HORNBILL

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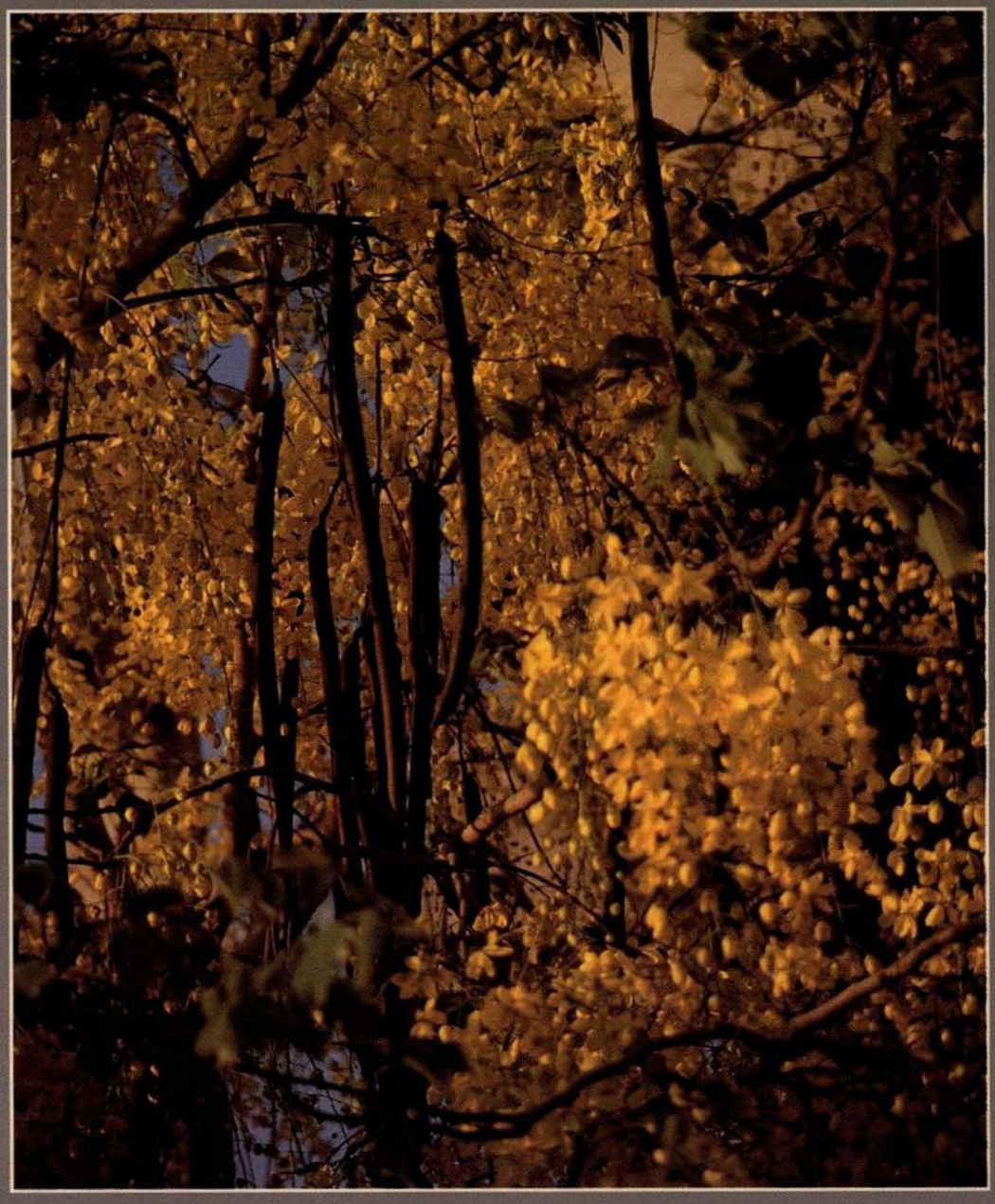

BOMBAY NATURAL HISTORY SOCIETY

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The Society was founded in 1883 for the purpose of exchanging notes and observations on zoology and exhibiting interesting specimens of animal life. Its funds are devoted to the study of natural history in the Oriental region, and 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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Our neglected wetlands

Water is considered as a sacred resource in Indian culture. Many rivers and also seas have been described as goddesses in Hindu mythology. From time immemorial, the banks of rivers and lakes have been inhabited by man and have served throughout his evolution as a major life support system. Even today millions of devotees worship the holy Ganga and other rivers which play a major role in the life of the people of India.

However, wetland habitats comprising of streams, rivulets, rivers, lakes, backwaters estuaries, lagoons and mudflats are totally neglected and rapidly degrading vital habitats in the country.

Present knowledge about these wetlands is scanty, except for a few well known wetlands like Bharatpur. There is also a rapid increase in man-made water bodies, which need to be studied for their potential for biodiversity conservation. At the same time, attempts must be made to assess the damage caused to them by anthropogenic factors.

According to one estimate, about 70% of the water in the riverine systems today is not potable. Considering water as the main source of life, it is depressing to note that today all our river systems are reduced to gutters to carry huge quantities of sewage and industrial effluents.

The area under wetlands in India is estimated to be 1,450,871 hectares of natural wetlands and 2,589,266 hectares of man-made wetlands. The Indian coastline is over 7500 km, with diverse wetland habitats like mangroves, lagoons, salt marshes and mudflats.

The major problem faced by Indian wetlands are siltation, weed infestation, encroachment, pollution and various anthropogenic activities, particularly due to increasing human population and the so called developmental activities.

BNHS has, for the last few years, been involved at various levels in trying to conserve wetlands in general, and some identified wetlands with biodiversity potential in particular. Research projects have been proposed on Chilka, Bharatpur, the west coast of Maharashtra and the Powai lake in Bombay. Research work has been initiated on amphibians and hill stream fishes in the Western Ghats. Awareness and nature education campaigns have been initiated at Bharatpur and Pt. Calimere.

It is imperative that BNHS members get involved in the Wetland Conservation Movement in their towns and cities, and that they make a sincere effort to protect and conserve these most vital, but neglected habitats in our country.

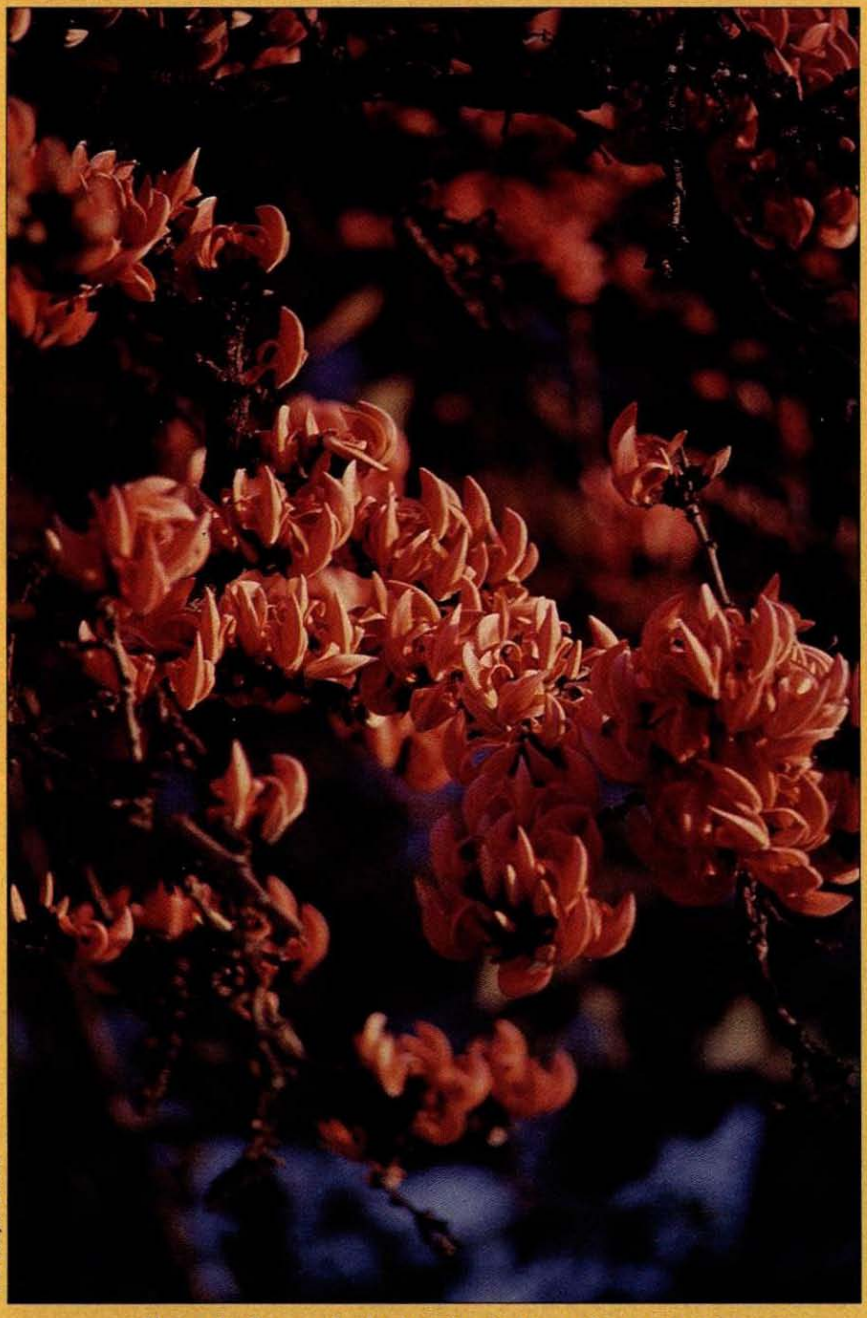
JAY SAMANT

A Look At Legumes

V.B. TULJAPURKAR

Leguminous plants have been on the earth for millions of years and will probably stay for years to come, giving us the benefit of their aesthetic and economic uses, provided they are not wantonly cut and destroyed.

The Leguminosae family which comprises about 20,000 species is best known by its fruit which is called a legume. Technically speaking, it is a one-chambered, two-valved seed pod with marginal ovule attachment, as in the common pea. However, the fruits of leguminous plants are often modified. Some are single seeded, winged, indehiscent (not splitting open along definite seams), while others are many-seeded, with constrictions between the seeds which break off at maturity as separate reproductive units. The peanut is an unusual legume in which the flower is produced



V.B. TULJAPURKAR

The scarlet flowers of palas have inspired poets from ancient times

Hala, a Satwahan, in his Gatha Saptashati, compares the palas flowers under a tree to saffron-robed Buddhist monks kneeling and praying to the Lord

above the ground, but as it matures it assumes a position near the soil and the pods are developed underground.

If the leguminous fruits show a great variation in size, shape and colour, the seeds are not ordinary either. Some are as small as pinheads while others are as large as a baseball. Some are drab while others such as those of *Ormosia* have a brilliantly striking black and red colour. Some seeds are used as currency by primitive people while others are used to make beads and handbags. Some seeds such as soyabean and mung have a high nutritional value,

The Indian Coral Tree is supposed to flower in Indra's garden. An episode in the Puranas relates that Krishna had stolen its flowers from the garden

V.B. TULJAPURKAR

The coral tree is pollinated by several varieties of birds

V.B. TULJAPURKAR

The cassias provide aesthetic and commercial benefits to man

while others are poisonous. With 20,000 species in the family, all varieties in colour, size, shape and use are represented.

The Leguminosae family can boast of some of the most beautiful flowering trees in the world. These have inspired poets and painters in India for centuries. The Mahabharata mentions the coral tree (*Erythrina*) and the palas (*Butea frondosa*). The scarlet flowers of palas have inspired writers and poets from ancient times. Hala, a Satwahan, in his Gatha Saptashati, compares the palas flowers scattered under a tree to saffron-robed Buddhist monks kneeling and praying to the Lord.

The fossil record is rich with numerous examples of leguminous trees dating back to the early Tertiary period, about 54 million years ago. Some authorities believe that the members of the Leguminosae family were probably well developed in the Cretaceous period about 136 million years ago.

Leguminous plants are of a bewildering variety, and produce a prodigious amount of pods and seeds. The seeds of certain cassias have germinated even after 200 years when stored at room temperature. Thus, wide distribution, an abundant supply of seeds and the capability of the seeds to germinate after several years assures a definite survival advantage for the various species of legumes.

The legumes provide various chemicals such as flavinoids, alkaloids, terpenoids, non-protein amino acids and others. Rotenon is another chemical found in certain legumes and is toxic to a number of organisms. Primitive people who knew of this property used parts of the plant containing this compound to poison fish. *Lathyrus sativus*, also known as khesari dal, is used to adulterate various pulses in India, an unethical practice indeed, as it leads to a special type of paralysis called lathyrism. Unfortunately, there is no cure for this illness. Species of *Astragalus* produce an amino-acid — mimosin — which is poisonous to livestock and when cattle consume these plants, they become unmanageable and "go crazy". The common bean is rich in a compound called phytohaemagglutinin. This substance has the capacity to agglutinate certain human blood types, and is toxic to rats. It has been found to have beneficial effects in certain diseases.

Perhaps the most important and well known property of leguminous plants is the ability to "fix" atmospheric nitrogen. Soil bacteria of the genus *Rhizobium* attach to the roots of legumes and the root swells around them to form small nodules. The bacteria now utilize nitrogen and other ingredients and convert nitrogen into compounds such as nitrates which a plant can use for its growth. This nitrogen, in the form of nitrates, enriches the soil and acts as a fertilizer. Thus the legumes and the bacteria function symbiotically to maintain an ecological balance by participation in the Nitrogen cycle. It has been estimated that the world's legumes add more nourishment to the soil than all the fertilizer produced by industry.

Many species of legumes are used as food. Edible oil is extracted from soyabean and groundnut and the latter is used for cooking in many parts of India. Various types of peas, soyabean, mung, kidney bean, etc., are used as pulses as they contain large amounts of proteins and vitamins. Marama beans, consumed by the bushmen of the Kalahari desert in Africa, taste like almonds, yield more oil than soyabean and

have more protein than peanuts. Tamarind needs no introduction to Indian children and housewives and there is hardly a home in the country where this fruit is not used. The word tamarind came from the Persian word 'tamar-e-hind' which means Indian date. Interestingly enough, the home of this tree is tropical Africa, though it is now very much a part of our lives in India.

Some of the legumes act as nurse plants, fostering healthy growth in crops around them. *Gliricidia*, also known as madre-de-cacao (Mother of Cocoa) is an excellent example of this. In the tropics, coffee, pepper, vanilla and many other crops are cultivated in association with *Gliricidia*.

V.B. TULJAPURKAR

Colville's glory is an appropriate name for the prominent and brightly hued flowering *Colvillea racemosa*

The Leguminosae includes a great number of trees, shrubs and vines which display spectacular and exquisitely beautiful flowers in season. No wonder nine different nations in the world have chosen flowers of leguminous trees as their national flower.

In India the palas, also known as the flame of the forest, adorns many a highway and jungle in early spring. The amaltas or the Indian laburnum (*Cassia fistula*) and coral tree are seen in the wild as well as in cityscapes. The cascade of deep yellow flowers of laburnum is indeed a treat to the eyes. The laburnum along with other cassias, gulmohar or Royal poinciana (*Delonix regia*), Colville's glory (*Colvillea racemosa*), *Parkinsonia*, and kovidar (*Bauhinia* sp.) make excellent avenue trees.

The simultaneous flowering of large numbers of these trees creates a truly memorable visual impact, which is associated with the coming of spring. The raintree (*Samanea saman*), tamarind (*Tamarindus indica*) and shirish (*Albizzia lebbek*) are generous in their canopy and are used as shade trees. The ashoka (*Saraca indica*) and *Amherstia* bring grace to any place where they grow because they have probably the most beautiful flowers in the world. The flowers of the ashoka blossom in clusters and they exhibit a range of yellow and red shades. They have been likened in Indian literature to the sparks of a forest fire. *Amherstia* flowers are breathtakingly beautiful with their crimson colour, inspiring the common name — Tree of Heaven.

Some of the world's fastest growing trees are legumes and these can be used for fodder and afforestation of wastelands, subabul (*Leucaena*) is a classic example of this and in India this is being planted in many places to convert wastelands into greenbelt. Sunn Hemp (*Crotalaria juncea*), a member of the pea family, is commercially cultivated in India for fibre. The plant grows in arid lands and is a source of income to many people. Certain leguminous trees yield gum. The acacias, palas, shirish, etc., are the best examples. The gum obtained from palas—called Bengal Kino — was sought by Europeans a century ago for various uses.

Leguminous plants have been on the earth for millions of years and will probably stay for years to come, giving us the benefit of their aesthetic and economic uses, provided they are not wantonly cut and destroyed. ❑

Dr. Vijay Tuljapurkar is a consulting physician and medical oncologist working at Miraj, Maharashtra. He is keenly interested in writing and photography.

• This refers to the article "Living Lights" by Beefsea in the *Hornbill*, Vol. 1994, No. 4.

At biology class in college, we are told that there are no plants in the sea below 150 metres, as there is no sunlight for them to carry out photosynthesis. Since there are so many animals giving out their own light, cannot there be photosynthesis at these depths?

Nazneen S. Antia
Calcutta

Beefsea replies: The minimum intensity of light that permits photosynthesis to take place is 1% of sunlight. Though as many as 150 flashes of light per minute have been seen at these depths, plant growth cannot take place as the light intensity falls far short of what is necessary for plants to photosynthesize, even though this weak light may seem dazzlingly bright to the dark-adapted eyes of a diver.

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• I am a life member of the BNHS and have been a member for many years. Once upon a time I served on the Executive Committee and also on the Advisory Committee. Hence, I read all the publications of the BNHS with the keenest interest.

However, lately the *Hornbill* has been overly critical in its articles of blood sports. The reduction in the numbers of animals and birds is being attributed to *shikar* in an unjustified proportion. If one takes a look at the human population now, and compares it to the population even 60 years ago, one can see that there is no place now for wildlife in terms of forest area and natural habitat for the numbers that existed at that time. Increase of population, and the advance of technology, dams, factories, and housing have really caused the damage. Added to this is the fact that *shikar* to most of us now means slaughter, not a careful harvesting of species that will regenerate themselves if allowed to. To that extent, it may be wiser to condemn this attitude. However, in other countries, *shikar* is done in a scientific manner, and a hunter is allowed to shoot only certain numbers of each sex of the prescribed species.

I shall not name them, but many of the illustrious presidents and senior office bearers of the BNHS have been avid sportsmen. I no longer shoot, but on my farm, I have to bear terrible losses due to depredations by ungulates, monkeys and parakeets. The number of a species in an area sometimes increases far beyond that which the forest is capable of sustaining, and a scientific cutting down of these will certainly do a lot of good.

If the authorities insist on putting up factories, business centres, and administrative centres next to national parks, I am afraid condemning *shikar* is the act of a Horatio Nelson.

S. Chaudhuri
Hardwar.

• • • •

• In India, tourism has always been looked on with suspicion. We find it difficult to accept the fact that visitors from other countries can indulge in five star luxuries, while there are people in India who are lucky if they get two square meals a day.

It is not surprising, therefore, that as the environmental lobby grows in India, the maximum brunt has to be borne by the tourism industry, even from those who condone more harmful industrial projects and hydroelectric projects.

While we would like to see our country with pristine and untouched wildernesses, we all realise that we need foreign exchange revenue to run the country and to provide employment for the population. And of all the options available, tourism is least environmentally damaging in ratio to revenue.

Among all businessmen, it is only the hoteliers or travel operators who get immediate gains from preserving the forests, sea coast, rivers, lakes and wildlife habitats. They are, therefore, instrumental in ensuring that lakes are not drained, green hills not denuded and pollution does not reach levels that could deter tourists.

Hence, while protests have been raised about tourism in Matheran, Mahabaleshwar and Kodaikanal, we must compare the environmental losses with the forested tracts elsewhere that have been lost to manufacturing industries, quarries and agriculture. Similarly, we can compare the impact of tourism on the sea coast of Goa and Kerala, with the impact of coastal industries in Gujarat. Resorteers also plant trees and shrubs for beautification and maintain existing greenery. If Ranthambore, Corbett and Kanha are targets of poachers today, it is not necessarily the result of tourism. The startling fact, not realised by many pseudo-naturalists, is that the only real wildlife concentrations and forest cover left are in those sanctuaries and national parks that have been attracting tourists in sizeable numbers, where regular tourist visits ensure reporting of poaching activities. In Ranthambore, the tiger may have been exterminated without anyone knowing about it, had the park not been regularly visited by tourists, journalists and naturalists. Now as tourist arrivals to Ranthambore have been restricted or declined due to official and NGO pressures, local employment has suffered and there is talk of allowing small non-pollutant industries, which could, with heavy lobbying and corruption, grow into big polluting factories.

The answer, therefore, lies in formulating a plan for systematic growth of Wildlife tours. As a travel operator, I would suggest (1) Making a network of resorts at various sanctuaries and national parks where tourists could move to another park if one resort were full. This will divide the load of tourism on individual reserves. (2) Identifying jungle lodges, former hunting resorts, old forts, hill castles, etc., around sanctuaries and national parks for conversion to heritage hotels. This will reduce the load on resources required to erect new hotels and resorts and the number of trucks that come in with such materials. An example of this is the Sariska Palace. (3) Insisting that every resorteer greens a certain area within the vicinity of his resort to encourage environment friendliness. (4) Every resort must have a fully operational orientation centre, where visitors learn the do's and don'ts in a sanctuary and facts about conservation, environment and wildlife. (5) The tourism industry can generate employment at all levels from the educated unemployed to the illiterate. Local employment must be generated through handicrafts cooperatives and emporia, tribal guides and folk theatre. (6) Activities that do not belong to wilderness areas, such as amusement parks, should not be allowed within 50 km of the reserve. (7) Approval must be given to guides and drivers operating in the reserve only after they go through certain courses on natural history and conservation. (8) Lion shows, tiger shows or baiting must be strictly illegal even for VIPs. Instead, artificial water holes must be created where wildlife is likely to be attracted with watch towers and hides for easy viewing. (9) Circuits must be drawn up by tourism authorities for zoological societies, bird clubs, nature clubs, etc., in India and abroad to get quality tourists. (10) Every resort must erect a camping centre for schools, colleges and nature clubs, Environment education can be inculated early. (11) Religious organisations must be approached to relocate temples and shrines that exist within or around wildlife reserves. (12) For employment we should target those communities involved in logging, bird trapping, etc., like the Padhars of Nalsarovar who are excellent boatmen and folk dancers. Environmental NGOs must approach Governments for involvement in designing the tourism policy to ensure that there is sustainable development in this sector.

Anil M. Mulchandani
North West Safaries
Ahmedabad

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Correction

The caption of the centrespread picture in *Hornbill* 1994(4) wrongly stated 'larva' instead of 'pupa' as the prey of the potter wasp. The error is regretted.

— Editors

SEASHORE LORE

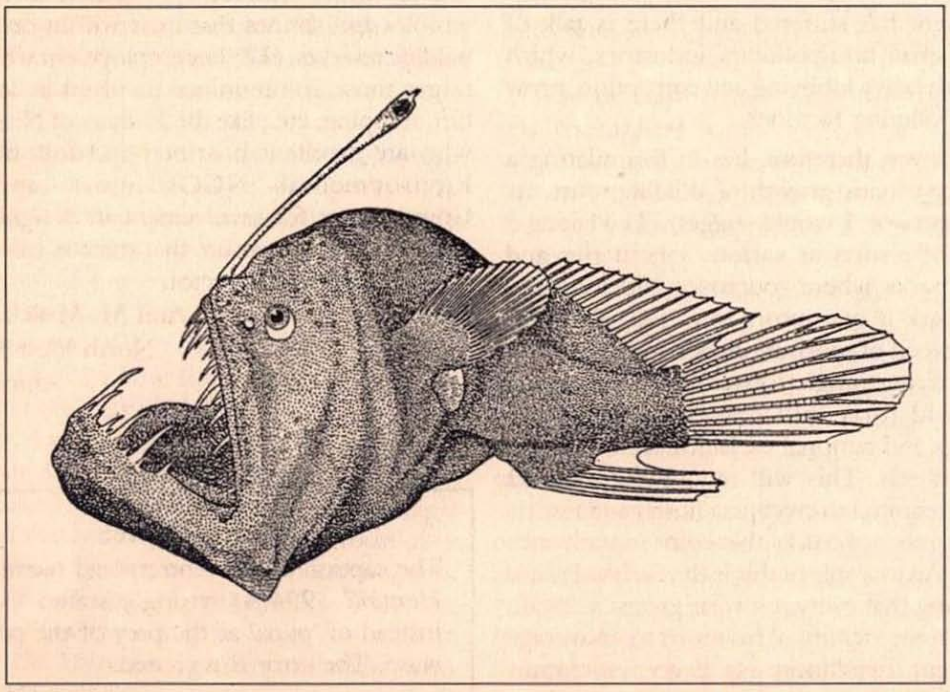
3rd fisherman: "Master, I marvel how fishes live in the sea".
1st fisherman: "Why, as men do a-land — the great ones eat up the little ones."

Shakespeare in *Pericles*.

19. The Compleat Angler

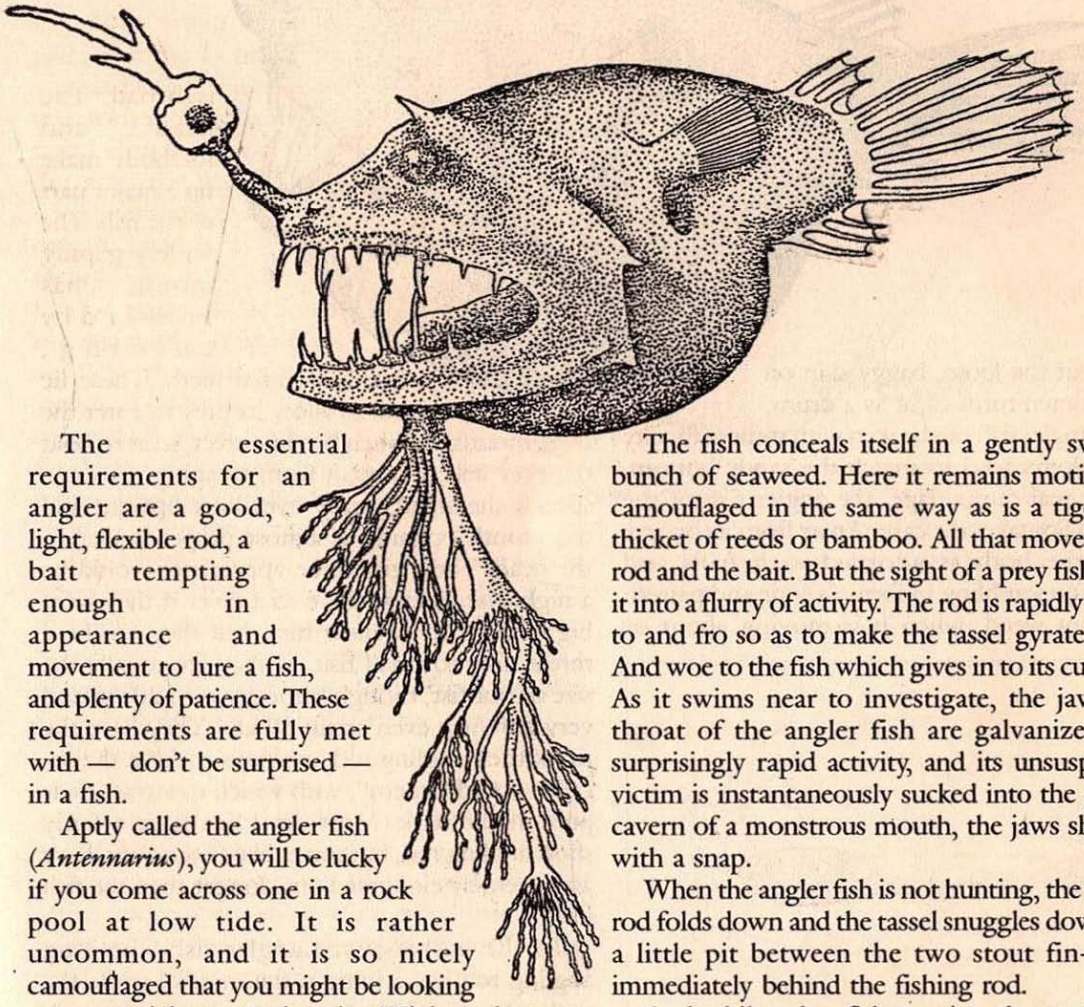
Beefsea

Through the seasons, I have seen many persons taking their ease on the seafront, holding an angling rod with rock-steady hands, motionless as if in yoga-like meditation, seemingly attuned to Nature. I have marvelled at their immense patience, gazing out for hours on end until the hum of their line sends them into a flurry of activity, reeling in their fish catch. Normally taciturn, they will open up if you evince interest in their hobby, explaining the fine points of various types of rod, and may even let you in on their favourite but secret bait.



Horrendous though it looks, this devil fish can do you no harm — it is hardly the size of your fist

The tasselled lure of the angler fish is a fatal invitation to its prey



The essential requirements for an angler are a good, light, flexible rod, a bait tempting enough in appearance and movement to lure a fish, and plenty of patience. These requirements are fully met with — don't be surprised — in a fish.

Aptly called the angler fish (*Antennarius*), you will be lucky if you come across one in a rock pool at low tide. It is rather uncommon, and it is so nicely camouflaged that you might be looking at one without seeing it. With a dumpy, misshapen body the size of a lemon, and beady, expressionless eyes, it is not exactly pretty, what with its grotesque white body with numerous brown streaks looking like a lump of fat.

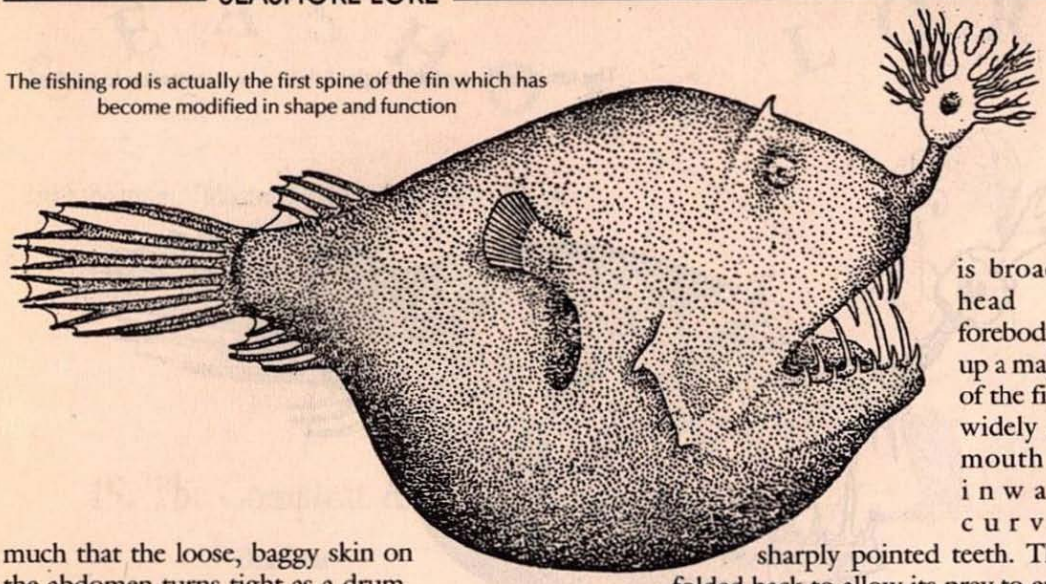
Above its widely grinning mouth is a jointed "angling rod", at the tip of which is the "bait" in the shape of a feather duster-like tassel. The fishing rod is the first spine of the fin on the back which, over millions of years, has migrated forward until it lies just above the mouth, and has become modified in shape and function.

The fish conceals itself in a gently swaying bunch of seaweed. Here it remains motionless, camouflaged in the same way as is a tiger in a thicket of reeds or bamboo. All that moves is the rod and the bait. But the sight of a prey fish sends it into a flurry of activity. The rod is rapidly flicked to and fro so as to make the tassel gyrate oddly. And woe to the fish which gives in to its curiosity. As it swims near to investigate, the jaws and throat of the angler fish are galvanized into surprisingly rapid activity, and its unsuspecting victim is instantaneously sucked into the gaping cavern of a monstrous mouth, the jaws shutting with a snap.

When the angler fish is not hunting, the fishing rod folds down and the tassel snuggles down into a little pit between the two stout fin-spines immediately behind the fishing rod.

And while other fishes swim, the angler fish "walks." Its four paired fins are modified into hand-like feet, complete with elbow joints. Though the angler fish is the embodiment of ugliness, one cannot help laughing when, seeing a prospective prey, it rolls its body from side to side like a tottering drunk. All this time it walks, ever so slowly and cautiously, like a chameleon stalking a fly, the fishing rod vibrating madly all the while.

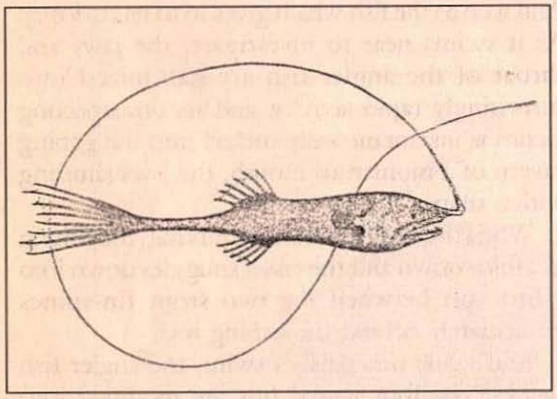
When disturbed, the angler fish has a habit of swallowing water until its stomach distends so



The fishing rod is actually the first spine of the fin which has become modified in shape and function

much that the loose, baggy skin on the abdomen turns tight as a drum.

Our angler fish can be seen with some difficulty as its colours tend to match the sandy bottom. But, for real camouflage, the angler fish of the Sargasso Sea takes the cake. Apart from its bizarre shape, the body is adorned with frills and filaments resembling in form, colour and pattern sargassum weed. when it is moving about or



When the fish is not hunting the rod folds down and the tassel is concealed in a little pit between the two stout fin-spines immediately behind the fishing rod

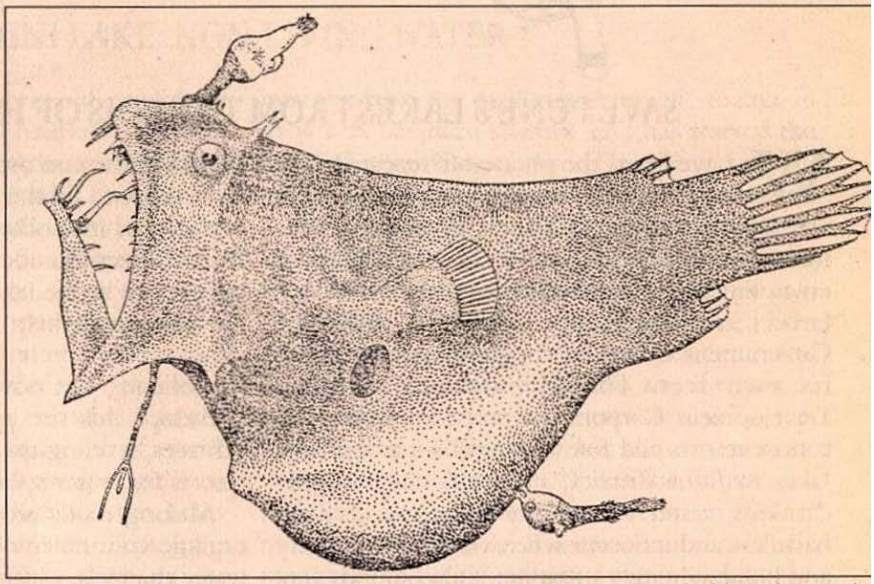
hiding within the sargassum, it can hardly be seen.

The angler fish of our seashore is an exception, in that most of its kith and kin live in the cold, dark depths of the ocean. These deep-sea forms, called devil fish, are ugliness personified, having a black body as broad as it is long and as tall as it is broad. The head and forebody make up a major part of the fish. The widely gaping mouth has inwardly curving, sharply pointed teeth. These lie folded back to allow its prey to enter the huge mouth, but then become erect, so as to hold the prey and prevent it from escaping. In some species the small, beady eyes look upward and the mouth opening is almost perpendicular to the head. Their gruesome appearance would be a nightmarish experience to a diver if they were big enough to swallow him, but they can be a threat only to small fish, as they are usually the size of our fist, though some grow to 20 cm and very few may even attain 80 cm. They have the tip of their angling rod luminous to form the so-called "head lantern", with which to attract their prey in the dark. Most devil fish have a fairly short angling rod, but some, like *Gigantactis*, have an extremely elongated one, longer than the fish itself.

In the basket-jawed angler fish, the long angling rod has a joint in the middle, while the tip has hooks. The upper jaw has brush-like teeth which, turning inwards, form a closed basket or net. Probably it acts as a sieve, filtering arrow-worms and other drifting deep-sea plankton which is lured by the lantern.

In addition to the lantern on top of the head, some devil fish (e.g. *Linophryne*) have a long, branched appendage hanging down from the chin. It is believed that this is a sense organ which, by sensing the strength and direction of currents from an approaching fish, enables it to estimate its size.

One angler fish (*Galatheathauma*) has dispensed with an angling rod. Instead, it has a forked luminous organ hanging just inside the mouth. This is more like a living mouse-trap with shining bait. The fish, which grows to a gigantic (for devil fishes) 45 cm, has just to open its mouth, lined with wicked incurved teeth, for a foolish fish or prawn to be lured in, snapping it shut to swallow the unfortunate victim. Unlike most devil fish, which swim freely in the depths of the ocean, the mouse-trap angler fish lives close to or on the ocean bottom.

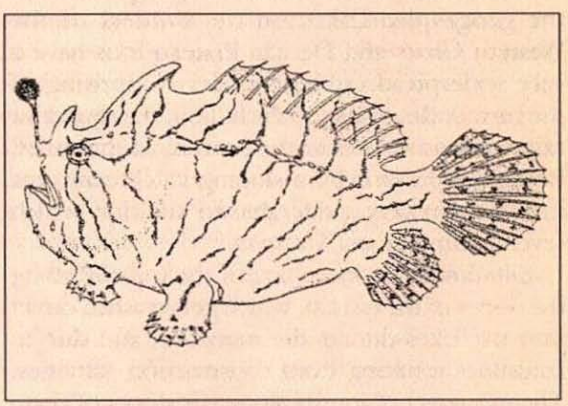


This female devil fish has recently had a meal, as can be seen from the bloated stomach. Note the dwarf male sticking to the female's belly.

Food here is scarce so that, like the python, when they are lucky to secure a meal, they gorge themselves until their stomach is literally bursting. Some deep-sea fishes can swallow prey much bigger than themselves; the stomach just stretches like a balloon to accommodate the victim.

Since fishes are few and far between in the vast expanse of the deep sea, a problem arises: how do the two sexes find each other in order to mate? This problem is not so great for fishes which swim together in shoals, and also for active swimmers which may meet from time to time. But for lethargic solitary fishes like the devil fish, the prospect is greatly reduced. They have, therefore, overcome the difficulty in a unique way.

The large female has a luminous head lantern, but in the male, the first spine of the dorsal fin is modified to form a hook which, abutting against the curved lower jaw, forms an efficient pincer. The male is much smaller than the female and swims actively until it comes across a female. It then grips the female wherever it comes in contact — be it on its belly, gill-cover or the back. The male's jaws and tongue now fuse with the skin of the female and grow into the tissues of the female. The blood circulation of the two gets united, so that the male shares the nourishment of the body fluids of the female.



The angler fish *Antennarius* is nicely camouflaged with its grotesque white body with numerous brown streaks, making it look like a lump of fat.

The male is this a virtual parasite on the female, but it renders an important service. The male's body organs, except for the testes, degenerate till it turns into a factory producing sperms. Two, three or more males may thus be attached to a female. It is truly a case of being wedded "till death do us part"! ❑

SAVE PUNE'S LAKES FROM THE SINS OF HUMANITY

We have heard the phrase oft repeated: *The sins of the fathers are brought down upon the sons.* This is also applicable to exploitation in the name of development. It is the worst of environmental crimes being committed by today's fathers in the heritage city of Pune where the Government is cutting the ground from under its own feet. The Maharashtra Tourism Development Corporation proposes to develop tourist resorts and forest bungalows around the lakes in Pune district, some of which supply drinking water to the city. This sounds very harmless and innocent when viewed by a weary and holiday-hungry urbanite; it also sounds very lucrative when planned by promoters in the name of development. However, when analysed by environmentalists who have their feet on the ground this spells disaster.

Each lake has a personality of its own, lakes in the same area share similar traits peculiar to the geography. Lakes on the borders of the Western Ghats and Deccan Plateau thus have a very widespread catchment area comprising of the surrounding valleys which drain the abundant rain water into lakes at the bottom of the valley. Being surrounded by a sloping catchment area makes them very vulnerable to siltation which severely limits their life span.

Siltation is the loosening of the top soil along the slopes of the terrain, which gets washed down into the lakes during the monsoon and due to landslides resulting from construction activities. The tree cover of forests along the slopes of these lakes take the impact of the rainfall which would otherwise strike the soil with greater force. The leaves of the tree act as buffers,while the roots of the trees hold the soil together. Small shrubs and grasses growing in the shade of the trees also perform this very function with as much efficiency. The trees, having safeguarded the soil from draining into the lake, also purify the air and again attract more rain. The forest saves the lake and helps it to grow by neutralising the impact of the rain drops and then using the very same drops to fill the lake drop by drop. The role of the trees in mothering the lake does not end there — trees provide roosts for birds which feed on the fish in the lakes. Bird droppings nourish the fish which help keep the waters pure and clean. This cycle has taken centuries to consolidate, but now vested interests want to "develop" this site by making roads, chopping off trees, leveling the slopes to make hotels and resorts for water sports and fishing.

Making roads around any lake disrupts the organic continuity of the lakes and blocks the water channels, causing flooding and preventing it from reaching the lake. Levelling of the ground for construction has the same effect. Cutting the indigenous trees and planting exotic trees and shrubs has a worse effect. These newly introduced varieties need a lot of pampering to survive. Water hyacinth begins to grow on the lakes which chokes the fish by depleting the life supporting oxygen from the lakes, and also adversely affects the quality of water. This kind of impurity must be removed if the water is to be potable.

It is difficult for Government to limit the number of hotels, resorts and forest rest houses to a minimum. There is bound to be a lot of secondary development around each hotel — car parks, bus stands, housing for supporting staff maintenance facilities, amusement parks, shops necessitating a widening of roads and so on.

Should Government permit this plan? Clean water in a lake is possible either by the absence of humanity or the presence of a very disciplined body of people who care for the society. No government can possibly enforce this self-discipline, it must come from within and by conservation education. The Government should enact a Lake Conservation Act, leave nature to itself and just draw clean pure water for supporting the life of the environs of Pune.❑

SURESH MALKANI

NAINI LAKE: NON-LIVING WATER !

Increasing population, unplanned growth of human settlements and tourists together appear to have taken a toll of the beautiful lake that gives the hill resort of Nainital its name.

According to a recent study conducted by D.K. Pandey of the Dehradun-based Forest Research Institute, the water quality of the Naini lake has been steadily deteriorating and is now unfit even for consumption by cattle.

"The results (of the study) show that the water of the Naini lake is highly polluted due to the addition of exogenous wastes as a result of a more than 37 per cent increase in human population in the catchment area of the lake and too many tourists, especially in autumn months, during the last decade," explains Pandey.

With an increasing amount of sewage, municipal and domestic wastes finding their way into the lake, the quantity of organic matter in its waters has risen sharply. This has starved the lake of cleansing oxygen, pushing up the biological oxygen demand (BOD) — a measure of the quantity of oxygen required by aquatic microorganisms to degrade the organic matter in the lake, by over 20 times over a 10-year period.

Similarly, the concentration of free carbon dioxide in the lake — which depends on the population of aquatic organisms and the type of waste added to the water ecosystem — has increased by 670 per cent over the same period.

Although waterbodies have a mechanism for recycling wastes quickly, the mechanism fails if the contamination level increases beyond their regulatory capacities. Naini Lake, it seems, has reached the brink. ❑

Adapted from **Down to Earth**

TIGER LINK MEETING AT BNHS

As a follow up action to the Tiger Link meeting in Delhi, a meeting of NGOs, wildlife enthusiasts and BNHS members was held at the BNHS on 21st April, 1995, the purpose of which was to inform wildlifers of the existence of Tiger Link as well as to activate the Western Region Network.

Dr. Jay Samant, Director BNHS, explained the crisis facing the Indian tiger and the need to urgently take all steps to protect the tiger, both within and outside the Protected Area Network. He also spoke about the need to activate the BNHS in the cause of tiger conservation. Mr Debi Goenka of the Bombay Environmental Action Group spoke about the ethos of Tiger Link, that the intention was to tap all the resources available and channelise them effectively for the cause of tiger conservation. Mr Goenka also spoke about the legislative aspects of wildlife conservation and the denotification of Melghat. After the conclusion of the meeting, a small group of core volunteers who were interested in wildlife trade were given a brief talk on the need to combat tiger trade.

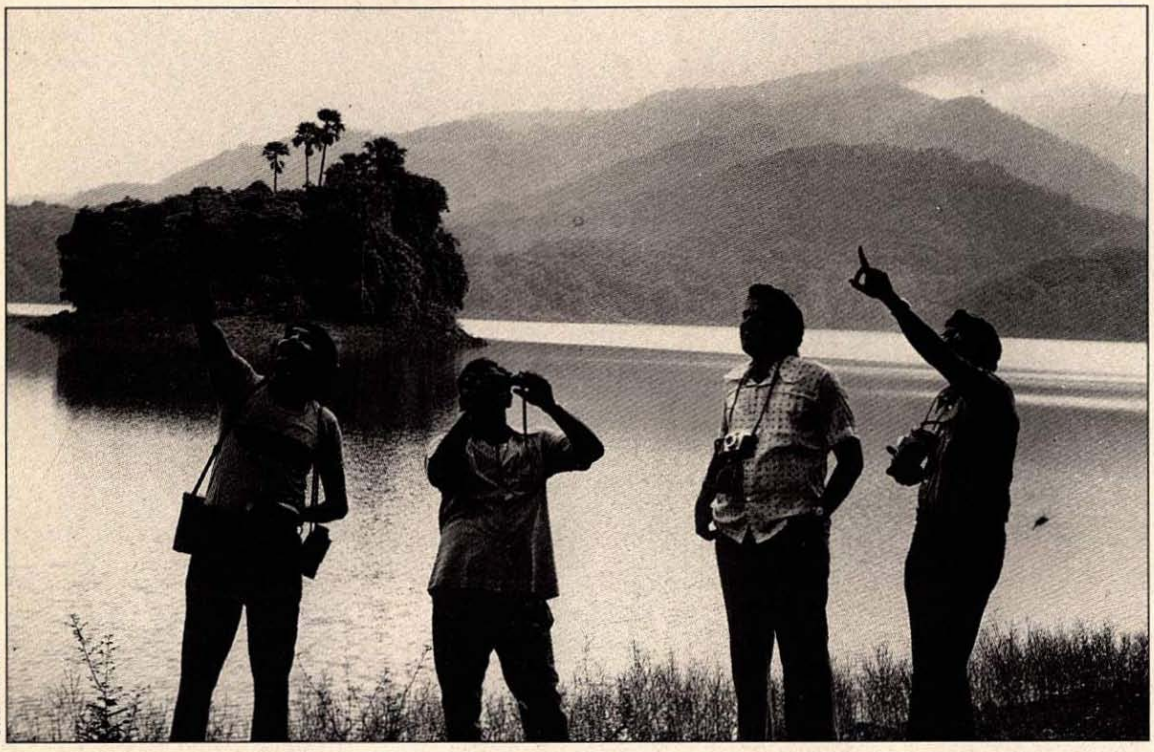
Mr Bittu Sahgal underlined the gravity of the problem by stating that a minimum of 400 tigers had been killed over the past 2-3 years. There was a great need to set up an intelligence gathering network, as well as legal follow up for all seizures made by the Forest Department and the police. He also read out a copy of the letter sent to Mr Arin Ghosh, Director Project Tiger, by several members of the Tiger Crisis Cell.

Mr. S.P. Godrej, Vice President of WWF spoke about the need to protect the tiger habitat.

Mr. A.K. Nigam, Conservator Forests (Wildlife), Western Region, spoke about the conservation aspects and the structure of the wildlife wing of the Forest Department.

Mr Jaffry, Deputy Conservator of Forests (Wildlife) spoke about the protection aspects, from field protection to trade and legal action. He highlighted the constraints faced by the Field Director because of limitations of staff and equipment. Mr Naresh Chaturvedi, Curator BNHS, suggested that the uselessness of tiger products for medical treatment be publicised, as well as the penalties for killing of tigers in India.❑

National Lake Conservation Plan



S.R. NAYAK

Fresh water lakes are crucial to aquatic fish and bird life, as much as to mankind

The Ministry of Environment and Forests, Government of India, has formulated a National Lake Conservation Plan (NLCP) under which 21 urban lakes have been identified for conservation programmes. Eleven lakes are proposed to be studied in the first phase of the NLCP. On the recommendation of the Environment Department, Government of Maharashtra, Powai Lake has been included in the first phase of the plan.

As a preliminary step, the Government of Maharashtra nominated the Bombay Municipal Corporation as the nodal agency for Powai Lake Conservation under the National Lake Conservation Plan.

A seminar on the National Lake Conservation Plan was held in New Delhi on 20th April, 1995, where it was decided that regional workshops would be held at site to formulate site-specific management action plans.

A preliminary meeting was organised at the BMC HQ, Bombay, where representatives from various government departments and NGOs including BNHS were present. The meeting held in the Hydraulic Engineer's office elicited opinions as to how best to save the lake and its environs from further damage. There are proposals to introduce water sports facility in the lake as part of the scheme to enhance tourism in the city. It was pointed out by the NGO

representatives that such a plan would be detrimental to the lake's ecology and overall cleanliness and tranquillity of the area. As far as possible, any increased human contact with the water body should be discouraged. It was also pointed out that the lake's boundary should be properly demarcated before expecting any plan to succeed. The BMC was informed that there are about 28 point sources leading from the lake's catchment area into the water body. Out of these, 21 carry storm water and are functional only during the monsoon, while the rest carry sullage throughout the year from the nearby slums. A site inspection was conducted to confirm the information. During the site visit it was also noticed that certain portions of the lake are subject to heavy siltation, which has led to the waterline receding much beyond the original shoreline.

Moreover, the lake's water is used by the Aarey Milk Colony for irrigation in the fodder farms and by industries nearby. Besides, the environs serve as a green lung for the teeming millions of this overcrowded city. These industries and the population will suffer immensely if the lake ecosystem is destroyed by negligence and apathy. Hence, it is imperative for all of us to take cognisance of the deteriorating conditions in and around the lake even now.

As a means to generate public interest and involvement in the lake's conservation, a meeting was organised under BNHS aegis at I.I.T. Powai to address this environmental crisis in the first week of June 1995. The public meeting was attended by a cross section of government agencies like the BMC, Fisheries Department, NGOs like the Bombay Environmental Action Group and real estate developers.

As a follow up, a national level workshop was organised by the BMC at the Bhandup complex in the last week of June 1995 under the Hydraulic Engineer's Chairmanship, a Jt. Secretary from the Ministry of Environment and Forests was also present to guide the discussion and to help evolve a feasible management plan for the conservation of the lake. The cross section of participants from government agencies, NGOs like the Maharashtra State Angling Association, BNHS and professional institutes like the I.I.T., Powai, helped in initiating a fruitful debate as to how best to tackle the problem of conserving Powai lake as a healthy water body and as a buffer against any water crisis in the future, considering the phenomenal rate at which the population of the metropolis is growing.

Amongst the various suggestions received were proposals to introduce water sports as a tourism-related activity and a source of revenue. As during previous meetings, it was pointed out that such activities would lead to garbage being dumped in the area in larger volumes, due to increased human activity. Noise and air pollution would also increase manifold. The prime objective should be cleanliness, which cannot be compatible with increased human contact with the lake.

Another plan envisages introduction of commercial fisheries so as to generate revenue and justify the expenses being borne for the lake's restoration. Even if these activities were to be limited to maintaining stocking nurseries it would serve a very vital purpose of sustaining other ponds and fresh water bodies with a regular supply of quality fish seeds.

The plan which was first mooted in April 1995, appears to be picking up momentum with the involvement of BMC as a nodal agency and the enthusiastic response of various government and non government agencies. It is now up to the general public to take an interest in this effort and help in conserving whatever is left of wilderness areas in urban centres.

It is a good indication that conservation issues are being addressed on a priority basis, especially in urban areas, where the pace of urbanisation seems to be smothering whatever little is left of green areas. The aesthetic value of water bodies like Powai lake is helping real estate developers to capitalise on their utility to serve their narrow interests, as evidenced by the numerous newspaper advertisements highlighting the lake's proximity to their housing estates. It is imperative that they should plough back a fraction of their profits into beautification programmes and eco-

restoration works in their areas of operation. The same holds true for corporate bodies who draw upon a water body's resource.

The Powai lake is about 2:2 sq. km in area. It is a man-made lake and was built in 1881 in anticipation of a famine, which did not occur. From the very beginning, its water was not meant for human consumption. With the increase in industrialisation in the area, its water is being used by some of the industries in the area, e.g., Larsen & Toubro.

The lake's water feeds one of the nullahs joining the Mithi river, which enters the sea at Mahim. Unfortunately for the beautiful lake, its catchment area, till very recently a 'no development zone', was released for real estate development under pressure from the powerful builders' lobby. This will definitely affect the quality of the lake's water and its future as a crucial water body in a congested metropolis.

The tonnes of top soil which flow into the lake as a result of the quarrying activities in the area is highly damaging. This damage has already occurred, a rough estimate arrived at by certain persons indicate that the cost of excavating a cubic metre of the silt in the lake bed would be about Rs. 250/-, excluding the transportation cost, which is exhorbitant by any standards. The other problem plaguing the lake is that of excessive growth of weeds like *Ipomea* and Water hyacinth. These have choked a good portion of the lake, especially on the I.I.T. side.

Lakes constitute an important component of freshwater resources. They are distributed in different geographical regions in the country. Most of the lakes whether natural or man-made, are directly or indirectly associated with the river systems. There is an organic relationship between the lakes and river systems.

Lakes serve as an important life support system by helping in recharging of acquifers and regulating hydrological regimes. They also act as natural traps for sediments and nutrients thereby helping to regulate water quality and sedimentation of the river systems from the catchment area. They carry out a crucial role as breeding grounds for fish and other aquatic life. Lakes also constitute habitats for a variety of birds, fishes and other aquatic life.

The lakes, particularly the urban lakes, are in varying degrees of environmental degradation. The main cause is rapidly increasing population in the catchment areas of lakes and industrialization. Both domestic sewage and industrial effluents have been causing serious pollution of these precious water bodies.

Besides encroachments, deforestation in the catchment areas leading to siltation and flow of pesticides from the agricultural wastes are the other major causes. The result is that the lakes are becoming increasingly unfit as a source of drinking water, recreational activities and habitats for aquatic life.

As already mentioned in case of urban lakes the threat comes largely from the large inflow of municipal sewage and industrial effluents. The NLCP is proposed to be handled on the same lines as the National River Action Plan (NRAP). Like the NRAP, it is proposed to implement the National Lake Conservation Plan (NLCP) as a centrally sponsored scheme with equal sharing of cost by the Central and State governments. ❑

OBJECTIVES OF THE NATIONAL LAKE CONSERVATION PLAN

Main objectives under the programme would include the following:

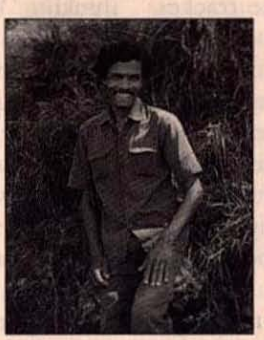
- *Prevention of pollution from point and* non-*point sources.*
- *Catchment area treatment.*
- *Desilting and weed control.*
- *Research & Development studies on floral and faunal activities and related ecological aspects.*
- *Other activities depending on the lake specific conditions such as integrated development approach, including interface with human populations.*

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

OBITUARY

CHENNAN

The sad demise of Chennan occurred on 4th July, 1995, when he went to the forest for firewood and honey collection along with his wife and sister-in-law in the afternoon. On his way back Chennan came across fresh elephant tracks. Since we are monitoring the movements of radio-collared elephants, these fresh tracks of the elephant group would have tempted Chennan to check which group it was. So he asked the two ladies to wait at the game road and he went alone to see the elephant group. After fifteen minutes, the ladies heard a sound from the direction where Chennan went but they could not recognize whether it was a screaming or calling sound. They waited for another sound, but since there was none for the next 15 minutes, they went in the same direction that Chennan took to check the area. They then found Chennan lying in a nullah. On close examination they realized that Chennan was already dead. They reported the incident to the forest officials immediately. The incident was related to the local police station by the forest officials, and after they had made their inspection, the body was taken to the Government Hospital, Gudalur. On 5th July, the body was handed over to us and by the evening the last rites were carried out by Chennan's family members.



As Chennan went alone to follow the elephants, nobody knows what actually happened. But based on the location of the body and the injuries we presume that Chennan on his way back to the same road would have encountered a tiger at close quarters. This place has very poor visibility. The tiger, having seen a moving object at a close distance, must have jumped suddenly and slapped Chennan on the left side of his neck. There were claw marks on the left side of his neck, right shoulder and thigh. The injury on the neck was very deep and the neck bone was broken.❑

— Reported by S. Bhaskaran, BNHS Research Fellow, Telemetry Studies on Elephants in Mudumalai, Tamil Nadu.

Down memory lane!
Chenna

A loud thump and yet another! An eerie, all pervading silence prevailed over the jungle. "Anai" (elephant) somebody whispered. A few anxious and nervous moments passed. A hand clasped my perspiring and shaky palm, comforting my equally shaky spirit —a hand that had given reassurance of safety to so many people in the jungles of Mudumalai Sanctuary and had saved many in situations from which they would not have come out alive had they been on their own.

It was 6.30 in the evening at the Ombutta waterhole, and long shadows over the glimmering ripples in the water were awaiting the denizens of the jungle at any moment. As a new member of the BNHS Elephant Research Team, I was anxious to return to the safety of our camp — affectionately called 'The Bear Bungalow' by J.C. Daniel, Principal Investigator of our project. According to him, it was the den of some bears who had been made homeless by us. The distance to the camp is an enjoyable walk of about a kilometre for any nature lover at some other time of the day.

The five of us had already climbed the gentle gradient to join the main road. Tall lantana bushes

on either side of the road hampered our view, but typical sounds of elephants were coming from all directions. Two or more herds of elephants were converging on the water-hole from different directions, gambolling on their way. A herd was coming from the direction in which we were heading and had split into two groups, one on either side of the road. A tricky situation indeed, which required deft handling that comes only through knowledge, experience and above all, courage. Only the best and the level-headed come out unscathed and alive. Krishna the tracker, Ramesh and Ajay were speculating in their minds about the best tree to climb, as best they could climb and were already inching their way towards the selected trees. I stood under one tree, wondering what on earth made me join this project and face death coming at me on all fours. I was not very good at climbing trees with big straight boles and definitely not in such a situation where my four limbs had lost coordination!

Only 'the hand' that reassured me moments ago, after some rapid consultation in Kannada with Ajay, remained steadfast at the centre of the road, an action which appeared to me as sure suicide. In a low whisper I asked Ajay if I could run back to the water hole and climb into the tall watch tower next to it. Ajay was dead against it, as he expected the elephants to stay around the water hole for some time and it would have been much more dangerous to walk back to the camp in the fast failing light, after the elephants' dispersal.

The hand belonged to none other than Chenna, who was now swiftly picking up stones as a female and a calf walked right on to the road 150 metres from us. I was now totally dependent on Chenna to perform some miracle. None of the others climbed the trees, but they kept away from the road. The female was soon joined by another female and her calf and they walked for about 20 paces trying to pick up our scent with their raised trunks. Suddenly the wind direction changed and all hell broke loose. The two calves, sensing human presence, screeched loudly and ran into the bushes on one side of the road, while their mothers trumpeted and ran in the other direction. The members of the herd on either side of the road raised alarm calls, and a few young tuskers started demonstrating by thundering through the bushes and small trees.

All of us were speechless, and conscious only of our palpitating hearts. There was just sufficient light to see the road, but the forest appeared gloomy and dark. The commotion died down slowly as the calves crossed the road and met their mothers, but the low rumbling of the females continued. None of the elephants moved, remaining motionless some distance from the road. Chenna beckoned and we followed him without thinking. We were about to walk through a herd of elephants and there was every chance of a full blooded attack at very close range by the matriarch or the young tuskers. All of us tiptoed inch by inch, fighting the instinct to break into a run. As we came abreast with the majority of the herd, there was some movement from behind the trees. Ramesh moved ahead at a faster pace and was about to start sprinting when Chenna and Ajay exchanged glances. In a flash Ajay moved forward and caught Ramesh by the collar. This timely action initiated by Chenna and executed by Ajay saved our lives. A running figure would have invited the elephants' attack, and the consequence would have been unpleasant. Only when we got well past the herd did we return to our normal selves, wondering how we did it, while and Chenna and Krishna continued as if nothing had happened!

Indeed, meeting the wild denizens of the forest is a part of the life of all tribals — the *Kad* and *Ten Kurumbas* of Mudumalai. Chenna belonged to the latter community, which gets it name from their age old speciality of honey (*Ten*) collection, which is slowly giving way to other avocations. Chenna had gone through too many such incidents during the better part of his life to take them seriously.

Though lean and wiry, Chenna could walk up and down the hills and valleys untiringly. I always used to say jokingly that Chenna's left hand is one and a half feet longer than the right, because it was difficult to imagine him without his favourite *katti* (sickle) dangling from his left hand, and in reality this was very true. He showed tremendous dexterity in handling the *katti*, from shooing off animals and cutting paths through bushes, to dressing a piece of chicken for a meal.

He was in his element once he left the beaten track and it was delightful to watch him move through the forest, always barefoot, avoiding thorns, snakes, dead wood and other hindrances, at the same time keeping track of so many fascinating aspects of life in the jungle. A veritable encyclopaedia, he would keep you informed, as you walked behind him, about a cavernous log harbouring a big bee hive and when it could be harvested without others knowing about it, a tiger's scratch marks on the side of the road, a sambar kill near a nullah where he had heard alarm calls of sambar the previous evening, a herd of elephants moving from one forest area to another, movement of a particular pack of wild dogs and how their number was on the decline, a bird nesting on a particular tree and the clutch size, or about a hyena den he had discovered.

He was equally at home in the tall grasses of Mudumalai-Game hut road or the thorn forest of Masinagudi. Every morning when he came to the camp he had exciting tales to tell of the previous night's experiences when he had walked back from our camp at Kargudi to Theppekad, his home, a distance of more than 3 km in the dark through the jungle. He would tell us about a tiger rolling on the tar road, or a pair of leopards crossing the road near Moyar river or how he had scared a bear out of its wits. On a rainy day when there was little outdoor work he used to tell amusing stories of the *kurumbas* and I really regret that more often than not, I missed his wisecracks due to my linguistic shortcomings.

Chenna was a very courageous person. He would never say that anything could not be done or that a particularly dangerous elephant could not be followed. Aware as he was of the dangers to be met with, his courage was all the more admirable. The only thing he was afraid of — like everybody in his community — was a short statured ghost only to be found in Mudumalai. Chenna was not only known to people associated with Mudumalai but to many nature lovers, scientists, casual visitors and wildlife photographers from different parts of India and the world. In a recently published book on elephants, the author Chadwick, devoting some pages to Chenna, speaks volumes about this little man. Chenna's popularity stemmed from his sincere and hard working nature. Do you know that Chenna holds the unique distinction of being the only *kurumba* and tracker to publish an article which was printed in *Hornbill*.

On 4th July, 1995, through a strange quirk of destiny, this wonderful person who saved our lives umpteen times in the forest of Mudumalai, surprised a tiger resting in a nullah and met his sad end. It is indeed a matter of great sorrow that the saviour of many could not be saved. As fate would have it, Chenna was going for honey collection with two members of his family, and on seeing the footprints of a study elephant, decided to follow them for information. That took him to the fateful spot where he was killed.

One thing is certain for all the members of the BNHS elephant team and the people who knew and loved Chenna dearly — life will not be the same without Chenna in the wilderness of Mudumalai. His memories will be cherished by all those whose lives were enriched by his ever-smiling, unassuming presence. ❑

Hemant Datye,
Scientist, BNHS,
Elephant Ecology Project.

WOLVES AND HUMANS: 2000

Satish Kumar, Sr. Research Fellow, working on the BNHS' Grassland Ecology Project, who is currently stationed at Aligarh, was invited to participate in a conference "Wolves and Human — 2000: Global Conflicts of Wolf Management" held in the University of Minnesota, U.S.A., from March 9-12, 1995. He presented a research paper titled "Strategies for Wolf Conservation in marginal areas of the Deccan, India."

Kutch — A Jurassic Park

text & illustrations
by
Jugal Kishor Tiwari

A mixed bag — Kutch is a rich hunting ground for fossil collectors.

Palaeontology deals with life in the past. That life is now represented by fossils which are the preserved hard or skeletal parts of the original organisms. Fossils are not lifeless stones, they are entities of what was once a living world. The fossil record represents adaptations to the environment in which these species existed. They appear as living organisms in harmony, but also in competition, with their plant and animal associates. Finally, they are landmarks on the road of geologic time, providing evidence to support theories about the earth's history.

The word fossil is derived from the Latin word *fossilis* which means something dug out of the ground. And the study of past life on earth is called palaeontology, while palaeobotany deals with ancient plants.

It is interesting to know how in ancient times people interpreted fossils. To some, fossils were discarded pieces thrown away by the Creator in his attempt to make perfect living organisms. Perhaps it was the Greek historian Herodotus in 450 BC who, for the first time, inferred that fossils were the evidence of ancient life on earth.

Ancient Greeks and Romans believed that fossils were freaks of nature. More primitive societies thought that fossils were *glossa petra*, or stone tongues, which were the remains of lightning after it struck the ground. The credit for the systematic collection and interpretation of fossils goes to William Smith (1769-1839). He spent a lifetime surveying land for the canals and railways in England. At the same time, he made collections and studies of fossils. He published his findings in 1815 in a geological map, the first of its kind in the world.

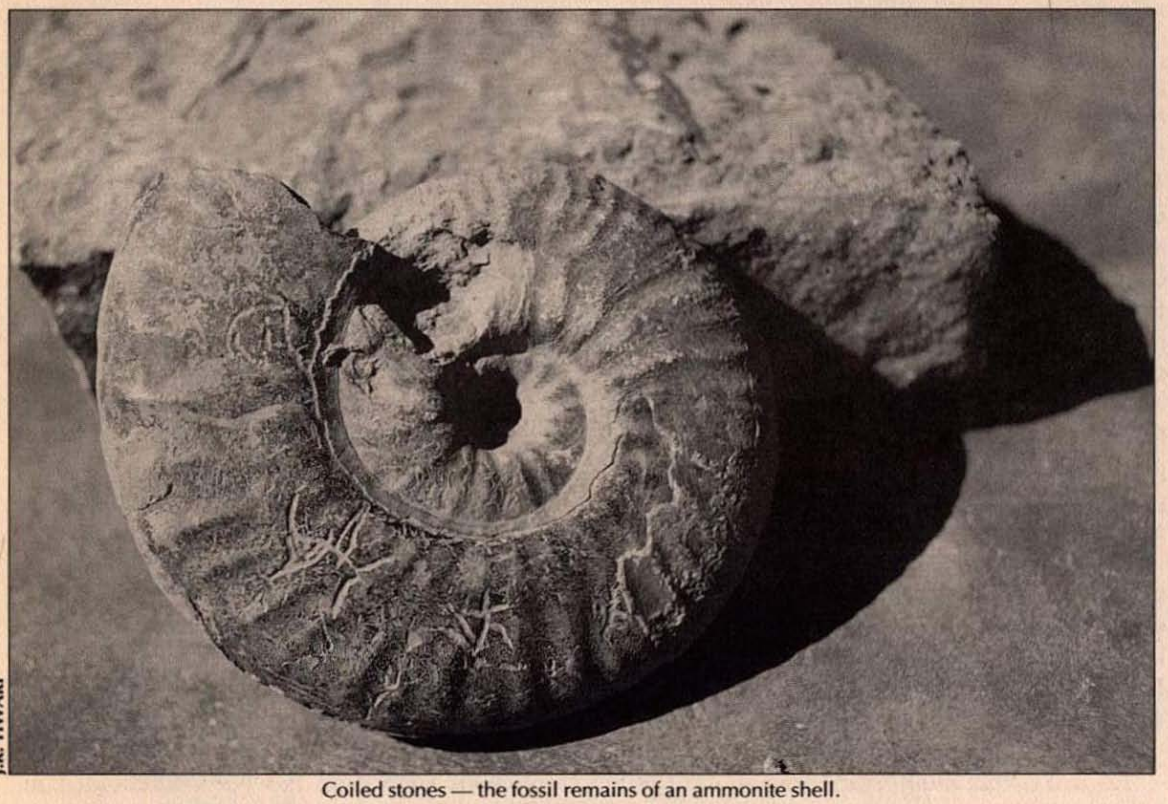
Fossils are formed and preserved in many ways. Rarely, the whole animal is preserved. An example is the woolly mammoth that lived in Siberia one million years ago, which got entombed in a pit of ice. Tiny insects also get totally preserved in the gum and resin of trees, known as amber. This was the basic idea behind the now famous story of the film Jurassic Park, in which a mosquito, after sucking dinosaur blood, got encapsulated in resin. That was how the dino-DNA was obtained from the blood of a fossilized mosquito. Usually the organic remains of animals or plants are replaced by inorganic elements during the process of fossilization.

Fossils are one of the best tools to understand the process of evolution. They help in dating archaeological finds and answer questions of time relating to artifacts. The mass scale extinction of a great number of species denotes the past climatic changes or tectonic movements in the earth. Evidence of these can be found in the fossil record.

We all know that the planet earth was born 4500 million years ago, and life is known to have existed for about 2500 million years. The oldest fossil dates back to 600 million years. Where should we look for fossils? Sedimentary rocks are the best source for fossil-hunters.In India, fossils can be collected in many places. The Gondwana system in central and eastern India is best for plant fossils. Vertebrate fossil hunters find the Sivalik hills in the north very rewarding, while marine fossils are found in ample numbers in Kutch.

Mesozoic rocks ranging in age from Middle-Jurassic to lower Cretaceous are particularly well represented in Kutch. The Jurassic and lower Cretaceous succession has been subdivided in Kutch into four series known as Patcham, Chhari, Katrol and Umia. The Patcham series is made up principally of limestone and sandstone. It contains fossil *Megatuthis, Trigonia* and *Corbula* and the Patcham coral beds are famous for remains of the corals *Stylina, Montlivattia* and ammonites *Sivajiceras* and *Macrocephalites*. For an explanation of these terms such as Mesozoic, Cretaceous, etc., you may look up any standard textbook of zoology.

The Chhari series, named after village Chhari located on the southern edge of the Banni grassland, is made up of five distinct stages. The oldest stage of this series, known as Macrocephalus beds, is made up of shales, calcareous bands and oolites and is characterised by *Macrocephalites macrocephalus* and a few other forms of ammonites. The overlying Rehmani beds are made up of yellow limestone, here *Reineckia* and *Shivajiceras* ammonites are found. The Anceps beds lie above the Rehmani beds and are composed of limestone and shales. These beds yield *Perisphinctus anceps* and remains of other ammonites.



J.K. TIWARI

Coiled stones — the fossil remains of an ammonite shell.

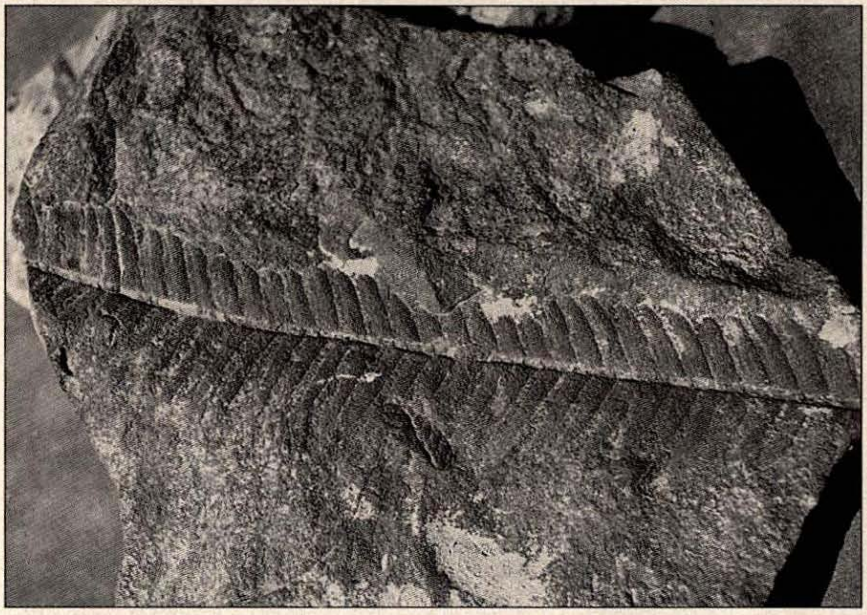
Gypseous shales occurring above the Anceps beds are known as Athleta beds, the ammonite fossil *Peltoceras athleta* can be collected from here. The uppermost layer of the Chhari series is formed by the Dhonsa oolite, made up of green and brown oolitic limestone. Local people call oolitic limestone *false gold* for when broken, it shines in the sunlight like gold crystals. From the uppermost beds of Chhari one can collect *Mayaites maya, Epimayaites polyphemus* and other important fossils.

The BNHS established a Bird Migration Study Camp at Fulay on January 1990. Being a student of wildlife, I was unaware of the thrilling Kutch fossils, volcanoes, and earthquakes. The remote village of Fulay was my destination where I had spent five and half years studying birds and other wildlife. Our main fossil hunting ground was the Chhari series.

One fine day in the winter of 1990, a few strangers arrived in Fulay village. I met them, a Professor and his students from Jadhavpur University, who had come to collect fossils from the Keera Dome. Prof. Bardhan had done his doctorate on the fossils of Keera hill. I found myself inquiring more and more often about the hidden treasures of Keera and took extensive notes about fossils from the kind professor.

It has been established that Kutch district was submerged under the sea two million years ago. The scattered hillocks around Keera are called the central anticline. The rock types are limestone, sandstone and shales.

Keera Hill stands on the northern coast of Kutch overlooking the Great Rann of Kutch. About forty miles northwest of Bhuj, there is the village of Chhari. If you camp between that and the wattle huts of Fulay you can reach the high conical hill of Keera which is believed to be an extinct volcano, but not the Keera of the ammonites. The ammonite fossil area is the wide dome of hills lying to the south of the cone. The ideal way of collecting fossils on the Keera dome is to walk around in a tightening circle and collect specimens of each fossil. All the Kutch Jurassic fossils are upper



J.K. TIWARI

A story in stone — fossilized fern leaf from Pakhda hill, Kutch.

Jurassic, except the Patcham which are middle Jurassic.

According to Prof. Bardhan, the fossils collected in the vicinity of Keera hill are not less than 135 to 150 million years old. The Keera hill is famous for ammonite and belemnite fossils. What the local people believe about the fossils is interesting to know. On inquiry they told us that they were remains of marine animals and they called them *kundi vara pahna*, meaning coiled stones. The tusk-shaped belemnite fossils are used in medicine by the local people in the Banni grassland. Since ages, they use the extract of the belemnite fossil to cure kidney stones.

Keera hill has been an attraction point even earlier. During 1912, J.H. Smith spent a few days camping near Keera to study the fossils. In 1913, F.H. Stone, a famous palaeontologist of his time, also came here to study the fossils of Keera hill. But much before these great workers, Wynne and Waagen had studied the fossils of this range.

I found myself spending more and more of my spare time after field work, heading towards the archaic Keera hill to collect fossils. At present I have a fossil collection of over 200 good specimens, and I find myself turning into a true student of palaeontology. From the Keera hill vicinity fossils such as *Nautilus* or shipworm, corals, *Khericeras, Nerinia and Pleuromatria,* which are extremely rare, have been collected. In fact, *Khericeras* has so far been collected only from Keera hill, and is named after it.

Coquino beds, where most of the fossil components are fragments, are commonly seen around the Keera hill. Stream beds were the best place where exposed and weathered fossils could be collected easily. This was the ideal spot to show our guests and fellow biologists the fossils of Keera.

There are many places in Kutch district where one can collect marine fossils. These places are Godhatad near Lakhpat, famous for marine cones and gastropods; Jangadia Dam in Abdhasa taluka, famous for starfishes (sea stars), sand dollars and screwshells. The Mithi Canal in Abdhasa taluka is a treasure trove of marine molluscan fossils. Sadhara village on the edge of the Great Rann is full of ammonites. Ler, Chadva, Vandhay and Yax are other places in Kutch where one can collect fossils.

It would be an encouraging experience for a beginner or an amateur to initiate himself into the world of fossils in Kutch. The sheer numbers and variety of fossils are most conducive to worthwhile collecting.

Some time ago students from the Deccan University, Poona, had collected a dinosaur skull from the vicinity of Dahisra village near Mandvi taluka of Kutch. It seems that the district must have been the kingdom of dinosaurs. Truly one can call Kutch a *Jurassic Park!* ❑

Jugal Kishore Tiwari is a BNHS Scientist working on the Grassland Ecology Project at Banni.

The pitta or navrang looks like a gaily coloured easter egg with a head and legs fitted on it.

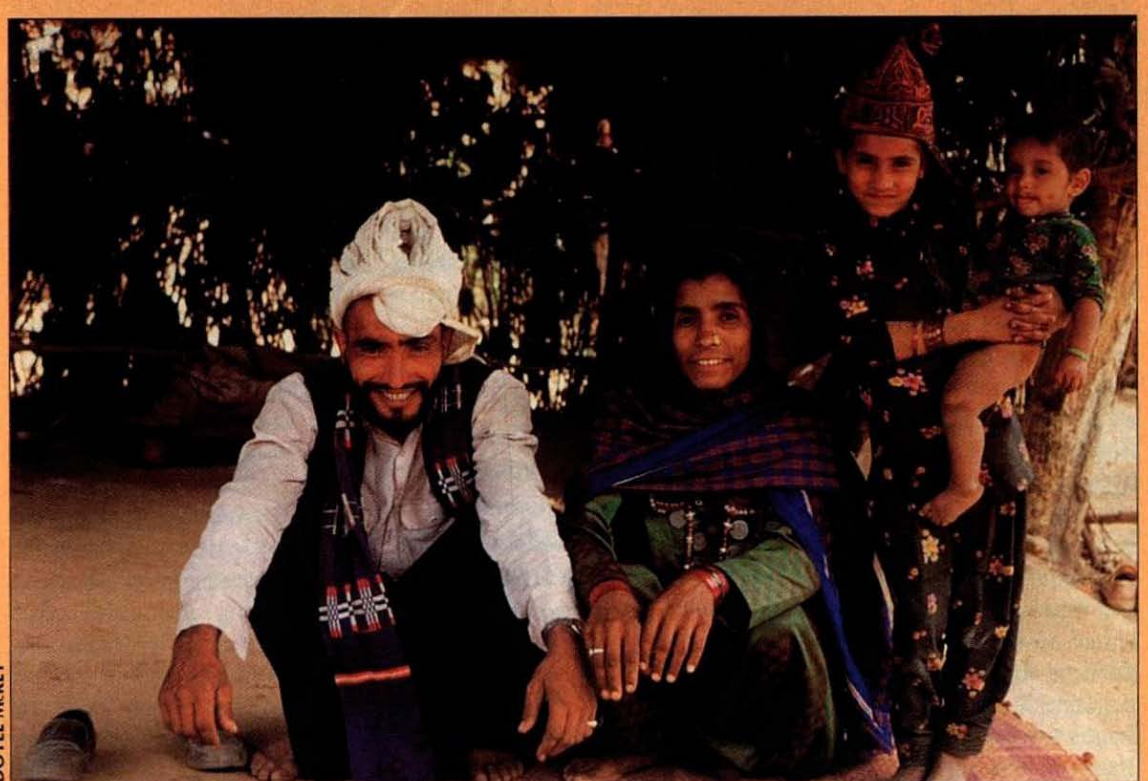
A Day at Dholkand

J.C. DANIEL

The Rajaji National Park near Dehra Dun flickers off and on in the flame of environmental controversy. Those NGOs who are with the Gujars, a pastoral people that live within the National Park, and lop the trees to feed their stock, vigorously and vociferously protect their rights to live within and continue to lop the forest and in the course of time make themselves and the forest extinct. The opposite lobby would have them move out to the tender mercies of government promises of a good life outside the forest in an entirely different lifestyle in jerry-built government colonies. In a reasonable and practical remedy to this contention lies the future of the Sanctuary.

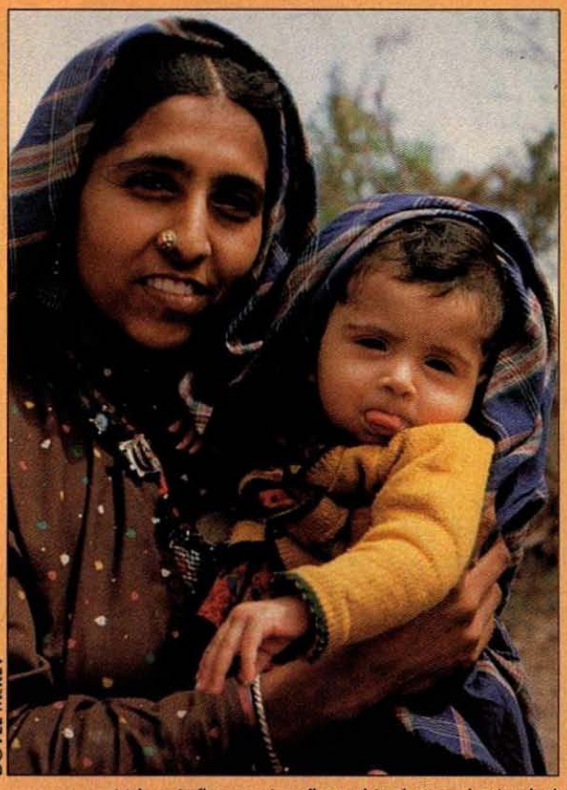
The sanctuary itself lies well protected by a *rau* at the site formal entry. A *rau* is a boulder-covered stream bed which, except for an occasional flash flood during the monsoon, remains a dry boulder strewn stream bed unsuitable for vehicular traffic. The forest department clears a road which lasts till the next flash flood.

We crossed several *raus* and reached the forest gate which blocks entry to the Dholkand Guest House. Dholkand, built



DOYLE McKEY

Traditionally nomadic, these gujars have taken to a settled life in Rajaji National Park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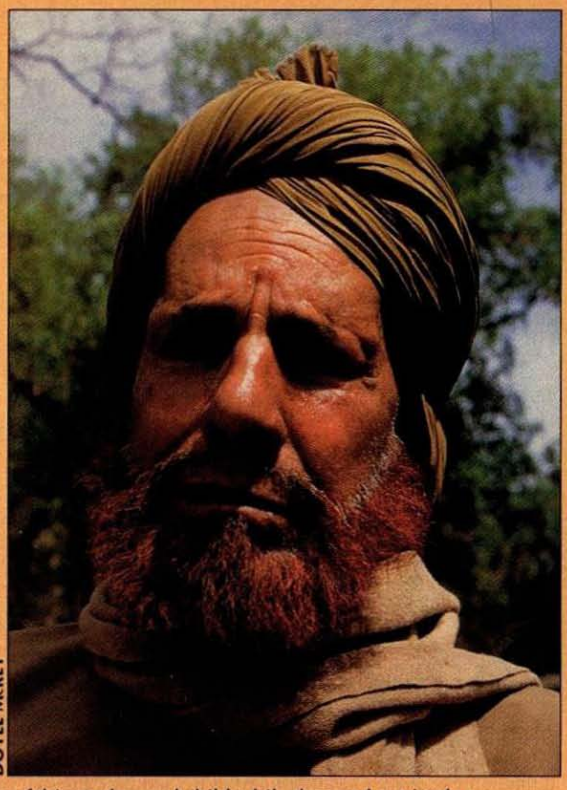
DOYLE McKEY

Urban influence is reflected in the synthetic clothing of this mother and child while the aged patriarch remains true to his type.

in 1883, is craftily situated on a hillock overlooking a *rau* and thereby denies itself essential amenities like water. Bold, black letters proclaim that it was renovated in 1958, but it remains as visitor unfriendly as it was in 1883. It does not affect the forest officials though, their visit brings tankers of water, and generators for electricity which activates the built-in fittings for water and electricity for the fleeting moments of their stay. Equally, it does not affect the young scientists of the Wildlife Institute who accompanied me. They were happy with its inadequacies as it keeps away visitors from their beloved study site. They, however, carted up a barrel of water for our benefit, but the VIP suite toilet has a permanently down seat, making its use difficult. For those who are intrepid enough to try it, a word of caution — a pair of small brown rats live behind the cistern! These minor irritations apart, Dholkand is a naturalist's country. Summer is the season of song among birds and in late May, the magpie robin had already partitioned the sanctuary and each territory had its singing male advertising its ownership, making one wish that people would also settle their differences with song. Along the length of the *rau*, pittas were whistling their challenge and if you are not familiar with a pitta, imagine a gaily coloured easter egg with a head and legs fitted on it. For the pitta has a very short and inconspicuous tail,

Along the length of the rau, pittas were whistling their challenge. The pitta has a very short and inconspicuous tail, and from the bright colours on the body it is locally known as navrang

DOYLE McKEY

The gujars vigorously protect their rights to lop the forest treets — a self-destructive way of life indeed.

and from the bright colours on the body, it is locally known as *navrang*. In spite of its colour it keeps a low profile during the non-breeding season and you are hardly likely to see it among the undergrowth in which it lives. I had not met the pitta blatantly advertising itself. I had only seen it at Point Calimere Sanctuary in Tamil Nadu to which it migrates over a thousand kilometres from the Himalaya, on its way to Sri Lanka. Many are trapped and eaten by the locals at Point Calimere, who relish it.

At Dholkand, the method to watch birds is to lie flat on your back on the verandah, away from the searing sun and identify birds by their call. We had five varieties of cuckoos on our list, all frantically advertising themselves. A majestic single tusker spotted out at the edge of the *rau* broke the general afternoon lull in activities. I was deposited in a watch tower overlooking a water hole and the younger naturalists went to have a closer look at the tusker who, probably anticipating such unwelcome visits, had already crossed the ridge into the next valley. At the pool, mynas were in command, officiously walking up and down at the edge of the water, occasionally giving their 'grinding teeth' call. A few jungle fowl skulked around, always within reach of cover. A herd of *chital* approached nervously, but fled in panic without drinking. Peace returned to the waterhole. On

At Dholkand the method to watch birds is to lie flat on your back on the verandah, away from the searing sun, and identify birds by their call as they can be heard frantically advertising themselves

the *rau* a young tusker crossed from one bank to the other and walked rapidly into the jungle when he heard a car loaded with tourists rattling up to the watch tower. Our day's watching was ended as the car parked by the side of the pool and several people got out and entered into a vigorous noisy discussion on whatever was of immediate importance to them.

Our younger group which had moved up the *rau* were lucky indeed. They saw a tigress reclining in a pool of water. A sudden movement and the tiger was up and over the steep side of the *rau* to be greeted by the alarm calls of the peacock and chital. Back at the bungalow, Franklin's nightjar whistled in the dusk, while the longtailed and the jungle nightjars clanged steadily in the distance. We went to sleep on the terraced roof—elephants apparently saunter through the verandah at night!

The next morning we met Prem Kali, the camp elephant. A mousy, rather subdued character, who seemed unhappy and bothered by the lack of water to bathe and cool herself, she glumly accepted a pair of biscuits, took us on board, and very carefully stepped down the hill and into the *rau*. Elephant rides are exasperatingly slow and leave the impression of travelling eternally without getting anywhere. There was another tusker on the *rau* who fidgeted a bit on seeing us but kept his distance.

We moved on. A tiger roared in the distance and there was a chorus of response from chital and peafowl. Prem Kali called it a day and we turned back, enjoying the summer season's gift of flowers along the way, the Indian laburnums "dropping wells of fire". ❑

J.C. Daniel, former Director, BNHS is currently a member of the Executive Committee, BNHS and chairman of the Salim Ali Wild Wings Trust.

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SANJAY KARKARE

Indian Tree Shrew

Anathana ellioti

The name tree shrew gives a mistaken impression of the true habits of this insectivorous mammal. Most of the time it can be seen rummaging among fallen leaves, or under rocks for insects or fruits that have fallen on the ground. It will not hesitate to go for a small bird or mammal. It is, of course, an expert climber, and quickly takes to a tree when alarmed. The tree shrew could easily be mistaken for a squirrel. But it does not leap from tree to tree as squirrels do, nor jerk its tail, nor cling head downwards to the tree trunk like the squirrels. The posture while feeding is also different from that of the squirrel.

The Indian tree shrew occurs in both dry and moist deciduous forests of peninsular India. Some taxonomists have classified tree shrews as primates, while others differ and put it together with insectivores like hedgehogs, moles and ground shrews. The latest classification, however, places the tree shrew in a new order — Scandentia — separate from both primates and insectivores. ❑

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The nominee should send his curriculum vitae, with his professional and home mailing address, present occupation and institutional affiliation along with a brief statement (not more than two pages) of his achievements in the appropriate field. Details of the contributions made, how each was accomplished, its value, effectiveness and involvement of others may be indicated.

The curriculum vitae should be accompanied by three letters of recommendation from individuals capable of assessing the nominee's contributions. Three additional referees who might be contacted by the selection committee may also be identified.

The Selection Committee reserves the right to request copies of publications or other evidence demonstrating the candidate's contributions to nature conservation. Such materials will be retained by BNHS unless requested otherwise. Nominees will be considered for a period of four years. A fresh letter of nomination and an update of achievements will be required thereafter.

Nomination forms for the Sálim Ali International Award for Nature Conservation may be obtained from :

The Director,
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Completed forms with all enclosures should be received not later than 31st October, 1995.