HORNBILL

DISCOVER THE LIVING WORLD

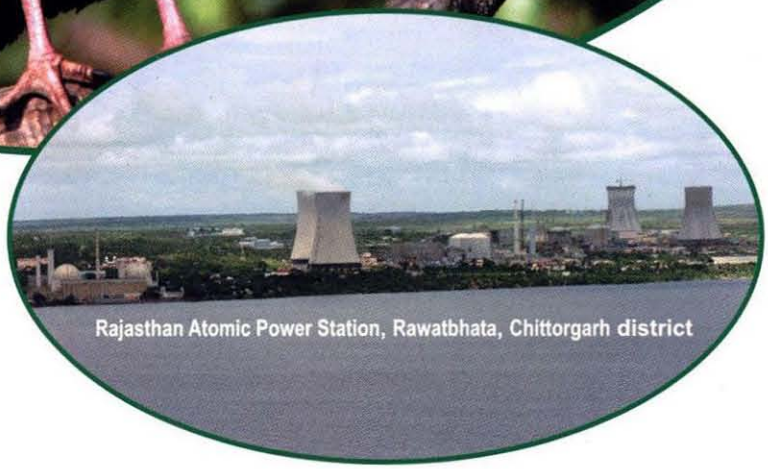
JULY-SEPTEMBER, 2009

BNHS India CONSERVING WILDLIFE SINCE 1883

BOMBAY NATURAL HISTORY SOCIETY

Photo: Meethil Momaya

Red-headed Vulture
(*Aegypius calvus*)



Rajasthan Atomic Power Station, Rawatbhata, Chittorgarh district

The Red-headed Vulture *Aegypius calvus*, also known as the Asian King Vulture, Indian Black Vulture or Pondicherry Vulture, is a large vulture, up to 85 cm (34 in) long and weighs 3.7-5.4 kg. This gaudy-faced vulture was in the past widely distributed, with a range over south-central and south-eastern Asia extending from Pakistan to Singapore. Today the range of the Red-headed Vulture is localised primarily to Nepal and northern India. In India, it was once widespread across north to south, but now very few recordings have been noted in southern India. It is found mostly in dry deciduous forests and adjacent open country, in plains and hills, and in cultivated and semi-desert areas.

As in the case of other vultures, Diclofenac is the major cause for population decline in King Vultures, in recent years. Diclofenac is a painkiller administered in livestock; vultures are exposed to it when they consume carcasses of livestock treated with Diclofenac before death. This results in their poisoning leading to death because of kidney failure.

From Least Concern it was uplisted to Near Threatened in 1994, by the IUCN and in 2007 it was uplisted to Critically Endangered in the 2007 IUCN Red List.

It is called 'King' Vulture because of a spurious reputation for boldness and overbearing pugnacity inspiring awe amongst its fellow feasters, and thus monopolizing a carcass until it has had its pick of the choicest titbits.

It is mostly seen solitary or in pairs, it tries to stay away from the group of other *Gyps* vultures at carcasses. It feeds on peripheral items, pirates prey from eagles, scavenges smaller carcasses and takes easy prey like turtles. It breeds overall December to April, earlier in the plains later in the lower Himalayas; most generally in February and March. Its nest is a large platform of sticks and twigs, untidily lined with straw and leaves, and nests often near villages.

NPCIL's volunteers have been monitoring the local population of the Red-headed Vultures at their Rawatbhata site. They have been working with the local communities to create awareness about the use of Meloxicam as an alternate to Diclofenac.

The Environment Stewardship Programme (ESP) of NPCIL, a voluntary programme, envisages scientific study of biodiversity, particularly avifauna, in the Exclusion Zones (EZs) and the environs of their seven nuclear power stations. EZ is a 1.6 km radius area around the centre of the nuclear plant. While only a fraction of this area is used for the plant structures, remaining is used for green-belting. Large number of bird species have made EZs their homes. The programme also includes training of local volunteers, public awareness campaigns to sensitise members of public on environment, and improving habitat (particularly of avifauna).

NPCIL as a responsible corporate citizen believes that these efforts will help in promoting habitat conservation and awareness on the importance of a healthy environment to make the world a better place for living.

Rajasthan Atomic Power Station at Rawatbhata in the district of Chittorgarh, Rajasthan comprises of four operating units, generating 100 MWe, 200 MWe and 220 MWe (two units) respectively. Two additional units of 220 MWe each are at an advanced stage of completion.

Nuclear Power Corporation of India Limited
(A Govt. Of India Enterprise)
Vikram Sarabhai Bhawan, Anushakti Nagar, Mumbai- 400094, http:\\www.npcil.nic.in

HORNBILL
July-September, 2009

Cover: Asian Widow
Palpopleura sexmaculata
Ishan Agarwal

Published and printed quarterly by Dr. Ashok Kothari for the Bombay Natural History Society, Printed at Stusa Mudra Pvt. Ltd., Lower Parel, Mumbai.
Reg. No. RN 35749/79, ISSN 0441-2370.

For more information on the Society and its activities, write to the Honorary Secretary, Bombay Natural History Society, Dr. Sálim Ali Chowk, S.B. Singh Road, Mumbai 400 001, Maharashtra, India.
Tel.: (91-22) 2282 1811
Fax: (91-22) 2283 7615
E-mail: bnhs@bom4.vsnl.net.in
Website: www.bnhs.org

CONTENTS

Others...

'Green' is patriotism in action

After the launch of the people's car costing Rs. 1 lakh, *The Times of India* (January 11, 2008) wrote that "this is the car the greens should embrace rather than oppose." The implied meaning being only the 'so-called' greens are concerned with the environment. Does it mean that the 'non-greens' are not concerned or should not be concerned with the environment? Do they not breathe fresh air? Do they not drink clean water or eat fresh organic food? Or, more importantly in the present context: would the 'non-greens' not want to drive on pollution free roads? Shouldn't environment protection be the concern of each human being?

I find the term 'green' used by the media, some times with derision, for people showing environmental concern, rather funny. Anyway for me this is a not a term for derision, but a compliment. I would like every citizen of this world to be 'green' (figuratively, not literally!). Environment should be a part of mainstream concern, like education, health, housing, food, wealth, and human rights. When we talk of human rights, why ignore the right of the Earth to maintain its ecological balance, or rights of species to survive in this world?

Look at all the fancy advertisements put up by builders, adorned invariably with lovely tall trees, green lawns, blue swimming pools, and a few birds flying around, who would not like to live in such places. I have not seen any advertisement of a future housing colony which shows smoke-spewing chimneys or mine-scarred hills in the background! Promising a clean environment is a USP of any intelligent builder, at least on paper. It means clean and green environment sells, so why deride people, intentionally or unintentionally, who have devoted their lives to protect the environment and nature? Environmental protection, unlike amassing wealth, is not only for oneself – it is for the whole society and future generations. I consider selfless environmentalism as the highest form of humanity and patriotism. In how many other human actions do we consider the rights of the future generations in mind? Working for environment protection or species/ecosystem conservation is a noble activity – a sort of altruism, unfortunately not fully recognized and appreciated by the society at large.

Have you noticed the glossy advertisements put up by different state governments to attract tourists: they all show forests, wild animals, waterfall or beaches, historical monuments, delicious local cuisine, and beautiful tribal dancers. I have not seen any state-sponsored advertisement which shows polluting factories, mines, filthy rivers, polythene-bag covered roads, slums, and big ugly housing colonies (which only a government *babu* is capable of designing!). We all have a family picnic in a clean and green environment, not besides a polluted river or a ravaged forest. We plan a tour with family or friends to see monuments, sanctuaries or national park, beaches or mountains, religious places – I still have to meet a person who has taken his/her family to a polluted industrial area as a family outing. Interestingly, even good industrial giants proudly publicise the greenery around their plants and housing colonies.

Despite deriving all types of benefits from nature, I still wonder why more people are not interested in protecting nature (or becoming 'green'). What prevents people from coming forward to stop further destruction of forests in the name of development? Why do we throw garbage into the Ganga when we worship it? Why do we leave filth after paying obeisance to our gods? Why do most of us keep quite when our national animal is hunted to extinction? Why do conservation NGOs have to struggle for financial survival

RUSHIKESH CHAVAN

when we give billions of rupees each year to temples, mosques, gurudwaras and other religious places? Some religious trusts are doing yeoman service by running schools, training centres, hospitals, libraries, medical vans, parks, but when it comes to giving donation to conservation NGOs, not many trusts, corporates and members of public come forward.

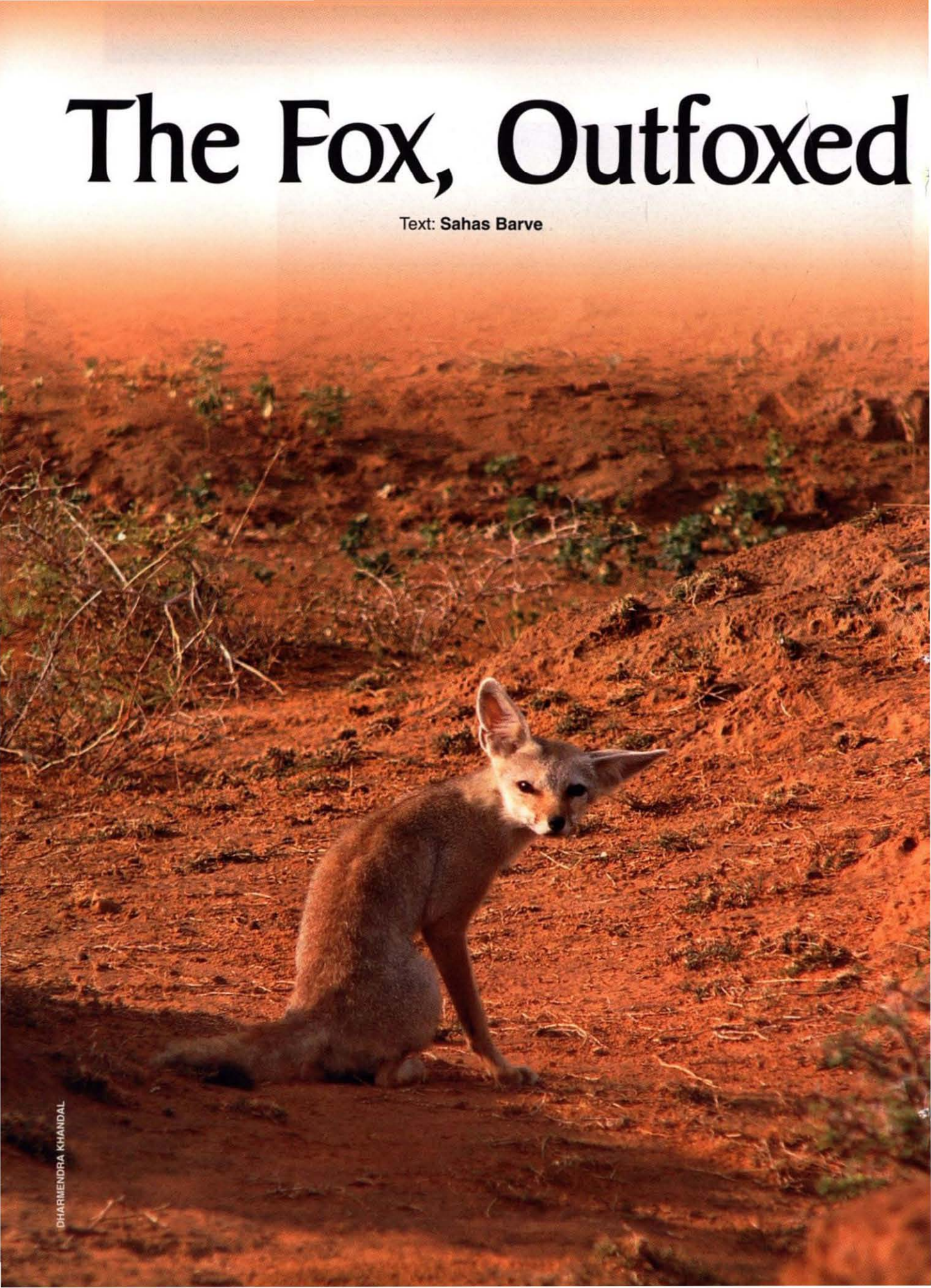
Where have we failed to make environment a part of mainstream concern? Why people do not connect good health, education and mental peace with good environment? Why does destruction of prime forests in Arunachal Pradesh or forced displacement of a tribal for mining purpose not stir the heart of more people? Conservation NGOs have perhaps failed in conveying the message and making links between a good environment and a better life. Perhaps, making environment protection a compulsory subject in all schools and colleges make future Indians more interested in nature protection.

The greatest disservice which we can do to our country is to spoil it through our policies, inaction or carelessly throwing garbage everywhere. Look at the unspoilt paddy fields of Kerala or the forest streams of Arunachal Pradesh. And, look at our garbage-littered cities, villages, highways and railway lines. When some 'greens' want to clean this mess, they are doing a service to their country. They need to be appreciated, not derided. I dream of a day when every Indian will proudly say that I am 'green'. For me, being 'green' is patriotism in action.

Asad R. Rahmani

The Fox, Outfoxed

Text: **Sahas Barve**



DHARMENDRA KHANDAL

The Indian Fox, also known as the Bengal Fox, is endemic to the Indian subcontinent

It was dry and hot, and the Acacia tree that I was sitting under didn't provide any respite from the searing heat. My water bottle was as dry as my throat and my work hadn't even begun. The bright colours worn by the tourists 'on evening safari' momentarily caught my attention as I saw the canter trudge along in the background. As I trained my binoculars back at the den site, I saw a pair of very long ears sticking out of one of the burrows. Roop Singh suddenly pointed out to another animal that was running away, its characteristic black tail tip leaving no doubt in my mind that I had had my first sighting of the Indian Fox *Vulpes bengalensis*, an animal I was to observe for the next 15 days.

Ranthambhore had always fascinated me, but I never thought I would go to Ranthambhore and study foxes. This ancient landscape of *Dangs* and *Khos*, local names for the mesa(s) and moist valleys respectively, is famous for its tigers that rule the forests. What had brought me to this place was not the great striped cat, but a cat-sized canid. I was in Ranthambhore's Jaisinghpura pastoral land. This place was only minutes away from the gate of the Park but had a stark contrast to the lush 'Dhak' *Anogeissus pendula* covered slopes of the Aravallis; it was quite evidently heavily degraded. Nevertheless, it had a family of foxes that looked quite happy and seemed to be doing quite well for themselves, all seven of them. I had the unique opportunity to peek into the life of this shy creature with the help of Dr. Dharmendra Khandal of Tiger Watch, an NGO based in Ranthambhore. As a part of their 'Volunteer for Research' programme in May 2007, I was to observe these fascinating animals in their natural habitat, recording behaviour near the den, the pressures that they faced and understanding the incredible tact that helped them survive in this human dominated landscape.

The Indian Fox is a widespread animal of arid and semi-arid areas, especially partial to grasslands. It is mostly crepuscular and nocturnal in habit and rarely wanders around during the day. Its secretive nature leads to it hardly getting noticed, a life history strategy that might have helped it to survive in the 21st century. It is locally common and seen frequently in areas like the Great Indian Bustard Sanctuary in Maharashtra, Velavadar National Park in Gujarat and Rollapadu

Wildlife Sanctuary in Andhra Pradesh. An opportunistic omnivore by nature it forages for insects, fruits, rodents and the occasional unsuspecting little bird. Generally solitary they form pairs in the breeding season, and both parents share the parenting responsibility. The average litter size is 3-4 and they are known to have more than one den site in their territory. It is not responsible for livestock losses, hence not persecuted in most of its range which spreads as north as Nepal, although they are hunted by some tribes in Tamil Nadu and

SAHAS BARVE

The Indian Fox is known to have more than one den site. The dens are large and complex with multiple chambers and escape routes

Rajasthan for food. They are quite tolerant of human presence and generally live in burrows or under bushes during the day quite close to human settlements.

The family of foxes I was studying lived in a den in an area of about 20 hectares of undulating scrub habitat that had highly over-browsed shrubs of *Capparis sepiaria, Capparis decidua, Zizyphus nummularia*, and *Echinops carinatus* amongst others. There were many patches of *Calotropis procera* which were fed upon by the brightly yellow, blue and red nymphs of Painted grasshoppers. Some trees of *Acacia tortilis* and *Prosopis juliflora* were scattered over the area. The area had a man-made water body in the south-western side. It also had three large hotels and agricultural fields. The den that the foxes occupied had 14 burrows. It had three large burrows while the other burrows were much smaller. The female fox seemed to favour one of the burrows, while the pups would just dive into anyone of them. There were 3-4 other similarly large burrows in a radius of about 30 m from the den.

The foxes consisted of a male, a female and four very playful pups. There was also another adult that seemed to linger around the den and occasionally guarded the den. This 'helper' adult has been noticed in other studies elsewhere on Indian Foxes and may be one of the pups from the previous litter, biding its time to inherit the parents' territory and its resources. Although foxes are territorial, they do seem to tolerate this individual. Unfortunately, this particular animal was so shy that I could never know whether it was a male or a female. I could distinguish the parent male from the female as she lacked the black tip on the tail. The pups, however, each with their unique personalities, were difficult to tell apart. Only one with a crescent moon mark at the base of its tail stood out and could be identified easily. This was also the most active and dominant of the pups. The pups although almost as big as the parents still suckled. It was quite hilarious to watch four pups lie on their backs to suckle while mom had to arch her back to accommodate her lively litter!

As foxes are crepuscular I would observe their behaviour late in the evening and early in the morning. Every evening I would sit under a tree at a distance of about 80 m from the den and observe the foxes. The female was generally the first to emerge from the den in the evenings and would go off for a drink. The male would come out of the den and lie under some bush while the pups played around. When the female came back the male would wander off, hardly ever did I see him coming back before I left the family after darkness.

Numerous feral dogs lived in the area and they regularly chased the foxes around. The dogs probably subsisted on the large amount of waste produced by the hotels and the villages. The female on seeing the approaching dogs would give a short 'bark', which would send the pups packing and they would dive into one of the burrows. The female often did a


SAHAS BARVE

Termites form an integral part of a fox's diet


SAHAS BARVE

The area is frequented by Long-eared Hedgehogs at night

distraction display and ran in the opposite direction to distract the dogs. Once a dog crept up very close to the female and suddenly attacked her. The female surprisingly retaliated by charging at the dog and chasing him away. It was quite amusing to see a large dog being chased by a lion-hearted vixen. The vixen chased the dog until both of them almost bumped into me. On seeing me the fox ran away, having displaced the dog away from the den. But on many occasions, the dogs would try and dig up the den area, while some would chase the parents around.

I tried to locate the foxes at night to determine their range from the denning area, using a powerful torch light, this activity made me aware of the other denizens of the night. The area was frequented by a pair of Golden Jackals *Canis aureus*, a Striped Hyena *Hyaena hyaena* and also Long-eared Hedgehogs *Hemiechinus collaris*. Indian Hares *Lepus nigricollis* flushed from the grass, and so did Savanna Nightjars *Caprimulgus affinis*. The waterbody attracted a lot of birds and it was a common sight to find Woolly-necked Storks *Ciconia episcopus*, Little Grebes *Tachybaptus ruficollis* and Black-winged Stilts *Himantopus himantopus* feeding near the water as the foxes went for a drink. The scrub habitat near the Fox's den rewarded me in many other ways. I often saw Painted Sandgrouse *Pterocles indicus* land quite close to me as they prepared to roost. Southern Grey Shrikes *Lanius meridionalis* hunted from a perch catching insects and reptiles, and one day a Fan-throated Lizard *Sitana ponticeriana* caught my eye! Once a Monitor Lizard *Varanus bengalensis* bolted from a bush quite close to me, this made Roop Singh also bolt in the opposite direction as there is a belief that the lizard is poisonous, which is not true.

During mid-day when the foxes were probably dozing off, I approached the den and collected the scat of the foxes. Indian Foxes have the habit of defecating just outside their den, hence fox dens are strewn with scats; it is also a great way to tell if the den is being used or not. A very preliminary scat analysis revealed something very interesting; more than 70% of the scat contained termite parts. Termites in my study area do not build large mounds above the ground, but have a vast network of tunnels just below the ground surface. Surprisingly, these termites form an integral part of the fox's diet. This has also been noted in some areas of Kutch, Gujarat. Most of the scats also contained bits of beetles, grasshoppers and *Solifuge*, some contained bird feathers while the others were full of hair, and some even had plant matter. Tragically, I also found pieces of plastic and foil in


SAHAS BARVE

A local collecting fuel-wood

FOX ... OUTFOXED

SAHAS BARVE

Sand and boulder extraction by the locals often disturb the fox

the scat, which meant that the foxes were also feeding on garbage.

Once, as I was approaching the den, I smelt a horrible stench. Roop Singh promptly pointed to the tail marks of a Monitor leading into one of the burrows. That evening I realised that the family had abandoned this den. Fortunately, I was aware of another den site in the area and found them there. But one of the pups was missing! Over the next few days the rest of the pups too started showing signs of disease and started to lose body condition. They became less active at first, and subsequently skinny and very obviously weak. I was helpless as I saw them die one after the other, I think even the male succumbed to the disease. A description of the symptoms to a friend who is a veterinarian revealed that it could have been a disease that the foxes contracted from the dogs.

The area is heavily grazed by sheep and goats

SAHAS BARVE

Although I can't say this with certainty, as we didn't collect any tissue sample, the truth remains that the foxes of Jaisinghpura have disappeared. The female, resilient that she was, probably escaped the disease, but had left the area.

The dogs were not the only threat to these foxes. The success of the pair in bringing up four pups, so far, was a testimony to their amazing resourcefulness and cunningness. Ranthambhore is surrounded by about 1,400 acres of pastoral land. Only 50 acres of this land remains, while the rest has been converted to agriculture. Sand mining is rampant in the area and people were seen regularly excavating sand less than 100 m from the den; they were literally carrying away the habitat in tractors! Plastic and other waste that was generated and improperly disposed off was finding a way into the diet of the foxes, which must have been detrimental to their health. The area is heavily grazed by sheep and goats. The herders often disturb fox dens by digging them up or sealing them with sand, this was told to me by a herder himself.

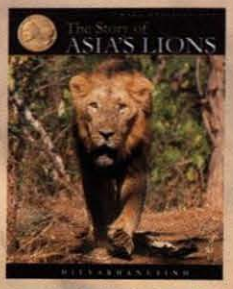
In a time when we talk about landscape ecology, areas like Jaisinghpura that lie outside protected areas, but harbour wildlife, also play a vital role in maintaining the diversity of the area. Granting them some level of protection can prove to be a blessing for lesser known animals like the Indian Fox, hedgehog, sandgrouse and monitor lizard. If we can't look beyond the 'tiger-centric' mode of conservation we can at least ensure that such areas are included while planning our protected areas, and try to help these small, but beautiful animals survive without fear. The foxes of Jaisinghpura have gone into oblivion. But there are other populations of foxes in other areas like the Banaas ravines near Ranthambhore. Protection of these peripheral areas of the Park can alone save the fox from being outfoxed in Ranthambhore! ■

Sahas Barve has finished his M.Sc. in Wildlife Sciences from Wildlife Institute of India. His interests include biogeography, community ecology, birding, hiking, camping, and photography.

NEW REVISED EDITION October 2008

The Story of ASIA'S LIONS

By Divyabhanusinh



Lions once roamed the Asian continent from Palestine to Palamau. Why they have been reduced to a beleaguered relict population in Gir is described, with implications for their future in the 21st century.

DIVYABHANUSINH is well known in the field of nature conservation. His book *The End of a Trail: The Cheetah in India* (1995) was a pathbreaking history of a species.

ISBN: 978-81-85026-87-9
280 x 215 mm Hardcover
268 page 162 illustrations
Rs 1950.00 / US$ 50.00

The Gir Welfare Fund will receive 5% of the net sales value per copy.

Marg

Please contact: The Sales and Marketing Department, Marg Publications,
Army & Navy Building, 3rd Floor, 148 Mahatma Gandhi Road, Mumbai – 400 001, India.
Tel.: (91-22) 22842520, 22821151, 22045947/48 Fax: (91-22) 22047102
E-mail: margpub@tata.com / margpub@vsnl.com

Hornbill 0609

Buy online: www.marg-art.org

A trapdoor nest of *Heligmomerus* sp. on the ground

Trapped for Life – the World of Trapdoor Spiders

TRAPDOOR SPIDERS

Text and photographs: **Manju Siliwal**

Little Miss Muffet
Sat on a tuffet,
Eating her curds and whey.
Along came a spider,
Who sat down beside her,
And frightened Miss Muffet away.

Most of us have been introduced to spiders in our childhood, be it this nursery rhyme or the story of the king observing the determined little spider that climbed up the wall every time it slipped down to create its web. Some of us understand Miss Muffet's predicament, but like all 'creepy crawlies', especially the most noticeable and grandiose architects — the bees and termites, spiders also have certain fascinating abilities and talents that demand our respect and attention. The accurate assessment of perspective and geometry while creating that perfect web is unique to these arachnids. But spiders do not just create webs to trap their prey ... there is more to the talent of our tricky spider!

There are certain spiders that do not make webs, and live either in burrows or amongst foliage or lead a nomadic life. One such group that remain trapped for life within their highly specialised burrows is the trapdoor spiders!

Trapdoor spiders are primitive and belong to the same suborder Orthognatha (mygalomorph spiders) as that of tarantulas — the bird eating spiders. Trapdoor spiders have two pairs of book lungs unlike the modern spiders (suborder Labidognatha) that have a single pair. They also differ from the modern forms by the vertical movement of the chelicerae, the structure that holds the fangs.

A camouflaging trapdoor burrows on tree trunks

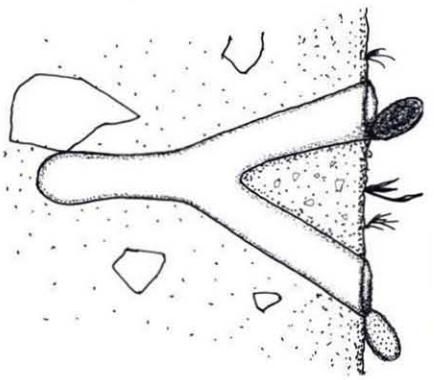
As the name suggests, the trapdoor spider's foremost habit is that they make a door at the entrance to their small tube like burrows, which serves the dual purpose of protection or cover, as well as a trap to capture prey. Another brilliant design of interior decoration/ architecture is the inside wall of the burrow that has a thick layer of silk, which prevents the burrow from caving in and also forms a suitable microclimate for the spider. The door is also made of a thick layer of silk and is tightly held hinged to one end of the burrow entrance. Most often dry leaves, moss, lichens and soil particles are adhered to the outer wall of the door, simulating the surrounding environment. And, with the trap door shut, the burrows are highly camouflaged making it difficult to locate. The only way the presence of these mastermind spiders in the area can be established is by locating empty trapdoor retreats, in which the door is left open. On closer examination of the immediate surroundings and with gentle prodding, active burrows can be located. Most often where suitable substrate is available many of these spider burrows, of varying sizes (based on the door size), occur in close proximity. Also, the reason for such clumped distribution of these spiders is that they are poor dispersers. Usually, there are many smaller burrows that are occupied by the juveniles that dispersed from their natal burrow near an adult female's burrow.

In India, of the total 83 species (under 26 genera and 8 families) of mygalomorph spiders, the trapdoor spiders are represented by five families, 10 genera with 21 species.

Trapdoor spiders are small in size ranging from 5 mm to 25 mm and

are either arboreal or ground dwelling. They occur throughout the country from the plains to the high mountains, though the distribution is patchy and not clearly known. They live in burrows that could be found on tree trunks, on or between rocks, on roadside bunds and on flat ground depending on the species.

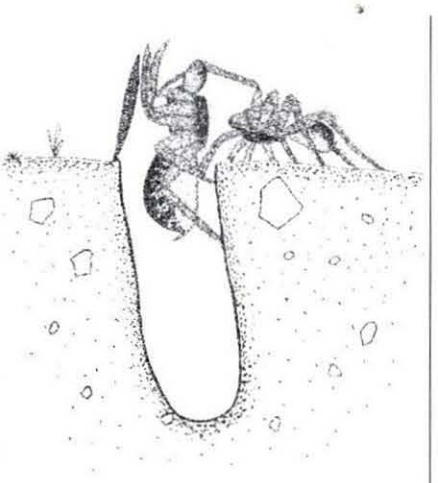
Trapdoor spiders are nocturnal and lead a solitary life confined to their burrows, except when the burrow is either destroyed or disturbed, and or when there is no chance of expansion of the burrow to accommodate the growing spider. Only male trapdoor spiders on maturation leave their burrow, and lead a nomadic life



An illustration of a *Diplothele* burrow

wandering in search of mates and occupy temporary hideouts during the day.

Living within the burrow for most of their lives, the trapdoor spiders live in a world dependent on vibrations. In the immediate surroundings of the burrow entrance a very fine network of silk lining is present, through which the spider senses the movement of prey and also, interestingly, judges the prey size. When a prey is sensed, the spider moves closer to the entrance and at the right moment, in a flash the trap door is opened, and the prey is quickly brought in and paralyzed. Like all spiders, these trapdoor spiders first paralyze their prey by injecting venom through the fangs in the chelicerae. Along with the

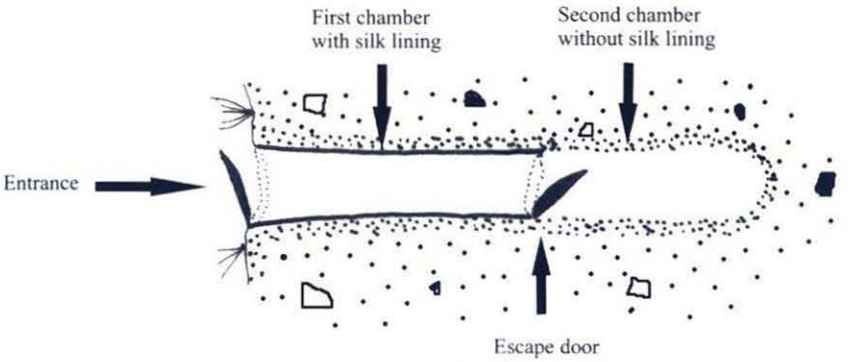


A mating pair of trapdoor spiders

venom, enzymes are also injected, which dissolve the animal tissue, and then the spider sucks the dissolved tissue. It is not clearly known whether the trapdoor spiders ensnare their prey in silk within the burrow. This may not be the necessary case as the prey is trapped inside the burrow and there is no chance of escape.

On the other hand, when the spider senses a threat, or when an intruder is at the door, these little creatures tightly hold the door from within and do not give up very easily. And, only when their strength drains out and on realizing that they no longer can hold the door they dash to the deeper end of the burrow. Trapped within the burrow and helpless as they may seem, few of these spiders have further evolved other ingenious escape strategies.

In those trapdoor spiders that have a single burrow entrance, as in the case of spiders of the genus *Idiops* and *Heligmomerus* (Idiopidae), they rely entirely on their strength. Their burrows lead vertically into the ground and are thickly lined with silk; their trap door is also relatively thick, cork-like and do not open easily. While in another genus *Sasonicus* (Barychelidae) the spiders also have a similar single burrow entrance, however, with a wafer-like trapdoor. And, at the time of threat instead of moving to the deeper end of the burrow they jump out when the door is forced open, to escape amongst the fallen debris on the ground. In the arboreal spiders of the genus *Sason* (Barychelidae), the burrow is a short retreat made in a shallow depression on the tree trunk. The burrow is shaped like a peanut pod and has two trap doors at either ends. In this case when there is an intrusion at one door the spider escapes through the other. Similar is the case in the ground-dwelling spiders of the genus *Diplothele* (Barychelidae), which have two trap doors that lead into a single chamber forming a Y-shaped burrow. In still others, as in the ground-dwelling spiders of the genus *Conothele* (Ctenizidae), they have two D-shaped cork-like doors, with one located at the entrance of the burrow functioning as a trap door, while the other is located at the rear deep-end



An illustration of a *Conothele* burrow

of the burrow and used as an escape door. At the time of threat, this little spider cleverly moves behind the rear door, giving an impression that the burrow is unoccupied.

The courtship and mating in trapdoor spiders is again very unique. Firstly, as to when exactly mating takes place in these spiders is not known. However, mature male trapdoor spiders that are known to be short-lived leading a nomadic life have only been collected during the rainy months, suggesting the mating period. It is only for mating that the adults of these spiders meet. Secondly, just as to how a male locates a female, who is hidden behind a trapdoor, is not clearly known. It is suspected that since males lead a nomadic life and any silk they come across, they know it to belong to a female or to an immature spider. Here again, the males are able to make the distinction as to whether it is an adult female burrow or of an immature based on the strength of the silk and from the size of the door. Moreover, it is likely that immature spiders do not respond to the male signals and do not open the door.

Dr. Robert Raven, a leading arachnologist from Queensland Museum, Australia, has found through experiments that when a female is kept in a container she silks it up. After removing the female from the container when a male is placed in the container, he responds to the silk alone. This shows that the female has a different silk type. Whether the female is putting a chemical signal in her silk for a male to detect her burrow is not known.

In the wild, on locating the burrow of the female, the male then taps the door signaling to the female his presence, and continues to tap till she responds. If the female is receptive, she opens the trapdoor and in a flash of a second, the male holds her up with his front legs. And, in order not to get eaten, he quickly locks her chelicerae fangs with the big spine present on the tibia of his first leg. Then, using the palps, the male, transfers the sperms into the female genitalia known as spermathecae. This lasts for a few minutes, following which he releases the female and quickly moves away. The male then continues its nomadic existence in search of another mate.

Diplothele gravelyi with its eggsac in an excavated burrow

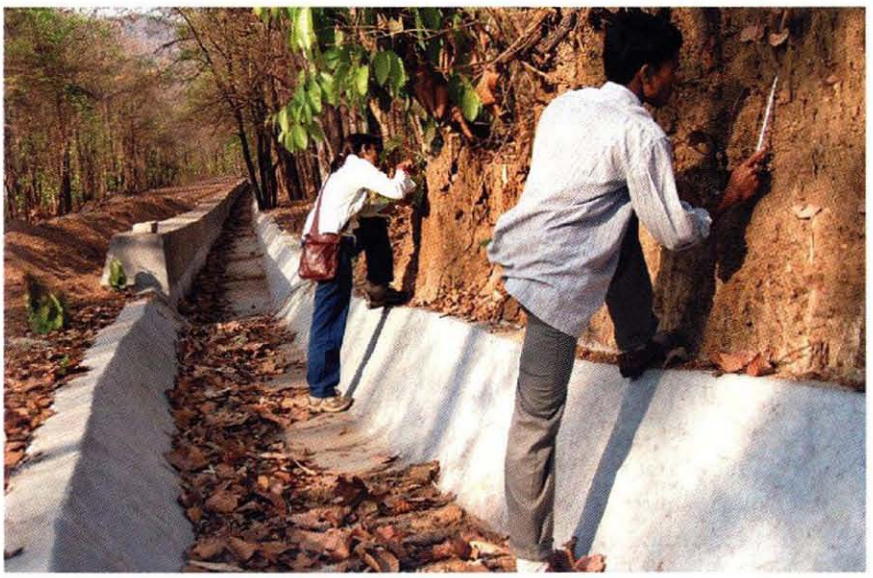
Upon egg-laying, the female trapdoor spider wraps the eggs in a thick layer of silk, and depending on the genera the eggsac is either hung to the roof of the burrow as in the case of *Sason*, or is carried by the spider in its chelicerae throughout the incubation period as in *Diplothele*, *Idiops* and *Heligmomerus*. The number of eggs in an eggsac may vary from species to species, ranging from 10 to 50. And, exactly as to how long the incubation period lasts is not known. The spiderlings appear to stay with the adult female for a few weeks, and undergo at least two moults before they leave the natal burrow to start life on their

A *Heligmomerus* spider teased out of its burrow

TRAPDOOR SPIDERS

INTERESTING FACTS ABOUT SPIDERS

- Spiders can taste their food and some items are rejected because of taste. Unlike humans, spiders taste their food with their tarsi using chemo-sensitive hair.
- Nearly all spiders use venom to immobilise their prey before feeding. This makes it easy for them to feed on otherwise dangerous prey animals. Some crab spiders catch Bumble Bees that are far heavier than themselves.
- Spiders practice what is called external digestion, which means enzymes and other digestive juices are injected or spat on the prey's body. The soft tissues are broken down by these juices and sucked up by the spider.
- Smaller spiders, especially those that feed on larger prey, e.g. members of Family Thomisidae, bite only a small hole in the cuticle of their prey and suck the juices out through it. Thus, what is left is an intact shell of the prey animal.
- Pirate Spiders from Family Mimetidae live exclusively on other spiders and the ant spiders from Family Zodariidae feed on ants in particular.
- Mouse Spiders are known to take insects and small animals, like bandicoots, in the wild. The brown recluse spider *Loxosceles reclusa* prefers dead scavenged prey over live prey.
- While most spiders feed on invertebrates most of the time, they will take vertebrates when they can. Reports of *Dolmedes* catching small fish several times her own weight, of *Leucorhestris* taking small lizards up to its own weight and of Lycosids and Pisaurids catching tadpoles and small fish are fairly well documented.
- Spiders such as *Cupennius* can hunt just as effectively with their eyes covered as with them open. However, spiders such as the wolf spiders, and particularly the jumping spiders, that go out actively looking for prey rely much more on sight.
- Evidence of large spiders taking small birds is also known in the tropics. Tales of tarantulas taking snakes in the wild are harder to verify though the first description of them doing so was written by the Roman Gaius Plinus Secundus about 2,000 years ago.
- In 1924, Reginald Pocock described finding a *Poecilotheria regalis* feeding on a rat in India, though no mention is made of whether the spider actually killed the rat.
- A tale from Australia written in 1919 by Mr. Chisolm describes him finding a chicken that had been killed and dragged 16 m to a burrow by a Barking Spider *Selenocosmia*.



The author and her assistant Saroj searching for live trapdoor burrows on a mudbank

own behind these trap doors. But very little is known about these wonders of nature as these secretive spiders still remain poorly studied mainly due to their cryptic nature and lack of awareness. Hopefully this article has been an eye-opener for some and the fascinating facts have over ridden the fear that some may feel for spiders. There possibly exist many more interesting facts and mysteries that continue to remain hidden behind the trapdoors and are waiting to be unravelled. ■

Manju Siliwal is an arachnologist working with WILD, Coimbatore.

We are grateful to

RISHAD NAOROJI

for a generous donation to the
Kekoo Naoroji Memorial Fund
to support the publication of *Hornbill*

Sow seeds of appreciation for our biodiversty

India is blessed with priceless treasures from dense forests, grasslands, deserts, mountains, corals and coastlines, which harbour a biodiversity that is the envy of the world. The health of natural habitats and their wild denizens is the finest indicator of the long-term health of our nation. All these combined constitute the survival assets for over one billion Indians to ensure a better quality of life.

We at Union Bank want to spread the conservation message to all our customers and beneficiaries.

Union Bank
of India

JYOTI PALEKAR

Large Silverstripe, the largest and finest among Indian Fritillaries

JYOTI PALEKAR

Punchinellos perch with wings only half open

JYOTI PALEKAR

The Circe is fond of overripe fruits and flowers

JYOTI PALEKAR

The Blue Duke is an endangered species

Amidst Butterflyland

Text: **Jyoti Palekar**

Sometimes the journey is as rewarding as the destination. How many times had I thought of this while we were on our butterfly trails in northern Sikkim. The lush green valley of the Teesta river on one side and awe-inspiring mountains, occasionally providing glimpses of snowcapped peaks on the other side, were our constant companions through our journey. The River Teesta is magically beautiful with her aquamarine blue colour, leaving a mesmerising effect on a nature lover.

On our way from Siliguri, we crossed the Sal (*Shorea robusta*) forest in the Rangit Valley in southern Sikkim and entered the temperate forests, in the north, beneath canopies of tall evergreen and semi-deciduous trees, there was a dense undergrowth of a variety of wild flowers, orchids, wild banana, *Pandanus*, nettles, tree ferns and giant bamboo. *Terminalia myriocarpa*, a gigantic buttressed tree with drooping branches, was pleasantly breaking the monotony of green with its coppery red fruiting branches. As the vehicle swerved, each turn on the road held a surprise. Numerous types of ferns, mosses and lichens formed natural patterns of vivid colours on huge damp rocks adjacent to the road turning each grayish black stone into a mural. Occasional glimpses of the stupendous Kangchenjunga ('The Five Treasures of Snows', as it contains five peaks), the third highest mountain range in the world, continued to take my breath away at every sight!

For a state of its size, Sikkim has remarkable biodiversity. Covering just 0.2% of the geographical land of the country, Sikkim is home to 4,500 types of flowering plants, 500 types of orchids, 36 types of rhododendrons, 20 varieties of bamboos and 9 varieties of tree ferns. The fauna includes about 550 bird, 33 reptile and 144 mammal species. Out of the 1,500 species of butterflies found in India, close to 700 species are found in Sikkim, including the gorgeous but endangered Bhutan Glory and Kaiser-E-Hind. Being identified as a biodiverse hotspot for and in order to protect, propagate and develop the rich wilderness therein, the state

Colourful murals of moss and ferns adorn the landscape

The confluence of the rivers Teesta and Kanika

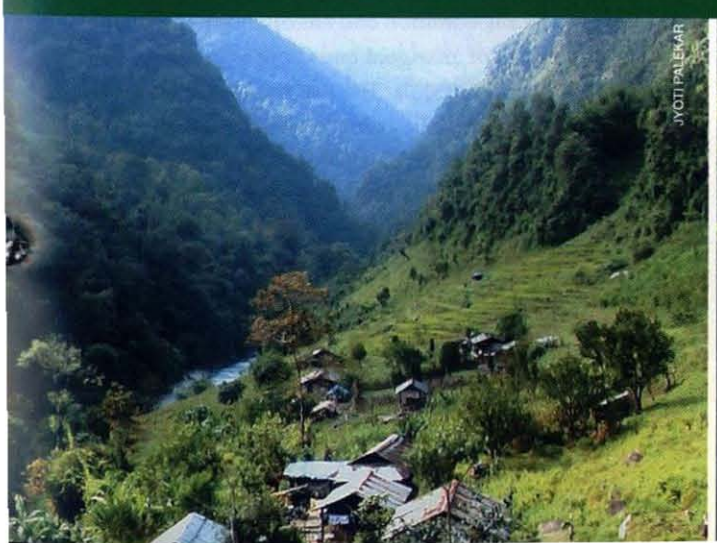
has brought 31% of its total geographic area under the Protected Area Network and Biosphere Reserve so that the fragile ecosystem of Sikkim is saved from being over exploited and depleted.

Our campsite was at Namprikdang near Mangan 'the district capital of northern Sikkim'. Situated near the confluence of rivers Kanika and Teesta in a verdant valley, and surrounded by overpowering mountains on all the four sides, the location of the campsite was unique and pristine. I was part of a team of nine members lead by Isaac Kehimkar, General Manager, Programmes, BNHS, and Ganden Lachungpa. We had best of both the worlds. Isaac, 'the butterfly expert' leading the butterfly camp in Sikkim, often referred to as the 'Mecca for butterfly enthusiasts', and Ganden looked over the smallest detail to make our camp enjoyable.

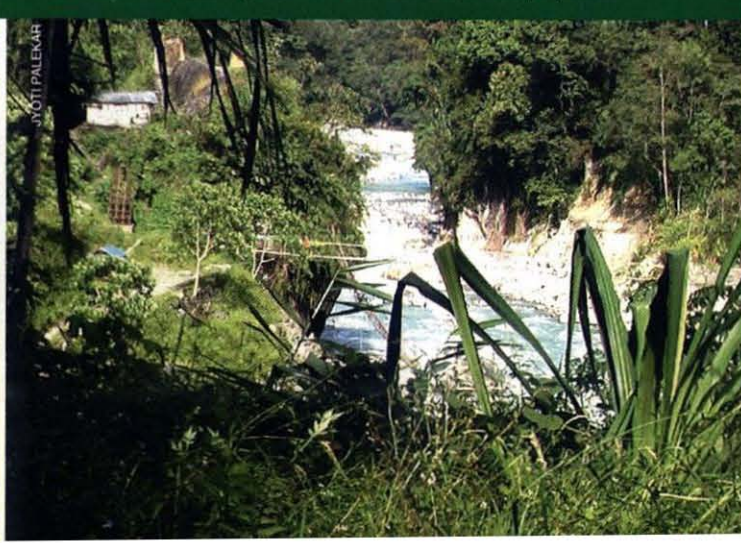
We began our journey well after sunrise. The main advantage of butterfly watching is that it suits everyone, even if one is not an early riser. Unlike bird watching, there are no early bird incentives or rewards. These tiny jewels derive their energy from the sun, and hence, the best time to watch them is when they bask in the sunshine to raise their body temperature, which would have fallen during the night. Our first day became memorable by sightings of rare butterflies. The first being Orange Punch (*Dodona egeon*) belonging to Family Riodinidae popularly known as 'Metalmarks'. Unlike most of the butterflies in this family that have blue upper sides of wings, this has a dark brown base with orange bands. We saw many other Metalmarks, including Punchinello (*Zemeros flegyas*), a purple-brown butterfly with white spots, perched on a fern leaf basking with its wings partly open, Tailed Judy (*Abisara neophron*) on bird droppings and Dark Judy (*Abisara fylla*) on the damp forest floor.

The credit of scientific study, classification and documentation on butterflies in India, Myanmar, and Pakistan goes to some members of the British army, Brig W.H. Evans, Col Charles Swinhoe, Lt Col Bingham to name a few. When these officials were posted to India, they were amazed by the diversity of butterflies and insects, and took their study as a hobby. England has about 45 species of butterflies, which is small compared to India that has *c.* 1,500; the British must have had a hard time while naming the Indian butterflies! Rightly the butterflies were named after either a civilian or

An idyllic hamlet in the valley

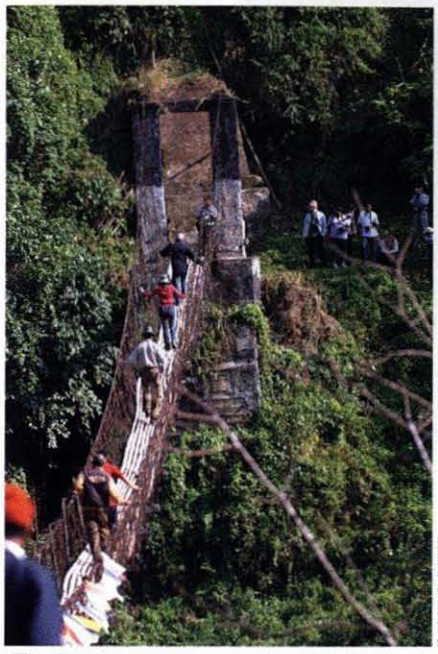


Pandanus is a food plant for a number of butterfly species



army titles (Sergeant, Commodore, Constable, Admiral, Knight), by royal names (Rajah, Nawab, Duke, Baron, Prince, Archduke, Count, Earl), animal or plant they resembled (Batwing, Birdwing, Panther, Crow, Tiger, Leopard, Yamfly, Jay, Peacock, Oak leaf), by the habitat where they were found (Jungle Glory, Forester, Grass Blue, Hedge Blue) or simply based on their shape, colours and appearance (Map, Orange Tip, Beak, Fourring, Flat, Lacewing, Silverline, Swordtail) or based on their behaviour (Hopper, Dart, Cruiser, Swift, Wanderer, Psyche).

As we crossed a precarious bamboo suspension foot bridge built over the rapidly moving stream for fun and for fulfilling our adventurous desire, there was a prized catch waiting on the other end. It was a Blue Duke (*Euthalia durga*), truly at its best behaviour, giving us an opportunity to take several pictures. This is a large butterfly with 90 to 105 mm wingspan flashing a greenish-blue metallic sheen, surely a photographer's delight. In the soft and warm rays of the sun, its olive green body and white discal bands were looking gorgeous. We spotted the Yellow and Clear Sailer (*Neptis ananta* and *Neptis clinia*) basking with wings outspread. It is not easy to differentiate between Sailers and Sergeants as both are similar in shape and have a black body with white/yellow bands. The key to identification is: Sailers have a white or yellow band on the upper side of their abdomen forming a discontinuous band across the hind wings, while in most Sergeants the band is continuous on the abdomen of the butterfly.



ISAAC KEHIMKAR

The bamboo suspension foot bridge lead the group to the beautiful Blue Duke

Later in the afternoon, on our way to the Tingvong monastery, on a small uphill path through thick green forest, we saw a Tailed Red Forester (*Lethe sinorix*), another rare butterfly. This brown butterfly is never seen basking with open wings and gels very well with the forest floor. It tilts its body perpendicular to the sun's rays so that one wing gets enough exposure and optimum energy from the sun.

Butterflies are classified into two superfamilies — Papilionoidae and Hesperioidae. So far, we had seen the members of Papilionoidae the 'true butterflies', which are further classified as Papilionidae (most of the members have tailed hind wings, hence aptly called Swallowtails), Pieridae (Whites and Yellows), Nymphalidae (Brush-footed butterflies — the forelegs are covered with hair which appear like brushes) and Riodinidae (Metalmarks). The Skippers are included under Family Hesperiidae. As we alighted from our vehicle intending to take a small walk to our campsite, we saw the first member of the Skipper family; it was a Green Awlet, again a rare butterfly. Its greenish glow and ochre bands were visible even from a distance. Most of us were on our knees to get a close glimpse of it and try our luck at photographing this tiny jewel in fading light. Yes, photographing butterflies makes one humble ... literally! It may appear that butterfly identification is relatively easy and logical, but it is definitely not child's play. This Awlet gets its name from the awl shape of the third segment of its palpi (area around its eye), 'Common Fivering' has six rings on its hind wings, 'Paris Peacock' is not found in Paris, and a few large skippers are called 'Demons'!

As we were 100 m away from the camp site, we saw our last butterfly of the day — the Red Caliph (*Enispe euthymius*), again a rare one.

The butterfly camp had an important visit on its schedule: the 'Rangrang Butterfly Park'. Usha Lachungpa, a Senior Forest Officer, is helping the Sikkim Forest Department to develop a six hectare terrace land, surrounded by thick, virgin forest into a beautiful butterfly park. Food plant of several native butterflies are planted between the trees by minimising the forest clearance. Unlike other butterfly parks in India and abroad, Rangrang Butterfly Park will be without an enclosure or nets. It is envisaged that the Park will be self sustaining, and will not require import of larvae and pupae for sustaining and nurturing the diverse group of butterflies.

As soon as we reached the butterfly park, our attention was caught by a series of black-winged large butterflies belonging to Swallowtails. These handsome and exquisite butterflies are locally common and are often seen fluttering on flowering plants of marigold and Chinese Hibiscus. But nothing was more spectacular than seeing a Paris Peacock (*Papilio paris*). Narrow metallic green discal bands on the upper forewings and large peacock blue patches on the upper hind wings make this butterfly truly attractive. It was impossible to capture it in flight on a still camera or in a movie shoot. Seeing the Paris Peacock in action is a moment to cherish for a lifetime.

It is an oxymoron that the butterflies referred to by majestic names like Rajahs and Nawabs never visit flowers but are attracted to animal dung, urine, overripe

fruits and dead crabs. We carried baits made up of over-ripe fruits and dried fermented prawns to the butterfly park. We had to wait patiently before we saw the Tawny Rajah (sub sp. *hierax*) actually settling on the bait. It looked quite different from subspecies *bernardus* we see in peninsular India. It is observed that butterflies that have isolated populations show geographical variations. Inaccessible terrains such as mountains prevent interbreeding between the species and cause it to evolve into separate species.

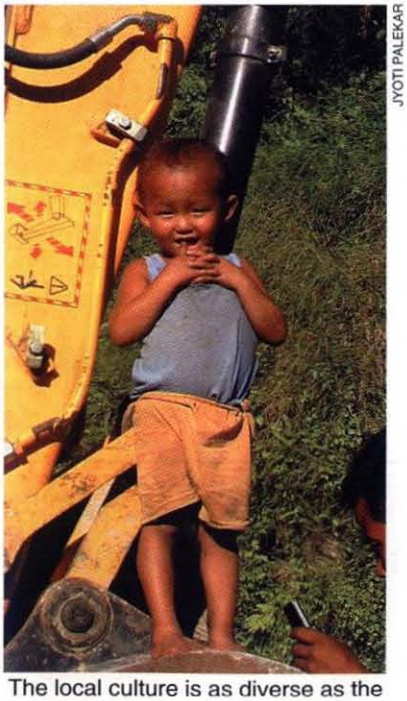
Kangchenjunga — India's highest and world's third highest peak

Before we wondered whether our other esteemed guests will approve our bait recipe, we saw a Large Yeoman (*Cirrochroa aoris*) and a Cruiser (*Vindula erota*) fluttering near the bait. These Nymphalids belong to the subfamily Heliconiinae which include larger butterflies in the shades of yellow called as Fritillaries, native of Himalayas and North-eastern region. Lacewings, Yeomen, Silverstripes and Costers are also included in the subfamily. On the first day near the Tingvong monastery, we had seen a pretty Large Silverstripe (*Childrena childreni*), an orange yellow butterfly with several black spots on the upper side of its wings and silver stripes on the underside of its hind wings, frequently settling on marigold flowers, which dotted the open grassland in front the monastery. We had previously seen Yellow Coster (*Acraea issoria*) and Red Lacewing (*Cethosia biblis*) on two different trails.

As we ventured into the cool forest near the butterfly park, we saw a small inconspicuous butterfly: the Great Darkie (*Allotinus drumila*). Seeing a butterfly which Isaac and Usha saw and photographed for the first time gave me a sense of achievement and excitement; and suddenly this butterfly became the most important sighting of the second day.

One of the most miraculous sights in nature is the life cycle of a butterfly, it goes through a complete metamorphosis as it passes through four distinct stages: egg, caterpillar, pupa and adult butterfly. Survival during each stage remains a challenge for these tiny harmless insects having no special mechanism to fight back their predators. Hence, various protective adaptations like camouflage, mimicry and symbiosis with other insects have been evolved by the butterflies. We saw a congregation of black spiny caterpillars of Indian Tortoiseshell (*Nymphalis cashmiriensis*) near the suspension bridge feeding together to avoid predation. Dark Blue Tiger (*Tirumala septentrionis*), Chocolate Tiger (*Parantica melaneus*), Chestnut Tiger (*Parantica sita*) and Striped Blue Crow (*Euploea mulciber*), are some of the butterflies that we ticked off from our list during the camp belonging to the subfamily Danainae, the Milkweed butterflies which ingest plant toxins from the foodplants during their caterpillar stage and store them in their body so that the predators find them distasteful. These butterflies advertise their bright warning colours and bold contrasting patterns by their slow and unhurried flight. Circe (*Hestina nama*) a fairly common butterfly, seen several times on the trails, mimics Chestnut Tiger.

The best display of camouflage is demonstrated by the Orange Oakleaf (*Kallima inachus*), which we spotted on our way to Namprikdang, and the Autumn Leaf (*Doleschallia bisaltide*), which we saw near the waterfall at Ligzya on the third day. Oakleaf is an exact replica of an oak leaf, complete with colour, shades, the midrib and even some fungal spots! Once disturbed, it opens its wings, flashing brilliant splashes of blue, orange and warm chocolate brown colors. This sudden display of colours startles the predator momentarily and allows the butterfly to escape and hide once again among other dead leaves, leaving the predator thoroughly puzzled. It is a challenge for a keen eyed butterfly spotter to spot the Oakleaf on the forest floor, amidst dry foliage



The local culture is as diverse as the flora and fauna of the region

Sikkim does not have a state butterfly given an opportunity, I would vote for the Golden Sapphire (*Heliophorus brahma*), a tiny turmeric yellow butterfly with red marking on the edge of its upper hind wings. This butterfly is fairly common in Sikkim. When perched in a closed wing position, it is not easy to differentiate this butterfly from the Purple and Green Sapphire that I had seen previously in

JYOTI PALEKAR

Plutodes flavescens is a moth found in North-east Himalayas, Borneo, Sumatra and Java

Namdapha in Arunachal. A follower unaware of its hidden beauty can miss a heartbeat if he sees this tiny butterfly suddenly open its wings and flash its golden, coppery sheen amidst the black borders on its upper wings. The iridescent golden colour is not due to pigments, but due to the structured scales present on the membranes on the wings of the butterfly. In several shimmering butterflies, the arrangement of scales on the wings determine the colour, pattern and iridescence or the rainbow effect.

River banks and the damp forests near the waterfalls are ideal spots to see butterflies mud puddling. Mud puddling is a social activity where several males of one or more species are seen on damp forest floor, river banks or on the mud patches engrossed in the uptake of salts. The sodium and amino acids collected from the salts are often transferred to the female during mating. These salts enhance the survival rate of the eggs.

Fortunately, we encountered clear and sunny weather throughout our trip. The ample sunshine helped these gorgeous beauties to warm enough to be alert and evasive, teaching us an important lesson that patience is a prerequisite in butterfly photography. However, we chanced upon our best models at night. A light trap to attract and study moths was set up for two nights. Several moths gathered on a white bedsheet. We were amazed by their variety in shape, size, even colours and patterns; some were transparent like a lace.

Our butterfly list became longer day by day going over 80 species. The list of trees and wild flowers sighted and identified during the camp looked impressive; it included Elephant Creeper, a vine with huge pods, which I saw for the first time. Ganden ensured that we got a taste of local cuisine during our stay, we tried 'Iscus' — a local vegetable, a preparation of ferns and *nakhima*, which flowers only once a year, dried spinach soup and momos.

The calls of the Himalayan Laughingthrush reminded us to head towards the nearby forest in the mornings and evenings for bird watching. Green Magpie, Great Barbet, White-capped Redstart, forktails, Grey-headed Canary Flycatcher, Verditer Flycatcher, drongos were all seen and occasionally heard. More blessed team members got glimpses of the Minla and Yuhina; birds found only in the North-east.

Sikkim's natural beauty is garrulous rather than tranquil. The waterfalls thunder, the Teesta gushes, butterflies quiver, insects hum and the locals are constantly busy in their activities. The Government is taking active interest in the development of infrastructure. The pristine forests have been cleared for cardamom plantations, roads are being widened and new ones are being constructed. National Hydroelectric Power Corporation Limited, India's premier hydropower company is at work building several dams across Teesta. Teesta Hydroelectric Project, stage–V is under progress. Blasting is seen and heard. The vigorous river is being tamed. Unfortunately, every man-made development comes with a price tag, which nature has to pay. I wonder how much a biodiverse state like Sikkim would have to pay. I hope it is not significant and Teesta will continue to keep constant company to a traveller passing through Siliguri and attracts individuals towards its lush luxuriant valley. The snowcapped peaks continue to shine resisting the climate change and the gorgeous butterflies which are the indicators of well preserved habitation draw nature lovers from the entire country to Sikkim for a rewarding sojourn. ■

Jyoti Palekar has a Masters degree in Environmental Engineering and is working in the area of environment management for Industries and infrastructure. She is a member of the BNHS, and has a keen interest in nature and enjoys camps.

We are grateful to

SETH PURSHOTAMDAS THAKURDAS & DIVALIBA CHARITABLE TRUST

for a generous donation to the
Pratap Saraiya Hornbill Fund
to support the publication of *Hornbill*

Different people value things differently.
That's why we offer different banking solutions.

www.hsbc.co.in

HSBC

The world's local bank

Sex change in a female Silver Pheasant!

The female Silver Pheasant (L) after sex change, and the male (R)

The female Silver Pheasant is mostly plain olive brown

The Lucknow Zoological Garden witnessed a rare phenomenon in a Silver Pheasant. A female Silver Pheasant changed her gender and has converted into a male.

The Silver Pheasant shows signs of sex change. The male is 1,200 to 1,250 mm in length, and is a large robust looking creature with silver coloured wings and a glossy, bluish-black, full and long crest, chin, throat and under parts. Its upper parts are white with black lines, wavy and often broken. The legs have spur used for protection and for fighting with competing males.

The Silver Pheasant female is mostly plain olive brown in colour and the feathers on the underparts are inconspicuously peppered with black and pale shafts, including the four central rectrices. The crest is tipped with black, the chin and throat are mottled whitish grey, while the belly and vent are plain brown. The lateral rectrices are mottled brown, black and white. The female is smaller than the male.

At the Lucknow Zoological Garden, a female Silver Pheasant started changing her plumage in 2006 and within a span of about two years she completely changed her plumage and now resembles a male, though her size, which is considerably smaller than a male, has remained the same.

This change was first observed by the Head Keeper of the Zoo, Shri Siyaram. These observations were very important as they indicated the change of sex in the female Silver Pheasant to a male.

According to Shri Siyaram, the female Silver Pheasant was in the plumage of a female till 2005 and regularly laid eggs. From 2006 she laid only one egg, which was unfertilized. Thereafter, the female bird laid no eggs and slowly changed her plumage to that of a male.

It appears to me that the plumage change in the female Silver Pheasant is due to hormonal disturbance. The female hormonal level must have declined and the male hormonal level must have increased leading to the change in its secondary sexual characters, including the plumage change similar to that of a male. This sexually changed female Silver Pheasant is staying with her male partner of previous years. They do not show any sign of aggression towards each other.

This 'sex change' in the female Silver pheasant bird has become a centre of attraction for the Zoo visitors, who are curious to know about this rare phenomenon and want to see the bird in person.

Renu Singh
Director, Lucknow Zoo,
Lucknow

Expert comments:

Surprisingly, quite a number of people are unaware of the fact that when elderly female pheasants stop laying eggs hormonal changes take place which result in plumage changes in subsequent moults.

Female pheasants tend to use only their left ovary in egg production – which is the reason why we put identification rings on their left leg (and therefore the males are ringed on the right).

Basically, the female adrenal cortex produces a little of the hormone testosterone, but all the time that the female is capable of laying, this is greatly outweighed by the oestrogen that she produces. Once ovulation ceases, oestrogen is no longer produced and the small amount of testosterone lacks any opposition. Consequently, it begins to play a significant part in the plumage, which appears during the following moult. If the female continues to survive, subsequent moults seem to increase the male coloration, although it seldom achieves the full brilliance of some of our male pheasants.

What must be stated is that although the bird has a masculine appearance, it does not become a male, so we cannot say that the bird has changed sex.

John Corder
Director
World Pheasant Association

About the Poster

Bats are the only flying mammals in the world. There are about 1,100 bat species worldwide, which is about 20% of the known mammals. Bats are either frugivores or insectivores (few species also eat small rodents); almost 70% are insectivores. They perform vital ecological functions such as pollinating flowers, dispersing fruit seeds and keeping a check on the insect population. Many tropical plants depend entirely on bats for the distribution of their seeds.

The Lesser False Vampire Bat is one of only two species belonging to the genus *Megaderma* (*Megaderma spasma* and *Megaderma lyra*). Paradoxically, whilst they are voracious carnivores, they do not resemble the vampire bats of South America, but are instead so named due to their large teeth which caused confusion before the true vampire bats were confirmed as the only blood-drinkers. The noseleaf, which is used for echolocation, is an oval-shaped lobe with a central bar that carries flaps on either side. The fur is very long and fluffy, and varies in colour from grey to brown. Juveniles are consistently grey.

The in-flight agility and sophisticated echolocation calls of the Lesser False Vampire Bat allow them to enjoy an astoundingly varied diet. They are known to feed on large insects, such as grasshoppers, cockroaches, beetles and moths, as well as vertebrates including frogs, mice, fish, birds and even smaller bats.

This particular picture was taken in the Amboli, Sindhudurg district, Maharashtra.

EDITORS' CHOICE

"I EXPECT THE TRAVEL PEOPLE NEEDED THE TREES TO PRODUCE THE BROCHURE".

Courtesy: Earth Mirth, The Kingswood Press

ERRATA

Hornbill April-June, 2009, pg. 47: Photocredit for image used under "News from BNHS-CEC, Mumbai" was wrongly credited to BNHS Photo Library; the image belongs to Mr. Sanjay Marathe.

Lesser False Vampire Bat
(*Megaderma spasma*)

NIKHIL BHOPALE

Of Shells and Slimes

LAND SNAILS OF THE WESTERN GHATS

Text and Photographs: N.A. Aravind and N.A. Madhyastha

Molluscs are an amazingly diverse group of animals; the second largest phylum, next only to Arthropods. The highest diversity of molluscs is found in the tropics, about six per cent of the total species found on Earth. There are about 80,000 molluscan species, and it is estimated that there may still be around 200,000 unknown species. Of the 80,000 species known till date, valid descriptions exist only for about 35,000 land snail species. Unfortunately, majority of the land snails remain undescribed because of under exploration and their minute size. Land snails are very important constituents of soil and leaf litter ecosystem as they help in nutrient recycling, along with other soil biota. The Western Ghats have 270 species of land snails, of which 76 per cent are endemic. The three families: Ariophantidae, Glessulidae and Cyclophoridae form the bulk of the species in the Western Ghats, constituting about 150 species. Recent collaborative studies done by the Ashoka Trust for Research in Ecology and the Environment (ATREE), Bengaluru, and Natural History Museum, London, under the Darwin Initiative Grant, has shown that there are at least 20 new species yet to be discovered from the Western Ghats region. Most land snails feed mainly on decaying vegetation or green vegetation except members of the Family Streptaxide, which are carnivorous (feed on smaller snails and worms). Most of the Indian land snails are very drab in colour except species such as: *Indrella ampulla*, which is either bright orange-red or white, *Euplecta* sp. which is green, or *Sitalla* sp. which is greenish-white. There is an amazing diversity in shape and size in land snails. The species of Ophistosoma has a peculiar recurved shell, members of the Family Subulinidae and Glessulidae have a long conical shell, while Ariophantidae and Cyclophoridae have a flattened broad shell. Nearly 40 per cent of the Western Ghats land snails are less than 5 mm in size. Land snails are found in almost all types of terrestrial habitats, but the highest diversity is seen in the evergreen forests of southern Western Ghats.

Land snails are very sensitive to changes in the environment. Habitat alteration and destruction has led to extinction of many species. It has been estimated that 1,222 species of land snails are classified under the threatened category in IUCN's 2002 Red List. We do not have an estimate of threatened land snails in the Western Ghats mainly due to lack of knowledge on this cryptic group. It is time we wake-up and conserve this lesser known group.

Ariophanta solata: An endemic terrestrial snail confined to shrubs in high altitude grasslands of the Western Ghats.

Euplecta sp.: This new species was recently recorded from the mid-elevation evergreen forests of the southern Western Ghats. A formal study is yet to be conducted to learn details of this species.

Indrella ampulla (**Ariophantidae**): This is a large endemic and monotypic genus found in the Western Ghats. There are two forms – white and red. They primarily feed on large mushrooms and are found mainly in the evergreen forests of the Western Ghats.

Euplecta cacuminifera: A typical mid to high evergreen forest species found in southern and central Western Ghats. This species occupies the under storey and sub-canopy strata of the forest.

Streptaxis perotti: A carnivorous snail from the Western Ghats; this species feeds on small snails, worms and insects found in the soil.

N.A. Aravind is a researcher at Ashoka Trust for Research in Ecology and the Environment (ATREE), Bengaluru. His interests are ecology of freshwater and terrestrial molluscs, butterflies, birds and amphibians.

N.A. Madhyastha is a retired professor of Zoology. His research interests are wetland birds, freshwater and land snails of the Western Ghats. He is also a coordinator of Malacology Centre at Poorna Prajna College, Udupi.

Living Jewels from the Indian Jungle

By Ashok Kothari & B.F. Chhapgar

Thrill your senses with real life shikar experiences,
Interesting episodes culled
from rare books and old issues
of the *JBNHS.*

Feast your eyes on more than
85 hand-painted plates of Himalayan flowers;
Mammals and birds from rare books
on Indian Wildlife published
more than 150 years ago.

Natural History and the Indian Army

J.C. Daniel and Lieut Gen Baljit Singh (Retd.)

The study of the natural history
of the Indian subcontinent was more or less exclusive
preserve of the officers
of the Indian Army. Their findings were recorded in
various journals in the U.K.,
and after 1886 mainly in the
Journal of the Bombay Natural History Society.

This book is a record of these findings
and a tribute to the remarkable personality
of the Indian Army.

I would like to purchase copies of ☐ Living Jewels from the Indian Jungle @ Rs. 1,200/-
☐ Natural History and the Indian Army @ Rs. 900/- } **Packing and Forwarding Rs. 100/-**

Name: Ms./Mr. _____ Membership No. _____

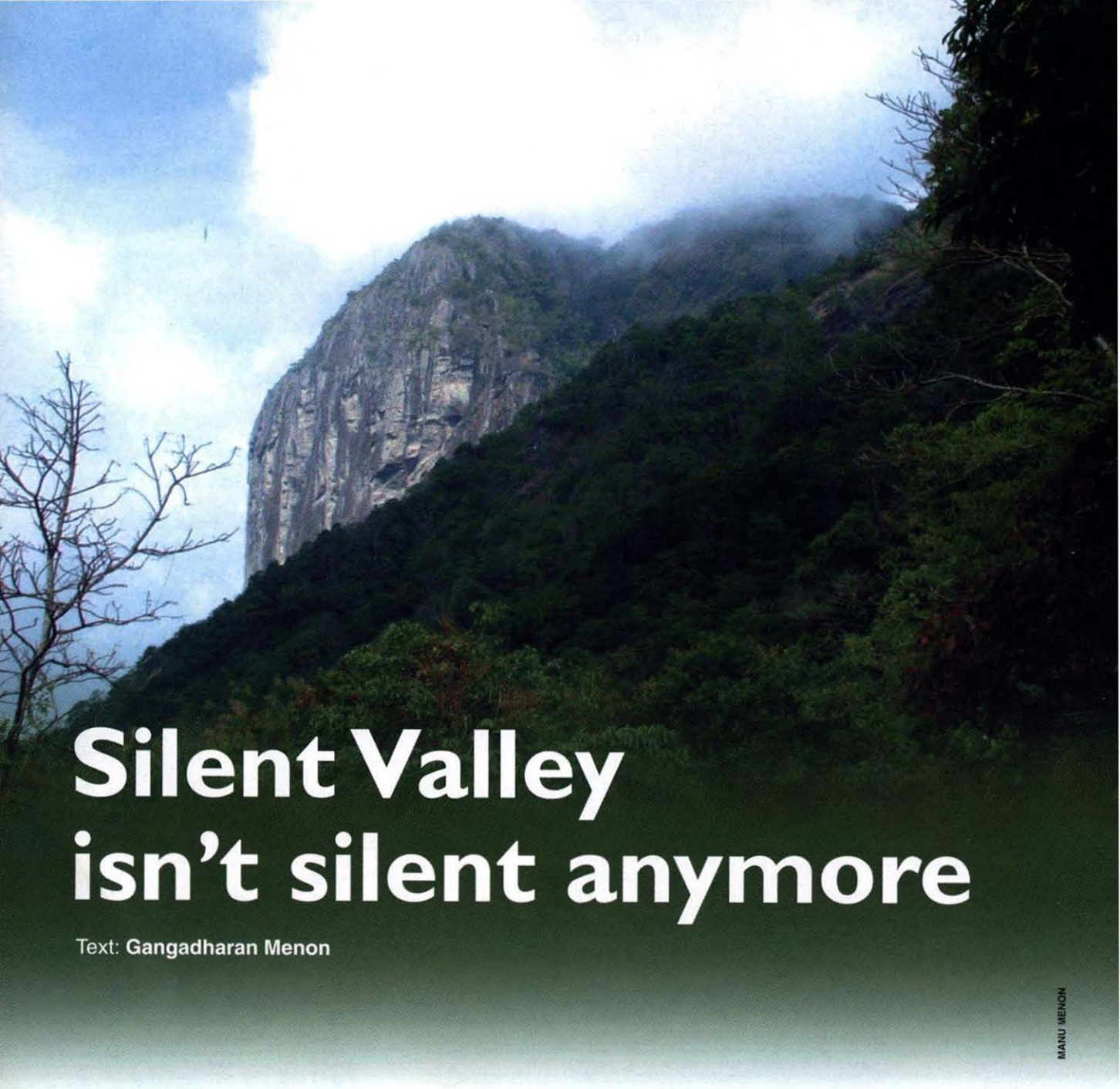
Mailing Address: _____

City: _____ Pincode: _____ State: _____ Tel.No. Off: _____ Resi: _____

Mobile: _____ Email: _____

For further information contact:
Mr. Santosh Mhapsekar
Bombay Natural History Society, Hornbill House, Shaheed Bhagat Singh Road, Sálim Ali Chowk, Mumbai 400 001, Maharashtra, India.
Tel: (022) 2282 1811, Email: bnhs@bom4.vsnl.net.in

THIS FORM MAY BE PHOTOCOPIED AND MAILED TO US



Silent Valley isn't silent anymore

Text: **Gangadharan Menon**

MANU MENON

Legend has it that the Pandavas, during their exile lived in the magical evergreen forests located in the state of Kerala. It is believed that the tribals named these forests after Sairandhree, the name of Draupadi, when she lived here incognito along with the Pandavas of the famous Indian epic, 'Mahabharat'. A popular theory suggests that the British, for easy pronunciation, anglicised Sairandhree Vanam to Silent Valley.

Be that as it may, there is (or there was!) a reason why Silent Valley was silent for many millennia. The curious absence of the cicadas that create a pleasant cacophony in the forests of India created a deathly silence in this tropical evergreen forest. Silent Valley is home to many rare species like the Lion-tailed Macaque and the Ceylon Frogmouth. Being untouched by man, it also contained many unaltered gene pools kept intact since time immemorial.

The Government of Kerala, in a moment of recklessness, decided to destroy these pristine forests by building a hydro-electric project to generate a few

megawatts of power. That was also the case in around 1978.

As many environmentalist groups were up in arms against this short-sighted move, the matter reached the Supreme Court. And the project was kept in abeyance till the Court gave its momentous verdict. In 1980, a small group of journalists and activists in Kerala collected a princely sum of Rs.75,000 to make a documentary on Silent Valley. The attempt was to document the significance of these precious forests for posterity, before they were submerged under the rising waters of the proposed dam. The film was to be scripted by me and directed by K.K. Chandran, an alumni of the Film Institute of Pune.

During our recce we realised that the last tribal village was at Mukkali, and the dam site was an exact 24 km from there. We were told no vehicles were allowed beyond Mukkali, which meant we had to carry our equipment, our tents, and the provisions that were to last us for two weeks, on foot! We desperately needed a guide who would take us to the pathless forests of Silent Valley, and more importantly, bring us back. And from what we had heard there was only one man on this planet who could do this, and fortunately we found him. His name was Thekkinkattil Hamsa, whom we later lovingly and respectfully called Hamsakka.

Hamsakka was a recluse who lived in a nearby town called Mannarkkad. Ever since he heard about the impending disaster of the dam, he had become more withdrawn. At first, he refused to be our guide. It was only after we told him about our mission of documenting the treasures of Silent Valley that he relented. Hamsakka couldn't write his name, but could read Silent Valley like the back of his hand. The wisdom he had distilled from living like a nomad in Silent Valley for more than three decades was passed on to us lovingly and generously in the time span we spent with each other; like a father to his son. The moment Hamsakka decided to join us, he took over as our leader. He told us about the enormity of the logistical problems and convinced us that we should have a team that's stripped down to the bare minimum.

Then, Hamsakka laid down his rules. Nobody will carry any arms, not even a knife. His reasoning was simple. No animal will ever attack you unless you threaten it or provoke it. The second rule was about food. The food, he said, will consist of rice and Kerala dal made with coconut, potato and drumstick. If we're lucky, he said, we could catch Paral (a freshwater fish), and he would make fish curry for us. Only black tea will be served once in the morning and once in the late afternoon. The same food will be served everyday for 14 days! Even after agreeing to these saintly conditions, we realised that each one of us would have to carry about 20 kilos, at least for the first week or so.

On the appointed date, we met Hamsakka and the tribal guides at Mukkali. We bought the provisions there and started on a journey that I treasure as the most memorable days of the 52 years of my existence — something that I will not trade for anything in this world, or even the next!

AKASH MENON

Ceylon Frogmouths almost disappear into the background with their brilliant camouflage

Carrying huge loads of bare necessities, we set out with an inexplicable fear in our hearts. A few kilometres into the trek, we came across a tribal hut. It was used by labourers who had come to clear the forest undergrowth to allow precious forest trees to grow taller. But now, the hut was in shambles. To an urban mind, it appeared as if a bulldozer had run over it. The truth, in fact, was worse. It was flattened to ground zero by a herd of elephants in search of left-over salt from the tribal kitchen. As we stood scared

MANU MENON

The sociable, mainly frugivorous Malabar Grey Hornbill feasting on a berry

and motionless, Hamsakka reassured us authoritatively. He informed if there was even a new-born infant in that tribal hut, the elephants would not have touched it!

Faith does wonders. It made us take our next step!

When we reached the dam site at noon, we witnessed manslaughter. A tree that had withstood the onslaught of time for two centuries was brought down in two minutes to make way for the dam. As we captured the heart-rending cry of that tree, we had captured the spirit of our documentary. At that moment, I remembered a shloka from the Upanishads: 'It takes many brooks to make a rivulet; it takes many rivulets to make a river; it takes many rivers to make an ocean; it takes many oceans to make *one* tree!' We proceeded to pitch our tent on the forgiving banks of River Kunthi. Using the branches of time-withered trees that we collected from the river banks, we erected two inverted 'V's across which we slung a large plastic sheet. It was to be our shifting home for the next two weeks.

MANU MENON

Indian Giant Squirrels are shy, wary animals that are sooner heard than seen

With a mischievous twinkle in his eyes, Hamsakka showed us the spot where animals descend to drink water at night — it was barely 15 m away from our tent! The only thing that would deter them from sniffing at our sleeping bodies was the stolen property of *Prometheus*: fire!

Then we set out to film what was to be the opening shot of our film. We waited at a small waterfall over an hour for sunlight to light up the scene. Later, we were to realise that in a tropical evergreen forest, only 10% of the sunlight reaches the forest floor. The rest 90% gets absorbed in the canopies! This practically meant we could only shoot in Silent Valley from 11:00 a.m. to 3:00 p.m., i.e., four hours in a day!

Winding up at three, we were on our errand of finding dried wood that would be our sentinels of the night. As it was our first day, we were all too tired to gather enough firewood. Looking at the pile, Hamsakka declared, 'This won't last till 3:00 in the morning!'

The fires that we lit near the openings of the tent on either side raged on. And our tired bodies went off to sleep immediately! At 3:00, the five of us, city-bred souls, got up as our subconscious mind knew that the fire won't last till 3:00 and it had woken us up. And true to Hamsakka's words, the fire indeed had died down! As we lay motionless in the misty morning waiting for the life-giving sun to wake up, Mooppan and his assistant Chinnu slept on blissfully. Later, Hamsakka gave us a few tips for the day on how to escape from animals during close encounters:

If an elephant crosses your path, give him/her the right of way. Stay as far away as possible from a lone tusker, especially if he is in 'musth'!

Stare a tiger in the eye, don't move a muscle.

If a wild boar attacks you, wait till the last second. Then step aside. The wild boar will pass you and keep on

going at the same speed, because he doesn't know how to turn!

When a bear charges at you, (it is one of the few animals who do not need to be provoked!) climb a thin, but sturdy tree. As the bear's hands get locked at a particular position, it can only climb up trees that are thick and well-fed!

At the river bed lit up by the lazy sun, Hamsakka showed us the pugmarks of many animals, and showed us how to identify them: the visitors of last night were a Jackal and a Barking Deer. As our unit moved on, we encountered one of the eeriest scenes that can be imagined. We had to either cross the Kunthi river about six times to reach the shooting 'location', or we could cross a patch that was a gigantic carpet of blood-sucking leeches!

Hamsakka advised us against crossing the river, what with each of us carrying about 20 kilos, and the rocks in the river being slimy and slippery with moss.

Hamsakka then prepared a paste of coconut oil, snuff (tobacco powder) and salt. He asked us to apply it on the exposed parts of our body. Then he gave each one of us a small bundle of tobacco leaves to gently flick away the leeches, in case they still manage to lodge on our bodies.

Armed with the ultimate leech repellent, we walked on a massive carpet of leeches, and to our utter amazement, only a couple of them managed to cling on to our bodies!

That night, as we lay down in the cocoon of our tent, we realised for the first time that the sound of silence was becoming unbearable. After Hamsakka ran out of his bedtime stories, one of us let out a false cough just to break the silence. And then we took turns in uttering non-stop nonsense, just to keep us on the acceptable side of sanity!

The next day, I came across a scene which made me think that I had gone over the brink. As we were climbing down a mountain slope, I saw a white apparition with long, flowing hair and a bare torso, walking in the valley below. With a lot of hesitation, I nudged K.K. Chandran and asked him whether he could see what I could. And he said yes, he too had seen it but was too scared to tell me — lest I think he had gone crazy!

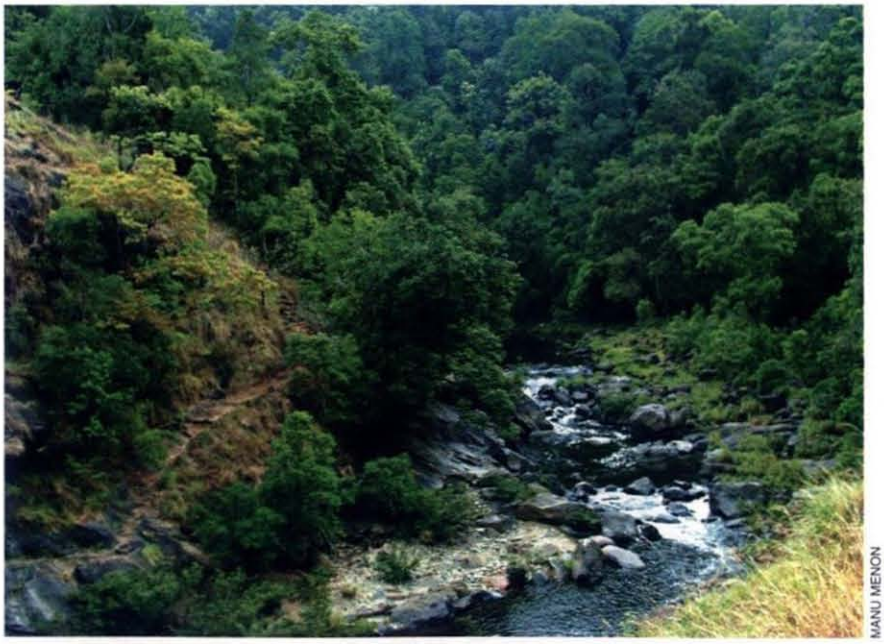
Mustering courage, we shouted out to the white apparition. And our collective scream echoed in the forest. The white man finally spotted us and came running towards us. He was Jacques, a school teacher from Holland, who was lost in the pathless land of Silent Valley for eight days — of which the last two were spent only on water from River Kunthi!

Hamsakka made an early dinner that day to celebrate the survival of Jacques. That night Jacques sang a rustic song that shattered the silence of many centuries. His songs were to become our lullaby, putting us to sleep, night after night.

The next day it drizzled. We took refuge in a nearby cave, hoping against hope that it is not already occupied by a predator. As we re-lived the anxiety of the pre-historic cave man, Hamsakka pointed out to a group of Lion-tailed Macaques on the nearby rosewood tree, taking refuge from the rain by holding up a branch. And he said, every time it rains they take refuge under a temporary shelter, making a firm resolution that next year they will build a permanent shelter for themselves before monsoon descends. And the moment it stops raining they forget the resolution!

By now, we were living on our spartan diet for a week. And we were craving for a change. We convinced Hamsakka to take us fishing. He made a fishing line for each one of us and unearthed worms from the forest floor to be used as baits.

We sat on the river bank and threw our baits into the river. Probably because no man had ever fished in Kunthi river, the Paral fish in all its pristine innocence would come rushing to bite the bait. And every time we pulled the line out, invariably there would be two or three fish desperately clinging onto one bait!



MANU MENON

The picturesque Silent Valley had and still has the author spell bound

A still from the expedition the author made to the Valley in the 1980s

After 16 days of shooting we finished our schedule and returned to Mukkali.

When we bid farewell to Jacques and Hamsakka, little did we know that it would be the very last time we would be holding hands.

When our bus stopped at a small town, I rushed to the PCO to speak with my parents. But believe it or not, the days in Silent Valley which were spent completely cut-off from the world outside had such a cathartic effect on me that I had forgotten my own residence number. It was only after two days in the bustle of the city that I could recollect it.

As we had overstayed in Silent Valley, by the time we finished editing the film we had run out of money. That was the time I met Ms. Dilnavaz Variava who was the Chairperson of the Save Silent Valley Committee. She donated Rs.10,000 from the Corpus to complete the film. Thanks to the baritone voice of Zul Vellani, and the masterful composition of Ustad Faiyyas Ahmed Khan (both of whom worked gratis), we had 18 minutes of a powerful anti-dam documentary called 'Silent Valley'.

When we submitted the film for censorship, we got a rejection certificate. The ostensible reason being the film was one-sided! Our argument that it is an anti-dam film and therefore *had* to be one-sided fell on deaf ears. That was when Ms. Dilnavaz and Mr. Soli Godrej sprung into action and fixed up a meeting with Mrs. Indira Gandhi, the only Prime Minister of India who was genuinely interested in the conservation of Indian wildlife.

And soon, the silent forests of Silent Valley travelled all the way to Delhi and decided to speak for themselves.

We screened the film for Mrs. Gandhi; and after seeing for herself the richness of one of India's untouched natural treasures, she patted the back of a stunned 24-year old and whispered in his unbelieving ears: 'Don't worry, son! This will be declared a National Park!' And it was, in the year 1984!

For 26 years after that, I resisted the temptation of going back. The only reason being, my trip to the Silent Valley was my initiation into the ways of the forest. I didn't want to touch the gossamer wings of those memories lest they disintegrate!

After much persuasion by my wife and son, I made my second trip, in 2006.

From the forest gate at Mukkali, we drove to the erstwhile dam site, where a 30 m watch-tower had come up. Standing there I surveyed the green 70 mm canvas called Silent Valley.

The first thing that struck me was a change in the forestscape itself. In 1980, dense evergreen forests alternated with grasslands. Now it was wet, verdant forests across endless stretches.

The leeches were as vicious as ever, and the only plants that a dinosaur would identify, if it were to be born again today, were still there: the Cobra Plant and the Tree Fern. The Lion-tailed Macaques and Ceylon Frogmouths had survived in large numbers.

But the most distinct feature of Silent Valley, the cold, chilling silence itself, was gone. Encouraged by the human encroachment and destruction of habitat in the nearby Attappadi forest, and an overall rise in temperature, the cicadas had made their entry into the innards of this exotic evergreen forest.

Today, I have none of the treasured souvenirs of my journey made 26 years ago. The audio tapes on which we recorded the soulful songs of Jacques are gone. Hamsakka is no more; and the prints of my film, which created a surging wave of public opinion in Kerala against the dam, have vanished; the negatives have been lost forever.

All that remains is Silent Valley, the mystical forest, which our film helped save. A forest, the likes of which rarely exist on the face of this fragile earth. ■

Gangadharan Menon made a documentary on Silent Valley, on the impending disaster of a hydel project coming there, which played a small part in the Valley being declared a national park in 1984.

Master of Disguise — the Octopus!

Text: **Aditi Nair**

The Indian peninsula, bordered by the Indian Ocean, Arabian Sea and the Bay of Bengal, boasts of a variety of diverse marine ecosystems. Dense mangrove forests in the Sunderbans, the world's largest congregations of nesting sea turtles in Orissa, delicate seagrass beds in Palk Bay, the enigmatic Dugong in the Gulf of Mannar, Majestic Whale Sharks in the Gulf of Kutch and some of the world's most beautiful coral reefs in the Lakshadweep, and Andaman and Nicobar islands; these are just a few of the rare treasures to be found along India's 7,516 km long coastline.

Working as a Research Fellow at BNHS provided me an unforgettable experience of witnessing the wonders of Lakshadweep. Mesmerising turquoise coloured water, white sand and clear blue skies form just one part of the beauty of these islands. Under the water lies one of the most diverse ecosystems on our planet, the coral reefs!

Built over thousands of years by tiny calcium-producing organisms, the reefs are a haven for countless life forms, some of which may seem totally alien in form. Only on the coral reef can one find living examples of nearly every group of organisms representing a billion years of evolution.

ADITI NAIR

The sucker-clad arms of an octopus are its weapon for capturing an unwary prey

Diving in a coral reef is like entering another world. Every day brings the discovery of an exciting new species that you may have never seen before. It's a fairy tale world like that of Disney's "Little Mermaid" movie. You descend into deep blue surroundings; there is a wonderful feeling of weightlessness and all you can hear is your own breathing. High above is the shadow of the boat, the only reminder of a world you left behind. An incredible array of marine animals keeps moving around you. In fact, it is this very diversity that attracts most divers to this ecosystem. One diverse group of invertebrates (backboneless animals), to which over 95 per cent of all Earth's species belong, that has become a favourite with many divers is the Mollusc. This group contains some of the most attractive animals on the reef (e.g., sea slugs), as well as some of the most intelligent forms like the Cephalopods.

The name Cephalopod comes from the Greek words '*kephale*' = head and '*podos*' = foot meaning 'head footed' – the 'foot' referring to the arms or tentacles which surround the mouth. They were once one of the dominant life forms in the world's ocean. Today there are only about 800 living species of cephalopods. The group is represented by nautilus, octopus, cuttlefish and squid. They are of a very ancient lineage that appeared in the late Cambrian period, some 438 million years ago. How long was this? To put this into perspective, it is from an era before there were fish in the ocean and upright plants on land.

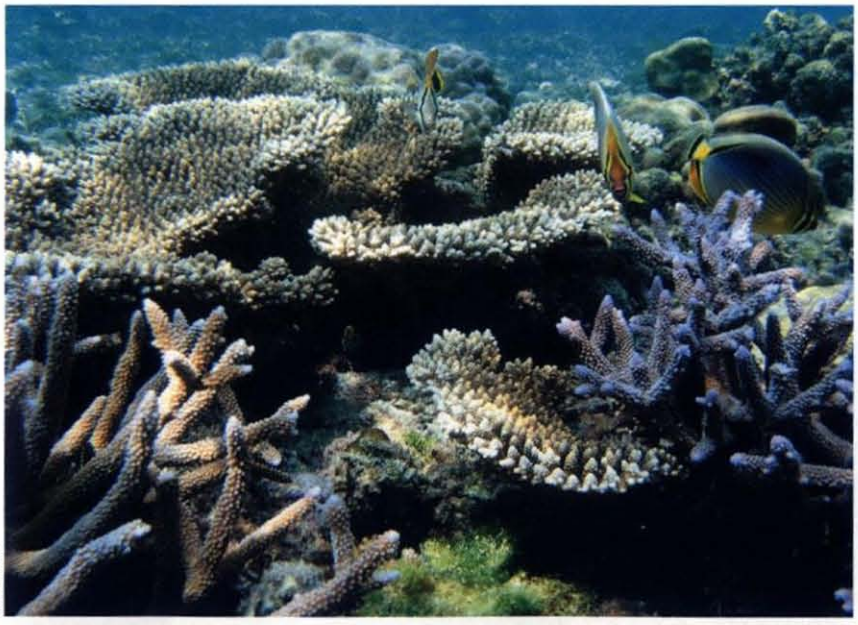
The first man to study Cephalopods was Aristotle. In his HISTORIA ANIMALIUM, written more than 300 years before the birth of Christ, he describes the habits, appearances and anatomy of common Mediterranean Cephalopods. Drawings on ancient Greek and Roman ceramics, mosaics and coins testify that octopus, like dolphins, were a part of the daily life of the people in the remote antiquity. The animal haunted the spirits of many writers and artists such as Victor Hugo (THE TOILERS OF THE SEA) and Jules Verne (20,000 LEAGUES UNDER THE SEA). It was always presented as a kind of monster dangerous to sailors and explorers, quite contradictory to the truth

Octopuses are found in all the oceans of the world, from the warm waters of the tropics to the near freezing waters at the poles. They are found from the wave swept intertidal region to the dark, cold abyss. My work in Lakshadweep involves the study of *Octopus cyanea*, one of the most common reef octopus found throughout the Indo-Pacific region.

A typical octopus has a globular fleshy body, often with wart-like prominences. The body narrows slightly into a 'neck' at the junction with the head. Eight arms spring from the octopuses head, being united at their base by a membranous web. The arms are often wrongly referred to as tentacles. In the Cephalopods only Decapods (deca = ten, podos = foot), that is, squids and cuttlefish possess tentacles, which are the two long organs that shoot out to capture prey.

An octopus catches its prey by seizing it with its sucker-clad arms, or by enveloping it in the web of membranes which connect the arms at their base. The first time I got a feel of the octopus suckers was while measuring a dead specimen, or so I thought. The minute I held it, a couple of its arms started moving and getting hold of my hand, it was an absolutely spine-chilling moment as I could not get rid of it. The more I jerked my hand, the more it tightened its grip. The only reason my friends stopped laughing and helped me was because my jumping could have capsized the boat we were on. Octopuses are essentially carnivorous, most of them being especially fond of crabs. Though it seems bizarre, but they frequently make a meal of a part of themselves. Autophagy (process of self-digestion) is frequent preliminary to death or food scarcity.

Predators of octopus include moray and conger eels, dolphins, sharks and humans. In Lakshadweep, Giant Moray Eels are their major predators. Eels are the only creatures in lagoon waters that terrify almost everyone. They usually hide in crevices and jump out in defence



ADITI NAIR

Myriad colours and patterns of coral reefs attract divers to this beautiful aquatic world

if you happen to move too close. Also, they always have their mouth wide open to breath, with sharp rows of teeth showing. Its tough convincing yourself that it does that only to scare you away. Whenever possible, the octopus will escape from its predators by shooting a jet of water through its body to create a burst of speed. Quite often, the octopus avoids detection completely.

Cephalopods have often been referred to as the chameleons of the sea, but unlike the chameleon many of the cephalopod's colour producing cells are controlled by nerves which allow them to change colours at an alarming rate. It can virtually disappear by changing its appearance instantaneously to match the colours, patterns, and even textures of its surroundings. The coloured pigment in its skin can be concentrated or diluted, forming stripes and patterns that blend with the environment. A recent study says that octopuses can change their appearance 2.95 times per minute or 177 times per hour on an average. Predators often swim by without even noticing it.

When discovered, an octopus will release a cloud of black ink to obscure its attacker's view, giving it time to swim away. The ink even contains a substance that dulls a predator's sense of smell, making the fleeing octopus harder to track. And their soft bodies can squeeze into impossibly small cracks and crevices where predators can't follow. If everything else fails, an octopus can lose an arm to escape a predator's grasp and regrow it later with no permanent damage. We once found a live octopus that had lost all 8 arms! These animals also have a beak-like jaw that can deliver a nasty bite, and venomous saliva, used mainly for subduing prey.

Octopuses are known to be among the most intelligent invertebrates. There is a wealth of information on its learning potential and behaviour. But the exact extent of their intelligence and learning capability is much debated among biologists. Maze and problem-solving experiments have shown that they do have both short- and long-term memory. Their short lifespan of 1-2 years limits the amount they can ultimately learn. On one occasion, I was lucky to spot an octopus out foraging. On sensing me it hid behind a coral, since I knew exactly where it went I was able to spot it again. It had its eyes fixed on me. As I moved to the left, it started shifting to the right and when I moved right, it shifted left, this funny game could have continued the whole day. But then I started moving towards it and it

ADITI NAIR

Octopus is considered a delicacy in many parts of the world

NICOLE CERNOHORSKY

Researchers on an expedition to study octopus behaviour

ADITI NAIR

Midden piles outside an octopus den are the only means of locating this master of disguise

started slipping slowly into the gap under the coral, varying its colour to match that of the coral. Changing from bright ivory-white in the sunlight to complete black by the time it went under the coral, disappearing in the shadow.

Reproduction in octopus occurs with the help of a modified arm, the Hectocotylised arm of the male. It is used to transfer sperms into the body of the female. In most octopus species the female stops eating after laying eggs. She devotes her entire time towards protecting, aerating and keeping the eggs free from parasites. The female octopus dies soon after the eggs hatch. The young ones spend about 40 days in the plankton (free floating) stage. During this time, most of them become food for other marine animals. The ones that survive settle down and begin a benthic (bottom dwelling) life. Many Cephalopods grow very fast, reproduce over a short period of time, and then die.

Many species live near the shore-line and have a habit of making lairs in rocks, among boulders, in empty shells, or in crevices of coral reefs. Once inside they close the opening of their den with small coral pebbles. The number of pebbles increases with increase in the size of the den opening and pebble colour is mostly pink or white, close to animals' common colour pattern. For me, this 'Denning Behaviour' was one of their most fascinating characters; they even do regular maintenance of their dens by blowing out sand and food remains.

The cleaning-up leads to formation of piles of shell and crab carapaces outside their lairs. These discards are called midden and are useful for several reasons. It is often easier to search for an octopus by searching for midden piles than looking for the animals themselves. While swimming above a reef, clean shells and brightly coloured crab carapaces can be seen from a distance of five metres or more, whereas it's unlikely to see a camouflaged octopus at half that range unless it moves. Scientists are interested in midden piles for two reasons. Firstly, the discarded shells give us a very good idea of what the octopus eats. Secondly, the middens give us a different view of what kind of animals are found in that area. Once you find a midden pile, the next step is to dive down and look for a lair. The lairs are typically holes in rocks or excavated under or between rocks. If the octopus is home, you are in luck. If not, a careful look in the surrounding area may reveal it as it is likely out hunting or it may be an abandoned lair. Being able to identify a midden in the reef is a skill I learnt from the expert octopus hunters who assisted me through my field work.

Everyday the timing of survey is decided based on the tide-timings. Low-tide hinders movement as the boat keeps getting stuck over the coral boulders. So, we work during high-tides returning back to the island only during the next high-tide after 6 hours.

A part of my study also included assessing the impact of regular harvesting on the octopus population and understanding the dependency of

ADITI NAIR

Octopus arms being dried to be sold as food

people on the resource. Thus, evenings were spent interviewing the locals, gathering data regarding their hunting area, amount of catch, size of catch, etc. With the continuous rise in population the number of people involved in octopus hunting on the islands has only increased. Heavy fishing pressure could completely deplete the resources. The octopus' short life-span poses a great threat as their recovery may take considerable time.

Also, coral reefs are fragile ecosystems and excessive fishing for octopus from such places is bound to adversely affect this resource and also create imbalances in the reef ecosystem. For any conservation measures to be taken up, a detailed study of the current resource utilization is a prerequisite.

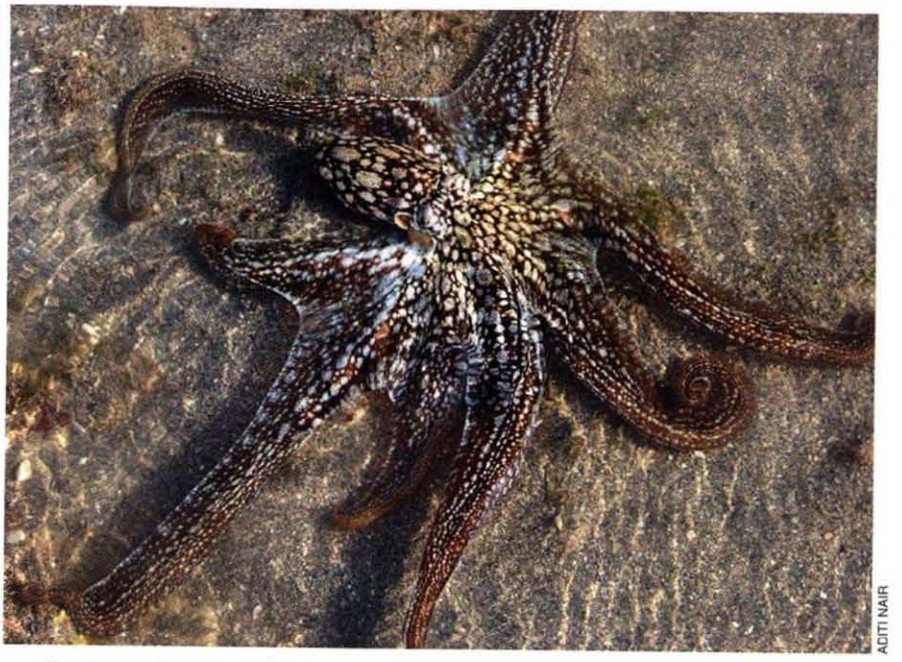
I was able to do a similar study on the octopuses found in the reefs of Gulf of Kachchh. The species commonly observed there is *Octopus vulgaris*. It is very easy to spot them crawling around and foraging in the reef during low-tides. The wide array of colour and textural changes that occur in seconds is marvellous. When hiding in algae their perfectly smooth skin develops filamentous branched projections just like the plant. Often after clicking its photograph, I have a tough time relocating the animal in the same image! Sometimes it throws a jet of water at us as a warning against coming too close.

One of the colour patterns that I really liked is called the 'passing cloud' display. The animal's colour remains exactly same as that of the background sand, and it makes dark patches on its body move all over, just like the movement of shadows of cloud. According to a study, the reason for doing this particular display is to startle its prey and make it move, so as to be able to detect and catch it.

In Kachchh we observed a large number of octopuses foraging during daytime. The species though mainly nocturnal is also known to show diurnal activity, an adaptation to fish predation.

On the other hand, the octopus found in Lakshadweep, commonly called 'Day Octopus' based on their activity time, were observed foraging in daylight only twice during the five months of my study. Could this changed behaviour of Lakshadweep octopuses be a result of excessive hunting of the species?

I have now returned to the chaotic life of Mumbai and often wonder what is that I miss the most about Lakshadweep. Well, there are a thousand splendid memories I can list. Like the evenings that were spent at the beach watching football or chatting with the ladies. The helicopter rides from one island to the other. Every single day of work was like a new adventure, the sea is never the same, there is always something new to see and learn, not from preserved, dead specimens but by seeing the same creatures live and roam majestically in their own kingdom. This was my first trip to these islands and I am left spell bound by the never-ending wonders and beauties that lie under its waters. ■



ADITI NAIR

Octopus vulgaris spreading its arms to appear larger to scare away predators

FACTS

- The first writing ink was made from a pigment found in the octopus' ink sac.
- The octopus is capable of learning. In an experiment, octopuses were trained to distinguish between shapes and also to recognise objects by touch.
- Octopuses have three hearts. Two pump blood through each of its two gills, while the third pumps blood through the body. The blood contains the copper-rich protein Hemocyanin for transporting oxygen, and is thus blue in colour.

Aditi Nair is currently working as a Senior Research Fellow at BNHS and is also pursuing her Ph.D. on the Ecology of Octopus.

"The City Bird-Brain"

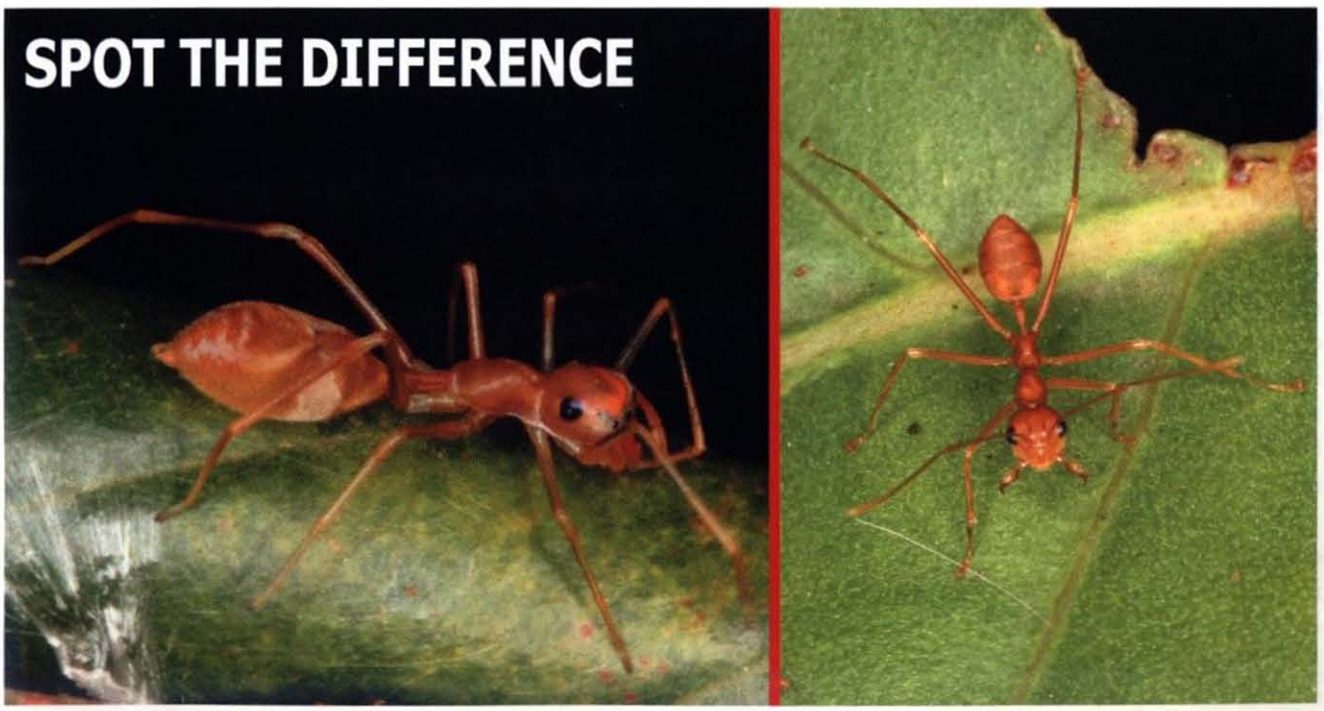
URBAN BIRDING
Author: 'The City Bird-Brain' Edited by Humayun Taher
B & W illustrations by Sachin Jaltare.
Size: 13.7 x 21.5 cm, 154 pages. Price not given. Paperback

Reviewed by Ranjit Manakadan

Before you get down to reading this book, a must-read is the foreword by Lavkumar Khachar, one of the 'old gang' of birders, who rubbed shoulders with the grand old man of Indian Ornithology: Dr. Sálim Ali and his ilk. The foreword gives insights into what the book is all about, the 'mystery author' behind the book, and what I enjoyed the most in the foreword was the enchanting prose, a delight of the bygone era. As Khachar says, the birders of today either write too laboured or highly ornate an English. A perusal of old and new natural history writings will suggest that the old guys 'wrote naturally', whereas the new 'struggle to write'. A great loss it will be when the last of these 'old guys' are all finally gone.

Now coming to the publication, it is basically a compilation of 25 popular articles that were originally published in *Pitta*, the newsletter of the Birdwatchers Society of Andhra Pradesh. For this reason, all the articles end with the signature 'Until next time, Happy Birding'. The first two articles deal with general aspects of urban birds and birding. The rest of the chapters cover 23 bird species that are common or 'not uncommon' in many Indian towns and cities, bringing out the character, habits, behaviour and even eccentricities of these feathered fellow beings with subtle humour. The best write-up according to me is on the Coppersmith Barbet. There are also lighthearted and informative narrations on the ubiquitous House Crow, Common Tailorbird (including an account of it feeding on the author's scrambled eggs in lieu of spiders!) and the Indian Koel, besides others. The only complaint against the book is large font size, which is distracting unless the reader is a kid or someone on the 'wrong side of 75'!

As for the idea of urban birdwatching, I guess with the increasing loss of wilderness; pollution, draining and filling-up of wetlands; and now large tracts of 'wastelands' coming under SEZs (Special Economic Zone), urban birding will be a more common thing in the not too distant future. To end, I had wished that the identity of the 'mystery author' would finally get revealed at the end (as in Hindi box office movies!), but alas! Wonder why he wants to remain incognito — unless he is 'Jack the Ripper', 'Dawood Ibrahim' or an 'Al Qaeda fugitive' with the Americans hot on his heels! I hope this convinces him to 'own up' for the (good) book! ■



For Answers, turn to page 42

This year, greet your family, friends, and business associates in style with our products.

(and help a noble cause of nature conservation too !)

Wide range of Greeting Cards to choose from. Call for our complete catalogue today.

Product Code : C 0132
Title : DIANTHUS
Size : 4.3" X 6.7", Rate : Rs. 9.50

Product Code : P 0123
Title : PIED MYNA
Size : 5" X 7", Rate : Rs. 12.00

Product Code : P 0112
Title : WATER CONSERVATION
Size : 5" X 7", Rate : Rs. 12.00

Product Code : C 0133
Title : PRIMULA
Size : 4.3" X 6.7", Rate : Rs. 9.50

Product Code : C 0125
Title : MANDARIN DUCK
Size : 4.3" X 6.7", Rate : Rs. 9.50

Product Code : P 0115
Title : MERRY MOODS
Size : 5" X 7", Rate : Rs. 12.00

Wall Calendar

Desk Calendars

Diary

Bombay Natural History Society
Hornbill House, Dr. Salim Ali Chowk, Shaheed Bhagat Singh Road Mumbai - 400 001, Tel.: (91) (22) 2202 5481 / 82
Tele Fax : (91) (22) 2202 5482 Email : bnhs.cmd@gmail.com Website : www.bnhs.org

Weaving Disguise ...

Text and photographs: **Dharmendra Khandal**

This planet has an amazing diversity of life forms, and each living form has an amazingly distinct behaviour of its own. Foraging and self protection are the essence of survival, these two life sustaining tasks are done through an array of diverse behaviour patterns by some animals. Some creatures do these jobs with utmost ease, while others have a complex way of doing so.

The study of such complex behaviour demonstrated by tiny living beings is enchanting and mystifying. One of these little wonders of nature are the spiders — the master predators. But a master predator is not always necessarily the top predator of the food chain. So spiders are not only master predators, but also possess the fine quality of saving themselves from other predators. To understand this, we need to study a very special behaviour called mimicry.

Mimicry is a phenomenon where organisms resemble one another in appearance, often to warn or deceive predators. There is a spider species — *Myrmarachne plataleoides* (belonging to the jumping spider family, Salticidae) mimic the *Oecophylla smaragdina* (weaver ant) for very different reasons.

The bright orange coloured weaver ants, with a pair of black compound eyes, get their name because of the arboreal nest that they construct by weaving silk to tie up leaves together. The spiders have learnt the art of imitating multiple characteristics of these ants such as colour, shape, antennae, and compound eyes to its advantage. But before understanding the mimicry patterns, we have to acquaint ourselves with the different body parts of insects and spiders.

While spiders have two body parts (cephalothorax and abdomen), four pairs of legs and six to eight simple eyes; insects have three body parts (head, thorax and abdomen) and three pairs of legs. Also unlike spiders, insects have a pair of antennae and two compound eyes. So to mimic an ant the spider has to demonstrate an additional body segment, antennae and large compound eyes. We will take into consideration the two species given on page 40 that is the *Oecophylla smaragdina* (weaver ant) on the right and the *M. plataleoides* spider on the left. So how does a *M. plataleoides* spider appear like a weaver ant?

The spider's cephalothorax has a constriction which gives an illusion of a distinct head and thorax. The abdomen too has constrictions, which make it look like an insect's abdomen. Two black patches on the spiders head compensate for the large compound eyes of the weaver ant. The spider moves its first pair of legs like the ant's antennae. And *voila*! we have a perfect mimic.

There is sexual dimorphism in the male and female *M. plataleoides*. The female spider measures 6-8 mm, which is the approximate size of Weaver ants. However, the males are longer — measuring up to 9-12 mm and have very long chelicerae. The dark colour of the chelicerae makes it appear as if it is not a part of the spider's body, creating an overall impression of a 6-8 mm ant carrying a smaller 3-4 mm prey. This is how both male and female *M. plataleoides* successfully mimic the same species.

But *M. plataleoides* do not prey on weaver ants. So why do these spiders need to mimic the weaver ants? They do it so that they can move close to ants and thus stay safe from predators. The weaver ant's bite is very painful, therefore predators avoid these tiny creatures. *M. plataleoides* are palatable but avoid predation by using their resemblance to the unpalatable and dangerous weaver ants. This model of deceiving potential predators is an example of Batesian mimicry.

With this ant mimic behaviour we can conclude how interlinked the existence of living creatures is ... Like a tower of cards the existence of each species is connected with another; if one is in peril other species get knotted with it. This is the *fait accompli* of the web of life. ■

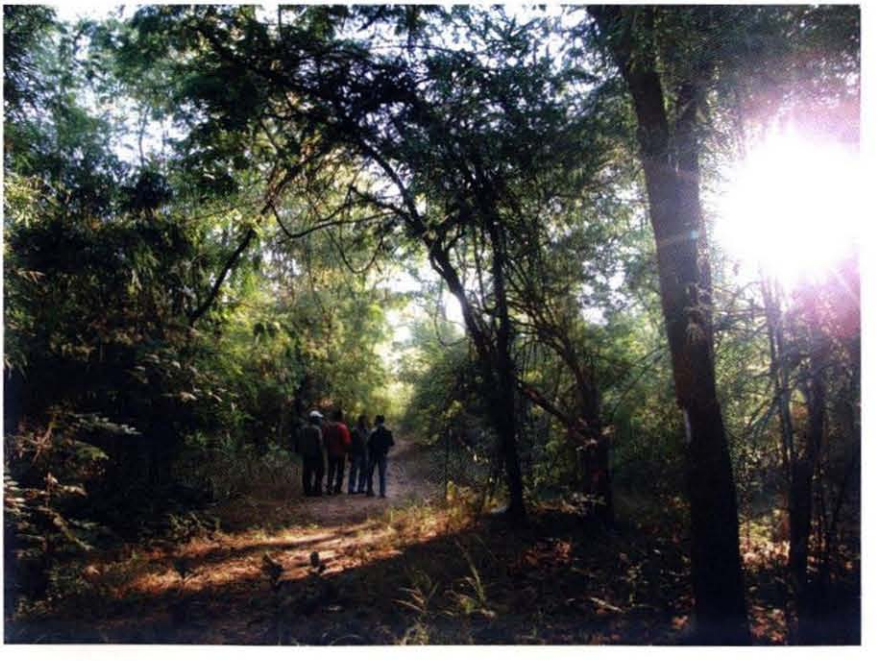
Dharmendra Khandal is currently working as a conservation biologist with a Non-Profit Organisation, 'Tiger Watch'. His work profile consists of anti-poaching operations, traditional poacher community, 'Mogya' rehabilitation. He has also done extensive work on spiders of India.

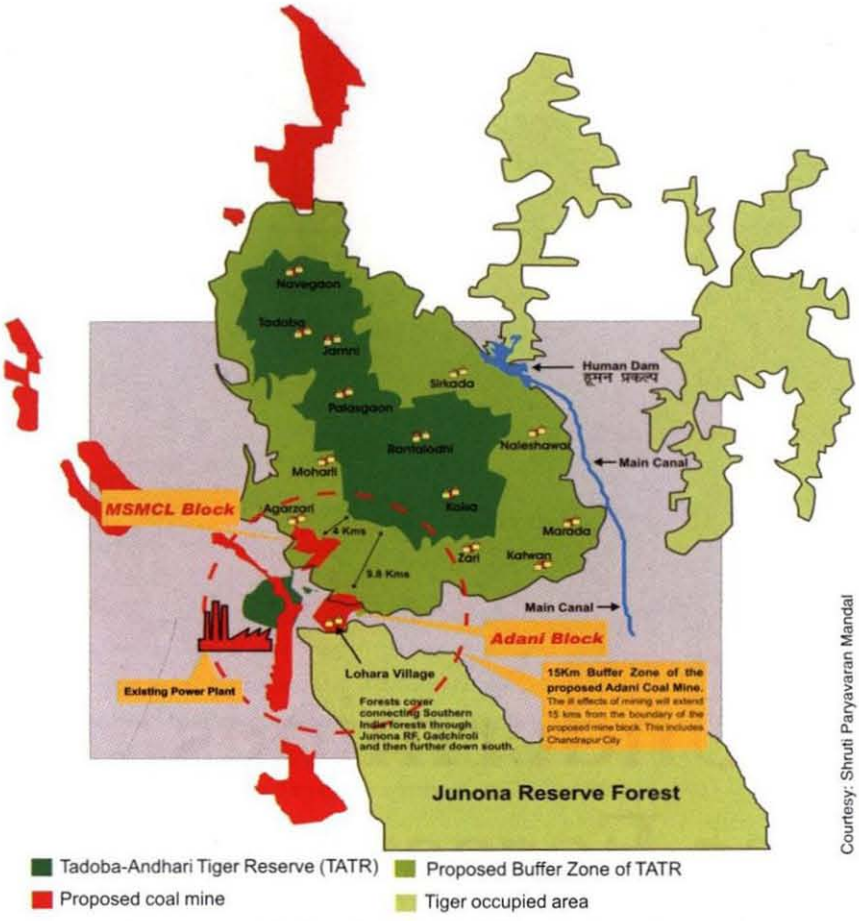
Mining Undermines Tiger Forest

Text: **Rushikesh Chavan and Sanjay Karkare**
Photographs: **Sanjay Karkare**

We cannot imagine a world without electricity, but do we think of the cost we pay for it (apart from the bills). Even as we write this article, we are utilising electricity. As per the Energy Information Administration, about 80 per cent of electricity in India is generated by conventional thermal power plants. Hydroelectricity, though a consistent source of power in India, accounted for only 16 per cent in 2006. Nuclear energy contributed roughly 2 per cent of electricity during the same year, while geothermal and other renewable sources accounted for as little as 1 per cent. This year, till August 2009, Ministry of Power claims 9 per cent increase in total generation of power, mainly due to 15 per cent increase in thermal power generation.

Above: Tiger sightings in this area are common
Below: The proposed mining site is a prime tiger habitat





Courtesy: Shruti Paryavaran Mandal

The proposed site is an important wildlife corridor that connects Tadoba-Andhari Tiger Reserve with the southern Junona Reserve Forest

Chandrapur district is home to several polluting industries

This clearly indicates that power generation in India is mainly through thermal power, which is largely coal based. It is an undisputed fact that thermal power is one of the most polluting ways of generating electricity, as burning of coal releases large quantities of pollutants. To make it worse, the coal procured is more often than not from open cast mining, which is one of the most ecologically damaging ways of mining. Here, we present to you the case study of ecological impacts of the proposed coal mining in Chandrapur district of Maharashtra.

It was reported in November 2007, that the Ministry of Coal allotted M/s Adani Power Ltd. a block for open cast coal mining in Lohara, Chandrapur district of Maharashtra. The block is six kilometres from Chandrapur city and measures 1,750 ha. This vast area is a combination of 1,598.71 ha of Reserve Forest, 86.66 ha of government owned land and 64.63 ha of private land. The proposed mine is aimed at fulfilling the requirement of 1000 MW thermal power plant by M/s Adani Power Ltd., situated at 220 km from the proposed site at Tiroda (Gondia district). The company proposes to mine four million tons of coal per annum with an expected mine life of forty years. It is speculated that mining for coal will have to excavate about 17 times as much soil, that is 78 million tons per year, and use 55 tons of explosives for the blasting operations. These activities will be in close vicinity to one of India's best tiger reserves.

This proposal has been highly contentious due to its proximity to the Tadoba-Andhari Tiger Reserve. Also, the area supports a rich forest and wide-ranging biodiversity. A biodiversity listing carried out by local organisations suggests that there are mainly 18 mammal species, 9 of which — including Tiger and Leopard, are included in Schedule I of the Wildlife (Protection) Act, 1972, 121 species of

Nullahs near coal mines invariably get affected by siltation and leaching

birds,75 species of trees, 35 species of shrubs and herbs, 16 species of grasses and 21 species of climbers.

Equally important is that the proposed area is a vital corridor for wildlife. It is expected that nearly 1.3 million full grown trees are going to be cut down to clear the land for the coal mine. The coal mine is also bound to annihilate the only surviving corridor that connects the Tadoba-Andhari Tiger Reserve to the forests to its south.

A presentation made by the project proponent included direct sightings of fauna such as Tiger, Wild Dogs, Sloth Bear, Gaur, Sambar, Chital, and Jungle Cat. The Forest Department census suggests presence of six tigers from the area. The presentation reports two range extensions of amphibian species, the *Kaloula taprobanica* and *Ramanella variegata*, which were reported from southern India. The environmental cost of the project, mentioned by the company in its environmental impact analysis is an astounding Rs. 2.78 billion. The buffer zone of the proposed coal mine covers an area of six reserve forests. Also, the area is Asia's only and one of the world's 12 teakwood gene pools (National Germplasm Bank), which houses 279 mother plants with three replicas of each.

Chandrapur city which is six kilometres from the proposed site has been recently named as one of the most polluted cities in the country. The city has earned this dubious distinction due

A typical smog covered morning in Chandrapur

Open-cast mining is unarguably the most destructive method of mining

The locals have unanimously opposed the project

to rapid industrialisation, particularly plenty of reckless open-cast coal mining; and operation of a thermal power station within the city. The mineral-based industrialisation and rapid urbanisation in this district has resulted in pollution and environmental degradation, and its effects are being felt on a wide scale, which the Maharashtra State Pollution Control Board (MSPCB) admitted in its recent report. According to the locals, black flakes in the morning is a common phenomenon in Chandrapur. This is an adverse effect of coal mining, power plants, and other industries in Chandrapur.

It is interesting to see that the people of Chandrapur have come together and raised their concern at various levels. This particular mining lease has been vehemently opposed, which is evident from the success of the 'bandh' that was called out in Chandrapur. On July 20, 2009, Mr. Bandu Dhotre, President, Eco-pro, went on a fast-unto-death in protest of the project. Mr. Dhotre's hunger strike gathered support from about 100 environmental organisations that staged protests, including mass head tonsuring and writing letters to the President of India in blood. On July 28, eight MPs from Vidarbha, including the Chandrapur MP Mr. Hansraj Ahir, wrote to the Prime Minister demanding the cancellation of the project. Mr. Dhotre called off his strike on August 2, after Union Environment Minister Mr. Jairam Ramesh assured that no project would be cleared without considering its effect on wildlife and environment.

We are fully aware of the severe power crunch prevailing in the country and of the imperative need to surmount it; therefore, there is no question of anybody being opposed to power generation. But, with 28 active coal mines in the district one wonders how much more can we demand from one area? Already the leaching and silting has polluted the water streams of the area. The loss of forest is only going to fuel the issues of human-animal conflicts. India is spending crores on initiatives for conservation of tiger in protected areas, but if we fail to protect these important corridors then the success of the entire initiative is at threat. The country's commitment to conservation of nature is being questioned. ■

Rushikesh Chavan is at present the Conservation Officer at the BNHS.

Sanjay Karkare is at present Education Officer, Tiger Cell, BNHS.

I do not think the measure of a civilisation is how tall its buildings of concrete are,
But rather how well its people have learned to relate to their environment and fellow man.

— Sun Bear of the Chippewa Tribe

Sálim Ali Award for Community Conservation 2008-09

The Sálim Ali Award for Community Conservation 2008-09 was recently awarded to Shri Ratan Lal Maloo (Jain) in recognition of his tireless efforts in feeding and taking care of the rare Demoiselle Cranes, and other birds like peafowl and pigeons in Khichan village, Phalodi tehsil of Jodhpur district, Rajasthan. Even at 78 years, Shri Maloo continues to feed the birds personally. Over the past 30 years, more people have been inspired to contribute to this noble task and other villagers, and tourists have contributed to building a boundary wall on two sides of the enclosure, along with a warehouse/ godown and a shelter for injured birds. ■

BNHS PHOTO LIBRARY

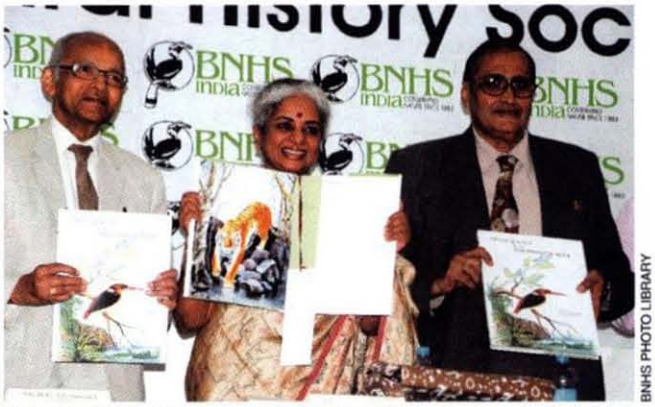
(L to R) Dr. Asad R. Rahmani, Director, BNHS, presenting the award to Shri Ratan Lal Maloo

BNHS launches a coffee table book: 'Living Jewels from the Indian Jungle'

'Living Jewels from the Indian Jungle' edited by Dr. Ashok Kothari and Dr. B.F. Chhapgar, a new coffee table book from BNHS was released on September 12, 2009, by Smt. Usha Thorat, Deputy Governor of Reserve Bank of India. Smt. Usha Thorat praised the efforts taken by the editors and emphasized on the necessity of such books to create awareness about wildlife conservation among people. The book gives an interesting insight into the natural heritage of Indian jungles over the past two centuries with paintings, photographs and articles depicting Indian wildlife of the past.

The articles, paintings and photographs reproduced in the book have been taken from the rare sources in the BNHS Library. The book consists of 80 plates and is priced at Rs. 1,600/-.

The function was graced by the presence of Mr. B.G. Deshmukh, President, BNHS, Mr. Sabyasachi Mukherjee, Director, Chhatrapati Shivaji Maharaj Vastu Sangrahalaya,



BNHS PHOTO LIBRARY

(L to R) Shri B.G. Deshmukh, Smt. Usha Thorat and Dr. Ashok Kothari at the launch of 'Living Jewels from the Indian Jungle'

Ms. Radhika Sabawala, General Manager, Marg Publications, and Mr. Virendra Widge, member of BNHS Library Subcommittee and immediate past President of Rotary Club of Bombay Seacoast. ■

BNHS PHOTO LIBRARY

Students taking the nature trail at CEC-Delhi

Unusual Visitors at BNHS-CEC, Delhi

Grover and Toto — muppets from the hugely popular children's TV series, 'Galli Galli Sim Sim' visited the BNHS-Conservation Education Centre (CEC) in Asola-Bhatti Wildlife Sanctuary in Delhi this September. The series was shot along CEC's nature trail, with a 40-member crew from Miditech TV, conducted over two days. An episode from this series will be broadcast on Doordarshan, Pogo and Cartoon Network. This particular segment shot will be aired by December 2009.

'Galli Galli Sim Sim' reaches to about 22 million viewers across rural and urban India and is an effective media-based educational tool for children. This is the first time that Delhi's Conservation Education Centre has been used for such an exercise. ■

Captive bred nestlings of Slender-billed Vultures take their first flight

The first ever captive bred nestlings of the Slender-billed Vultures fledged successfully this year at BNHS' Vulture Conservation Breeding Centre at Pinjore, Haryana and Rajabhatkhawa, West Bengal. Three pairs of White-backed Vultures also bred successfully at the Pinjore centre earlier this year and the two White-backed Vulture nestlings which fledged during 2007-08 are now over 18 months old.

BNHS has been running three Vulture Conservation Breeding Centres (VCBCs) in the country with funds provided by the RSPB and other funding agencies, and in collaboration with the State Forest Departments. The vultures have now started breeding and this good trend is expected to continue in the coming years. The conservation breeding programme is considered to be the only viable way of saving the vultures from extinction.

BNHS PHOTO LIBRARY

Captive bred nestlings at BNHS' Vulture Conservation Centre

The Slender-billed Vulture is perhaps the most endangered vulture in the world with less than 1,000 birds remaining in the Indian subcontinent; their main area of distribution. This species along with White-backed Vulture and Long-billed Vulture are critically endangered and are on the verge of extinction.

These species till a decade ago were seen in millions in India but their population crashed due to a non-steroidal anti-inflammatory drug, Diclofenac, which is given to livestock as a pain-killer. The vultures get exposed to Diclofenac when they feed on the carcass of cattle (their principal food), that were treated with Diclofenac and died within 72 hours of treatment. Vultures are scavengers and feed chiefly on dead animals. They are long lived and are slow breeders reaching adulthood when they are 5-7 years old and lay one egg per year. ■

Latest at CEC-Mumbai

This brochure on butterflies is available at CEC-Mumbai and Hornbill House

BNHS-CEC, Mumbai, recently launched a variety of educational exhibits and materials to educate patrons and enhance visitor experience. The project was entirely funded by MMREIS (Mumbai Metropolitan Region Environment Improvement Society), a part of MMRDA (Mumbai Metropolitan Region Development Authority). A brief on the activities is given below:

- **Nature Field Guide**: A colourful brochure on five themes: birds, insects, butterflies, moths and trees, and wildflowers has been developed to depict the biodiversity of BNHS land.
- **Educational Trunks**: Five theme-based travelling trunks on: bird life, insect life, plant life, endangered life and environment will be leased out to schools for classroom use to help create awareness about wildlife amongst students. These trunks contain fact books, puppet shows, games, experiments, posters, flashcards and audio-visual aids.
- **Wildlife Dioramas**: Life-size statues of animals that are seen on BNHS land have been created to give a glimpse of the major wildlife forms found in the surrounding forest.
- **Pond Observatory**: The pond observatory at CEC comes to life during monsoon. Home to a variety of life forms like guppies, Fungoid Frog, Stalk-eyed Crab and Monitor Lizard, it also attracts local birds and Bonnet Macaques. The observatory helps visitors learn about the pond ecosystem. ■

Dr. Ashok Kothari, an active Rotarian and Honorary Secretary, BNHS, was invited by Rotary Governor 2008-2009 of Rotary District 3140 and BNHS life member, Rtn. Bansi Dhurandhar to present TREASURES OF INDIAN WILDLIFE to the Rotary International President 2009-2010, John Kenny.

Published on October 26, 2009, by Dr. Ashok Kothari for Bombay Natural History Society, Hornbill House, Dr. Sálim Ali Chowk, S.B. Singh Road, Mumbai 400 001, Maharashtra, India.

A silent battle, vital for the very survival of man, is being waged ...
Where are you? Come ... Join us ...

For details contact: Bombay Natural History Society, Hornbill House, S.B. Singh Road, Mumbai 400 001, Maharashtra, India. Tel: (022) 2282 1811 Fax: (022) 2283 7615
Email: bnhs@bom4.vsnl.net.in or visit us at: www.bnhs.org

BNHS INDIA CONSERVING NATURE SINCE 1883 125 Years

Registered with the Registrar of Newspapers under No. RN 35749/79

Decisions of today will shape the world of tomorrow.

Representing future generations and their interests in today's decision-making processes is ingrained in the ethos of MSPL. Our approach therefore transcends regulatory, programmatic and jurisdictional constraints, and emphasizes on synergizing ecology and economy.

It is this responsibility towards mother earth and its future residents that has led us to invest in wind energy. An initiative which shall ensure availability of much-needed power for accelerated progress, at a minimal environmental footprint. Today with an installed generation capacity of 191.6 MW we are the largest producer of wind energy in the country and we are on course to double this capacity by 2010.

At MSPL, we want to make a difference and it is our endeavour to gift to our children a more sustainable world than the one we inherited.

BALDOTA

MSPL LIMITED

Baldota Enclave, Abheraj Baldota Road
Hospet-583203, Karnataka, India.
www.mspllimited.com