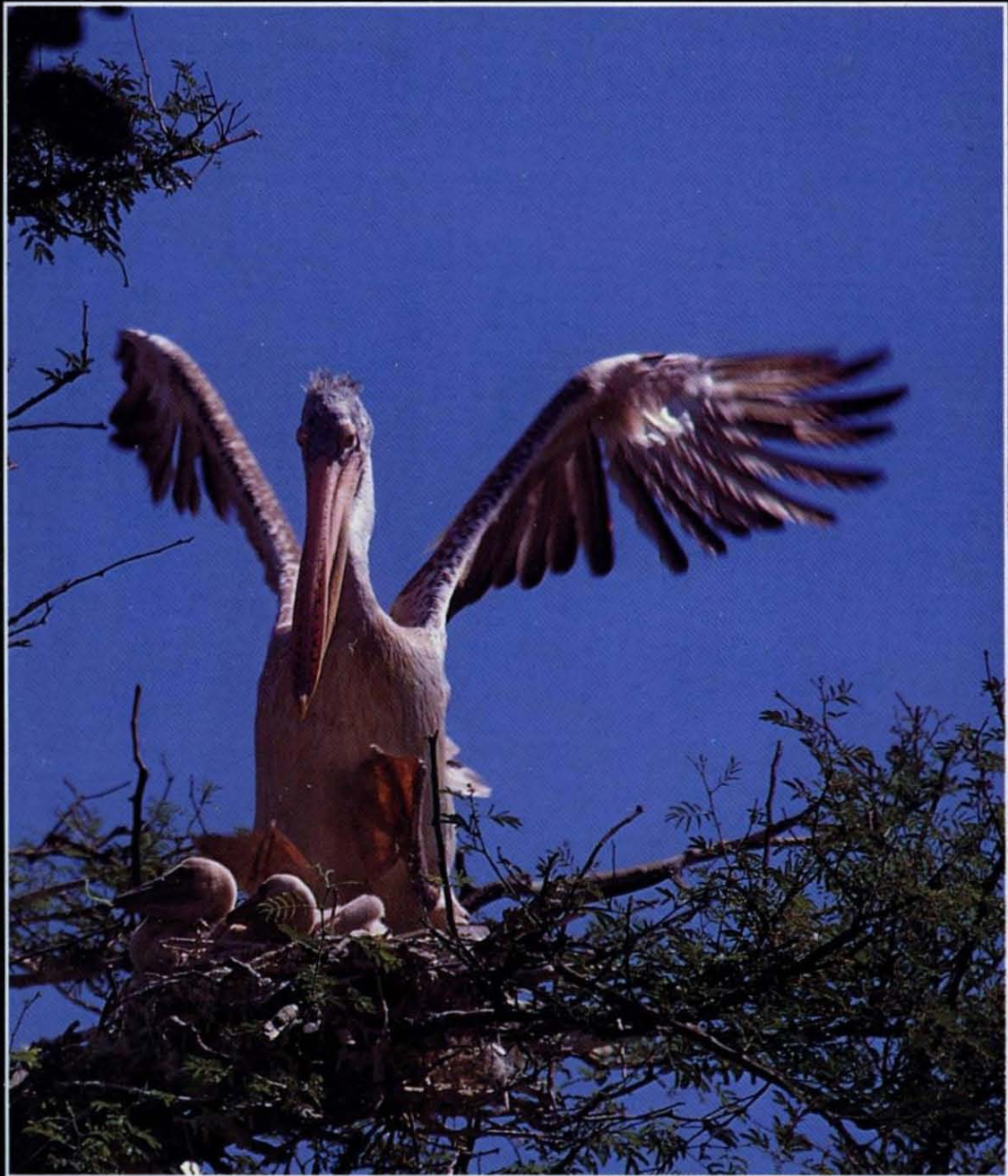


# HORNBILL

1996, No. 2



BOMBAY NATURAL HISTORY SOCIETY

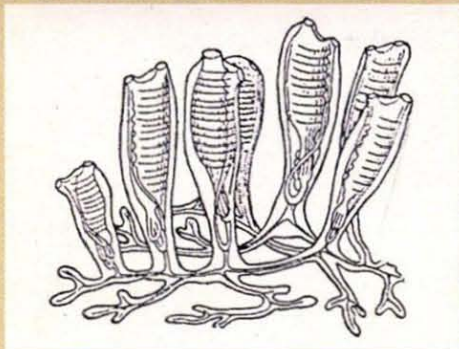


## 2.

### **Saving the Spotbilled Pelican**

— **S. Subramanya & K. Manu**

A popular programme involving the local inhabitants has succeeded in restoring the pelicanry at Kokkare Bellur.



## 10.

### **Seashore Lore 22. Our Forefathers**

— **Beefsea**

“Am I my keeper's brother?” asked the monkey on being told about Darwinism. Beefsea explains.



## 28.

### **Environmental Impact Assessment — an ecological perspective**

— **Alex Abraham**

Till recently, environmental protection only envisaged treatment of wastes, but development must be self-rectifying to be sustainable.



## **and other features.....**

**8. Letters**

**18. Newslines**

**20. Conservation Notes**

**23. Book Review**

**24. News Notes and Comments**

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

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# HORNBILL

1996 (2)



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Spotbilled pelican

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## People do matter



K. BOSE

**S**OME time back, when a popular television serial on Indian wildlife was shown, wildlife enthusiasts felt cheated because there were more tribals, nomads and farmers in the film than wildlife. But that is indeed the reality of the Indian wildlife scene, where people do matter. BNHS researchers too realised that local people, though in conflict in sharing the habitat, have the inclination to be partners in conserving the very same species they are in conflict with, whether elephants, eagles, bustards or blackbucks. Their ancestors had co-existed peacefully and today some like the Bishnois or the villagers of Kakkare Bellur still practice the age-old wisdom of live and let live.

Three years ago, BNHS launched the most innovative project on Conservation Education to initially understand dependence and attitudes of the people who share wildlife habitats for their basic need for water, fuel and fodder. Today with the confidence building efforts of the CEP team, attitudes are positive, alternatives are acceptable and what is more heartening is that there is a growing readiness to participate in conserving and protecting wildlife as they have realised that it is their future too.

ISAAC KEHIMKAR



One of the pelican nestlings at the nursery — an uncertain future?

## Saving the Spotbilled Pelican A SUCCESSFUL EXPERIMENT

S. Subramanya & K. Manu

**T**HE spotbilled pelican (*Pelecanus philippensis*) is one of the endangered bird species which has suffered a rapid decline in its population in the last 70 years. From over a million pelicans around the 1920s, the world population of this species has crashed to an

estimated population of less than 13,000 birds in the wild today. Once distributed all over south and southeast Asia, the bulk of its population is now found only in India and Sri Lanka. In India, the species breeds in about 10 sites. Over the last 100 years, about seven

nesting sites have been lost in India. For the ensured survival of this species, continued nesting of the birds at these breeding sites is crucial.

In Karnataka the pelicans, along with painted storks (*Mycteria leucocephala*), breed at Kokkare Bellur in Mandya



A grown up nestling ready to fly out to a life in the wild.

district, located about 80 km from Bangalore. Though published records indicate only that this pelicanry was in existence in 1864, the colony may well have been over 500 years old. At this site, the pelicans along with painted storks nest on trees found amidst houses in the village. Over the years, this pelicanry has also experienced a dramatic decrease in the number of pelicans. From a population of well over 2000 breeding birds about 30 years ago, the numbers have dwindled to a mere 330 nesting birds today.

The two main factors contri-

buted to this alarming population decline at Kokkare Bellur are the loss of preferred trees and damage to existing trees used for nesting by the birds and the loss of nestlings which fall down from their nests due to overcrowding. These nestlings which are unable to fly and take care of themselves either die out of starvation or fall prey to dogs in the village. Every year, over 100 nestlings are lost at Kokkare Bellur due to this problem.

Between March and August 1995, a programme was started by a voluntary group of birdwatchers from Bangalore and Mysore, and with partial

assistance from the State Forest Department, to care for such nestlings as their parents take no interest in them after their fateful fall from the nest. All the fallen nestlings were collected and raised in an open-air nursery constructed for the purpose. The nestlings were fed with fish (their staple diet) till they were able to fly. The nestlings, being voracious feeders, require well over a kilo of fish per bird per day. The fish required to feed the nestlings had to be purchased by the project team each day from fishermen at tanks located about 10-25 kms away. To enable



S. SUBRAMANYA

A fish pond has been built within the nursery for training pelican nestlings to capture fish.

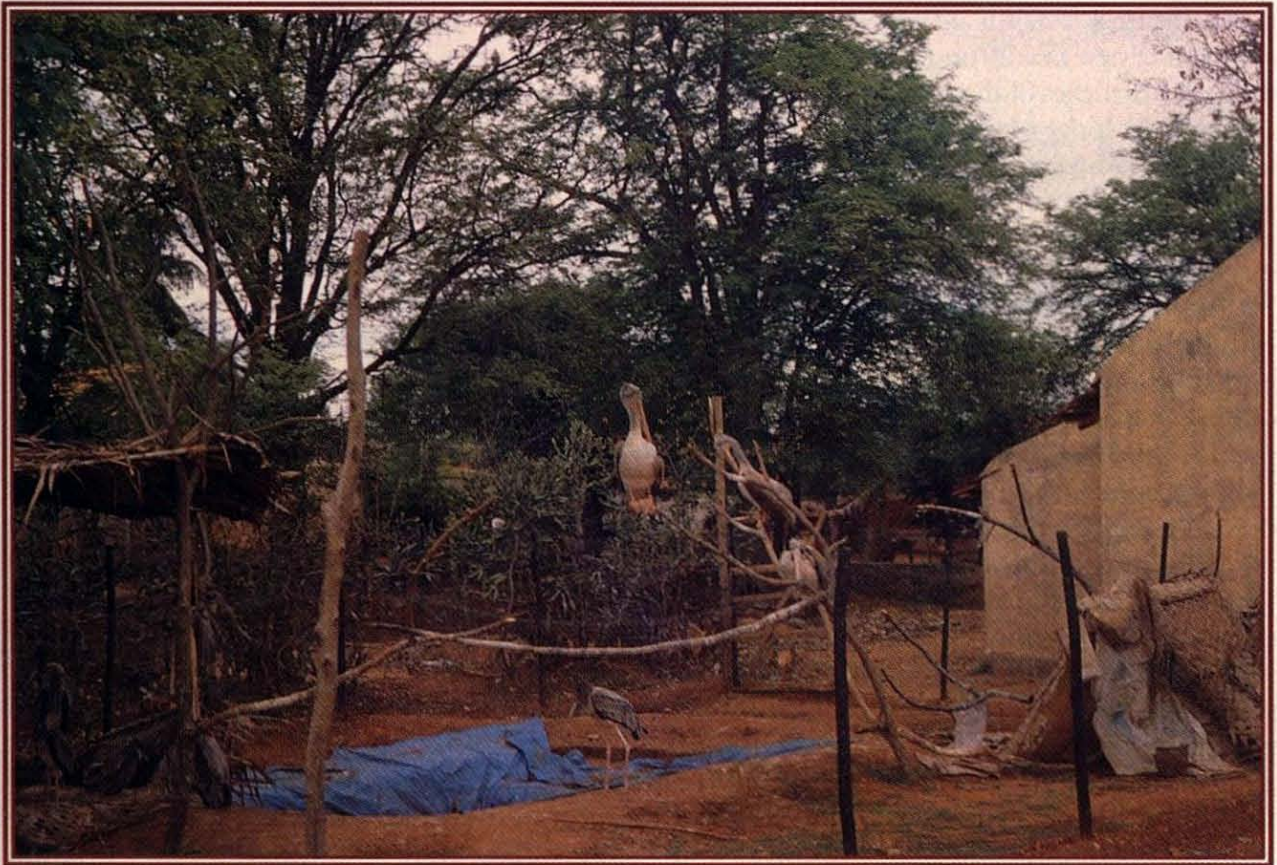
individual identification, each nestling raised in the nursery was colour ringed.

Even as the nestlings were being cared for in the nursery, the programme was faced with two problems typically associated with the rehabilitation of captive-reared wild species: that of teaching the nestlings how to catch fish in water and to let them know where to find the fish they feed on. To solve the first problem, a fish pond was constructed within the nursery and was stocked with fish brought from nearby tanks. Within a short time, the nestlings learnt to grab

fish from the water and could practice their fishing technique. By the time the nestlings flew out of the nursery they were feeding from the water like any wild adults of their species.

The solution to the second problem came far more easily than we expected. The nursery had been deliberately located in the midst of the village where the nestlings could easily watch adults of their species, perching and nesting on the trees, and also flying and soaring around the village. Once the nestlings were able to fly, they flew out of the nursery to perch on trees close by. Soon they started mingling

with the wild pelicans in the village. Even though the nestlings that *fledged* out of the nursery often returned during feeding time, they were conspicuous by their absence from the village for over a week at a time. The first clue to their survival in the wild came when one of the nestlings was photographed by a wildlife enthusiast at a tank about 80 km away from Kokkare Bellur. We wondered how the nestling, with no prior experience, managed to reach a tank located so far away. Later, it was found that the nestlings simply followed the wild birds to the feeding grounds.



S. SUBRAMANYA

A view of the open-air nursery built for raising pelican nestlings at Bellur.

At Bellur, right through the day, pelicans and painted storks keep soaring in small to large flocks to rise high up in the air before they glide down to their feeding grounds, the tanks located within a radius of about 80 km. Observations revealed that the nestlings after wandering in the village for some days, started joining these flocks of soaring birds, to head towards the feeding grounds. Subsequently, other nestlings were observed by the project team at tanks where fish was being procured for the nursery. By the time the problem of loss of nestlings was realized, well

over 50 nestlings had fallen prey to cats and dogs. Through the nursery programme which was started in March 1995, we saved a total of 24 pelican nestlings. Of these, 21 nestlings have flown out and successfully joined the wild population of pelicans. The three nestlings that continued to stay at the nursery even after the nesting season was long over at the village, were shifted to a large aviary at the Bannerghatta National Park close to Bangalore. In addition to the pelicans, over 35 nestlings of painted storks were also cared for in the nursery.

The pelican nursery programme at Bellur necessitated that

one of us (KM) from the Mysore Amateur Naturalists Club, live in the village right through the project period and live like any villager under trying circumstances, attending to the day-to-day problems and developing a rapport with the village folk. The work became much easier once he was accepted by the community. Nevertheless, the task was easier said than done.

While pondering over the problem of pelican nestling loss at the nest trees, we soon realized that the causes lay at the grassroots level. At Bellur, the pelicans, the people and their cattle share the same resource,

that is, the trees. Pelicans are very choosy and nest mainly on *Ficus* trees. The branches of these trees are regularly lopped by villagers to provide fodder to their goats and buffaloes whose populations are sizeable. The bare branches that remain are dried and used by the villagers as fuel for cooking. Interestingly, pelicans prefer to place their nests on top of these lopped branches as they provide very good anchorage. Unfortunately, such trees being devoid of their densely branched natural canopy cannot help in preventing the nestlings that slip out of the nests from falling. Keeping this in view, nearly 700 saplings of preferred trees were planted during the monsoon of 1995. Once these saplings grow, they are expected to ensure the availability of trees for nesting by birds and also a surplus of trees to meet the fodder and fuel requirements of the villagers in the future.

Though the villagers at Bellur were co-operative, they were not receptive to our ideas of conservation. The majority of the villagers, being poor, look for benefits in our programmes. Considering this, several community development programmes under the banner of 'Pelican Project' are being started to try and improve the quality of life of the villagers. Dr. Madhusudan, a physician from Bangalore, who is part of the project team, runs a clinic at Bellur every Sunday to provide free medical aid to the villagers. Also, wherever possible, we have been trying to generate local employment by engaging village labour.

Villagers and the students of the local school are being actively involved in the programmes, so that local expertise is built-up for the care of the nestlings and pelican conservation at Bellur in future. The greatest break-

through in our efforts to involve local people has been the formation of a local Pelican Conservation Group comprising of village youth, school children and ourselves.

Saving the nestlings of the spotbilled pelican, which would otherwise die each year, improving the habitat conditions and tackling problems at the grassroots level are essential for the survival of these birds at Kokkare Bellur. Of this, the nursery programme will be one of the most important conservation measures towards saving the species. It is intended to continue this nestling feeding programme for the next few years until the pelicanry, with the involvement of the local populace, becomes self-sustaining. □

*Dr. S. Subramanya, a BNHS member, is now working at the University of Agricultural Sciences, Bangalore. Dr. K. Manu is a member of the Mysore Amateur Naturalists.*

### SAVE THE SPOTBILLED PELICAN – CONTRIBUTE TO THE PELICAN FUND

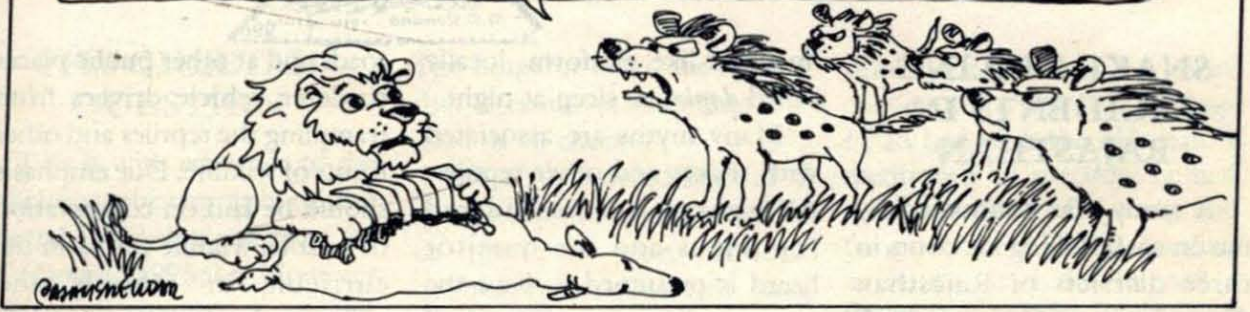
This success achieved at Bellur would never have been possible, but for the assistance and cooperation of several committed people and two nature groups namely, Mysore Amateur Naturalists, Mysore and the Merlin Nature Club, Bangalore. The latter group willingly took on the task of collecting small contributions and donations that were needed to keep the project going. Initially, the Forest Department provided logistic support to run the nursery. The help and official support given by Mr. A.N. Yellappa Reddy, former Special Secretary, Department of Ecology and Environment, GoK and Mr. B. Venkatesh, former ACE, Wildlife Division, Mysore were invaluable. Recently, the Rotary Club, Bangalore Metro, has shown keen interest in supporting our cause.

The nursery programme at Kokkare Bellur to save 24 fallen pelican and over 35 painted stork nestlings was carried out under trying conditions and from the money raised from birdwatchers and nature lovers as contributions. Funds and contributions for the 1996 programme and for the future are welcome from all concerned.

**Please send donations to: Merlin Nature Club, # 13, 8th Cross, 30th Main, J.P. Nagar I phase, Bangalore 560 078. India. Tel: 080-6644682.**

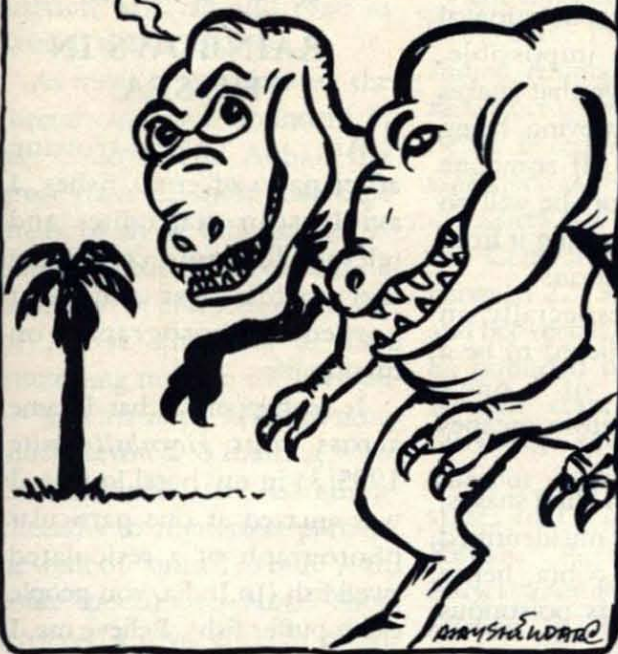


ARE YOU GOING TO QUIETLY SLINK OFF OR DO YOU WANT US TO DRIVE YOU AWAY

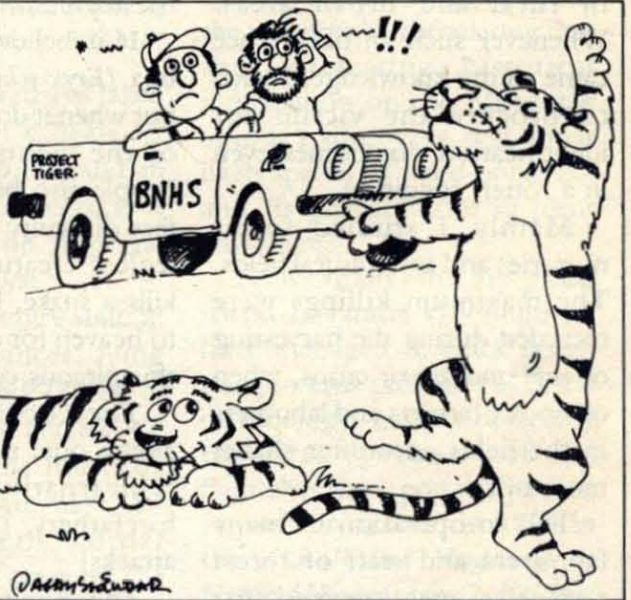


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THE MAMMALS ARE TAKING OVER!

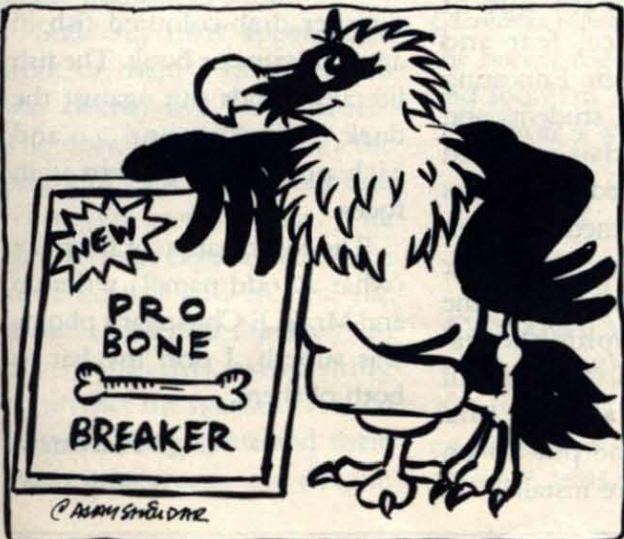


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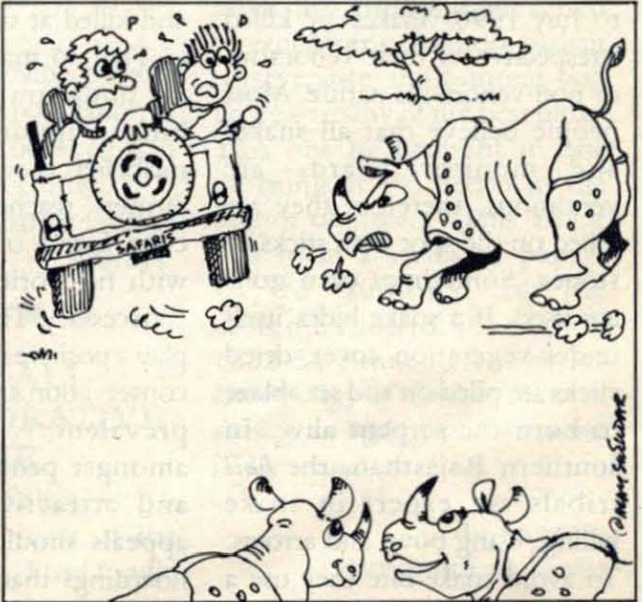


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YOU SURE KNOW HOW TO CONFUSE THE RESEARCHERS



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I LOVE HIS UNPREDICTABLE NATURE



## SNAKE KILLING INCIDENTS IN RAJASTHAN

A study was conducted by me on snake killing incidents in three districts of Rajasthan Alwar, Jaipur and Udaipur, both in rural and urban areas. Whenever such an occurrence came to my knowledge, I tried to procure the victim for identification, sometimes even in a rotten condition.

Mainly, I studied forest nurseries and agricultural fields. The maximum killings were recorded during the harvesting of *rabi*- and *kharif* crops, when obviously farmers and labourers in the fields encounter snakes more often.

The co-operation of many labourers and staff of forest nurseries was secured for procuring the specimens and data. I collected a lot of information from January 1982 to July 1990. Snakes are killed irrespective of their venomous or non-venomous nature. Most people believe that all snakes and monitor lizards are venomous, therefore they are killed on the spot with sticks or stones. Sometimes even guns are used. If a snake hides itself under vegetation cover, dried sticks are piled on and set ablaze to burn the serpent alive. In southern Rajasthan, the *bhil* tribals are expert in snake killing, using bows and arrows. To avoid snake-bite they use a

'machan'-like platform, locally called *dagla*, to sleep at night.

Many myths are associated with snakes and other reptiles. All snakes are considered venomous and the monitor lizard is presumed to have the most deadly venom among all the reptiles.

It is believed that an earth boa (*Eryx johnii*) hardly bites, but when it does so, the survival of the victim is impossible. People also believe that snakes face difficulty in moving, being legless creatures. If someone kills a snake, he or she will go to heaven for delivering it from this piteous condition!

The cobra, especially an albino one, is believed to be a reincarnation of one's forefathers, therefore escapes attacks!

The vermiform blind snakes, *Typhlina spp.*, are misidentified as the young of cobra, hence they are treated as poisonous and killed at sight.

That so many reptiles meet an unnatural death out of human ignorance, fear and misbeliefs is evident. Educating farmers, teachers, students and even forest officials involved with field oriented operations is necessary. The media too can play a positive role towards their conservation and removal of the prevalent 'ophiophobia' amongst people. Meaningful and attractive slogans and appeals should be put up on hoardings that are installed on

roads and at other public places to deter vehicle drivers from trampling the reptiles and other forms of wildlife. Due emphasis should be laid on conservation of various wildlife forms in the curricula of schools and colleges.

S. K. Sharma,  
Udaipur.

## RAINBOWS IN THE SEA

As a globe-trotting aficionado of coral fishes, I avidly scan magazines and relevant literature containing the world's best and most gorgeous photographs on marine life.

It so happened that I came across your *Hornbill* issue 1995(3) in my hotel lounge. I was amazed at one particular photograph of a reticulated swell fish (In India, you people call it puffer fish). Believe me, I had never come across such a beautiful photo-composition of a rather drab-coloured fish in any magazine or book. The fish literally stands out against the dark background, and each prickle on its skin is in focus.

The combination of Beefsea's (what an odd name!) write-up and Mr. B. F. Chhapgar's photos was superb. I doff my hat to both of them.

Olga Hartman,  
Camp Goa.

## THE CHEETAH QUESTION

This is with reference to the excellent photograph of the cheetah published on page 27 of *Hornbill* 1995(1). However the text needs a minor correction... The last authentic record of three males shot together in Korea, Bastar district, M.P. should read as Korwai and not Korea.

As most of us are aware the cheetah was once abundant in our country and Akbar, the great ruler of India had kept many of these lithe felines as pets. In the *Akbarnama*, a collection of episodes in the life of Akbar, there is a very interesting note on the cheetah — "His majesty was at this time much devoted to hunting with cheetahs and after assigning cheetahs to numerous parties, he went off himself to hunt with some special attendants. They let loose a royal cheetah called Chitranjan at a fleet footed deer in the hunting grounds.

Suddenly there appeared in front of them a ravine which was twenty-five yards broad. The deer leapt into air to the height of a spear and a half and conveyed itself across. The cheetah in its eagerness took the same course and cleared the ravine and seized the deer. On beholding this astonishing occurrence the spectators raised a cry of amazement and there was much surprise and delight.

The Emperor raised the rank of that cheetah, making him the head of all cheetahs.

He also ordered that as a special honour and a pleasure to men, a drum should be beaten in front of that cheetah."

**N. Shiva Kumar,**  
Life Member, BNHS.

The cheetah record was taken from S.H. Prater's Book of Indian Animals, p. 27 and in fact Korea, M.P. is correct, it being listed in the Imperial Gazetteer as follows:

"Korea is a tributary state in the Central Provinces, lying between 22° 56' and 23° 48' N and between 81° 56' and 82° 47' E, bounded on the north by Rewah state and east by Surguja; southern border Bilaspur dist and west by the states of Chang Bhakan and Revah." R. E. Hawkins in *Encyclopedia of Indian Natural History*, p. 98, refers to the cheetah:-

"a possible surviving cheetah (*Acinonyx jubatus*) population in the border region between Iran and southern Baluchistan."

Korwai is a separate entity.

— Editors.

■ ■ ■ ■ ■

## SÁLIM ALI COMMEMORATIVE ISSUE

In the Sálím Ali commemorative issue of the *Hornbill* 1995 (4), I had fondly

reminisced on some conversations and field outings I had had with the old man. I mentioned an anecdote he had told me how Layard, the famous expert on Sri Lankan avifauna, had discovered a flycatcher which he later named after his servant Muttu. I ended the anecdote by speculating that this interesting historical information on the *Muscicapa muttui's* discovery was most likely spread by word-of-mouth and "is probably not in print anywhere."

Now, thanks to my good friend Priyantha Wijesinghe, I have managed to track down this precious piece of historical ornithology. Layard described the first specimen of the flycatcher (now popularly called Layard's flycatcher) in 1854 in the *Annals and Magazine of Natural History* series 2, 13(74): 127. After the usual scientific account on the bird, Layard writes: "I name this new species after my old and attached servant Muttu, to whose patient perseverance and hunting skill I owe so many of my best birds. This one he brought in one morning at Pt. Pedro in the month of June..." This article was from a series of papers Layard authored in the aforementioned journal in 1853-54 entitled *Notes on the Ornithology of Ceylon, collected during an eight years' residence in the island.*

**R. Kannan,**  
Fort Smith, Arkansas

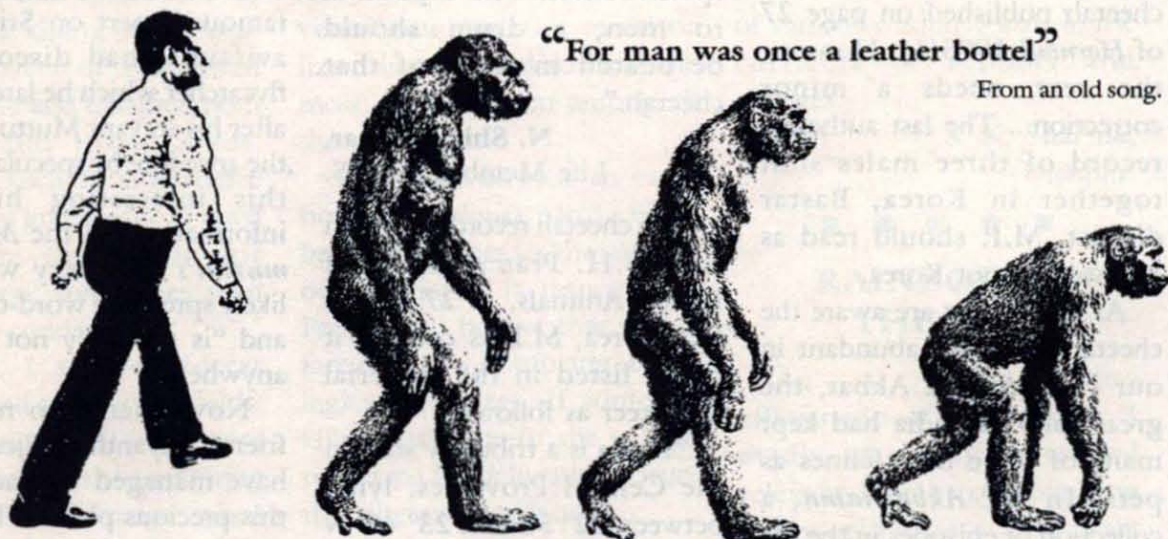
# SEASHORE LORE

## 22. Our Forefathers

### Beefsea

“For man was once a leather bottel”

From an old song.



**I**F you walk along the seashore, you will notice spurts of water shooting up here and there. A closer look will reveal small leathery or translucent, shapeless forms with two short, stubby projections (called siphons) ending in openings. Touch the animal, and you will be rewarded with a jet of water in your face, squirted out from one or both openings.

These animals are appropriately called sea-squirts, from this habit. They are also called tunicates, as the outer layer of their body-wall is enclosed in a tunic. This tunic is made of a substance called cellulose, which is normally a component of the cell walls of plant tissues, so that it is surprising to find it in an animal. They are also known as ascidians, from the Greek word *askidion*, meaning a leather wine-bottle.

Sea-squirts come in different shapes and occur from the shore to the deepest regions of the sea. Some are globular, soft and jelly-like, while others are hard and leathery. Some look like dried prunes, others like peaches, and yet others are as transparent as cellophane, with their insides visible through the skin. And they vary in size

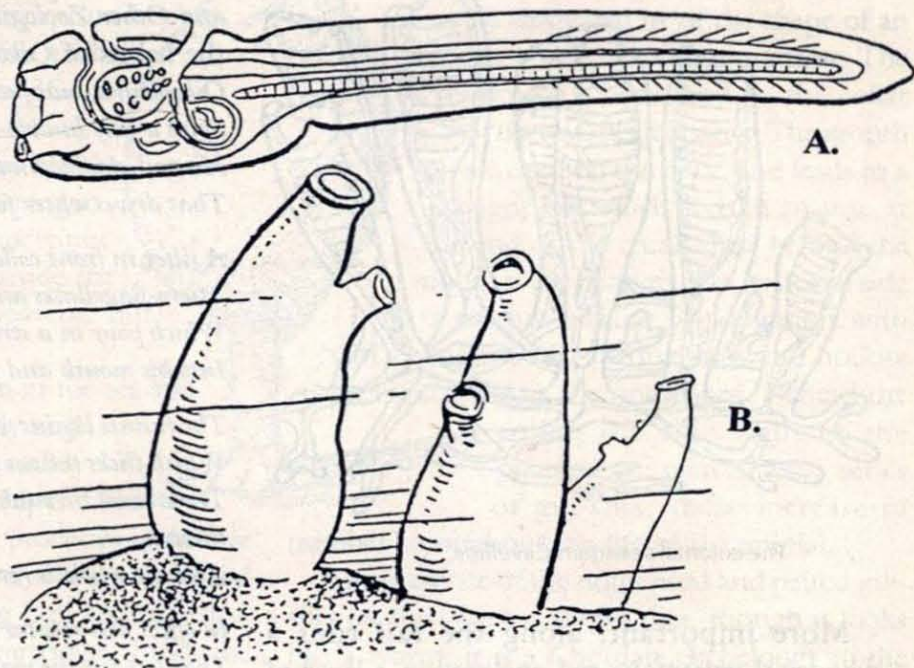
from tiny spheres to massive ones 30 cm wide. They may be whitish, grey, brown, yellow, orange, purple, green, lavender, red or black.

A sea-squirt has two openings; water is taken in from one, called the inhalant aperture or oral opening, and passes out of the exhalant or atrial aperture. The inner walls of the body are pierced with thousands of tiny slits like a sieve, and as the water passes through, it acts as a strainer, filtering out minute organisms in the water and retaining them for food. The sea-squirt also has a heart and blood system. The heart is peculiar in that it pumps blood to and fro. It beats, sending a succession of rhythmic waves from left to right for about 90 to 120 seconds. The beats become slower, and the heart stops for a few seconds. Then it starts beating once again, but from right to left. The beats become stronger, until the next period of rest, when it again reverses its beats.

Some sea-squirts live together in colonies. They are jelly-like and cover the undersides of rocks, wharf piles, sea shells or seaweeds, which look as if they have been coated with glue. Others may be white, yellow, green, brown, purple or

crimson red. When Victor Hugo, in his epic *Tailors of the Sea* wrote that "the walls are splashed with crimson stain as if giants had been fighting there", he was describing colonial or compound ascidians. Many a time, the colour of the animals is in vivid contrast to the jelly-like background: white on scarlet, purple on yellow, golden on jade-green. Whatever may be their colour, they can be identified by the small, star-like dots which cover the entire surface. While the individuals in a colony have their own separate intake openings, several individuals share a common exit opening. Others are branched, or have lobes or tubercles, or grow on the ends of stalks, or form lumps upto 15 cm in diameter.

You may not believe it, but all these, and many more which we shall see later in this chapter, are our remote ancestors. I am sure you will ask: how can these primitive, jelly-like lumps which cannot see, hear, walk or think, be our ancestors? We humans, together with fishes, amphibians, reptiles, birds and mammals share a common trait; all have backbones (vertebrae) and are therefore known as vertebrates. But, apart from this, there are other common characters which separate us from backboneless animals (invertebrates). These are: 1. a notochord — the backbone is formed from an organ called the notochord — a stiff but elastic unjointed rod that later calcifies or is filled with cartilage (in sharks and sting rays). 2. Paired gill-slits connecting the pharynx (throat) to the exterior. Fishes and amphibians (frogs, toads and newts) have well developed gill-slits. They disappear in most adult



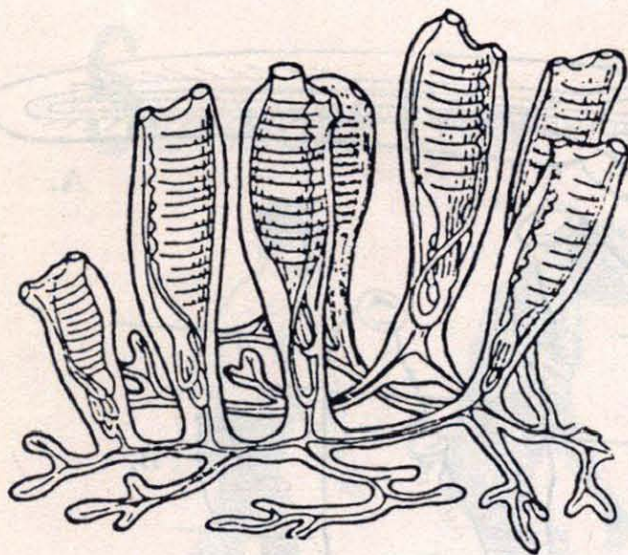
A. A section of the ascidian larva showing the circulation of water.

B. A colony of sessile tunicates

amphibians, but are seen as vestiges in the embryos of reptiles, birds and mammals. 3. A tubular nerve-cord running along and above the backbone. 4. A hepatic portal circulatory system, where veins collect blood from the intestines and then go to the liver, where they ramify.

The first two characters are also found in some animals which are not backboneed animals, but seem to be a link between these and the invertebrates. These are the ones dealt with here, and belong to the Phylum Chordata, so called because of the presence of the notochord.

Coming back to our ancestors — the ascidians, we shall have to see the babies of these ascidians. As in many animals, the young do not resemble their parents, but look radically different and are known as larvae. The young of an ascidian, unlike the adult, swims freely in the sea. It is shaped somewhat like a frog's tadpole and is in fact called an ascidian tadpole. It has a tail flattened from side to side, fringed with a tail fin with a series of striae just like the fin-rays in a fish's fin.



The colonial sea-squirt *Cavellina*

More important, along the tail runs a cylindrical gelatinous rod enclosed in a layer of cells — the notochord. It has paired gill-slits, and there is also an eye-spot, brain, ears, mouth and digestive tract, heart and complex nervous system. In short, the ascidian tadpole resembles, anatomically, an early stage of certain vertebrates. At the front end there are three processes called adhesive papillae. After swimming about for some time, the ascidian tadpole attaches itself to a substrate with the help of these papillae. The notochord disappears, the tail vanishes, and so do the eye, brain, ears and mouth. The body rotates to bring the mouth end away from the point of attachment, and the result is the shapeless mass which we call a sea-squirt.

While most ascidians seem resigned to their fate and meekly submit to the retrograde metamorphosis from an actively swimming larva to a sedentary adult, there is one rebel which refuses to do so. This is *Oikopleura*, also called the *housebuilder*. It retains the larval tail and continues to swim in the sea. While doing so, it produces masses of jelly-like ascidians larger than itself. These cover its body, become big and are discarded, while new ones are formed. Walter

Garstang, in one of his poems from *Larval forms and Other Zoological Verses*, has vividly described the habits of *Oikopleura*, as follows:-

*Oikopleura, masquerading as a larval ascidian,  
Spins a jelly-bubble-house about his meridian;  
His tail, doubled under, creates a wood draught,  
That drives water forward and sucks it to aft.*

*A filter in front collects all the fine particles —  
Micro-flagellates and similar articles —  
Which pour in a stream through a jelly-built tunnel  
Into his mouth and its mucilage funnel.*

*The funnel begins with his endostyle gland,  
Which flicks mucus up to his circular band:  
The stream through his mouth trails it out into  
threads,  
And the whole is rotated as fast as it spreads.*

*In effect this rotator's a neat centrifuge  
That lets out the water and keeps in the ooze:  
The water's sucked outwards by paired water-wheels,  
The residue serves him with plentiful meals.*

*Now although *Oikopleura* sits by himself  
In the midst of his house on a jelly-built shelf,  
He's firmly attached in front by his snout,  
And never lets go till his house wears out.*

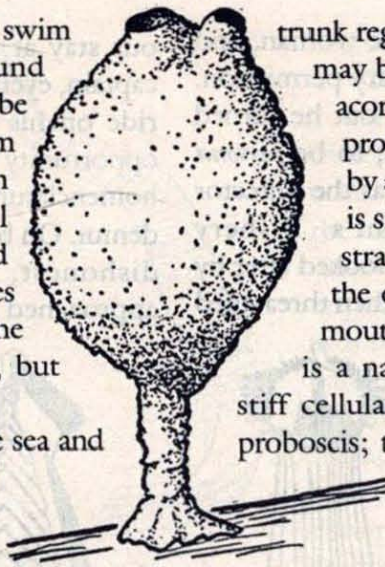
*But his body behind is completely free  
And bathed by the water that comes from the sea  
Through two lattice-windows let into the walls,  
Which limit the size of incoming hauls.....*

*Then, after windows and traps are all ready,  
The tail pops inside and, with motions more steady,  
Sets the pump working, the water streams in,  
The jelly-house swells, and the fishings begin.*

*We believe we can satisfy any scutator  
That anatomy, house, and pharyngeal rotator  
Are pure Doliolid in all their relations,  
With highly original specialisations.*

*His tail is the problem and also the base  
For nothing will work if this you erase:  
It seems that, from lack of metamorphosis,  
He is larva and adult in half and half doses.*

Sea peach



There are other ascidians which swim in the sea. *Pyrosoma* are compound tunicates, the colony, shaped like a tube closed at one end, may be 5 to 35 cm long and 0.5 to 7.5 cm in circumference. The individual animals (called zooids) are arranged side by side with their gill apertures outside and atrial openings inside the tube. The animals are transparent, but shine at night.

The salps (*Salpa*) also swim in the sea and reproduce alternately asexually and sexually. A solitary salp is spindle-shaped or cylindrical, about 2.5 cm long and with two siphon-like processes at the rear end. It produces buds which remain attached, and form a double row containing hundreds of salps, somewhat like a bandolier of cartridges. Inside the transparent body of each individual can be seen a small compact mass of viscera tinged with pink. The whole chain, a metre or more long, swims with a wavy, snake-like motion, caused by the contraction of conspicuous transverse muscle bands in the body wall. Each individual in the chain now lays an egg which grows into a solitary form.

Ascidians are hermaphrodite, both sexes being found in an individual. All the animals described above are placed in the subphylum Urochordata, of the Phylum Chordata, as the notochord is found in the tail region of the larva.

Krusadai Island, near Rameswaram, is called a paradise for marine biologists, because of the rich variety of sea life found there. It is especially noted for the occurrence of the acorn worm (*Ptychodera flava*), first described by Eschscholtz in 1825 in the Marshall Islands. It seems to be widely distributed in the Indian and Pacific Oceans, from the Red Sea and Mozambique to the Galapagos Islands, but in India it is restricted to this small region.

The body of an acorn worm, known as *Balanoglossus* to specialists, is soft and worm-like and has a proboscis, joined by a collar to the long

trunk region. The proboscis is conical and may be elongated or of the shape of an acorn — hence its common name. The proboscis is connected to the collar by a narrow, flexible neck. The mouth is situated on the neck, and leads to a straight gut which ends in an anus at the end of the trunk. Just behind the mouth is the pharynx. On its dorsal side is a narrow tubular prolongation with stiff cellular walls, jutting into the hollow proboscis; this is the notochord. Behind the collar, the side walls of the pharynx are pierced by a series of gill-slits; these increase in number throughout the life of the animal.

The presence of the notochord and paired gill-slits on the pharynx shows that, though it looks like a worm, it is a Chordate. It belongs to the Hemichordata. On the other hand, its top-shaped larva, called a *tornaria*, is very similar to the auricular larva of the echinoderms, so that the acorn worm links echinoderms with vertebrates.

I was keen to visit Krusadai, and an opportunity finally came when I had to lead a batch of postgraduate students. As the fauna of Krusadai had been badly depleted by over-collection over the years, prior permission had to be obtained to visit it. On the way, we had to attend a seminar at nearby Mandapam Camp, where, by luck, we met the doyen of Indian fisheries at that time. He told us to mention his name, and we would be given access. Krusadai was not connected to any place by road, so we had to trudge some 12 kilometres along sandy beaches, with a few narrow creeks where we had to wade thigh deep in water. Finally, we reached the opposite shore, and clapped our hands and shouted to attract the local people's attention. A dugout canoe took us across and we met a formidable lady who was in charge. Behind her stood an old man wielding a double-barreled gun. He faithfully followed the woman everywhere, so we named him "Mary's lamb".

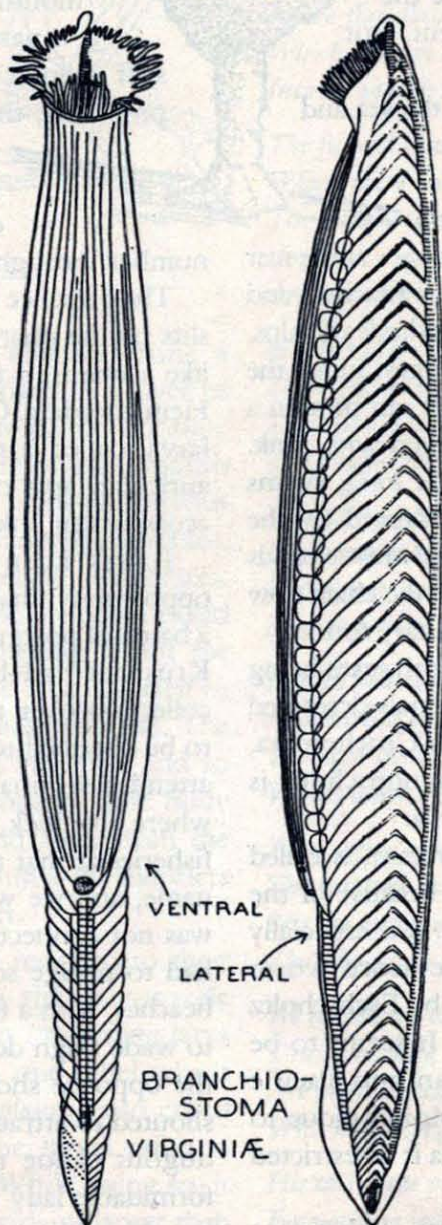
We introduced ourselves to the woman, and she asked us if we had the necessary permission. We had the name of the doyen, but he turned out, as far as she was concerned, to be *persona non grata*. It transpired that he was the Director of the Central Government's Fishery organisation, while Krusadai was looked after by the State Government. I pleaded, then threatened that I would report her to the higher-ups, but to no avail. I even told her that I would go back to Madras by the next train and return by the night train. She coolly told me that the ferry did not operate after sunset. When I told her that I would swim across, she informed me that there were sharks. To add to my discomfiture, all the time "Mary's lamb" stood by fingering his double-barreled gun. We learnt later that he was the woman's father, so he was protecting her against any mishaps in that God-forsaken village.

We were crestfallen, and had to be content with restricting our shore study to a region where there were no acorn worms. This was just the beginning of our ordeal. As no food is available on the island, we had stocked our larder amply for our stay there, or so we thought!

Tiring walks on the shore in the hot sun, reinforced by the insatiable appetite of my young students, soon exhausted our stock, and we were thinking of shortening

our stay at Krusadai, when a naughty trawler captain, eyeing our girl students, offered us a joyride on his boat and, as this would mean an opportunity for the students to refresh their fish nomenclature, I accepted his invitation without demur. On board we had a cunning, if somewhat dishonest, idea. Coily, one girl student approached the skipper for specimens of fish which *could* be useful additions to our museum, as many fishes in the Bay of Bengal are not met with in the Arabian Sea. He gladly complied with the request. He would have been horrified, had he seen these specimens in the frying pan that evening instead of reposing in jars full of preservative!

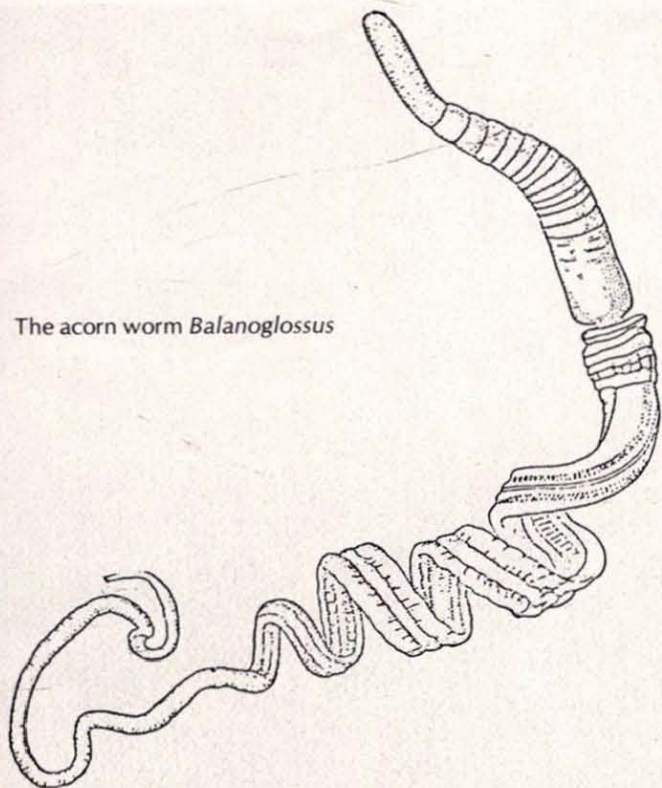
Finally we come to the lancelet (*Amphioxus* or *Branchiostoma*). It is a semitransparent animal, about 5 cm long, with a fish-like body but no distinct head. Along the body are V-shaped muscle segments, with the point of the 'V' directed forward. A fin extends along the back and enlarges at the rear end to form a tail fin. There is also a ventral fin extending up to an atriopore (the rear opening of the atrium or branchial cavity). At the front end is a funnel-like oral hood, with the mouth at its bottom. The hood is lined with many bristles, called cirri. The mouth leads into a pharynx occupying the



*Amphioxus* has the essential organs of a vertebrate but in a very primitive stage.



The acorn worm *Balanoglossus*



front half of the body, and pierced by over a hundred gill-slits. The intestine opens into an anus a little to the left of the tail fin. A notochord runs all along the body from the front end of the 'head' region to the tip of the tail. (In vertebrates, the notochord extends forward only as far as the mid-brain, stopping short at the pituitary body).

As the notochord extends even into the "head" region, the lancelet is placed in the subphylum Cephalochordata. It has all the four features of chordates indicated earlier, viz. a notochord, a tubular dorsal nerve cord, paired gill-slits in the pharynx, and a hepatic portal blood system. Thus it is the most advanced of all the Protochordates (i.e. all the animals we have discussed so far).

There is a so-called "eyespot" in front of the end of the notochord, but this is not a true eye, being only a pigment spot. The lancelet sees by many "spinal eyes", situated at regular intervals

and consisting of a pigment cell next to a visual cell.

Lancelets are seldom seen and therefore thought to be rare. But they occur in fair numbers at many places on the east coast of India where a low-tide sand bar shelters the mouth of an unpolluted bay, protected from wave action. The lancelet lives with the greater part of its body buried in sand, only a bit of the front showing above the surface. When disturbed, it quickly burrows head first into the sand, disappearing instantaneously from view. Stamping the ground with the foot will bring it out of hiding for a moment, when it writhes about on the surface for a moment, and then dives back. Rarely, it is seen resting motionless on one side on the sand surface, or swimming with a darting motion.

Perhaps many people will not feel particularly proud at the thought of being descendants of such animals as those we have seen above, no matter how remote this relationship may be. When Charles Darwin first propounded his thesis on the Origin of Species and Descent of Man, Samuel Wilberforce, the Bishop of Oxford questioned him thus: Was it through his grandfather or grandmother that he claimed descent from an ape? Darwin, who was absent at this meeting of the British Association for the Advancement of Science, could not reply, but Thomas H. Huxley, on his behalf, replied in the classic rebuff: "I would feel no shame at having an ape for an ancestor — but I would indeed be ashamed of a man who plunged into scientific questions of which he knew nothing". Anyway, there is consolation for those of us who might feel awkward about our forebears; we humans are *not* descended from monkeys, but monkeys and we are branches of a common ancestral stock! □



## Hill Stream Fishes

WITH its great variety of ecological conditions, and its position at the confluence of three biogeographic realms, the Palaeartic, Afrotropical and Indomalayan, the Indian subcontinent has a tremendous diversity of plant and animal species. This biodiversity is under constant threat because of various human activities. Due to our ever increasing population growth coupled with industrialization, much of the area which was under forest is either degraded and converted into unproductive wasteland or has been brought under monoculture for cultivation. Most of the indigenous flora and fauna are now restricted to protected areas and even these protected areas are vulnerable.

The Western Ghats form a practically unbroken relief dominating the west coast of the

Indian peninsula for almost 1600 km from the river Tapi in the north to the tip of Peninsular India. The Western Ghats are unique in several ways. They include most of the remaining tropical rain forests of Peninsular India and are home to several endangered and endemic species of flora and fauna. Different aspects of this fragile ecosystem have been studied to some extent. However, in the recent past little attention has been given to the endemic and highly adapted hillstream fishes, the changing environmental conditions of the Western Ghats and their probable effect on the hillstream piscifauna.

A lacuna developed in the knowledge of natural fish ecology because the attention of the scientific community was diverted towards commercial fishery in the last few decades. During this period the Western Ghats have faced widespread dynamic changes in their biotic and



JAY SAMANT

abiotic features due to anthropogenic activities. Today, information on how much these activities have affected the system and the fish community is urgently required.

The data available on fishes at present does not give any information on the endangered species and their status, except on the Mahseer *Tor* sp. Moreover, in the IUCN red list of threatened animals, only two endangered fish species namely *Horaglanis krishnai* (Family Clariidae) and *Schistura sijuensis* (Family Balitoridae) were identified from India (IUCN 1990).

A project has been launched by the BNHS to study the ecology of hill stream fishes. This will cover the following areas of study:

- Assessment of the current status and distribution of fishes in the high altitude hill streams of the Western Ghats.
- Studies on the present status and habitat conditions of the endangered species like

*Horaglanis krishnai* and other endemic *Homalopteran* species in Western Ghats.

- Evaluation of the changes in fish communities by comparing areas with different levels of habitat alteration.
- Development of a data base for aquatic habitats in the Western Ghats in co-operation with various institutes (National Bureau of Genetic Resources, Zoological Survey of India etc.)
- Development of conservation management guidelines to maintain aquatic habitats and fish communities in the highlands.

This project will cover a few identified areas in the north and higher altitudes of the Western Ghats between Kudagu in Karnataka (Netravati river) and Mahendra Giri in Tamilnadu. This region contains most of the high peaks and elevated areas in the Western Ghats. The area represents the meeting ground of the Eastern and Western Ghats. □

## National Painting Competition

**T**HERE is a Michelangelo, a Picasso in all of us, only most of us never realise it. There may have been umpteen reasons for it, paints were costly, one could not earn enough as a painter and our parents never encouraged us, and so on. Whatever the reason, all that is past now. The Sálim Ali Birth Centenary Celebrations National Painting Competition was co-centres all over the country. At each place the response was overwhelming and children accompanied by their parents and teachers came in droves to exhibit their talents. Armed with paints and brushes, pencils and crayons they squatted on the floor or benches and desks and went about seriously doing what they had set out to do.

Some centres were magnanimous in providing drawing paper to the participants while most had to get their own. It would have charmed many a heart to see these young un's at work. In New Bombay, the Bombay YMCA,

New Bombay branch hosted the event. Their indoor games hall was packed with children, three hundred in all. There were little ones not qualified in age to participate in this event but yet keen to show off their prowess.

The National Painting Competition event brought out one important fact to us — no matter where we are, in Guwahati or Calicut or Kota, the birds and the beasts of the air and water will forever receive our love, reverence and protection. We might choose to use our paints as these children have done, or pen or cameras or what have you. Thanks to one *Ole Man* who instilled this respect in us and in whose memory this event was conducted. It will be our endeavor to conduct the Sálim Ali painting contest in the years to come.

Lima Rosalind, Research Officer, CEP.

*The centrespread of this Hornbill features one of the winning entries*

# TOXICS LINK



JAY SAMANT

**A recent judgement of the Delhi High Court jammed the wheels of the Toxic waste juggernaut, which has been gathering in its wake a crowd of technocrats, administrators and vested interests. This, coupled with the already desperate issue of solid wastes, is assuming grim proportions in the country. We are facing a double edged sword in the form of toxic waste and incineration.**

**T**HE issue at stake is the disposal of solid waste. Bombay city itself deals with approximately 5500 tonnes of solid waste daily. At this rate the city's landfills will suffice for just another decade. The desperation that has crept into the system has led to equally desperate decisions being taken in a hurry, for short term

gains. Incineration technology which is being touted as the panacea for all waste disposal problems, is one such decision which is being rushed through, without considering its grave long term implications.

The technology itself has been rejected by more advanced countries, where informed public

JAY SAMANT



A burning issue — can we afford the environmental cost of incineration?

opinion has opposed, hammer and tongs, the installation of all such units near human habitations. Incinerators have been shut down all over the USA, Scandinavia and Britain and are being phased out in Germany. But we appear to be more than willing to commit the same mistakes, in spite of evidence to the contrary.

Incinerators which burn chlorine wastes and halogenated products like PVC create dioxins and other chlorine byproducts that are even more dangerous than the original product. Some of the most hazardous byproducts are hexachloro-

**The *hysteris effect* deals with the emission of toxic gases from the incinerated solid, which continues long after the burning process has been completed. This is not included in conventional measurement techniques.**

benzene and the deadly dioxins and furans. Most dioxins are chlorinated and can only be created in association with chlorine.

Dioxins and furans are polychlorinated aromatic hydrocarbons. There are 75 forms of polychlorinated dibenzodioxiden (PCDD or dioxin) and 135 forms of polychlorinated dibenzofuran (PCDF or furan), all of which are likely to be produced by waste incinerators. Their toxicity is expressed in terms of TCDD, i.e., 2,3,7,8 - tetrachlorodibenzo-p-dioxin, which is the world's most toxic synthetic chemical.

According to the US Environmental Protection Agency (EPA), the tolerable daily intake of dioxins and furans is six thousand-million-millionth of a gram ( $6 \times 10^{-15}$  grams) of TCDD equivalent per kilogram of body weight.

The diversity of the organic composition of the waste creates conversion problems, as each chemical has its own optimal oxygen and heat requirements. Anything short of these requirements results in the formation of a new group of toxic chemicals.

Heavy metal waste like lead and mercury in the incinerator feed will be released, sometimes as more toxic byproducts. Halogenated chemicals are another common product of incineration, forming a lethal cocktail of chemicals like dioxins, furans and polychlorinated biphenyls. The gaseous effluents include greenhouse gases to the extent of 75% of the emission volume.

Alert environmentalists have pointed out flaws in every step of the incinerating procedure. Incinerators with a 99.99% Destruction and Removal Efficiency (DRE) are said to be environmentally friendly. DRE is a quantum calculated by analysis of index chemicals in the input and output. Another factor is the *hysteris effect* which deals with the emission of toxic gases from the incinerated solid, which continues long after the burning process has been completed. This is not included in conventional measurement techniques. DRE measurements have also proved to be highly inconsistent and unpredictable, fluctuating dramatically from day to day, which translates into a phenomenal quantity of toxic waste and a highly morbid environmental picture.

Fortunately for India, a group of individuals and NGOs has woken up to the creeping disaster of incineration technology. These groups are presently very active in metropolitan centres like Mumbai, Delhi, Calcutta and Madras. At a recent well attended core group meeting of Toxics Link for strategy discussion held at the BNHS on April 2, 1996, Dr. Paul Connet, a professor of

chemistry from New York, informed the audience of the hazards of incineration that lay ahead for India, if urgent remedial measures were not initiated. The meeting was followed by a very informative illustrated talk by Dr. Connet at Hornbill House.

Alternatives to incineration of organic waste include using natural processes like vermiculture and composting, which experts opine can deal with 80% of the waste, about 12% of the material can be effectively recycled by an integrated programme using rag pickers. The other 8% is toxic, inorganic and chemical non-recyclable waste, which after adequate treatment can be disposed of by landfill techniques.

The campaigners have sought to address decision makers and prime users of the technology, like municipal bodies, hospitals and chemical industries, who seem to be mesmerised by this quick fix technology. In the absence of proper information, the users can hardly be taken to task. Hence, it is imperative that all relevant data should be made accessible to the relevant government agencies and decision makers, to bring about basic policy changes. □

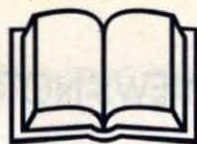
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Compiled by S. Asad Akhtar, Conservation Officer, BNHS.



## TARAPOREVALA AQUARIUM GUIDE

By B.F. Chhapgar

Department of Fisheries, Maharashtra State,  
Bombay.

pp. 22, with 47 text figures. Price Rs. 10.

In its heyday, the Taraporevala Aquarium used to have a variety of literature for visitors, such as an aquarium guide, picture postcards and a fish album. Over the years, these have disappeared one by one, so that the average visitor has no inkling of the curious features and behaviour of the denizens in the aquarium tanks. Fortunately, the authorities seem to have woken up, and a new guide has been brought out.

At first glance, it does not create a good impression, what with its bilious-yellow photograph of the Aquarium building on the cover. Scanning the pages inside reinforces the impression that it is a rather shoddy job, with illustrations that could have been the handiwork of a five-year old.

It is only when we read the guide in detail that we can appreciate its worth. Written as it is by Dr. B.F. Chhapgar, an internationally renowned doyen of marine biologists in India, its inhabitants of the Aquarium treats the in a lucid style, with simple language that does not overawe the reader, and with brief, to-the-point descriptions which give us an insight into the wonders of aquatic life. At the end, we come away out of the Aquarium with a feeling that we have learnt something about fishes which we were not aware of when we went in.

There are several jarring mistakes. A small guide, unlike a book, need not have a foreword. The first mistake is in the foreword, with the words "22 long year (instead of years). On page 1, the two words "sea anemones" are twice compacted into one word "seaanemones." Similarly, on page 2, "moray eels" is printed as "morayeels" On page 7 "shark-fin" is made into "shark-in". Page 8 - "venon" instead of "venom." Page 11 has "sinnuous" for "sinuous."

But, irritating as these mistakes are, it is with the illustrations that we have to find serious fault. Could not the concerned persons have employed a good artist? The drawings are, frankly speaking, terrible caricatures of the beautiful fishes they are supposed to portray. Fig. 1 is nowhere to be seen; the guide starts with Fig. 2. Here, the lettering is done by a rank amateur with no feel for uniformity in size or shape, and with spelling mistakes galore. A few examples — "Aqurium main building", "pump weel for", with as if on an afterthought, "sweet water" printed elsewhere, "water canel" (channel?) "exhibition water supply lane" (whatever it means), "exhubition tank", "sitng (settling?) tank," "pilet chanel", etc.

It is very difficult to find out which fish an illustration refers to, as there are no captions. Since all illustrations are numbered as Figures, it would have been a simple matter to have indicated this Fig. number in the text. The fish in Fig. 11 is supposed to have a spine at the root of the tail, but this is not shown. Similarly, the vertical stripes in Fig. 5 and arched bands in Fig. 6 are not shown. The doodles on Fig. 12 do not give any indication of the beautiful jigsaw-puzzle design in the fish.

Fig. 34(a) seems to have been inserted as an afterthought, but surely the numbering of subsequent illustrations could have been changed. The long, streaming pectoral fins of the fish in Fig. 40 are missing, and so are the right claw and legs on the right side in Fig. 42. The goldfish in Fig. 44 seems to have grown a large, bulbous Roman nose!

In short, the effect of the beautifully written text is completely nullified by the atrocious illustrations. If the authorities concerned have any regard for quality, they would do well to scrap the current edition and follow through with a better illustrated guide. The question is — will they? □

HIMANI DUGGAL





## Bird traffic in north India

MAN has been a foodgatherer since time immemorial, and hunting was a major tool which enhanced his efforts. This was later replaced by farming as the prime source of food. Waterbirds are a source of food and hence they are harvested by many people in India. However, due to indiscriminate trapping, the populations of many species have declined alarmingly. The Government of India, in its wisdom, imposed a total ban on the trade of wild birds in 1991.

A survey done by Traffic-India, from 1993 onwards, revealed that certain communities like Mir Shikars, Baheliya, Pathani, Chirimar, Sahanis and the Mundas, are still dependent on waterbird trapping as a livelihood. The surveyors found nearly 456 waterbirds of 34 species being sold in just four bird markets of Lucknow, Kanpur and Unnao in Uttar Pradesh. This indicates the intensity of the trade in northern India. It has been estimated that the trade involves thousands of waterbirds in a single season. Interviews with bird trappers in the towns mentioned above revealed that most of the birds sold in weekly markets were from nearby wetlands such as

Nawabganj jheel, Kurri and Bachrawa.

With the growing concern for wildlife conservation and the rapid destruction and alteration of habitat, there is an urgent need to study the damage caused by the once traditional trapping of birds. This activity is now highly commercialised. The use of poison for baiting waterbirds for mass capture, extensive trapping of ducks and collection of chicks of some species such as the sarus crane *Grus antigone*, is a cause for concern.

Most of the traditional bird trappers are aware of the illegality of their trade and are willing to change their profession, if alternate employment opportunities are provided. Besides strict enforcement of the Wildlife Protection Act, the problem has to be considered from a humane viewpoint. Professional trappers, most of them very experienced in catching and keeping birds, should be employed in zoos, field research projects and bird sanctuaries. In fact, Mir Shikars were employed by the BNHS and contributed phenomenally to the BNHS Bird Migration Project that concluded in 1991. □

*Courtesy: Abrar Ahmad and Asad R. Rahmani*

## Of Cranes and Men

CRANES are one of the most endangered families of birds. Hunting, egg collecting and destruction of wetland and grassland habitats have been catastrophic events for cranes worldwide. But in some regions, cranes thrive in response to care provided by people.

Northwest India, with thousands of resident sarus cranes and tens of thousands of migrant Eurasian and demoiselle cranes, is an excellent example of peaceful coexistence between cranes and man. Sarus cranes are protected by Indian tradition and are considered symbolic of conjugal fidelity; village ponds over Rajasthan, Gujarat

and Uttar Pradesh often have resident pairs which roam freely, untroubled by man. Their survival, in one of the earth's most populous areas, is a tribute to the Indian psyche and the cranes' ability to adapt to altered environments. A similar public sentiment, in Tibet and Mongolia, ensures the protection of the blacknecked and demoiselle cranes, in those areas.

Cranes can only survive if human values embrace crane conservation as the Indians, Tibetans and Mongolians have practised since time immemorial. Public education is vital, along with the successful application of new techniques

for the reintroduction of cranes in regions from which they have disappeared.

Five species of cranes have been recorded in northeastern India, these are the common crane *Grus grus*, blacknecked crane *G. nigricollis*, hooded crane *G. monacha*, sarus crane *G. antigone*, and the demoiselle crane *Anthropoides virgo*. All the species are extremely rare or recorded as winter vagrants in the area.

Recent field studies have confirmed the common crane as a regular winter visitor into the Indian faunal limits. A new migration route of the species through the Dibang Valley of Arunachal Pradesh was discovered in 1993. Appearances of the blacknecked crane have been recorded in North Bengal and in some small valleys of Arunachal Pradesh, though it seems to have vanished from the Apa Tani Valley, a known wintering site.

The hooded crane has not been recorded for nearly a century except for one stray record of the nominate race, *G. antigone antigone*. This record of 1994 has extended its range by about 500 km. The Burmese or the Indochinese race *sharpii* is virtually extinct in the region. The demoiselle crane also continues to be an occasional winter visitor with only a few records.

The cranes wintering in protected areas like Orang and Dibru Saikhowa Sanctuaries are safe



This winter saw the return of sibes to Bharatpur.

from any disturbance, unlike other areas where they are often hunted. Concerted efforts are now required to save the predominantly wetland habitats of these birds from agricultural activity, building construction and unplanned development. □

## More on Kokkare Bellur



Saving the spotbilled pelican.

In our leading article, we give a first person account of the programme to save the pelicans of Kokkare Bellur. Here are some comments on the same subject from researchers working at the University of Agricultural Sciences, GKVK, Bangalore.

A census of the spotbilled pelicans *Pelecanus philippensis* and painted storks *Mycteria leucocephala* was conducted during the nesting season at Kokkare Bellur. The counts revealed that the number of storks range between 850 and 900; and that of pelicans between 300 and 350. The aggregation of nests appeared to follow the aggregation pattern of trees. Eighty per cent of nests were located adjacent to houses in the village.

The trees holding nests of pelicans and storks included common species such as *Ficus baeleerica*, *Thespesia populnea*, *Delonix allata*, *Tamarindus indica*, *Melia dubia*, *Albizia lebek*, *Azadirachta indica* and *Ficus bengalensis*. The larger the canopy of the tree, the greater was the number of nests and the nesting success in that tree. Instead of nesting on the outskirts of the village, the birds preferred to nest on trees in the village. This seemed to show that aggregation of trees within human habitations gave some kind of advantage to the birds. □

### NEW ARRIVALS at the BNHS LIBRARY

1. S. R. Hiremath, Sadanand Kanwalli & Sharad Kulkarni (eds.): All about draft forest bill and forest lands towards policies and practices as if people mattered — SPS: Dharwad, 1994; 280 pp.
2. Surendra Nath: Recent advances in fish ecology, limnology and eco-conservation. Daya: Delhi, 1994; 13 pp.
3. S. Aksorn Koae: Ecology and management of mangroves. — IUCN: Thailand, 1993; 176 pp.
4. A.B. Chaudhari & A. Chaudhury: Mangroves of the Sundarbans. Vol. 1. — IUCN: India, 1994; 247 pp.
5. Phan Nguyen Hong, Hoang Thi San: Mangroves of Vietnam — IUCN: Thailand, 1993; 173 pp.
6. Kushal Mookerjee: Birds and trees of Tolly. Tollygunge Club Ltd: Calcutta, 1995; 126 pp.
7. Richard H. Gerove: Green imperialism: colonial expansion, tropical island Edens & the origins of environmentalism 1600 — 1860 O.U.P.: Delhi, 1995; 540 pp.
8. T.S.N. Murthy: Illustrated encyclopaedia of the reptiles of India — B.R. Publishing: Delhi, 1995; 112 pp.
9. C.A.W. Guggisberg: Birds of East Africa: non Passerines, 4th edn., Vol. 1 Mount Kenya Sundries, Kenya, 1994; 168 pp.
10. C.A.W. Guggisberg: Birds of East Africa: Passerines, 2nd edn., Vol. 2— Mount Kenya Sundries, Kenya 1988; 196 pp.

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# Environmental Impact Assessment

## An Ecological Perspective

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Alex Abraham

It is only in the recent past that man has, once again, discovered the importance of the environment. The insatiable ambition for economic prosperity and affluence, with the myopic view that natural resources are unlimited and expendable, has resulted in the rapid depletion of forest cover and other resources. It was soon realised that burgeoning populations, the frenetic pace of developmental activities and rapid

industrialisation could cause irreparable and significant losses to the country's natural resources. However, the immediate need is to ensure development in a manner that is self-rectifying, or what is known as Sustainable Development.

Till a few years ago, environmental protection only envisaged treatment of wastes after generation. However, this concept of "end-of-pipe treatment" has now given way to the strategy of incorporating

environmental concerns in the developmental stage of any project, thus limiting the quantum and strength of effluents to a large extent. Measures like the use of low sulphur/ash fuels, modification of the manufacturing process, use of alternate raw materials, recycling of wastewater, modification of final product specifications and subsequently, the provision of suitable pollution control equipment, are



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Wildlife in cleared areas is directly affected due to site preparatory activities.

now considered. All the above measures reduce, to a large extent, the strain on our ever depleting natural resources. Implementation of any of these methods or a combination of them will help in resisting degradation of the environmental setting, as also make economic sense to the industry as they involve lesser costs on inputs and reduced expenditure on waste treatment and disposal.

### Background

Flora and fauna are some of the most important features of the environment. Most of the organisms in an undisturbed habitat are native or indigenous to the area in which they are found, though a few may be exotic. Retention or removal of natural communities and their replacement with introduced forms have numerous implications that need to be considered. Different types of methodologies are available to describe the natural community and its components. The assessment should provide a description of the community's unique features, dominant species and an evaluation of rare or endangered species. Further, their vulnerability and the outcome of human development activities need to be considered. Finally, the biotic assessment should predict the potential of the natural community to recover from disturbance.

The physical setting of the inanimate world largely determines the presence and types of biological organisms and any alteration in these abiotics factors

tends to bring about a concomitant effect on these living creatures. Thus an ecosystem is self-contained and self-sustaining and is composed of plant and animal populations which involve the total nutrient and energy economies of the system as well as the organisms involved.

### Environmental Impacts

Developmental activity, be it construction of a highway or setting up of an industry, in an undisturbed habitat usually produces two types of adverse biological consequences, that is, direct and indirect, of varying duration, short-term or long-term. **Direct Impacts are those that destroy or displace, or in some way adversely affect, vegetation and wildlife.** Examples are site clearing, land grading and leveling. **Indirect Impacts are those that destroy or disrupt habitats and ecosystems upon which a species depends.** These include livestock grazing, alteration of water table, elimination of nesting sites and breaking food chains or webs upon which



The life-giving forest cover which took years to develop is being lost due to inundation in mining areas.

an organism depends. **Short-term impacts relate to immediate environmental changes that occur at the inception of a project action, but end or can be rectified after the termination of the said action.** Conversely, **long-term impacts result from major direct environmental changes or chronic perturbations resulting from both the construction and the operational phase of the project.**

Typical impacts on flora and fauna due to developmental activities may be stated as follows :

## *IMPACT ON VEGETATION*

### **Direct Impact**

- Alteration of Plant Habitat
  - Reduction of native plants
  - Reduction in community stability
  - Reduction in the variety of native animals
- Introduction of plant and animal pests

### **Indirect Impact**

- Interferes with
  - Water Table
  - Drainage

## *IMPACT ON WILDLIFE*

### **Direct Impact**

- Destruction of animal habitat
  - Loss of native plants
    - Direct destruction
    - Indirect loss
  - Loss of native animals
    - Direct destruction
    - Indirect loss due to loss of shelter, food and nesting sites

### **Indirect Impact**

- Interferes with
  - Breeding
  - Feeding
  - Migration

A typical example of a developmental project having the kind of impact described above is that of an open-cast mining project in a forest area. While there is no doubt that mining is vital to the

economy of a country to tap the vast resources of minerals and ores, the environmental impacts due to this activity are large and varied, the most serious among them being land degradation and the resultant impacts on wildlife.

Site preparation for this activity involves felling of trees and clearing vast stretches of land which sustain rich vegetation and wildlife. Direct impacts on vegetation due to the preparatory and construction phase include alteration of plant habitat by reducing the native plants and animals. Also development activities induce the increased presence of plant and animal pests which would otherwise be balanced by the presence of indigenous plants and wildlife. Wildlife in the above area is directly affected and diminishes, due either to direct destruction, loss of their natural plant habitat or other indirect reasons, e.g., imbalance in male-female populations, loss of food, natural shelter or nesting sites.

Indirect impacts on vegetation arise from decrease in water table level and changed drainage patterns. While the scenario before site clearing was that a lot of the precipitation was absorbed into the soil due to the retention of water by plants, now, rainwater would drain off the paved roads and cleared areas at a faster rate without allowing water retention by the soil. Consequently, floods could also result.

While it is obvious that wildlife in the cleared area would get directly affected due to various site preparatory activities, it must also be noted that animals, particularly large mammals, operate in a vast territory which may consequently be fragmented by the project area. These and other smaller animals, through their life-span, need to travel long distances through the forest areas to feed themselves and their young ones, breed and also migrate to other areas. These activities tend to get hampered by the sudden presence of man-made infrastructural facilities like buildings, roads and pits, which may lie between them and their destinations.

Thus all the above activities, whether in the

construction phase of the project or the operational phase, have direct or indirect impacts. A few of these impacts may be short-term, e.g., felling of a certain type of tree in the project area, but the long term impacts are of greater consequence, e.g., climatic change, reduction of species diversity and subsequent growth of plant and animal pests.

VIBHU PRAKASH



Degradation due to mining activity is amply demonstrated in this bleak landscape.

Thus, there is a need for judicious site selection procedures and planned development activities are a must, even in site-specific projects like those of mining.

statements dismissing the biological attributes as if they did not exist or had no merit. This has been partly due to inadequate evaluation by the EIA agency and to reviewers who lack a biological

## Ecological Assessment

Environmental Impact Assessment studies for flora and fauna attributes have thus far been conducted on a superficial level, either by a biologist, enumerating the physiological aspects of wildlife or by environmental engineers who tend to look at ecological aspects as a whole in considering project impacts. Most of these studies have thus far been nothing more than short

VIBHU PRAKASH



Loss of forest cover is an inevitable outcome of mining operations during the construction phase.



perspective. This deficiency must be urgently rectified. The need of the hour is a co-ordinated effort by both process engineers and ecologists to study in detail the project activities and ecological aspects of the project area and correlate the effects on vegetation and wildlife due to specific project actions. The studies carried out should be able to ascertain the specific project activities (whether in the construction or operation phase) which are responsible for the destruction or displacement of various plant and animal types and also whether the effects would be short and/or long term.

Common lacunae in the ecological component of Environmental Impact Studies are :

- ❑ Very few field studies are carried out to substantiate official records and most of the surveys, if carried out, are at inappropriate periods which do not take into account plant life distribution and animal behaviour during various seasons.
- ❑ Most of the surveys do not mention survey methods and methodologies.
- ❑ Very few studies indicate important parameters like species abundance, diversity indices etc.
- ❑ Very few studies mention potential impacts and indirect impacts are nearly never mentioned.
- ❑ Lack of detailed mitigation measures related to the specific impact.
- ❑ Cosmetic mitigation measures (landscaping, tree planting) are viewed as sufficient alleviating measures. Specific mention needs to be made of the tendency to plant fast

growing tree species without considering their suitability to the local habitat.

Realising the importance of wildlife resources, India has frequently taken steps by way of various wildlife Acts and creation of wildlife parks and sanctuaries throughout the country. Also, conservation projects for individual endangered species like the Lion (1972), Tiger (1973) and Crocodile (1974), have been undertaken by the Government of India, reaffirming its commitment to wildlife conservation.

The reason for concentrating on the protection of large mammalian wildlife is apparent in that if all is well at the "apex" of the ecosystem pyramid, automatically the base would be in a state of health, i.e., if the tiger flourishes, it is reasonable to assume that the lower forms of life, herbivores and plants would also survive. However, while these measures have helped to arrest depletion of animals, it should also be noted that due importance needs to be given to plants and herbivorous forms which constitute the base of the

ecosystem pyramid. To maintain this balance, strict enforcement of the Acts which seek to protect our diminishing forest reserves is essential. Also, rehabilitation of different species in available habitats is required to be carried out in a scientific manner to achieve the elusive goal of Sustainable Development. ❑

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Moon Moth — *Argema selene*

ISAAC KEHIMKAR

The beauty of the Moon Moth has few parallels in the insect world. It gets its name from the distinctive moon-like markings on the wings. The moth belongs to the family Saturniidae, or emperor moths, known for their beauty and large wingspan.

The Atlas and Tussar silk moth belong to this group. They do not feed in their winged stage that lasts for a week or two. The male's feathery antennae are finely tuned to detect the presence of a freshly emerged female moth that

might, from even a kilometre away, be giving out chemical signals via her pheromones.

The apple green caterpillars, having long thin, sparse hairs, grow finger-thick, feeding voraciously on the leaves of the food plant *Lannea*. When fully grown, the larvae spin cocoons of coarse silk, incorporating leaves and thin twigs. The adults emerge usually in about a fortnight, if the weather is conducive, or else the pupal stage may last as long as 8 to 10 months. □

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