late 18th to early 20th centuries. The jacket of the book informs us that Jagmohan Mahajan has written extensively on British artists in India and his books include *PICTURESQUE INDIA: SKETCHES AND TRAVELS OF THOMAS AND WILLIAM*

DANIEL, THE RAJ LANDSCAPES: VIEWS OF INDIAN CITIES, and THE GRAND INDIAN TOUR: TRAVELS AND SKETCHES OF EMILY EDEN. For this book, he was joined by Bikram Grewal, a well-known ornithologist and author of two highly successful bird books, to help in the description of birds. The result is truly splendid.

*SPLENDID PLUMAGE* contains bird paintings by 18 artists and naturalists, covering a period of more than 200 years. The paintings, therefore, differ considerably in technique and style. Some of them were made by naturalists themselves (James Forbes, Christopher Webb Smith), while others were made by professional artists (John Gould). I did not know that many paintings were produced by Indian artists working for British bird collectors and scholars (p. 8). They were made in the Moghul style, but often adapted to European techniques as desired by their employers. The first major publication of Indian birds was by John Edward Gray's *ILLUSTRATIONS OF INDIAN ZOOLOGY* (1830-35). E. C. Stuart Baker was the last of the great British ornithologists. His famous book *THE FAUNA OF BRITISH INDIA* (1922 to 1930) contains wonderfully accurate paintings by eminent artists J.G. Keulemans, H. Grönvold and G. E. Lodge, most of which originally appeared in the *Journal* of the BNHS.

The Introduction is well written, and a must for anyone interested in the history of Indian ornithology from the 18th to early 20th centuries. When a large number of artists are involved, we expect that the quality will vary. My favourite illustrations are from the *GAME BIRDS OF INDIA, BURMAH AND CEYLON* and *BIRDS OF ASIA*.

The paintings of painted sandgrouse *Pterocles indicus* (plate 26) by H. Grönvold and the satyr tragopan *Tragopan satyra* (plate 55) by Henry Constantine Richter are the epitome of wildlife art. They seem to "fly" out of the pages. Bird description by Bikram Grewal is brief, almost telegraphic, and does not say much about the species. Perhaps it was kept that way intentionally so as not to dilute the effect of the lavish artwork. The price is not given, but looking at the size, paper quality and production cost, it should be beyond the reach of most birdwatchers. 

**FLOWERS OF SAHYADRI:  
Field Guide to 500 flowers of the  
North Western Ghats of India.**

Author and Publisher Shrikant Ingalhalikar, 2001.

Pp. 210, (21 x 14.7 cm).

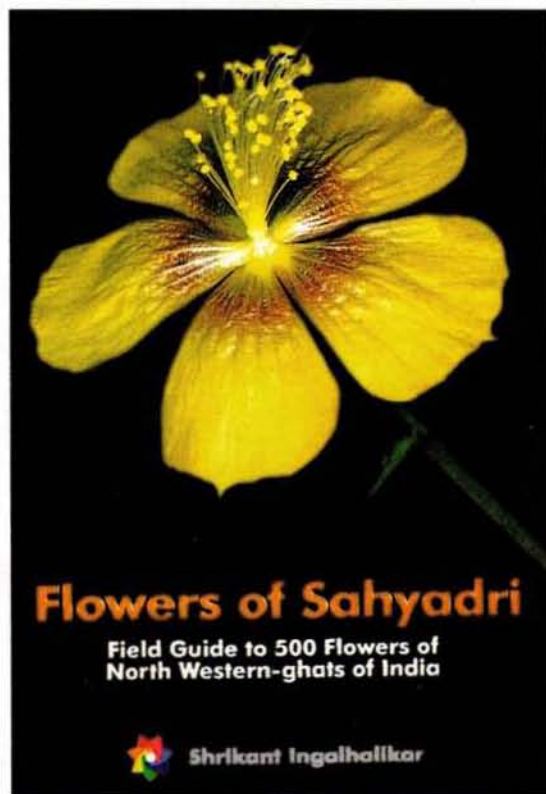
Price not indicated.

REVIEWED BY S.R. NAYAK

The book is profusely illustrated with close-up photographs of 500 flowers of the Sahyadris. Taxonomic descriptions have been given for each flower. The book contains a key to identification, types of inflorescence, description of leaves, a chart illustrating the flowering and vegetation of different habitats during different seasons, a profile of the flora of Sahyadris. Index of species and local names in Marathi are also given.

Scientific names have been cited from the FLORA OF MAHARASHTRA, Vol. 3 of the Botanical Survey of India. Synonyms have been given as per FLORA OF BOMBAY PRESIDENCY by T. Cooke. Each illustration has a red and green scale, which represents the flowering and vegetative growth period of the plant respectively.

The photographs are excellent, though most of them appear to be studio managed, with cut outs, and isolated flowers. No leaves or characteristic appearance as in the wild are shown. Some flowers are enlarged, shown larger than life.



Shrikant Ingalhalikar is a mechanical engineer by profession. His superb book shows what an amateur naturalist can achieve by giving a field guide on flowers to the layman. Dr. Madhav Gadgil, a well known name for naturalists, has written an apt foreword to the book. 📖

**MOSTLY BIRDS, SOME MONKEYS AND A PEST**

by Ranjit Lal. Ravi Dayal Publisher, 2000. Pp. viii+180, no illustrations,  
(17.5 x 12 cm). Hardbound price Rs. 175/-.

Fine nature writing in a colourful first person style that would inspire readers to nature watch, but strange for a naturalist, a Peeping Tom attitude towards mating and procreation (p. 49). 📖

G.W. UGRA



We are grateful to the  
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for a generous corpus grant to constitute  
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to support the publication of *Hornbill*.



# Towards Extinction?



# Camera Trapped

TEXT AND PHOTOGRAPHS  
BY S. SWAMINATHAN

S. Swaminathan is a research biologist at the Society and is presently working at the Mudumalai Wildlife Sanctuary

THE 321 SQ. KM Mudumalai Wildlife Sanctuary & National Park, in the Western Ghats Nilgiri district, Tamil Nadu is located at the tri-junction of Tamil Nadu, Kerala and Karnataka. The diverse habitats and fauna and flora of this area of the Nilgiri Biosphere Reserve make it one of the biodiversity "hot spots" in India.

I was working at the Sanctuary on a small one-year project funded by the Tamil Nadu Forest Department through the Bombay Natural History Society to study the impact of human disturbance on large carnivores.

For the last two years we had been studying large carnivore density, diversity and foraging ecology in Mudumalai Wildlife Sanctuary. We collected 90 tiger pug marks and 35 leopard pug marks. For our study, we had identified the large carnivores regularly moving about on the trails and forest roads.

Tigers and leopards are nocturnal in habit; hence a direct count is not possible. Spotting a tiger in the wild, in the dense undergrowth field conditions of the Mudumalai Wildlife Sanctuary, is not an easy task, and sightings are often momentary. So we decided to use two different methods to estimate the wild carnivore population, pug mark tracing, with photographic capture and recapture (Camera Trap Method).

The price of the imported camera trap device, required for the photographic capture and recapture study, was quite stiff for my pocket. When my consultants Mr. Ajai Desai and the Wildlife Warden, Mr. Udayan encouraged me to develop a cheaper indigenous version of the imported camera trap device, I discussed the project with my brother who is quite an electronic wizard. He heard me out, and in a short time he manufactured a camera trap unit suitable to my field requirements.



Tiger: Documenting the movements of this big cat is now going to be easy

This new camera trap unit was based on a laser tripping device. Addicts of thriller movies may recall seeing people creeping about, ducking under invisible beams. My camera trap worked on the same principle, with a fixed focus Yashica camera unit (with electronic shutter release, auto-flash, and auto-winder). The laser trap had two components, one emitting the laser beam and the other receiving it, which tripped and activated the camera when the laser beam was interrupted.

We set up the first trap near our field station, Bear Bungalow, to check out the new device. The camera trap was set up on the side of the forest road and fully camouflaged with small twigs, leaves and dry material. We fixed the device late in the evening and removed it early in the morning, before the tourists and forest department people started moving around.

To set the camera trap units, narrow points of the trails or forest roads were selected. Tigers can be easily identified from their stripe pattern, as each animal has a unique stripe pattern and facial markings. The six camera trap units used for this study were fixed in different places on the known tiger beats.

Though the trap proved to be cost effective and functioned well, there were many constraints in the field while using it. One rainy day, I went for transect work and saw Priyanka, the elephant we had radio collared, when I was about to finish the transect. After finishing the counts, I fixed the camera trap on a forest road nearby, and went back to the anti-poaching camp to sleep. I expected to get some good pictures, as the area was frequented by tiger, leopard and other carnivores.



Leopard: The sudden flash from the camera does take an animal by surprise

I woke up in the night, hearing the trumpeting of elephants outside the anti-poaching camp. I came out immediately, and was thrilled to see Priyanka, the elephant grazing nearby. She was with a herd of about 15 elephants. Next morning, when I went to check the camera trap, I found that my equipment had been crushed to pieces, and thrown about 25-30 m from where I had fixed it. There were elephant footprints around, all along the road. This happened ever so often, that I took the elephants to be an occupational hazard!




Elephant: The not so expensive equipment was crushed to pieces by this huge mammal



Porcupine, Sloth bear, Black-naped hare: Some other mammals were also trapped by the camera laid for the large carnivores

A month later, with renewed energy and equipment, I went and set the camera traps in the same place. On the way, I met the forest department staff and anti-poaching staff, who told me that an hour earlier they had seen a tiger crossing the game road. I rushed immediately to check this information, and saw fresh pugmarks all along the forest road. The same evening, I fixed the camera trap on the forest road. Early next morning, when I went and checked the camera trap, I saw that the camera had triggered two snaps, but the whole device was lying near the pugmarks, scarred with deep scrape marks, victims of a feline manicure! The flash of the camera may have annoyed the tiger. After processing the roll, I saw that I had a very close range shot of the tiger — the angry carnivore had been trapped!

Another evening, while on a field trip, we met an elephant mahout, who said that he had seen a tiger kill: an adult sambar female close to a watchtower. Immediately, we went with our camera trap equipment to the tall grass covered area very close to the kill. We heard the tiger growling nearby, but could not see him, though we waited half an hour. It was only when everyone climbed a nearby tree that we saw the tiger. It must have sensed our presence, as it left soon after. We fixed the camera trap on both sides of the footpath, but were unsuccessful. Maybe the tiger was aware of the presence of our camera trap. Afterwards, the tiger dragged off the carcass more than a hundred metres away.

So far, we have got photos of six different tigers, one leopard, six palm civets, four sloth bears, six porcupines, three chital, eight elephants, one black-naped hare and one wild dog. As long as I can keep replacing the camera trap unit, I cannot think of abandoning such an exciting field study. 

*“Mera Colgate”*



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# Such a long journey

*"At length did cross an Albatross,  
Thorough the fog it came:  
.....And a good south wind sprung up behind:  
The Albatross did follow."*



By RACHEL REUBEN

---

Dr. Rachel Reuben is a former Director  
of the Centre for Research  
in Medical Entomology, Madurai.

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*Paintings, courtesy: Birds of Ocean and Estuary,  
Orbis Publishing, London.*

The seafarers of old knew the wandering albatross (*Diomedea exulans*) well, and associated this enormous seabird with favourable winds. They knew it was a great traveller, because they saw it many thousands of kilometres from land, over the oceans of the southern hemisphere. Albatrosses spend over 90 per cent of their time at sea, but until about a decade ago, no one knew where they went, or why, increasingly, they were not returning from their journeys. For numbers have declined at all their major breeding sites, and there are believed to be only about 15,000 pairs left. The albatross mates for life, and lives for 50 to 60 years, so that if one partner is lost, two breeding birds are removed from the population. Thus, it is of great importance to know where they go and what happens to them.

Since the species ranges so widely over the ocean, conventional radio tracking methods are of little use; but with the advent of satellite telemetry, two French researchers made a detailed study of foraging movements, by fitting six male birds with transmitters during their stint of incubating the eggs. When relieved at the nest by the females, they flew out to sea and remained away for up to 33 days, covering 3,600 to 15,000 km on a single foraging trip. After the chicks hatched, foraging flights were much shorter, 330 to 381 kms, and the birds returned to the nest to feed the chicks on the fourth day.

Long flights, up to 936 kms, were recorded only during daylight hours, and the albatrosses flew much shorter distances by night, especially on moonless nights. Both by day and night, short stops were made for resting and feeding, but these rarely exceeded an hour at a time. The birds made maximum use of the wind to power their flight, and moved continuously during windy conditions by day. Sometimes, however, they seemed becalmed for a few days by high pressure anticyclonic weather, and appeared to be waiting for favourable winds. On the way back to their nesting grounds they sometimes faced the wind, and when this happened, they either tacked towards the island by a zig-zag route, or looped around it till they found wind directions which suited them.

These observations were made only during the breeding season. But wandering albatrosses breed only once every two years, and it was much more difficult to plot their wanderings during their

Wandering Albatross



non-breeding or "sabbatical" year. Because of the long periods spent at sea and the great distances involved, data collection proved very expensive, and due to the limitations of battery life, satellite tracking over long periods was not possible. Dr. Henri Weimerskirch and his colleague Rory P. Wilson were the first to use a simpler technology, which borrowed from the navigational methods of the past by incorporating a clock set to the time at the starting location in a tiny battery powered device less than an inch square and weighing under an ounce, fixed to a band around the leg. Also included were a light sensor and a memory chip for storing data. The device determined latitude from the time of dawn and dusk each day, since day length varies with north-south location. By comparing the time of dawn and dusk to the time at the starting point, longitude could also be calculated. Light sensing was not as accurate as satellite tracking, but was enough to show where the

“  
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 ”



birds were spending their time.

Only a few albatrosses have been banded so far, but a preliminary communication published in the journal *Nature* shows that females go northward towards more tropical latitudes while males go towards Antarctica. Once they have reached their destinations, which may be tens of thousands of kilometres away from the breeding grounds, they tend to remain there. Activity levels are far lower than in the breeding year when they circle their breeding area continuously. Without families to feed, they can take things easy. This is very necessary, since they are moulting and flying is difficult. So they use their 10-foot wingspan to soar with the winds as much as possible, and use little of their own energy.

Other research has established that the main reason that albatrosses do not return to breed is because they have become the accidental victims of

commercial fisheries. Bluefin tuna and Antarctic bass are caught with baited hooks on long lines. The birds, which feed on fish and squid near the surface, go after the baited hooks as they are played out by the fishing boats and are dragged underwater and drowned as the lines sink. Since this harms fishing interests as well, some fisheries have tried to weight the lines to make them sink more rapidly, but this has not been enough to protect the birds. Numbers of the wandering albatross and other endangered albatross species continue to decline. A detailed knowledge of where the birds spend their non-breeding year could lead to regulations restricting fishing in the Southern Ocean at certain times of the year, or change of method of fishing.

One's mind goes back to the "Rime of the Ancient Mariner", quoted at the beginning of this

article, and the strong conservation message it contains. Samuel Taylor Coleridge, who wrote the poem in the late 18th Century, knew intuitively that man must live in harmony with Nature.

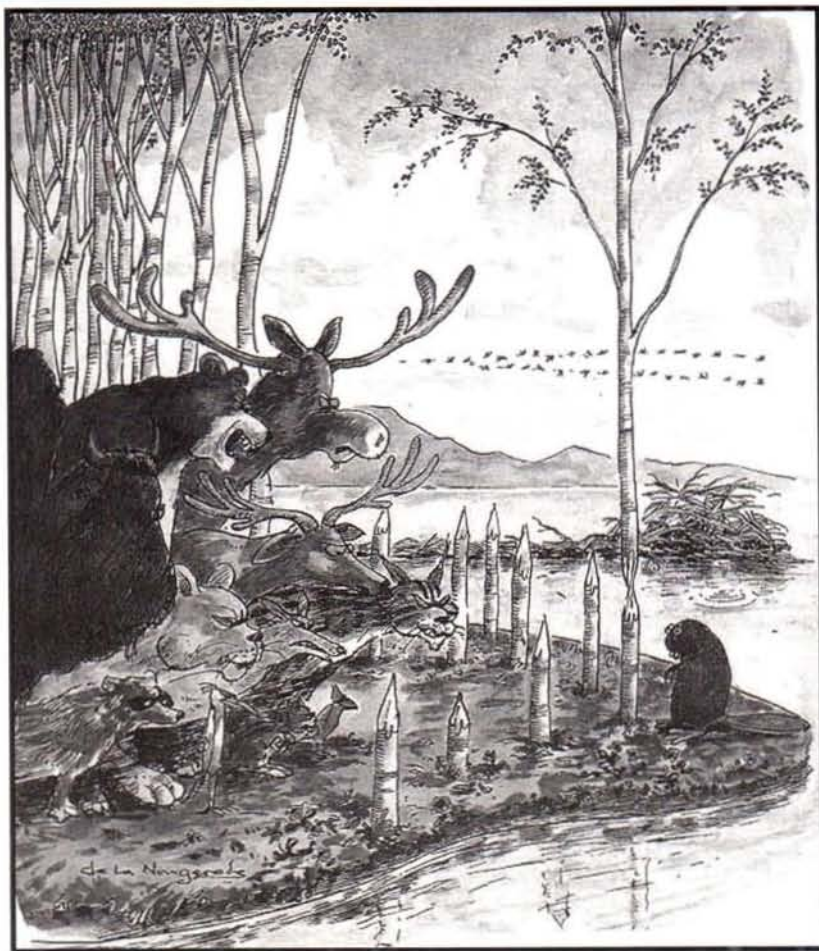
The mariner shoots the "harmless albatross" and brings down unspeakable sufferings upon himself and his shipmates. The curse is only lifted when he acknowledges and blesses the beauty of Nature in the form of seasnakes:

"Blue, glossy green and velvet black  
They coiled and swam; and every track  
Was a flash of golden fire."

He spends the rest of his life telling anyone whom he can compel to listen:

"He prayeth well, who loveth well  
Both man and bird and beast;  
He prayeth best, who loveth best  
All things both great and small." †

On the lighter side



Courtesy: Earthscan Publications, London.

'At least we don't have to worry about *men* destroying our environment'



From : 01/02/2002

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Table No. 149

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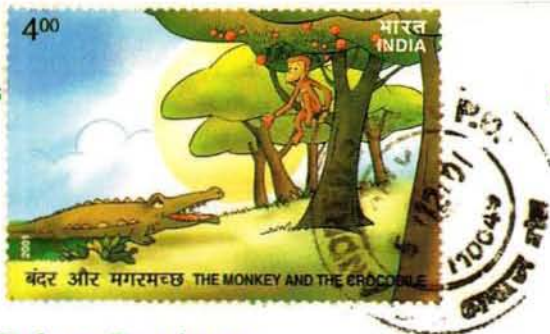
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## The Debate Continues

### WILDLIFE & POWER FENCES

#### I

In continuation of the debate on Mr. S.D. Bhat's letter 'Wildlife & Power fence', I agree with Mr. S. Chaudhuri's view in *Hornbill*, Jul.-Sep. 2001, that animals do damage crops if they raid it in great numbers. Most Indian farmers have small land holdings, which in itself means more investment and increased burden on the farmer (thanks to the Bhoodaan Movement and the Land Ceiling Act). Moreover, the Shyamlat (community grazing and timber source grounds) have also come under cultivation. These used to be beneficial not only to the local population, by supplying timber for domestic use and fodder for cattle, but also to the wildlife like deer and antelopes, which grazed on them, putting less pressure on crops.

Sadly enough, our lawmakers are ignorant of the ground realities. In shortsightedness and vote hunger, they make laws and implement them without consulting the people affected. Should not farmers have a right to protect their crops from raiders? Most wildlifers are urban dwellers, their main contact with the forests and their denizens being an occasional organized trip for photography or to fill up research papers. Very few among them have actually stayed and observed wildlife in the forest.

We should not alter the lifestyles of animals. Instead, emphasis should be laid on co-existence, like it has been for millennia. Did wildlife and food grains not coexist before the enactment of the Wildlife Protection Act? A non-prejudiced mind will notice that the flaw is with our laws, not in the people who live near the forest and are dependent on the forest and its wildlife for survival.

Wildlife thrives in all the developed countries where pressure on land is greater and regulated

hunting is allowed. That is only because the legitimate interests of farmers and other people dependent on the forest have been protected. They are properly educated about how to harvest and take care of the

forests and its denizens. Has the population of tigers increased considerably after 33 years of the ban on its hunting? No, because poaching is still rampant. The need is not stringent laws, but education so that people understand the age-old practice of co-existence.

Our government and most of the modern conservationists are dead set against hunting, but can they deny the fact that most of the sanctuaries and national parks today were once shikargahs of royalty, where wildlife was preserved for their sport. What would the present forest cover and animal population in India be, if these royal patrons had no liking for this royal sport is anybody's guess.

Hunting has been banned, but poaching goes on unabated. Controlled and legal sport hunting of species does not harm, instead it helps to eliminate the feeble, resulting in healthy offspring. ☐

Karan Dhir Singh  
By email

#### II

I refer to the letter 'Farming is no fun game' (S. Chaudhuri, *Hornbill*, Jul.-Sep. 2001). In my earlier letter (Wildlife & Power fence, *Hornbill*, Jan.-Mar. 2001), I had not blamed farmers, nor said 'no' to the use of power-fence. We all are equally guilty. Lest I be regarded otherwise, I am from a rural farm family and have spent about 15 years in agrarian settings amidst forests and participated in many activities there. Spent around 150 nights on a *machan* to guard paddy fields from wild pig, seen sugarcane and banana damaged by wildlife and I have used power fences to protect my crops. I understand, appreciate and sympathize with farmers, and don't mean that wild animals should be allowed to destroy their hard labour at will.

My last letter was only meant to focus on 3 points:

- We should acknowledge and accept that we have usurped perhaps 97% of India's moist fertile productive areas that originally belonged to wildlife, relegating them to less productive areas. About 57% of India's area is cultivated, and 5-10% has become urbanised. For these purposes, we first snatched the habitat from wild animals, killed them, drove them out and now use power fences to keep them out. If people feel that such land is their birth right, and wild animals are the intruders, then there is no guilt and hence no responsibility to rectify the situation.
- There is a seeming complacency that power fences resolve human-wildlife conflict well, but the truth is that they favour only humans and constrain wildlife. The problem has not been solved, but conveniently brushed under the carpet. Another checkmate for wildlife! But I do not mean to blame the power fence.
- I had concluded attributing the said constraint to the human population explosion. That was my main message, because conservationists are not united in their views on the severity and impacts of the growing human population on wildlife and the need to control it. I wanted to instigate such people, to try and raise a united voice to check the uncontrolled population growth. If our population was just 15 crore in India's present area, wildlife could be far safer and conservation far easier. But now a staggering 104 crore are struggling to live and in the process are strangling wildlife. Mr. Chaudhuri says that the population problem is engaging the minds of many brilliant, eminent, powerful people. Then where are the results? The efforts to control the population have been highly inadequate. The 150 crore humans expected to be present around 2050 AD will bulldoze more wildlife and wild habitats.

Mr. Chaudhuri says that the growing population needs to be fed. Our leaders, agronomists and other scientists, academicians, and most other decision makers vocally accepted such misguided obligations. Very few attacked the problem on a war footing. The strategy should have been more vocal; instead for the last 50 years we have been doing just the opposite. People were

made complacent that their growing numbers would be fed and fostered forever. Our population was not cultivated like a crop plant; instead it was watered and fertilized into a huge, vast, weedy growth that suppressed other plants (wildlife) below it. We are only trying to hedge in that weed now, but it may be too late.

Let us begin now. The conservation community should unite and try all means to check the human population. Like the camel that invaded the Arab's tent, and finally drove the owner out, humans have erred. But if we continue to err, we shall lose our wildlife, biodiversity, environment and, in the long run, even more. ☐

*Shridhar D. Bhat,  
Sirsi, Karnataka.*

### A new angle to the debate

Never before has the natural heritage of India been so badly threatened both from without as from within. Emphasis has been put on destruction. The crux of India's conservation problems is that the demands of natural resources for humans and their livestock are so great that little is left for any other forms of life. As J.C. Daniel has correctly pointed out (*Hornbill* 1997(3) Jul.-Sep.) India's protected areas amount to a mere 4.5% of the land mass. It is on us to stop blaming villagers for destroying the forests through collection of fuel wood and fodder, without realizing the greater onus put upon industrial developments by the state — big dams, mining, and so on — which have been mainly responsible for the destruction of India's natural heritage and forests especially, over the past half century. ☐

*Bulu Imam  
Hazaribaug, Jharkhand.*

#### ERRATA

*Hornbill* October-December, 2001

p. 11, 4th para for "...in one case at least 15,000 ft above the level of the marshy valley..." read "...in one case at least 1,500 ft above the level of the marshy valley..."

p. 20-21, the excellent picture of the tiger was photographed by Gertrud and Helmut Denzau. We regret the omission of the credit line.

**T**rees play an important role in the life circle of the forest floor.

Soil accumulates around it and small animals find shelter underneath. A porous decaying log can store critical moisture through long, dry seasons. Insects and fungi feed on it, and some fungi pump water from it to the roots of nearby trees. Eventually, the fallen tree becomes a 'nurse log' to young seedlings that feed on its nutrients. A log can take as long to decompose as it took the tree to grow.

A tree that remains standing after it dies is called a snag. Eagles and hawks perch on it while hunting. Owls, bats and woodpeckers use it to nest and store food. A large snag may stand, bleaching in the sun, for as long as a century...

### **The Tale of a Fallen Tree**

written by a conscientious Park warden, displayed against a dead tree in the Serengeti (Tanzania)

Photographs: Ian Lockwood

Ian Lockwood is an educator, photographer, and environmentalist with a passionate interest in the natural history, culture, and peoples of South Asia.



IT WAS the rainy season of August 1996 in Pune. I was walking along the bank of the River Mula looking for insects of my interest. The weather was pleasant and the vegetation lush green. A considerable part of the greenery consisted of a species of *Ipomoea*, flourishing along both banks of the river. The plant grows to almost 2 m and has bluish-purple, bell-shaped flowers. Cattle do not feed on this plant due to its toxic properties, but it provides food and habitat for various kinds of insects. It provides cell-sap to bugs, especially jassids, flowers to the blister beetle (*Mylabris pustulata*) and leaves to the caterpillars of a few moths. This straggly shrub also acts as a host to one of the most interesting insects — the tortoise beetle. The most common tortoise beetle found in Maharashtra is an orange-red species with black spots.

I soon realized that I was being followed by a few school boys, who were curious to find out what business I had in this swampy area. One enthusiastic fellow offered to help me and actually tried to collect the beetles. We tugged at the creeper and bent twigs to collect the beetles on higher branches, when suddenly we saw something shining brightly. For a fraction of a second, I felt it was a gold ornament or a fancy button. But the very next moment I saw it walking, and realized that it was a tortoise beetle completely golden in colour. Such events add to the excitement of collecting and studying cassidine beetles, which are commonly called tortoise

This golden beetle surely enjoys advertising its presence



# LITTLE JEWELS OF THE WILD

TEXT AND PHOTOGRAPHS BY SACHIN RANADE

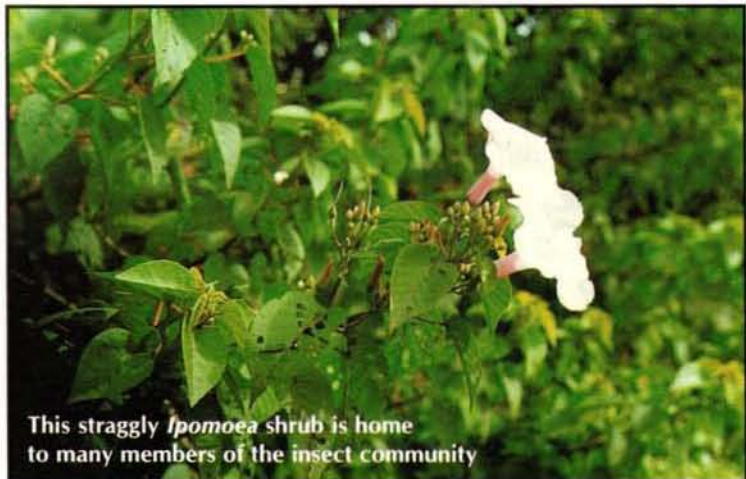
Cycloalexy, an aggregating habit seen in beetle larvae helps them keep predators at bay



beetles, in and around Pune. The word 'cassida' means a helmet and thus exactly describes the shape of the beetle. The outer wings or elytra of these beetles are shaped like a tortoise shell and vary greatly in colour, size, and surface texture. The beetle retreats its head, antennae, and legs under this shell to protect itself from danger, just like a tortoise, therefore the name Tortoise beetles (subfamily Cassidinae).

These beetles belong to a large family called Leaf beetles (Family Chrysomelidae) because all the members of this family feed on leaves; in fact, for the same reason, some are considered to be serious pests. Although all beetles have the first pair of wings modified to form a tough, leathery shield or elytra, the tortoise beetles have theirs, along with the upper side of the thorax (dorsal plate of the pronotum) uniquely modified into a rounded shell that has a hat-like margin, or felt on all sides. Of course, the pronotum is free and not fused with the elytra.

The tortoise beetles are sometimes called jewel beetles, but the true jewel beetles, belong to another family (Buprestidae). They are called so because some of the tortoise beetles look like precious stones — rubies, emeralds, or topaz. However, a few members of this family do not like to advertise themselves: on the contrary, they have colour patterns that camouflage them to match their surroundings. They have rough surfaces, and are coloured black, green or brown, like the soil, leaves or bark of trees.



This straggly *Ipomoea* shrub is home to many members of the insect community

Many tortoise beetles are found feeding on leaves of Family Convolvulaceae. This family includes genera like *Ipomoea* and *Argyriaea*. These plants are mainly climbers and have bluish-purple, bell-like flowers. A few other plants such as *Ziziphus*, *Carissa*, *Leucas*, *Gmelina* from other families are also infested by these beetles. While feeding on leaves, some beetles only scrape the surface, some feed at the margins, and the rest eat large areas creating holes on the entire leaf.

The leaf beetle not only feeds on leaves, its entire life history is completed on them! After the

beetles have mated, the females lay eggs on leaves and young shoots. The eggs are laid in a very special kind of bag or covering called ootheca, which is made up of a protein-rich secretion, secreted by the female. Sometimes faecal matter is deposited on the ootheca to deter egg-parasites and conceal it. In the world of insects, only mantids, cockroaches and grasshoppers have been known to form such complex oothecae to protect their eggs. In tortoise beetles, the number of eggs per ootheca varies to more than fifty, depending upon the species. In



Mating pairs of tortoise beetles are often seen in monsoon


the common tortoise beetle, *Aspidomorpha miliaris*, the ootheca is a more or less rectangular pouch in which the eggs are laid in two rows. There are gaps in and around the eggs for ventilation. The smaller, green beetles (various species of *Chiridopsis*) lay a single egg and cover it with a thin translucent membrane.

The tiny larva generally hatches within 4-10 days. This period, however, is variable. The larvae of tortoise beetles are very interesting. They are elongated

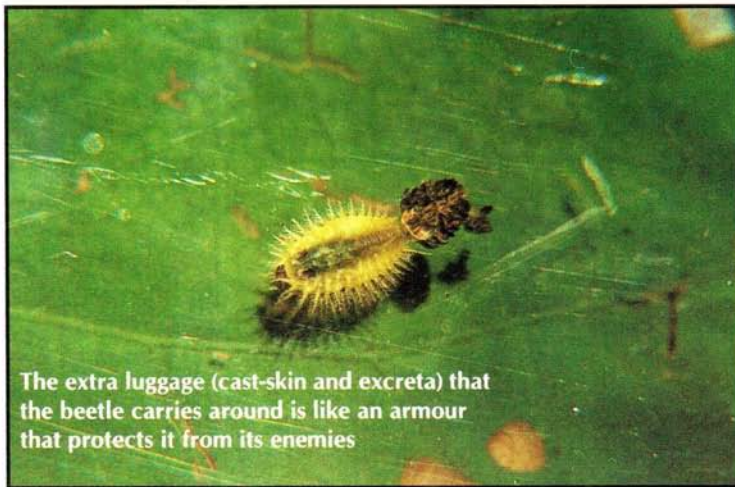
the entire leaf lamina. In some cases, they feed so quickly and extensively that only the veins of the leaf remain. Such larvae are called skeletonisers. All insect larvae shed their skin during development. The larvae of these beetles, however, carry their cast skins and even faecal matter on their posteriormost pair of spines. This broomlike or shieldlike complex of old skins and faecal matter helps the larva to protect itself against enemies. In a few species, the larvae show an interesting habit

cannot capture this excitement. The pupa is flat and is attached to the leaf by its abdominal segments. It has a semicircular anterior end, under which lies the prothorax of the future adult. Within a few days, the imago, or adult beetle emerges, leaving the pupal skin behind. Most of the adults emerge during early morning. The newly emerged adults do not have the bright colours that first attract your attention. But within a few hours, the beetles gain their black spots, patches and other colours.

Nature has provided these beetles with the shield-like first pair of wings, their eggs are protected by a special covering and the larvae and pupae are also provided with the umbrella of their own cast skins. In spite of this defensive armour, a few parasitic wasps do succeed in infecting its eggs and larvae by laying eggs in them. An infected larva becomes lethargic, turns black and dies. Some beetles die at the pupal stage and the parasite wasp comes out, breaking the host's skin. Sometimes an entire population meets with the same fate.

Beetles control populations of their host plant, while parasitic wasps control the beetle populations. An interesting way of balancing life in nature, or survival of the fittest. What would you call it? 

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The extra luggage (cast-skin and excreta) that the beetle carries around is like an armour that protects it from its enemies

and flat, with the head facing downwards. As is well known, they feed and grow, moulting several times (each moulted stage is called an instar) before maturity. Generally, the first two instars (developmental stages of the larva) feed only on the upper layer or the epidermis of the leaves. The next three instars are voracious feeders: they feed on

of aggregating called as "cycloaexy". In this, all the larvae arrange themselves in full circle with their heads facing inward. Such formations look bizarre and confuse or deter their predators from attacking.

The larval phase is followed by the pupal phase. The change from larva to pupa is an exciting experience to watch. Mere words

**The earth does not belong to man; man belongs to the earth.  
Man did not weave the web of life: he is merely a strand in it.  
Whatever he does to the web, he does to himself...**

*Chief Seattle*

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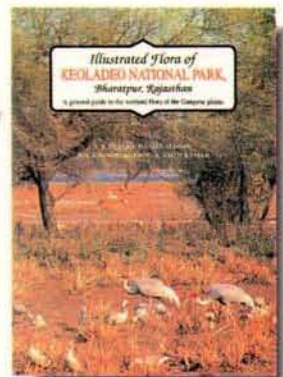
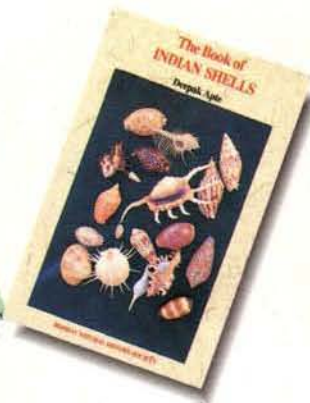
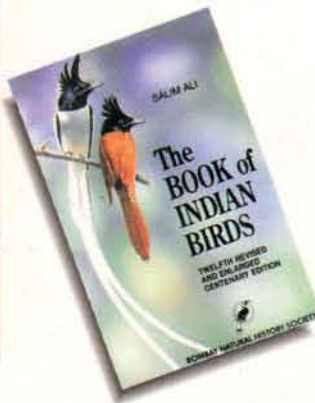
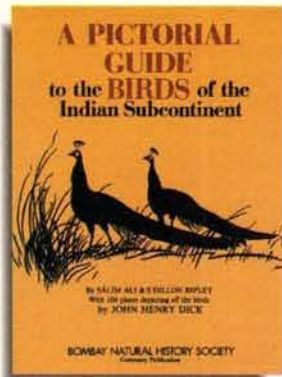
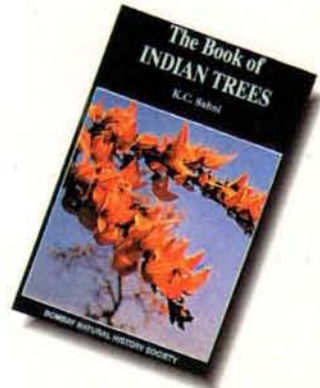
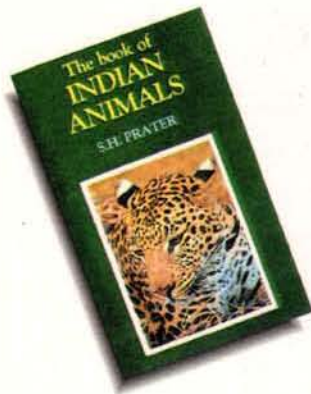
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