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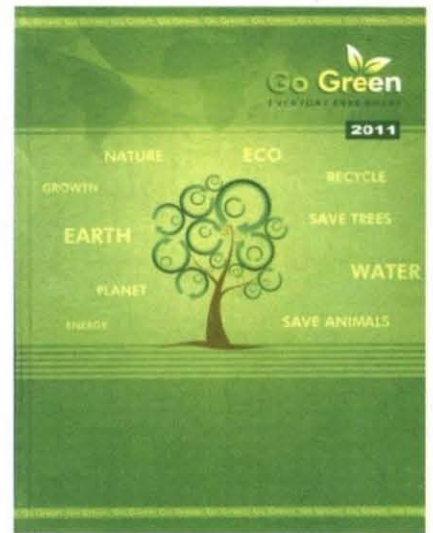
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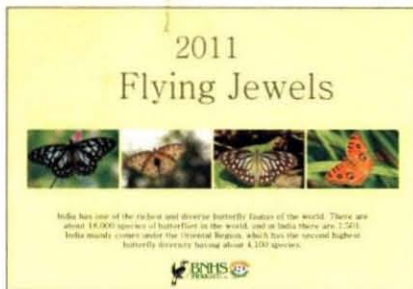


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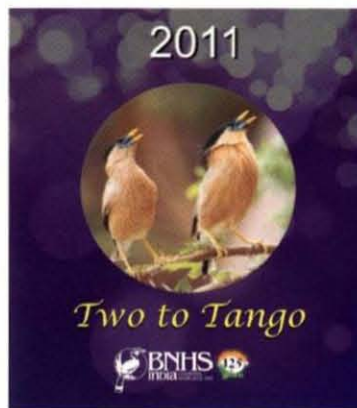
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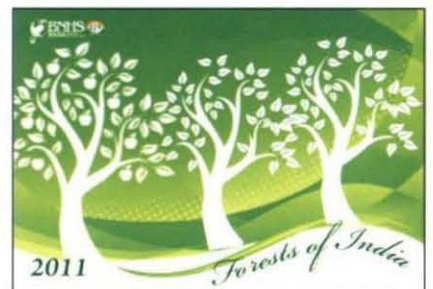
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*Microhyla* sp. Tadpoles  
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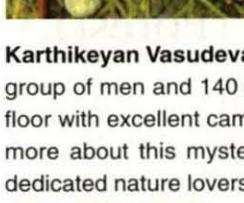
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## Retracing Evolution, Bountiful Biodiversity

Ferns take the first ever steps on land... Gymnosperms take the baton and conquer land and a similar story unfolds with the dual existence between land and water with amphibians. And soon the golden age of reptiles came into being ...



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## A Quaint Turtle in a Gigantic Forest

Karthikeyan Vasudevan and V.Deepak narrate the story of a small turtle, a group of men and 140 days! An elusive 12 cm long turtle in the vast forest floor with excellent camouflage can prove to be quite a challenge! Find out more about this mysterious turtle and the efforts put in by the group of dedicated nature lovers ...



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## In Search of the Himalayan Salamander

The only species of Salamander of India – the Himalayan Salamander! Read and delight your senses, as Kaushik Deuti speaks about the lifestyle and the unique and highly threatened habitat of these tiny, tailed amphibians ...



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## Crocs/ Alligators/Caimans/Ghariahs?

The who's who of the 'Megalizards': Kedar Bhide will settle your doubts, if any, about the crocodylians of India ...



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## Here Today, Gone Tomorrow

Are you aware about the problems faced by the threatened amphibians and reptiles of our country? Varad Giri puts across some heart-rending, truthful questions ...



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## The Barta Chronicles

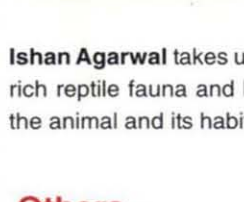
Ashok Captain is assured to capture your rapt attention, while portraying the magic of North-east India, with its priceless biodiversity and rich culture, wherein he holds a nail-biting tale of the Barta! Curious to know what it is all about, read on ...



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## Mysteries of a Scaly Kind: Skinks of India

*Surpa chi Mavshi* (Snake's aunt) - the local Marathi name of skink, could not have been more apt! Aniruddha Datta Roy speaks about these swift animals that are mostly responsible for the rustling sound of leaves that may have spooked most first-timers in forests ...



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## Reptiles of the Thar Desert

Ishan Agarwal takes us across the Thar Desert to take a quick look at the rich reptile fauna and help understand the intimate connection between the animal and its habitat ...

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## REDD: Reducing Emission from Deforestation and (Forest) Degradation

One of the fall-backs of the threat of climate change is the realization of the importance of forest as carbon sink. Deforestation, particularly in tropical countries, results in about 17% of global greenhouse gases, second largest source after the energy sector. In some tropical countries, deforestation, forest degradation, forest fires and slash-and-burn (jhumming) practices make up the majority of carbon emissions. We are losing 20,000 ha of tropical forest every day, and between 1995 and 2000, the rate of forest loss was 13 million ha a year. Although rural poor are blamed for cutting down forest for agricultural expansion, fuelwood, livestock grazing and timber extraction, rich countries have to share a larger blame as large-scale deforestation is taking place for oil palm plantation (e.g. Indonesia, Malaysia), to produce cheap meat (Latin America), and biofuel (many countries). In our country, where good forest cover is about 11%, infrastructure development (dams, industries, roads), slash-and-burn practice (jhumming), over-grazing, fuelwood cutting, and mining are the biggest reasons for forest decline. Although massive plantations could have increased the 'forest' cover in government statistics, plantations are not a substitute for natural forests.

Tropical forests are home to nearly 50% of all terrestrial species. About 74% of all bird species live in forests. In the world, about 60 million indigenous people are completely dependent on forests, while 350 million people are highly dependent, and 1.2 billion have some dependence on forests for their livelihoods. Even the urban people depend on forests for many luxuries indirectly. Sometimes rural communities are the biggest victim of deforestation when the forest is taken over for oil-palm plantation, dam building or mining – the benefits of which goes to urban rich. Therefore, forest protection and forest expansion goes beyond the forest sector, it is an important component of the Millennium Development Goal (MDG). Reducing deforestation and degradation can also play an important role in climate change mitigation, and accrue benefits to rural communities through the United Nations Collaborative Programme on Reducing Emission from Deforestation and Forest Degradation in developing countries (UN REDD). It is more popularly known as REDD (Reducing Emissions from Deforestation and Degradation).

Under the REDD programme, countries, communities and even individuals who protect forest are given monetary benefit for not cutting forest. Two major aims of REDD are to identify and calculate the financial value of the carbon stored in forests, and offer incentives to countries/communities/individuals to reduce emissions from forest lands. The concept is very simple: forest users are paid more than the minimum amount what they would get by cutting the forest. The REDD has the potential to create new financing schemes for sustainable forest use in developing countries. Now we have REDD+. It goes beyond deforestation and forest degradation, and includes the role of conservation, sustainable management of forests, benefit sharing with rural communities, and enhancement of forest carbon stocks.

The concept is good, but it is not as simple to implement as it looks. Lot of debate is going on in the world among conservationists, rural communities, investment bankers, World Bank, United Nations, climate specialists, social scientists, intellectuals, politicians and members of the civil society. Whatever I have read about REDD and REDD+, and listened to specialists during REDD workshops, two themes occur regularly: corruption, and benefit from REDD+ not going to communities who traditionally protect forest (this is also related to corruption).



There is also a danger of 'environmental blackmail' by countries, communities and individual forest owners. Moolah can change the value system. Individuals or communities who would have traditionally protected forest, under the REDD+ opportunities would threaten to deforest unless paid. As payment under REDD+ is a sort of bribe (euphemistically called incentive), communities who anyway protect forest for various reasons, are not going to benefit. But, this REDD+ scheme would reward people/communities who traditionally cut forests, by giving them incentive not to cut. Another danger expressed by many social scientists and community leaders is that REDD+ scheme is bringing market forces to the sphere that comes



ISAAC KEHIMKAR

under traditional land use. We must keep in mind that REDD+ is not a substitute to carbon reduction in developed and developing countries (a sort of 'green-wash'), but complements various steps that the world should urgently take to reduce output of carbon. Carbon output reduction and carbon sequestration are both critical to successfully address climate change.

In this brief editorial, I will not be able to discuss all the issues that brought up the concept of REDD+. I suggest BNHS members to do some google search – they will get loads of information on this issue in the internet. Perhaps some member may come up with a better concept of forest conservation which he/she can share with others.

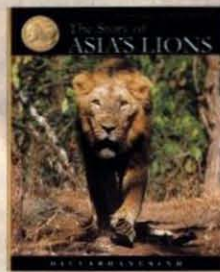
In this *International Year of Biodiversity*, if we are able to develop a clean and implemental REDD+ policy, that benefits rural communities and biodiversity, it will be a great achievement.

Asad R. Rahmani

# REVISED EDITION

## 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

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With an epilogue to update the status of this endangered species.

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.

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October 2008

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# Diversity featuring in this issue

Salamander



Agama



Toad



Barta



Skink



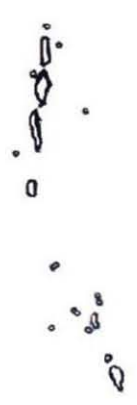
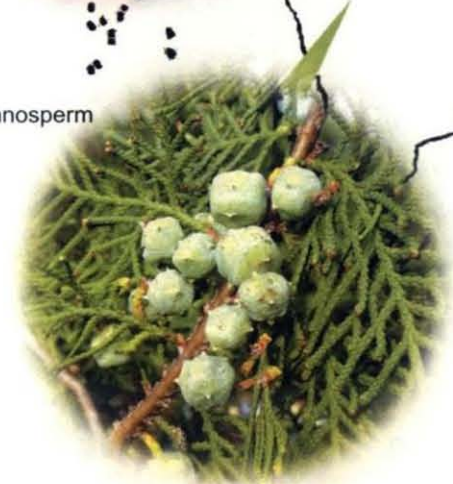
Turtle

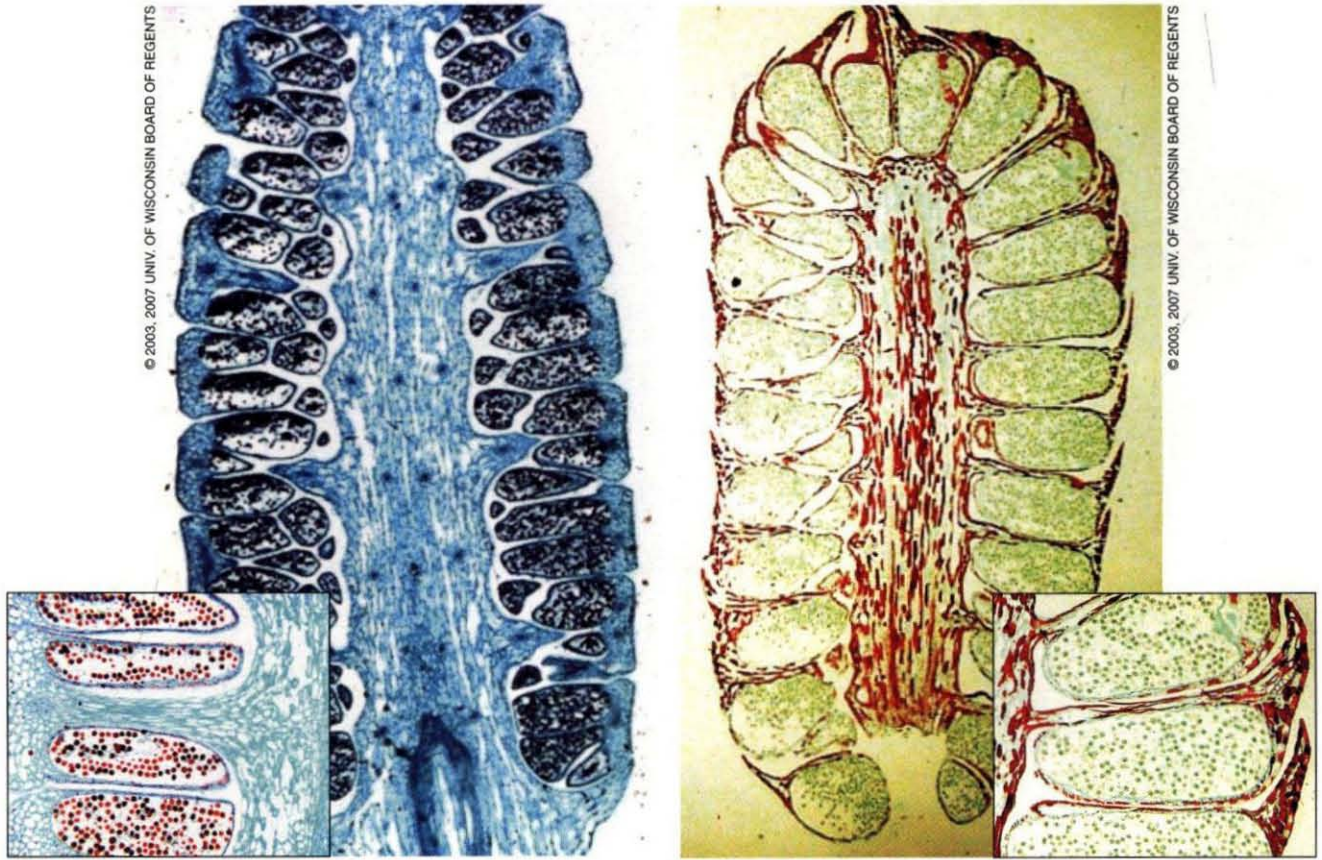


Crocodile



Gymnosperm





Internal structures of a pteridophyte fruiting body (left) and a gymnosperm cone (right); the similarity in structures is evident

# Retracing Evolution, Bountiful Biodiversity

*Most of us have seen the famous Steven Spielberg movie – “Jurassic Park!” But do any of you remember noticing the plants in the movie? Seems like a silly question? I beg to differ. As we take a quick look at the plants of that era you will soon learn, these plants are equally exciting if not more. Along with these, we also take a look at incredible diversity of the ‘cold’ vertebrate fauna that moved to land – Amphibians and Reptiles!*







Compiled by: **Priyanka Iyer**

Expert Consulted: **Mr. Sagar Satpute**

Sources: THE BOOK OF INDIAN REPTILES AND AMPHIBIANS by J.C. Daniel,  
COLLEGE BOTANY (Vol. 2) by H.C. Gangulee

The plant life of the Jurassic era included Ferns and their allies. This was of great importance, as it was a path-breaking moment in the course of plant evolution for many reasons - photosynthesizing organisms became plants, i.e., developed roots, stems, and leaves; they became vascular (plants with vessels, to transport food and water, as opposed to direct transport between cells), and that is not all - in fact, they moved to land to colonise the then foreign environment.

Ferns and their allies are Pteridophytes. These plants reproduce in vegetative as well as sexual reproduction. Vegetative reproduction is when one fern puts out runners and comes in contact with the ground. This spot becomes the birth place of a new fern! On the other hand, sexual reproduction occurs through microscopic spores and not seeds. They were the 'trail blazers' after all, still figuring their way onto land.

These microscopic spores are stored in sporangia (tiny sacks). You may have seen small circular structures on the underside of the leaves which are a collection of the sporangia known

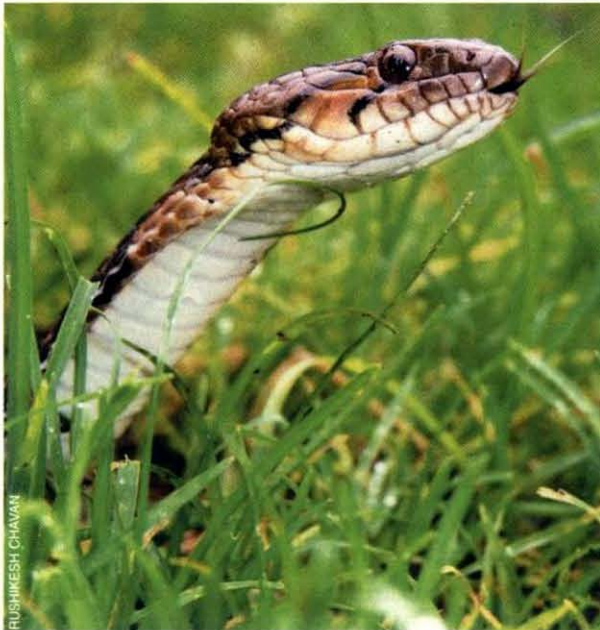
as sori. But, in the case of some higher ferns, the sporangia form on the tip of a small fertile stalk (e.g. *Ophioglossum* sp.). In fact, the structure of the leaves and the arrangement of sori are sometimes considered as key identifying characteristics of these interesting plants.

But, there was also another group called seed ferns which in fact, does not fall under Pteridophytes or Gymnosperms, these are what you may call (one of) the 'missing link(s)' between Pteridophytes and Gymnosperms. And interestingly, this extinct group of plants is known technically as the Pteridosperms (Pterido - fern, sperm - seeds). In fact, some seed ferns are even said to have resembled the true ferns in appearance.

Seed ferns are said to have reproduced through seeds (as you may have guessed!). Also, certain specialized cells located in the outer layer of the stem of seed ferns are known to have produced secondary xylem and phloem which increased the girth of the plant as they grew. These are some of the factors that enabled Pteridosperms to stand out.

Quickly returning to the plants of today, in the structure of the *Ophioglossum* sp. (a Pteridophyte) one can see the stepping stones that were laid to welcome the Gymnosperms; what are these? Gymnosperms are a group of trees that have seeds unprotected by a fruit, including the conifers, cycads, etc.

If you have travelled to the north of India you would have come across pine cones. In fact, its seeds are wedged within the stubby projections of the cone. Take one look at the internal structure of the fertile portion of the stalk of an *Ophioglossum* sp. (a Pteridophyte) and a cone of a Gymnosperm, and you will see the connection. Keeping in mind that evolution is not a linear process, wherein one life form evolves after another, one can hazard a guess that gymnosperms may have evolved from the Pteridophytes.



Checkered Keelback, distinguished by the two distinct markings near the eye





And that we are lucky enough to see both members of the link.

Gymnosperms took the mission to conquer land to the next level. And the fact that gymnosperms reproduced via seeds, gave them an added advantage of seed dormancy, wherein a seed can remain dormant till the environment is favourable for it to germinate. This was not possible in case of ferns as they require moist environment and reproduce via spores which cannot remain dormant. Gymnosperms grew tall, like the trees of today. They are seen in many habitat types of our country including the Himalayan and Trans-Himalayan region, North-east, Western Ghats (Internationally recognised Biodiversity Hotspots) and Eastern Ghats.

Along with plants, faunal life moved onto land as well ... it was tough to adapt to the difficult terrain but as they say, 'Life always finds a way!'

Amphibia, includes all frogs and toads, salamanders, and caecilians, each readily recognizable based on their highly distinctive body plans. Frogs and toads are those mystical animals that make their presence felt, more than ever, during the monsoon. The night boasts of a melodious symphony which can be attributed to these little wonders. They keep the insect population in check and have remarkable lifestyles.

Most species of living salamanders are quite typical-looking, with a tail and four legs. Some aquatic or burrowing species have reduced limbs and girdles, and elongated trunks. India has just one species – Himalayan Salamander.

Living caecilians are elongate, limbless, tailless or nearly so, and have grooved rings encircling the body. A distinctive yet small, tentacle at the front end of the animal, below the typically inconspicuous eye is used for



The cones of *Thuja* sp., a common gymnosperm

chemoreception. Although the majority of the species are burrowing, one lineage has invaded aquatic habitats.

With time, life became more terrestrial with the onset of (you guessed it) the reptiles! The Crocodylians, Turtles, Tortoises, Lizards and Snakes make up the reptiles of today which are a fraction of the number and variety that lived during the age of reptiles. Reptiles can be



Dual lifestyle!

differentiated from amphibians by their dry scaly skin. But all animals that have scales are not necessarily reptiles. The breeding habits, that is, the laying of

eggs on land and the nature of the eggs distinctly separates reptiles from the water bound amphibians.

Crocodylians are one among the many survivors of the test of time and the elements. The reason for this is their dual lifestyle and incredible adaptations. The three crocodylians of India are – the marsh crocodile (lives in lakes and rivers), the estuarine crocodile (inhabits coastal river estuaries) and gharial (inhabits Indus, Ganges, Brahmaputra and Mahanadi river systems)

The Chelonians include, the marine turtles, the freshwater tortoises or terrapins, the freshwater turtles and the land tortoises. The terrapins or freshwater tortoises are hard-shelled forms which closely resemble land tortoises in appearance, whereas the freshwater or mud turtles have flattened disc-like shell, covered with soft skin.

Lizards are a widely diverse group of reptiles among which the limbless ones can be separated from snakes by the presence of eyelids. Lizards occupy all biotopes ranging from deserts to evergreen forests to plains, up to 5,000 m in the Himalayas. Contrary to any that may prevail, most lizards are not poisonous.

Last but definitely not the least, the slithering reptiles – the legless miracles of nature! Snakes are one among the many misunderstood animals of our nation. They are remarkable animals with the forked tongue to smell rather than taste, i.e., it collects scent particles by its constant quivers. They cannot hear through the air but can feel waves through their lower jaws as vibrations.

Next time we will be exploring the vast world of the Angiosperms (angio - container, sperm - seed) also called the flowering-plants. Faunal life takes a leap of faith into yet another new environment – the air, along with birds and mammals! 🐦

A Kingfisher bird with vibrant blue and orange plumage is perched on a dark, mossy rock. Its reflection is clearly visible in the water below. The background is dark and out of focus, showing some green foliage.

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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 wild creatures is the finest imaginable indicator of the long-term health of our nation.

Protecting natural ecosystems helps India to sequester and store carbon and thus fight climate change. This will enhance the quality of life of over one billion Indians.

In the days ahead, we at Union Bank, intend to spread the conservation message to all our customers and beneficiaries. This, we believe, is vital to national development.



**Union Bank**  
of India



V. DEEPAK

The elusive Cane Turtle *Vijayachelys silvatica*

# A Quaint Turtle in a Gigantic Forest

*A spotlight-like beam of sunlight was focused on the twisted, dark and wet surface of fallen leaves. Our careful footsteps approached the spot. Some animal had disturbed the leaves on the surface. An area of few square inches was the focus of our rapt attention, in the gigantic rainforest of Banathiar in Anamalai Tiger Reserve. It had been four hours since we had been intensely scanning the forest floor; with our backs arched and necks strained, as if searching for a precious object that was dropped on the floor. What we were searching for, was indeed, nothing less than priceless!*



Karthikeyan Vasudevan is a scientist at the Wildlife Institute of India, Dehradun and is involved in field research on reptiles and amphibians in the Western Ghats.



V. Deepak is doing his Ph.D on the Ecology of two endemic turtles of Western Ghats. His interests include ecology, systematic zoology and biogeography of reptiles.





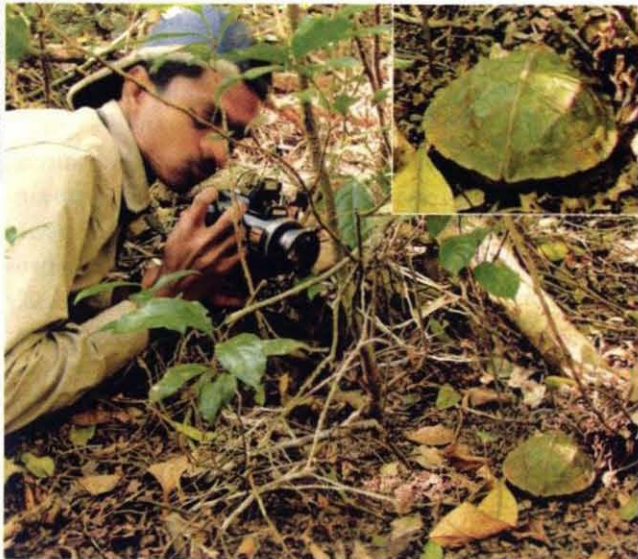
Text: Karthikeyan Vasudevan and V. Deepak

We looked at Silamban disappointedly; but he was unperturbed as always. He smiled back at us and it lifted our spirits. Silamban, a lithe young man from Sankarankudi, grew up scaling mountains, tending cardamom plants and gazing at the panoramic view of the mountains from his home. He was a man of very few words and just smiles; he had walked several hundreds of kilometers in the forests, searched several hundred square kilometers of forest floor for small, cryptic, and nocturnal animals in the rainforests of the Western Ghats. He had seen many forest animals and had searched for seemingly 'unimportant' animals in the forest, and this time it was a small forest floor dwelling turtle, about 12 cm long. The Cane Turtle *Vijayachelys sivaatica*, a mysterious forest dwelling reptile, continued to elude us for all the hundred and forty days, we had spent in the rainforests of the magnificent Anamalai landscape.

The other day, in the night after our meal, when we sat to discuss our study plan, Silamban heard us out silently and then said that it is going to be very difficult to find the Cane Turtle. We were surprised when he narrated how the turtle buries itself into the litter debris once it hears even a faint noise. At the end of another

uneventful day, we could not resist reminiscing about the enclosure that J. Vijaya describes in her papers, housing 125 cane turtles in Kavalai, not far from where we stood. Vijaya re-discovered this enigmatic turtle in July 1982, and studied this species for two long years. We knew that Vijaya – 'the turtle girl' was an extraordinary field biologist, and to emulate her effort would be nothing less than a back-breaking effort, even if we used our combined strengths. We knew this because villagers in remote locations in the Chambal ravines, and in the Western Ghats would mention a woman, small in stature in khaki fatigue several years ago, asking them if they have seen turtles. Understandably, after her demise in 1987, there was a void in research on the ecology of turtles in general, and till date the status of this enigmatic, rare forest dwelling turtle has remained doubtful.

The Cane Turtle is one of the few species in the world that are representatives of a unique lineage of species that have survived over 100 million years on earth. In other words, this species has survived several episodes of harsh conditions in earth's history, while other related species have succumbed to it and perished. The evolutionary significance of the species was highlighted by Peter Parschag, who revealed something very important. Peter has been fascinated by the cane turtle for many years and has attempted to breed them in the basement of his house in Austria. An architect by profession, Peter imbibed the passion from his father, who kept several species of turtles in the house and bred them as a hobby. They could breed over 40 different species of turtles in their basement, but the Cane Turtle was a tough nut to crack. The last surviving pair in their collection died without breeding in captivity. Peter unravelled the evolutionary uniqueness of this fascinating species after having made comparisons with all other related turtles. The results of his study prompted him to



The Cane Turtle has been listed as Endangered by the IUCN



V. DEEPAK



KARTHIKEYAN VASUDEVAN



The radio tag attached to the turtles enabled the study that was terminated in 1982, after the death of Vijaya

assign the Cane Turtle to a new genus, because of its distinctiveness from all other turtles. It was only befitting that this new genus is *Vijayachelys* in honour of late J. Vijayalakshmi *alias* Vijaya, and her extraordinary contributions to freshwater turtle ecology and natural history of cane turtle in particular.

Back in Top Slip, we doubled our effort and in the course of the next two years, Deepak walked more than 1,100 km in both Indira Gandhi and Parambikulam Wildlife Sanctuary (presently Parambikulam Tiger Reserve) in search of the Forest Cane Turtle and the Travancore tortoise. Many days of painstaking search revealed, that the Cane Turtle was only restricted to evergreen forests. The locals and forest department staff had seen the turtle only in evergreen forests. Following this

clue, we intensified our search in the wet evergreen forests.

On the morning of December 6, 2006, there was a downpour in the morning. Deepak, Silamban, and Hari continued the ceaseless discussion on how we could find the elusive cane turtle. Karian shola is a 650 ha patch of evergreen forest adjacent to Top Slip in the Anamalai Tiger Reserve. Spontaneously, we decided to go and search the forest by spacing ourselves at 10 m and scanning the forest floor. Nearly half an hour had passed and almost every large twisted brown leaf in the forest floor was scanned by many peering eyes. Finally, one of us (Deepak) leapt forward almost as if he had tripped over something on the forest floor. In the dim light, a wide toothy smile was shimmering. A cane turtle wedged under a thick liana, was

spotted! It could have gone completely unnoticed by an untrained eye. We were quick to reach the spot where Deepak was now kneeling down and had started taking a flurry of pictures of the cane turtle. The turtle was still and cold when we touched it. Its eyes were shut, when the camera flash lights went on in a flurry, it opened its large white and red rimmed eye slowly and stared at us. We lifted and held the turtle in our hands to have our first glimpse of a wild Cane Turtle. In the next few days, it rained heavily and surveys in Karian shola yielded three more cane turtles. We were convinced that we could find this species and study it in the evergreen forests. When we were so severely challenged to locate the cane turtle in the evergreen forests, it struck us that its disappearance will not even make a faint *blip* on our conservation radars. There are many such dainty creatures, mostly small, screaming for attention from biologists in these forests.

Soon, we radio tagged four of them, two male and two female turtles and monitored their activity on a daily basis for two years. The radio-tags were tiny electronic gadgets weighing 2.5 gm and they were pasted on the carapace using glue. The whip-like antenna that protruded from the transmitter was left to extend down along the back, as if the turtle had an extended tail. It would have been impossible to study a species such as the cane turtle without fitting them with transmitters. We came to know for the first time that this species actively hunted large beetles and snails on the forest floor. They were extremely alert all the time and each individual had a distinctive behaviour. One of them, a female, was extremely shy and would move every time we approached her at close proximity. The male, however, was unperturbed by our presence and would perform most of his normal activities. Their movements revealed a curious pattern. They sometimes moved over



100 m in a day, a long trek for a small and slow turtle, but always remained within the bounds of the evergreen forests. The movement of the animals on a map looked as if they were particles moving purposefully back and forth, and continually being recoiled from the boundary of the evergreen forest. They just do not seem to like to get out of the comfort of the evergreen forests. What is it that they like so much about their favourite habitat?

We had placed extremely precise automated temperature data loggers beside them, and this instrument was moved every time the turtle moved, and it captured the temperature preference of the turtle. Once we analyzed our data we were amazed to find that the turtle performed most of its activity within a temperature range of 18-22 °C. The turtle neither liked very cold or warm areas and this microclimate was typical of the evergreen forest floor. Being a reptile, their physiology is tuned to the ambient temperature and any change in this will make them perform adjustments in their activity or even completely avoid certain areas. In the case of the cane turtle, they seem to be “prisoners” in the evergreen forests, because their extreme adaptation to the microclimate, confines them to these forests.

Evergreen forests are the most threatened forest type in the Western Ghats. They exist mostly in the form

of islands that are surrounded by tea, coffee, cardamom and teak plantations or degraded forests. While this is a cause of major concern for the Cane Turtle, there is some relief for the species from the fact that they survive in high densities in the evergreen forests.



For the Turtle, more dangerous is its 'medicinal' value for its survival as they encounter man, their arch destroyer

During our study spanning over two years, we encountered 28 different individuals, 19 of them being males and the rest females, in the 42 ha intensive study area. About 50 Cane Turtles could survive in one square kilometer of intact and well-protected evergreen forests.

The craving to seek cure for simple ailments by butchering turtles and other wild animals alike, is probably the most despicable facet of humans. The Cane Turtle too is exploited for some unknown medicinal value. They are

hunted using trained dogs that can sniff out the turtles hiding in the forest floor among the litter and debris. The Cane Turtle also faces several objective risks at this point in time and that our study provides insights into. During our intensive study we did not observe egg laying in cane turtle, however, we did sight a hatchling of the species that was about half the size of our palm. It is known to lay few eggs, slow-growing and therefore, the recruitment of new individuals in the population is meagre. Any offtake of breeding individuals could dramatically reduce their population, and it might take a long time for it to recover. Populations in evergreen forest fragments will be isolated and subjected to small population effects such as inbreeding, which will impact them. The sensitivity of the turtle to a narrow range in ambient temperature, and its specialization to the evergreen forests, make this species

vulnerable to rising land temperature caused by climate change. A shift in the ambient temperature by a degree centigrade can make the species withdraw further and can drive the species to extinction. Our quaint creature has survived several million years of earth's tumultuous episodes, and is now holding fort in the gigantic rainforests in the Western Ghats, its last home! If these forests are destroyed, we will definitely lose a legend in the evolutionary exposition that the Western Ghats presents us with!



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The Himalayan Salamander *Tylototriton verrucosus*

# In search of the Himalayan Salamander

*We trekked down through the cloud-covered forests of Pine and Cryptomeria and climbed down the hill slope covered with tea bushes into Margaret Hope Tea Estate. Thick fog restricted our view to less than five metres and the morning mist on the ground made our shoes wet. We could only see a few tea bushes in front and part of the track going down the slope. Out of the fog, the indistinct figure of a Gorkha school girl came into view. I asked her in Hindi, if she knew about the pokhri (pond) in this tea garden. She nodded and pointed downwards. My companion Raj Bose asked her in Gorkhali, "Yiha Gora paincha?" (Are salamanders found there?) 'Gora' being the Gorkhali name for the Himalayan Salamander. To our utter surprise, she replied in English, "Yes, salamander is there" and trudged on her way up.*



Kaushik Deuti, a surveyor, looks for salamanders and frogs in the Darjeeling hills; for frogs in the Khasi Hills, North Bengal plains and Eastern Ghats. He is presently in-charge of the Amphibia Section at Zoological Survey of India, Kolkata.







Text: Kaushik Deuti

A few minutes later we reached the *pokhri*, which the tea garden manager had told us about. It was a small mountain lake inside the tea garden; the actual water surface being confined to a circular natural depression, bounded by steep inward facing terraces. The local Gram Panchayat has put up a notice board declaring the lake as protected and the efforts have paid off; the locals do not bathe or wash in this lake.

As we roamed around the bank and spotted our first salamander in the water, clouds covered-up the lake and it started drizzling. Soon a heavy downpour followed and we ran for cover under a tin shed. Drenched by the sudden cloudburst, we stood shivering under our meagre shelter, a gust of cold wind coming through the mountain gorge, adding to our discomfort. But the spectacle that unfolded then before our eyes, kept us perplexed.

Scores of salamanders came down the hill-slopes and entered the water of the lake. After breeding, as the males left the lake through the rain-water filled channels, the females stayed back to deposit 60-80 greenish-yellow eggs. These were just a centimetre in diameter and were deposited on the submerged blades of grass on the lake bed. Salamanders were crawling everywhere, on the grassy bank of the lake, in the channels which turned into torrents by the road-side, on the road itself, and some even

seemed to come towards us to take shelter under our tin shed!

Salamanders are one of the three orders of amphibians which retain the tail in the adult stage. There are 597 species living today that are divided into 9 families, and are mainly distributed in the temperate parts of Europe and North America. The Appalachian Mountains in the eastern United States has the maximum concentration of salamanders. There are a few species in Asia too, occurring in Japan, Russia, China and Central Asia. But, only one species, the Himalayan Salamander *Tylotriton verrucosus* of the Family Salamandridae is found in the Indian subcontinent. It occurs between the altitudes of 1,330-2,220 m in the Darjeeling district of West Bengal, Lohit district of Arunachal Pradesh, and Ukhrul and Senapati districts of Manipur. It also occurs in eastern Nepal, Bhutan, western China, Kakheh hills of Myanmar and Chiang Mai province of Thailand. It is a very unique and rare Urodelan amphibian which is threatened and protected under Schedule II Part II of the Indian Wildlife (Protection) Act, 1972.

It is a keystone species of the lentic habitats in the eastern Himalayas where it seems to be a bio-indicator of undisturbed standing water bodies. It inhabits the leaf-litter zone of cloud forests, meadows and pasturelands on the banks of cool mountain lakes and ponds, as well as temporary and permanent marshes, and pools inside tea estates. During their breeding season (May-August) they are found in temporary pools, shallow ditches and marshes which abound with submerged or emergent vegetation like *Polygonum*, *Cyperus*, and *Scirpus* spp.

Somewhat lizard-like in appearance, the salamander's body is cylindrical with four short stumpy limbs of equal size and a long tail like that of a crocodile. It is therefore, sometimes called a Crocodile Salamander. Just like frogs, there are four fingers on the forelimbs and five toes on the hindlimbs. However, the fingers and toes are



Eggs of Himalayan Salamander on a blade of grass





KAUSHIK DEUTTI

Mountain lakes like Namthing Pokhri are the last few breeding habitats of the Himalayan Salamander

without webs, nails or claws. Its head is triangular and flattened. Eyes are lateral and protruding. Males are 12-17 cm in total length weighing 15-25 gm, while females are bigger (15-19 cm) and heavier (21-40 gm). The laterally compressed tail is 8-9 cm long, but the tail is longer in males. Both sexes have a chocolate brown colour with pale orange on the lower lip, chin, throat, palm and sole of feet. But during the breeding season the skin of the males become brighter and smoother. The females have a distended belly and swollen cloaca (a cavity at the end of the digestive tract). In males, the cloacal slit becomes orange-coloured, while in females, the entire conical-shaped cloaca becomes deep orange.

Salamanders are secretive creatures, mostly seen during the rainy season from May-August, when these otherwise

terrestrial animals enter water to lay eggs at the edge of the pools. They swim slowly by the undulatory (wave-like) motion of their tail and crawl along the bottom of the pool with the help of their limbs, occasionally, coming up to the surface every 3-4 minutes to gulp air and dive down again. At night, they leave the water and move around actively on land in search of food and feed on certain species of earthworms, snails, slugs, aquatic insects like Dytiscid beetles, Hemipteran bugs, their larvae and pupae, nymphs of Odonata, tadpoles of Himalayan toad, eggs inside foam-nests and tadpoles of Himalayan tree frog.

Egg-laying occurs immediately in June-July either singly or in pairs on leaves and stems of submerged aquatic plants like *Polygonum*. Therefore, the occurrence of these plants in mountain lakes, ponds and pools are very essential

for continuing the life cycle of the Himalayan Salamander. The salamander larvae, also called tadpoles, are bottom-dwellers, but surface at night by taking support of these aquatic plants as they are weak-swimmers. They feed among various levels of aquatic vegetation and sink down, tail first. However, when frightened, they stir up mud becoming invisible to their potential predators. They feed on diatoms and zooplankton. Larger tadpoles hunt blood worms and mosquito larvae in the water and soil worms from the bottom of pools. Cannibalism occurs in salamander larvae if there is a shortage of food. Water beetles, water bugs and Odonate larvae predate on salamander tadpoles. In a strange quirk of nature these tadpoles, if they can escape these aquatic predators and move on to land, they will return to the water some day to feed on the very same insects which



predated upon them while they were tadpoles. This is how Mother Nature maintains her “ecological balance” in a Himalayan rock-pool, with the Himalayan Salamander as the “keystone species”. The larvae hatched in June-July pass through five stages to metamorphose by September. Then they move onto land to hibernate inside mud burrows and under fallen logs and leaf litter becoming sluggish and inactive when the temperature drops to  $-5^{\circ}\text{C}$  in January, and pass the time in a torpid state. They emerge from their hibernating dens with the first rains. They leave their hibernating places at night and move about actively; wandering far and wide to enter a suitable water body, where the adults mate, lay eggs and continue their life cycle. Therefore, lentic water bodies are extremely important for the completion of the life cycle of the Himalayan Salamander.

However, man with his short-sightedness and never-ending penchant for “development” is now disrupting this simple balance of nature, by rapidly modifying the lentic habitats in the Himalayas, which are being drained for housing and agriculture. As a result, many breeding pools have dried up and the eggs and larvae of the salamander are stranded and desiccated during the breeding season. Smaller water bodies that are still left, are used as garbage dumps and public urinals, thus totally destroying them as breeding sites for salamanders. Today, due to the ever increasing human population accelerated by the burgeoning tea and tourism industry, all flat lands in the Darjeeling hills are being used for housing and building tourist complexes. The slopes are being converted to huge tea estates. Deforestation is so rapid in the hills that the cloud forests with their associated moist leaf litter, so vital to the year-long survival of the salamanders, are vanishing at a rapid



KAUSHIK DEJTI

A pair of courting adult Himalayan Salamanders

rate. Such rapid deforestation is resulting in siltation of the water bodies. Developmental projects like road-construction through pristine habitats are also taking a heavy toll on the population of salamanders as they are very sensitive to such alternation in their habitat. Water pollution by domestic sewage, detergents used for washing clothes and pesticides from surface run-off from tea gardens kills adults, eggs and larvae. Adults that survive have visible tumors on their skin. Introduction of carps and cultured exotic fish which are potential predators of eggs and larvae, are taking heavy toll on the already dwindling population. Exploitation for folk-medicine and over-collection by academic institutions

are other reasons for their population decline.

The future of the Himalayan Salamanders which are finding no proper water bodies to breed in the Darjeeling hills seems to be quite grim. Salamanders symbolize the health of the cloud forests and water sources that they give rise to in the Darjeeling Himalayas. The disappearing Himalayan Salamander is only a warning of the acute water shortage that the towns and villages in the Darjeeling hills are likely to face in future! Digging a few small pools in forested, and uninhabited areas and fencing the existing water bodies might help for now, but will this be enough to protect the last few salamanders in our country?



KEDAR BHIDE

Crocodilians are semi-aquatic reptiles

# Crocs/Alligators/ Caimans/Gharials?

*On our first launch ride in the Sundarbans, we saw a medium-sized estuarine crocodile on the bank. Our guide was describing it in detail, when one gentleman from the group told him that the reptile he was calling a crocodile was in fact an alligator. I was mildly surprised, but that was nothing compared to what I felt when the guide, with a know-it-all air, told them that alligators and crocodiles were one and the same!!*



Kedar Bhide is the founder & president of Reptile Rescue & Study Center (RRSC) and has been working on reptile conservation in Mumbai for the last 18 years. He also pursues his hobby in photography and reptile conservation in India.





Text: Kedar Bhide

All this would have passed without event, had I not tried to help by correcting both of them. That was when I was with an NGO camp group in Sundarbans, Jaldapara and Gurumara in West Bengal.

After this episode, on the way to Jaldapara, we visited a gharial breeding center, where *deja vu* struck, and the debate reared its head again. Yet again, I made the mistake of correcting both, the guide and the gentleman. I presume this to be the reason why I was made an outcast.

There is so much firm belief when it comes to crocodiles and alligators in our minds, due to random use of these terms that they are used commonly for anything that resembles these prehistoric reptiles.

Let's start with a more clear account of this amazing group of reptiles. Today, crocodilians

That is not to say that the body form is not ancient. And it plays a major role in the functional success of this aquatic predator, that ambushes prey in shallow water or near water. All modern crocodilians are semi-aquatic and spend much of their life in water although they bask regularly on the shore and construct terrestrial nests to lay their eggs.

All crocodilians are oviparous and fertilization is internal. Eggs are generally deposited in mounds of vegetation and other detritus near the shoreline or floating vegetation mats in shallow water. Females construct nests using the entire body to bulldoze available debris into a mound. If surface debris is inadequate, a female will dig a nest cavity in the ground. Parental care, as nest attendance is common.

Currently, there are only three taxonomic groups of crocodilians: Alligatoridae; which includes American and Chinese alligators, and the Caiman of Central and South America; Crocodylidae, which includes the Marsh and Estuarine crocodiles of India; Gavialidae, Gharials from central India.

It is good to remember that alligators and caimans are not found in India at all. So, in the true sense, you do not need to worry about the difference between them and crocodiles. But it is worth getting ourselves acquainted with them. As most experts say, it is all in

the snout. As a general rule, alligators have shorter, blunter and heavier heads ("U"-shaped) than crocodiles, which have long, tapered snouts ("V"-shaped) lined with sharp teeth. It is unlikely that you will go close enough to check but a crocodile can also be distinguished by its upper and lower teeth, which can be seen sticking out of its closed jaws. Alligators are less 'toothy-looking'.

The reason behind this is that a crocodile's lower and upper jaws are nearly of the same width so the teeth are exposed all along the jaw line in an interlocking pattern even when the jaws are shut. Their fourth, very large tooth on the lower jaw can be seen nicely accommodated by a depression in the upper jaw just behind the nose. The alligator's upper jaw, meanwhile, is wider than the lower — so when it closes its

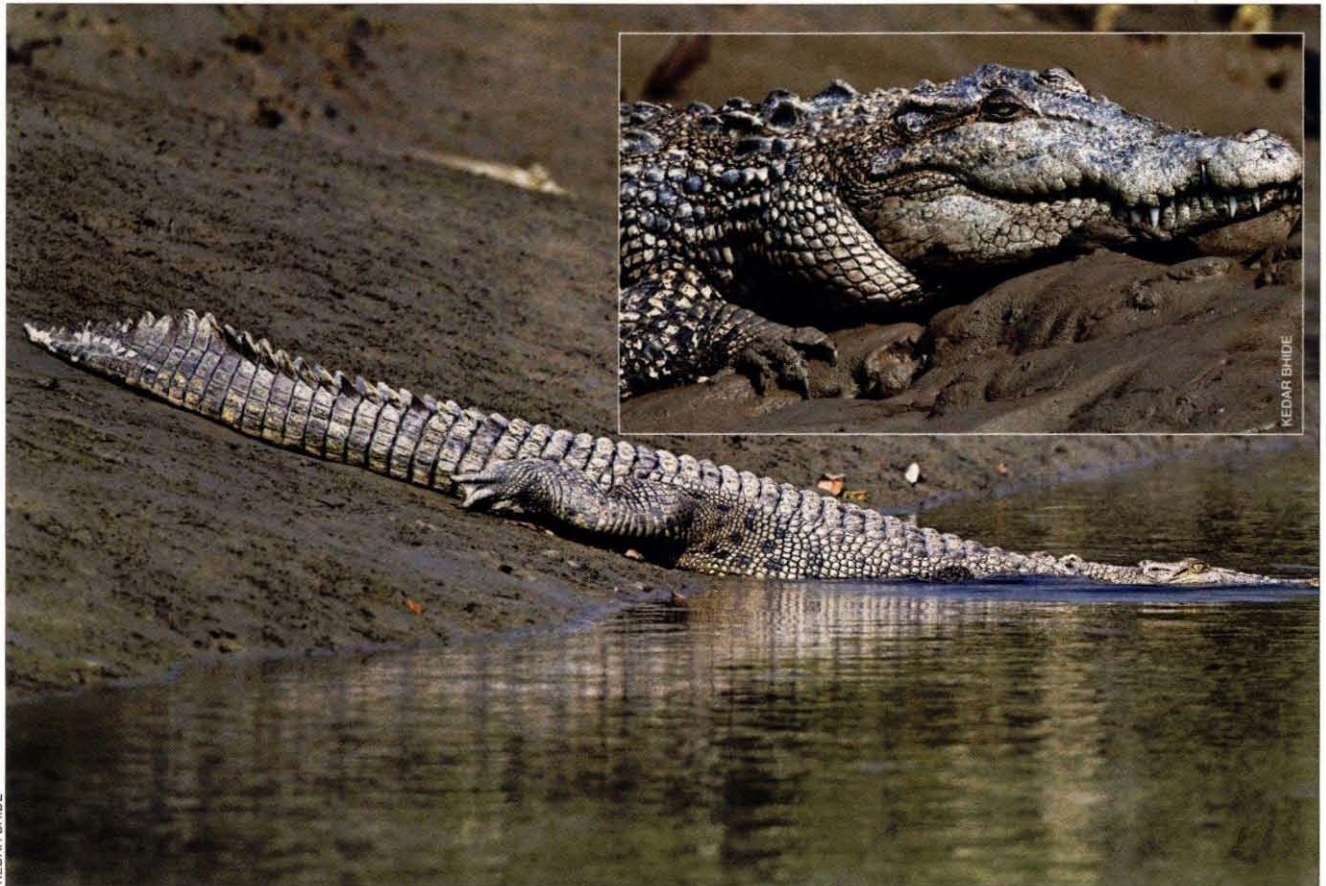


The 'sticking out' lower and upper jaws' teeth of Crocodiles distinguish it from Alligators

represent only a fraction of the species that lived since their origin in the late Triassic over 220 million years ago. All crocodilians share a similar elongated body with a robust skull, a long snout and strongly toothed jaws, a short neck, a cylindrical trunk extending into a thick, laterally compressed tail and short but well-developed limbs.

Bony plates (Osteoderms) covered with thick keratinous skin provide an armour-protection to the neck, trunk and tail. The name "living fossil" bestowed upon them can be attributed to this ancient body form of theirs. But this name does not befit these majestic predators, as there are other reptiles that are living fossils in the true sense of the term.





The largest present day reptiles found on Earth are the Estuarine Crocodiles, endangered due to loss of habitat and hunting

mouth, teeth of the lower jaw fit into sockets of the upper jaw, hidden from view. Only teeth from the upper jaw are visible along the lower jaw line. Even the large fourth tooth on the lower jaw is hidden in the alligator as opposed to crocodiles.

Speaking more commonly, body colour of the alligator is darker than that of crocodiles. Alligators are mostly blackish grey, while crocodiles are olive green. So, as you all can now correct your friends and others about 'crops' and 'gators', let us see what we have in India.

Throughout our water systems on land, rivers, streams, lakes, ponds and *jheels*, and even backwaters of our man-made dams, you can find marsh crocodiles, which are commonly called Muger. In some parts of India, their population has drastically depleted

due to loss of habitat, industrial pollution and other man-made problems. In some areas, there are reports of conflicts between local people and crocodiles as the water bodies frequented by these amazing reptiles are also shared by local population for many activities.

The second species of crocodile — found in only three locations across

#### Dermal Pressure Receptors (DPRs)

DPRs are small, black, sensory pits that help in detecting changes in the water pressure. Both in alligators and crocodiles, DPRs serve as an important organ for locating their prey. In alligators, DPRs are present only around the jaw, whereas in crocodiles, these sensory organs are present in nearly every scale of the body.

India — is the estuarine crocodile, commonly called as "Salties", short for "salt water crocodile". Once distributed from the west coast of Kerala to the eastern coast, up to the Sunderbans, they are now isolated in Sunderbans, Bhitarkanika and Andamans; and as their name suggests, inhabit saltwater environments, backwaters and estuaries. They are probably the largest present-day reptiles found on earth. They are more aquatic than marsh crocodiles and can be found far out in sea. These crocodiles are endangered due to loss of habitat and hunting.

The third species found in India and one of the most threatened reptile on earth, is the Gharial. Their distribution is now restricted to the Indus, Ganga, Brahmaputra and Mahanadi river systems. Another very small population can be found in the Irrawaddy and



The cartilaginous mass seen on the tip of the snout, which looks like an earthen pot, gives the 'Gharial' its name

Arakan river systems in Myanmar. These reptiles are unique in their snout structure, which is very long and narrow, and ends into a bulbous tip. In adult males, there is a large cartilaginous mass on the tip of the snouts, hence the name "Gharial" (*Ghara* is an earthen pot). Habitat loss, heavy industrial pollution and false fishing competition with local economy (fishermen think gharials eat all the fish) has resulted in Gharials losing the battle of survival.

#### Salt Gland

Both alligators and crocodiles have structurally modified salivary glands (salt glands) in the tongue. The crocodiles use these salt glands for excreting excess salt from the body, whereas in alligators, these salt glands are non-functional. This is the reason why a crocodile can tolerate saline water, whereas an alligator cannot.

In a country where conservation is still not a priority on the agenda of policy makers, and the lack of

resources limit most of the conservation programs, efforts are now being directed towards a dedicated conservation program for each species of these Indian crocodiles. It is going to be a real uphill task to find resources for these projects, as they do not have the support of the society in general, maybe due to lack of knowledge and information. Through this write-up, I am hoping that these efforts will get more participation from the decision makers, in the near future. 🐾

*After sleeping through a hundred million centuries we have finally opened our eyes on a sumptuous planet, sparkling with color, bountiful with life. Within decades we must close our eyes again. Isn't it a noble, an enlightened way of spending our brief time in the sun, to work at understanding the universe and how we have come to wake up in it? This is how I answer when I am asked—as I am surprisingly often—why I bother to get up in the mornings.*

— Richard Dawkins

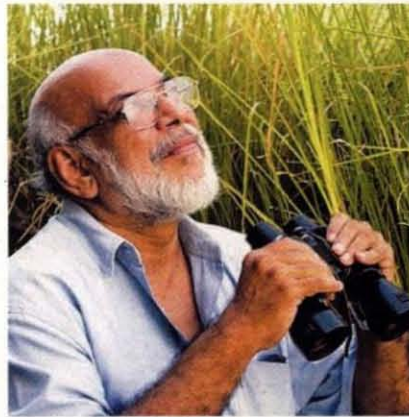




### Fond remembrance of S.A. Hussain

Departings are especially sad when the living element from the chord of mutual respect and empathy struck during the final encounter with another, is snapped by death. Long before nature conservation awareness 'workshops' became an annual fixture on the Army's training calendar, Mr. J.C. Daniel acceded to my request to organize slide-illustrated talks at Kota in 1987.

A firm hand shake and a fetching smile created the magic lending to fond acquaintanceship with Hussain Sahib. The workshop was launched with his talk on birds of the Indian Wetlands which became his forte. Subsequently, Sunjoy Monga followed, with his excellent slides of Borivali wilderness and the Karanji shrubs which flowers once every seven years. Meena Haribal spoke on Butterflies and Vibhu



Prakash on the nesting raptors of Bharatpur. Last but not least was the suave EC Member (a practicing architect) with his slides of the lakes of Bombay, the city source of drinking water.

Hussain Sahib remained in touch even from the wetlands International Asia-Pacific assignment. My last active

involvement with him on a conservation issue occurred in 1990-91. He wanted to (a) record the calls of the Narcondam Hornbill and (b) make a photo and sound recordings of the valiant but brief to and fro Eastwards flight which the birds attempt, presumably to reach mainland Myanmar! He assumed that being at the Eastern Command Head Quarters, I would be able to assist with the logistics from Port Blair onwards. It gave me great pleasure to do so but my regret is that, I never got to hear and see the results of Hussain Sahib's endeavour.

Hopefully we shall meet in Valhalla and catch up with the lost times.

Lt. Gen. Baljit Singh (Retd.)  
Chandigarh

### ABOUT THE POSTER

#### Andaman Emerald Gecko *Phelsuma andamanense*

A small, slender beauty, known to occur in the Andamans – the Andaman Emerald Gecko *Phelsuma andamanense* has a bright green coloured body.

The geckos belonging to the genus *Phelsuma*, have a very peculiar distribution; they occur only in oceanic islands and not in the mainland. Most Indian geckos are known to be nocturnal, but *Phelsuma andamanense* being an exception, is diurnal, i.e., active in the day-time. Another unique and interesting feature of day geckos is that, they do not have eyelids; but have rounded pupils and a clear, fixed plate covering their eyes, which they clean with their tongue.

It generally visits coconut and banana plantations to feed on the nectar and the insects attracted by its flowers. This species of geckos may possibly be pollinators.



Bombay Natural History Society wishes "Happy Bird Watching" to all birders attending the Bird Watcher's Conference from November 25-27, 2010, at Khijadiya, Jamnagar, Gujarat

Andaman Emerald Gecko  
*Phelsuma andamanense*




# Here today, Gone tomorrow

Text and Photographs: **Varad B. Giri**


Amphibians and reptiles are widely distributed across the Indian Subcontinent, but a majority of them are confined to the Western Ghats and North-east India. They are coldblooded animals (i.e., their body temperature is at the mercy of the atmospheric temperature), and thus require optimal ecological conditions and habitat. Some species have a wider array of habitats and are widely distributed, while others have unique habitat requirements, and are thus restricted to specific habitats. A slight alteration in the condition of the habitats/microhabitats, even over a long period of time, is detrimental for these ecologically sensitive animals. One often reads and hears of drastic declines of populations of several amphibians and reptiles globally, one of the main reasons being the loss of their habitats. What's new you may ask? Well...

While a variety of data for 'charismatic' animals are prolifically discussed and documented, not much study has been done on the herpetofauna of this Subcontinent. Now, with lack of data on habitat relationships of the animals in this group, can the statements in the para above be called mere speculation or the ultimate truth? Yes, we cannot deny that efforts need to be taken to conserve their habitats so that we do not lose these marvellous creatures. But we need more responsible and accurate answers to the questions asked; answers supported by scientific data that can prove, without doubt the relationship between a species and its habitat. The questions that may come to your mind, I am sure are many more than this space could accommodate.



▲ **Malabar Gliding Frog *Rhacophorus malabaricus***

An endemic of the Western Ghats, the Malabar Gliding Frog, seen resting during the day in this photograph, is a tree dwelling species that builds egg nests on trees overhanging rainwater pools and puddles. What will happen to their nests with the rainfall pattern changes?



**Indian Chameleon *Chameleo zeylanicus***

This lizard is widely distributed in a number of habitats, but is not commonly encountered. It is mostly a tree dwelling species and is rarely encountered on the ground. Does rampant deforestation threaten the survival of this species? ▶


**Spotted Gliding Lizard *Draco maculatus***

This lizard is evolved to glide in the air and to do so it needs some open space in forests with big trees. Will uncontrolled logging of big-sized trees in forests leave a safe landing spot for these lizards? ▼



▲ **Malabar Tree Toad *Pedostibes tuberculosus***

Unlike its 'relatives', which are strictly ground dwelling, this toad is a good climber using small bushes and trees along streams, but only in wet evergreen forests, for breeding. Changing climatic conditions may deteriorate their habitats; can these toads withstand this change?

A close-up photograph of the head of a Tawny Cat Snake. The snake's head is a vibrant orange color with a pattern of large, overlapping scales. Its eyes are large, round, and also orange, with vertical pupils. The snake is looking directly at the camera.

**Tawny Cat Snake *Boiga ochracea*** ▶

This beautiful snake prefers bushes and shrubs, and is reported from many places in the North-east and Andaman & Nicobar Islands in India. Is large scale habitat alteration in these areas creating problems for this species?

**Wrinkled Frog *Nyctibatrachus* sp.**

Frogs of the genus *Nyctibatrachus*, commonly called 'night' or 'wrinkled' frogs, are endemic to the Western Ghats and breed in forest streams. Is the changing rainfall pattern and climatic conditions affecting their breeding pattern? ▶





▲ **Olive Forest Snake *Rhabdops olivaceus***

This rare and endemic snake of the Western Ghats, mostly reported from the forest streams, is only known from five to six confirmed localities. Is blocking of such streams for minor irrigation projects, making survival difficult for these snakes?

**Deccan Banded Ground Gecko *Geckoella deccanensis***

This brightly coloured, but elusive, ground-dwelling gecko, endemic to the forests of northern Western Ghats dwells among leaf litter or under rocks and logs. What is the fate of such ground-dwelling reptiles, in case of forest fires? ▲



Male



**Daniel's Gegeneophis *Gegeneophis danieli***

A recently discovered burrowing amphibian, this species is only known from a few localities in the Western Ghats region of southern Maharashtra and Goa. Will this species survive the effects of changing land use patterns and agricultural practices in these areas? ▶



***Indirana* sp. tadpole**

Frogs of genus *Indirana* are endemic to the Western Ghats. Interestingly, unlike tadpoles of other species, they lay their eggs outside water and the tadpoles, which are equipped with suckers in their mouth, mostly adhere to exposed rock faces with little water where they metamorphose into froglets. If rocky outcrops are flattened, will this species adapt to the new environment or vanish? ▶



▲ **Pied-bellied Shieldtail *Melanophidium* sp.**

These snakes belong to the family of burrowing and little known snakes of the Western Ghats, Uropeltidae. Do the upcoming mining projects in these areas leave room for the existence of this poorly known species?

**Mugger *Crocodylus palustris***

This large and once common reptile inhabiting most river systems was struggling for existence a few years ago. Its population in captivity is higher than in the wild, and it is no longer slaughtered, but will it ever be able to share its space with humans, as it did in the past? ▼



Varad Giri is presently the Curator, at the Collections Department at BNHS.





# The Barta Chronicles

## CHAPTER ONE

Text: Ashok Captain

Photographs: A. Captain/ K. Bhide/ B. Bhatt/ The Nyishis

### Barta!

Leporiang village, Papum pare district, Arunachal Pradesh, India (regardless of chinese claims), 21st May, 2006.

**K**edar was stumped. He sat in the verandah of the P.W.D.I.B<sup>1</sup>, listening to varying descriptions of a snake the Nyishi called a *Barta*. Nothing he'd ever heard of matched this giant snake. It fitted no snake that he'd ever heard of. He'd been invited along as 'expert' herpetologist by a television crew who were there to film bamboo flowering (supposedly once every fifty years). Right now he felt like a flummoxed herpetologist.

The team had camped at Leporiang, where news had rapidly spread that there was an 'Animal Planet' T.V. crew. News that they were there in search of the legendary *Barta* rapidly spread, and a steady stream of self-proclaimed *Barta* experts converged on the I. B. to offer sage words of advice, warnings and the like. Most agreed that along with the explosion of rats (that appeared to eat the bamboo seeds) came a giant snake called the *Barta* (presumably to eat the rats). This sounded plausible, even probable. They went on to elaborate that if a person got bitten by a *Barta*, the area around the bite turned black and the victim died. Times claimed till death, were hotly debated, from 'instantly' to '2 hours' at best. Grim pickings indeed. This was K's first trip to the Big A and his adrenalin levels certainly weren't being helped by this kind of talk.

To sooth his nerves, K found a black Monocellate cobra *Naja kaouthia* and a beautifully coloured orange, yellow and turquoise blue legless lizard *Ophisaurus gracilis*. Both were duly filmed. Days passed by without any *Bartas*. The T.V. crew's collective patience was wearing thin. To make matters worse, the bamboo steadfastly refused to flower. Rumblings of dissent were heard – the main crew would head for Mizoram (where the bamboo was supposedly flowering). However our hero K, was made of sterner stuff. Undeterred, he chatted with the Nyishi villagers over endless cups of green tea. (His wife would've approved



Ashok Captain photodocuments Indian creepy-crawlies, has co-authored 2 books on snakes, writes papers on ophidian taxonomy, rides a bike, hates getting wet, but has fun working in rain forests. Claims, his bad attitude is good for taxonomy and that taxonomists shall inherit the earth.

<sup>1</sup> Public Works Department Inspection Bungalow (quite a mouthful)





the low-cal approach). “Sorry, I don’t know any Bollywood stars. Any idea where I might find a *Barta*?” Pause to sip tea. Finally the tea ceremonies paid off. Someone knew someone who claimed there was evidence of a *Barta* in Ranchi, the next village. K arm twisted Nabang, the young Nyishi ‘fixer’ employed by the T. V. crew, to take him to Ranchi. ‘*Tera picture T. V. pe ayega aur sab ladki log aapko dekhenge*’ (You’ll be on T. V. and all the girls will see you). The allure of the small screen was apparent even in darkest Arunachal. In Ranchi village, which was all of 6 huts, K was taken to an old man’s hut. Nabang and the gent launched into an animated conversation in Nyishi, which finally resulted in the unrolling of an old, smoke-blackened skin. When spread, it was nearly seven feet long! This was without the head and tail, which were missing. The *Barta* was a whopper and suddenly it didn’t seem like fiction anymore.

K wondered if it were a King cobra *Ophiophagus hannah*. When shown a picture of a ‘King’, the old man shook his head emphatically and made a triangle with both forefingers and thumbs. No translation was necessary! Could the *Barta* be a seven foot viper? Impossible! K recalled our conversation in the hallowed specimen rooms of the BNHS before he’d left Mumbai, “Anything is possible in Arunachal.” K smiled and this prompted the old man to bring out two enormous fangs, each nearly 2 inches long. They were modified for folding. Incredible! If the fangs and skin actually belonged to the same snake, the *Barta* was a giant viper. K pulled a field guide out of three layers of plastic (all plastic is not necessarily bad) and handed it to his host. The old gent carefully thumbed through the pictures and shook his head. K tried to control his excitement and failed. Could the *Barta* be new to science? Arunachal magic! After getting permission, he photographed the skin and fangs. K walked back to Leporiang determined to find at least one *Barta*. It had been impossible to count scales on the smoke-blackened skin. (One of the aids taxonomists use to identify snakes is scalation data).

K played his media trump card yet again and coerced Nabang to guide the entire crew to a village that everyone unanimously agreed was teeming with *Bartas*. Unfortunately

the walk was entirely uphill. The expedition collapsed muddy and bloody (courtesy – Arunachal leeches) in Sango basti. Warm fire and green tea quelled an impending mutiny. However no bamboos were flowering, and even more disappointing for K, no *Bartas* were forthcoming. A few days later most of the T. V. crew left for Mizoram, leaving behind an apprentice cameraman, K and an ultimatum. He had just two days to come up ‘wid-da-goodz’. K spent most of his time in the forest searching for elusive *Bartas*, but as every non-T. V. snake hunter knows, there’s never a snake around, when you actually need one! K realized he needed local help - lots of it. Nabang was summoned and worked upon. K gained an audience with Hanya, one of the *Gaon Boodas* (village headmen). N obviously convinced H of the importance of finding at least one *Barta*, because K was led to Nyipo’s home. N had the keenest eyes in Sango. If he couldn’t find a *Barta*, there wasn’t one to be found. N listened and simply nodded.

The next morning dawned with a bleak, dark sky. K donned his leech guards and went out *Barta* hunting. He feared in his heart of hearts that he’d find zilch. He was right. Four hours later, he staggered back to Sango, the prospect of steaming hot tea being the only bright spot on the horizon. He’d sat down by the fire after de-leeching himself and barely managed a sip when he heard some children shouting excitedly. At the time K understood a single word of Nyishi, but it was enough. *Barta!* Galvanized, he leapt to his feet, stopping only to grab his sac full of snake gear and ran. The children led him to a corner of the village where a steep track led into the forest below. It seemed that the whole of Sango Basti (all 43 of them) had turned out to witness the impending debacle. Later, K recounted snapshot images etched for eternity in his memory, “Everyone was shouting... I’ll never forget Nyipo walking up the path carrying a long bamboo with a snake tied to it... He never looked anywhere except at the *Barta*.” K had no idea what it was, only that it was a *Barta*. N put the snake-bamboo down and retreated to watch the proceedings from a safe distance. K instantly assessed the situation and moved in, snake hook in hand. Instinct, honed by years of snake encounters took over. Calmly he pinned down



its huge head and caught it firmly, but gently. Having gained control of the business end, he carefully cut away the restraining cane noose. The crowd gave a collective gasp, which K never heard. His entire concentration was focused on the *Barta*. Once he had the head and tail clear off the bamboo, he lifted the snake and moved it to a clearer area and asked everyone to move back before 'throwing' the viper to the ground.

(I digress here in the hope that this may prevent at least one reader from getting bitten. There are far too many cases/ instances where snakes on being released have turned and bitten the hand that held them. It is best to avoid handling wild animals as far as possible. However, during rescues from confined places, or other unavoidable circumstances, it is sometimes necessary to catch the perpetrator. When one releases a venomous snake that has been 'head-caught', it is safest to make a controlled, quick 'throw' after checking to make sure that the tail and/ or body is not coiled around one's body/ arm. For the benefit of animal rights activists, one hastens to add that the 'throw' is executed a few inches from the ground and is in no way akin to lobbing a cricket ball. Enough said. Back to K and the *Barta*.)

He looked at the snake with pure exhilaration. In his entire life K had never seen a snake with such beautiful markings. Once his eyes got past the exquisite colour pattern, his brain registered that it was a pit viper. He was unable to even hazard a guess as to its identity. By now the skeleton T.V. crew (of one) had arrived and wanted K to "do it again for the camera". He didn't oblige. What he did however, was to get the snake into an acrylic tube so he could safely count its scales. As K recorded the necessary data his brain was processing several trains of thought in parallel – 'Midbody scales 23 hmm/ where's the head/ don't get chomped/ I have no idea what this snake is.' The 'going-ons' were duly filmed by the assistant camera man.

Real life (in stark contrast to reel life) taxonomy often boils down to "I dunno!" Annoyingly, the mysterious *Barta* resisted K's best attempts at identification. The number of midbody scale rows tipped the i.d. in favor of *Protobothrops jerdonii* Jerdon's Pit Viper, but the rest of the scalation data and the description matched that of *P. kaulbacki* Kaulback's Pit Viper. The Nyishi also insisted that it laid eggs, which was a characteristic of Kaulback's Pit Viper; Jerdon's Pit Viper gave birth to live young. After nearly an hour, K was still undecided as to whether the *Barta* was *P. jerdonii*, *P. kaulbacki*, something 'Chinese' (i.e. a species found in China, but not previously known from India), or something entirely new to science. Later that night, K's thoughts wandered as he mulled over Smith's keys<sup>2</sup> in the beam of his head torch. "Certainly a pit viper"... 'cos the snake has loreal pits<sup>3</sup> and hinged fangs; genus *Trimeresurus* or close to it... upper surface of head covered with small scales. He could get no further and fell into a deep sleep. Maybe in the cold light of the morning...

Next morning K still hadn't a clue as to the identity of the snake. He went through descriptions of each pit viper in Smith, resisting the temptation to 'force-fit' the *Barta* into a taxon.

Back in Mumbai, we met at the BNHS. The conversation was pure taxonomese. "I feel it's *kaulbacki*." "But midbody scales point to *jerdonii*." "Maybe I counted wrong." "Or maybe there was scale row reduction just where you counted." "I gotta know what it is. The TV crew needs a name." "And if we identified it, we have one more species for the next edition<sup>4</sup>."

A lunch of almost certainly carcinogenic triple-fried rice (wild exaggeration) from an Udipi canteen opposite the BNHS helped us formulate an action plan. We had to go back and find some more *Bartas*! We were hoping we could identify K's mystery snake without the need to collect<sup>5</sup> a specimen. However there was no avoiding the fact that we might need to collect at least one.

<sup>2</sup> Malcolm A. Smith wrote 'The Fauna of British India, Ceylon and Burma, including the whole of the Indo-Chinese sub-region' in 1943. Even today, most of us still use the keys in this book to identify snakes in the region.

<sup>3</sup> Heat sensitive pits between the eye and nares ('nose holes'). This area is called the loreal region.

<sup>4</sup> Snakes of India The Field Guide - Whitaker, R. and Captain, A.

<sup>5</sup> Euphemism for euthanize (kill) and preserve. Most (Linnean) taxonomy is still based on specimens in collections. This is not a forum for debating the issue/ ethics of collection, but a story of how another species was added to the checklist of Indian snakes. We are strongly against mindless collecting (a bloodbath), but will collect with the necessary permits if the need arises. The collected herp is deposited in a responsible collection - the only one in India at present is the BNHS.



## CHAPTER TWO

**You'll never leave these mountains alive!**

Kedar was a determined man and used his frequent flier miles to get me to Guwahati. We met at the airport (he was already there) and I was whisked away to Arunachal. K had spoken to Asit Biswas of 'Help Tourism', whom along with his Arunachali counterpart Duyu Tomo, instantly offered to arrange logistics of the entire 'Search for the *Barta*' expedition, just because they believed in our work. This meant we were free to concentrate entirely on fieldwork rather than get bogged down by bureaucratic and administrative details. Inner line permits had been arranged, rations bought and we were ready to leave. The trip had been remarkably smooth so far.

Next morning we met Duyu, Shishir and Nabang, all of whom who were to prove invaluable in our search for the *Barta*. Rations were bought, diesel filled, and we contacted an old friend and colleague at the State Forest Research Institute - Dr. Bharat B. Bhatt (B.B.B.) who instantly agreed to join us on the expedition. In order to do this without risking any chance of his application being refused, he took leave rather than try and convince his office to sanction a hunt for a mythical snake, which probably didn't exist.

We left for Leporiang, which at 130 km away from Itanagar was fairly close by Arunachal standards. Fairly close, it may have been, but it took us an entire day to reach our destination as parts of the road had been buried in a mud slide and needed reformatting by excavators. We camped at the P.W.D.I.B. (inattentive readers please refer to footnote 1).

News that the *Barta* hunters were back spread and we were informed of "two large black snakes on nests close by". A local resident offered to take us to the site. Both K and I simultaneously shook our heads and went, "Nah!" and burst out laughing. It's every snake enthusiast's dream to find a wild

'King' (actually/ to be more precise, a Queen) Cobra at a nest, and here we were turning down an offer to be led to not one, but two such nests. "Maybe on the way back..." "If we have time...!" "Gotta tell Rom..." "Ha, ha, ha". Shishir conjured up a breakfast of cornflakes, porridge/ oats (I kid not), toast, eggs, jam, and marmalade. This was quite an incredible feat in the land of rice. Looked like it was going to be a rough trip. Well nourished, we shouldered our loads, as did the team of young lads who'd agreed to help ferry our supplies up to Sango. As we set forth, an old lady looked at us, wagged her finger and somberly proclaimed, "You'll never leave these mountains alive!" Yikes!

We heard her and resolved to be super-duper-triple-extra careful. On the trudge up to Sango, K stopped to photograph some insects and flowers. Our walk-ability was aided by performance enhancing high-tech carbon fiber trekking poles. Clumsy jungle walkers tip - use two poles, never mind if one looks like a wuzz. This slightly reduces the likelihood of impromptu mud baths. Our trek started off in bright sunny weather. About an hour from Sango, the sky turned black and the heavens opened up - a scene straight out of an Asterix comic. We plodded on resolutely, somewhat shielded from the wind and rain by our low-tech breathable fabric indigenous rain shelters (non-folding umbrellas). Though 'brollies are extremely effective in most jungle/ field conditions, in high wind situations they are utterly useless.

We took refuge in a house on stilts, which the owners had left open. Our reluctance to enter someone's house while they were away was pooh-poohed by one of the Nyishi lads who rationalized, "Its raining outside, dry inside." His brand of field logic appealed to the bedraggled *Barta* hunters (us). A fire was lit, and after waiting out the storm went to the



Gaon Booda's house. He was delighted to see K again. No outsider who said they'd return to Sango, ever had. Besides which, K had brought along the photographs that he'd taken of the villagers on the last trip, as promised. Over tea (yup, green) K explained we'd come back to find another *Barta* as we needed to count its scales and photograph it. Hanya looked at us as if we were stark, raving nuts. Nabang had sent word in advance that we were coming, and two *Barta* 'nests' (egg sites) had been found and reluctantly left undisturbed<sup>6</sup>.

The Nyishi maintain that the female stays close to the eggs till shortly before they hatch. Smith confirms this observation. K was under pressure to come up with the identity of the *Barta*. The clip of the snake that was to be used on television in 'When the Bamboo Flowers' would be far more meaningful if the snake had a name, or better yet, was new to science!

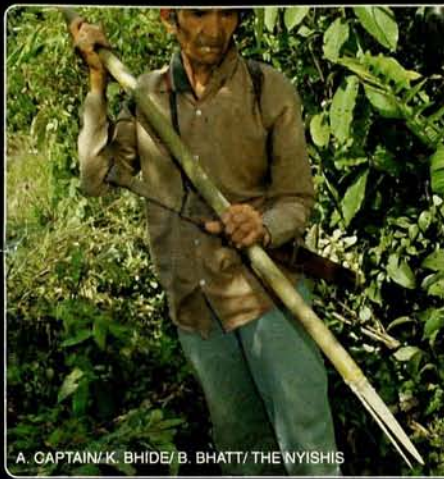
Next morning, Hanya decided that it was far too dangerous for us urban hicks to go after *Bartas* alone and deputed an armed escort (with himself in the lead) to ensure our safety. We posed for a photograph outside his house with the entire village and a banner that Shishir had carried. I was used to solo trips with the Lisus in eastern Arunachal and this felt like an expedition in the days of the British Empire. After being recorded for posterity\* we left Sango. (\*Remember the old woman's warning?)

A steep path led downhill into the forest. All along we were regaled with *Barta* lore. "Last year thirteen *Bartas* were killed in this field." "A *Barta* bit a woman here. She died." After some slippery downhill sections we were made to stop near a huge fallen tree. Our guardian cum guides approached the fallen tree very, very carefully. Each had either a drawn dao (machete), or a special three-pronged bamboo trident at the ready. Their approach was textbook – step, stop, scan visually, scan again and then step forward carefully. Finally,

Nyipo sniffed the air and said, "The mother was lucky and just left. The eggs are still here" (translation courtesy - Nabang). Lots of shrubbery was cleared before K was allowed to get close enough to photograph the eggs. Gunmen guarded him lest the *Barta* return. After some discussion, we were left with Nabang to 'look around' while four very earnest Nyishi hunters went off on the real search. We began searching the overgrown areas around the egg-site very carefully. Several leeches that evidenced an unhealthy interest in the proceedings were terminated without extreme prejudice. No *Bartas*. K found some butterflies to photograph. While he was photographing them, some mysterious insects bit the back of his hands and caused them to swell alarmingly. Suddenly we heard shouts in the distance. *Barta!* Everyone was galvanized. We attempted to follow the man from Sango. There was no path as he ran downhill. We slid after him. I had a trekking pole in one hand and a snake stick in the other. The Nyishi hunters had fanned out at the base of an enormous tree with buttress roots. The tree was on a very steep gradient. I approached the prop roots at the base of the tree. In a deep hollow, lay coiled a snake with its head aimed outwards, poised to strike. Just behind it was a dark hole that disappeared into the earth. If the snake got into it.... No! I gestured to the Nyishi that I was going to try and scoop it out of the hole and that they should move back. Flying *Bartas* were more dangerous than terrestrial ones.

Slowly, very slowly, I moved the snake hook past the *Barta*, till it blocked the hole behind the snake. I'd probably stopped breathing and was willing the snake to remain still. I moved the hook behind the coils and suddenly scooped the *Barta* out of the tree hollow. As it flew out, someone shouted. I grabbed at its tail as it shot past. Luck was with me and I got its tail. While holding its tail, I let it 'go', snake hook at the ready (in case it turned towards me). It didn't. Instead it attempted to escape. Once the business end was 'locked' by some obliging undergrowth, I contemplated my next move while keeping

<sup>6</sup> When a *Barta* egg-site is found, the eggs are destroyed. This, the Nyishi reason, keeps a check on the population. Getting bitten is a very real (and almost always fatal) prospect for the Nyishi of Sango. There is no *Barta* antivenom. Urban wildlifers may well find this appalling, but then they don't live in Sango. We were there to try and identify the *Barta* and not to pass judgement.



A. CAPTAIN/K. BHIDE/ B. BHATT/ THE NYISHIS



KEDAR BHIDE

my attention on its head. Peripheral vision picked out a clear spot. I told the Nyishi that I was going to move it, hoping at least one of them understood Hindi. As the *Barta* was lifted clear, Nyipo was ready with his bamboo trident. By now I'd pinned the head and was yelling, "No! No! No!" We needed the *Barta* alive and unharmed. Nyipo understood, and in a flash of his dao, converted the trident into a 'bident' that he used to help further immobilize the snake.

I caught the *Barta* by its head, got the tail in my other hand, lifted it clear off the ground and reassessed the entire situation. Head secure, mouth shut, body clear of obstruction.... Trying to relax I yelled for K who appeared a few moments later. We'd rehearsed the bagging protocol several times. It was imperative that no one got bitten. K held the snake bag (pre-clipped to a degutted badminton racket) at arms length. After re-confirming that K was ready, I threw it into the bag. Instantly K twisted the racket and laid the bag on the ground. I placed the snake stick over the neck of the bag and K twisted it several times after checking there was no snake beyond the snake stick. The neck of the bag was bent back in a 'U' and tightly tied.

This bag was placed in another bag that was similarly tied. This double bag was put in a plastic bucket with a lid that was securely taped shut. The gift-wrapped *Barta* was handed to Hanya. It was the first time in Nyishi history that a *Barta* had been captured alive. Shishir had us pose for another photograph with the banner. We went down to the river and ate lunch with our friends from Sango. They ate our lunch and we ate theirs. K wanted to remove the *Barta* and photograph it on a rock midstream. His artistic endeavors were flatly vetoed by all of us. We couldn't risk it escaping; we still didn't know its identity.

As we climbed back to Sango, the skies turned black and the heavens opened up (again), this time accompanied by deafeningly loud claps of thunder. Later, we found out that back at the village they thought we'd found a *Barta*, it had bitten one of us, he'd died and the storm was an ill omen. We were more than happy to prove them wrong. Word

had traveled ahead that we'd caught a live *Barta*. Soon after we arrived, the sun shone brightly, we were able to count the scales and photograph the *Barta*.

As we left Sango, all of us thanked our hosts. A few months ago, K knew a single word of Nyishi - *Barta*. Now he knows another - *Paya-ling-cho* (thank you).

We stopped briefly in Itanagar on our way home, where much to K's amusement I booby-trapped our room with climbing ropes to prevent anyone from stealing our camera data cards.

Scalation data indicated that the *Barta* was not a new species, but was Kaulback's Pit Viper *Protobothrops* (previously *Trimeresurus*) *kaulbacki*. Our provisional identification was confirmed by Andreas Gumprecht and Frank Tillack, our German colleagues who compared our data and images with the type specimen.

### Epilogue

#### *What's new under the sun?*

1. A road has been cut, either all the way/ almost all the way to Sango from Leporiang.
2. *Barta* nests are still destroyed whenever they are found.
3. Villagers still get bitten and die.
4. There have been *Barta* sightings in other parts of Arunachal.
5. Another expedition (along with Varad Giri of the BNHS) failed to turn up any *Bartas*.
6. Yeah, we went and saw both King Cobra nests. K even photographed a momma on one of the nests.
7. Nabang got famous and at least one gal knows of him.

Has anything changed for the people of Sango or the *Barta*? Not much, I think, except we now know its identity and have added a tiny piece of hiss-tory to India's biodiversity.



S.P. VIJAYKUMAR

## Mysteries of a Scaly Kind: Skinks of India



Aniruddha Datta Roy is a Ph.D. student at Centre for Ecological Sciences.

His interests lie in reptile systematics and biogeography with his Ph.D. work on the phylogeny of skinks of India.

*In spite of being one of the most commonly seen lizards in India, it is quite unfair that hardly any attention has been paid to these 'snake-like' lizards. However, the sheer diversity of form and characters, as well as the fascinating evolutionary origins of this family of lizards, have long intrigued scientists and naturalists.*





Text: Aniruddha Datta Roy

It is, therefore, definitely surprising that hardly any attempts have been made to study one of the most beautiful and mysterious groups of the lizards, the skink.

Skinks are very small ground-dwelling lizards, that can be recognized by their glossy scales, enlarged symmetrical shields on the head, a broad flat tongue and movable eyelids, except *Ablepharus* found in North-western India – prominent features of these lizards. Their small limbs and elongated body gives the appearance of snakes. It is this snake-like body, a pivotal character, which has been studied in some detail in skinks of the African and Australian region.

Some studies suggest that skinks originated in the super continent Gondwana land around 200 million years ago, and during the course of the break-up of the super continent, they were carried over to different parts of the world.

Even though skinks are one of the most ancient squamates that we find all over the world, they are poorly studied and many questions related to their taxonomy, distribution, ecology and evolution remain unanswered. In India especially, there has almost been no work done on skinks, even though there is a large diversity of skinks spread throughout the country. India boasts of around 63 species of skinks, of the 1,300 globally known species, found almost all over from sandy coastal beaches to evergreen forests and up to over 3,000 m in the Himalayas. Talk about diversity! With such large numbers of herpetology enthusiasts in the country, it would be just a matter of time, that many more species may be discovered, if the study of these lizards is taken up seriously.

But, what are Skinks? These little known lizards are members of the family Scincidae. Skinks are largely terrestrial, with some skinks like *Dasia* having arboreal tendencies. There are also some burrowing skinks that are known to 'swim' under soft soil or sand and spend most of their time just below the surface of sand. Some skinks like those belonging to the genus *Tropidophorus* are aquatic and live in the

vicinity of water and on the slightest disturbance jump right into it! In some burrowing forms, the limbs may be reduced to a stub or completely absent. Skinks are generally fast, alert, agile and diurnal, i.e., active during the day. They do not possess a pronounced neck, except for a few genera or species.

While the skinks belonging to genus *Eutropis* possess very well-developed limbs with five toes, the genera *Ophiomorus*, *Barkudia* and *Sepsophis* have either a reduction in the number of toes, or limbs, or a complete absence of limbs. How and why did these characters evolve? The reduced limbs (or the complete lack of it) make their movement at times resemble that of a snake. This is probably why some individuals are scared of these harmless creatures and they are killed on the basis of the incorrect notion that they are venomous. In fact, the translation of its local name *Sapachi maushi* is 'snake's aunt'!

Skinks are generally carnivorous; they eat insects and sometimes even other smaller lizards. There are vegetarian skinks too, not found in India though! They are also cannibalistic, eating young ones of their own species. These lizards are largely diurnal, but on occasion can also be seen foraging at night. One of the few truly nocturnal skinks is the burrowing desert genus, *Ophiomorus*. Being reptiles and hence cold blooded, skinks are much slower at night when their bodies become cooler. Early in the mornings they can be seen basking in patches of sunlight in the forest. They prefer areas that receive direct sun, such as forest edges or open patches inside the forest, where they can be seen actively foraging. Most skinks are oviparous (laying eggs), but some are ovoviviparous (hatching eggs internally and giving birth to live offspring), and even viviparous (direct development and giving birth to live offspring). The main predators of skinks are snakes and birds. These lizards generally have long tails that can be shed just like in geckos in order to confuse their predators. Their tails regenerate later.



VARAD B. GIRI





They are largely terrestrial, with some skinks like *Dasia* having arboreal tendencies. There are also some burrowing skinks that are known to 'swim' under soft soil or sand, and spend most of their time just below the surface of sand. Unlike the well-known house geckos and some other lizards,

skinks do not possess the ability to vocalize. Most often, the only way to locate them in the forest is to hear the rustling of leaves when they are disturbed, moving in response to your approach. Some skinks (like genus *Tropidophorus*) are aquatic and live in the vicinity of water and on the slightest

disturbance jump right into it! Most other skinks are generally found living in burrows in the ground, crevices, under rocks and boulders, and leaf litter.

With such rich diversity of skinks in India, it is imperative that we study these lizards in more detail and not restrict the studies to mere checklists.

With a hope that budding herpetologists take more interest in the ecology and evolution of these reptiles, here are some of the more interesting skink genera found in India.

### *Kaestlea*



*Kaestlea* are endemic to the Western Ghats. This genus is composed of five species, most of which are found south of the Palghat gap, in the Western Ghats. All the species of this genus have shiny, long, tapering blue tails. Nobody is sure as to what the

ecological significance of such a colourful tail is, as it may attract predators. One possible reason may be that, once the predator is distracted by the tail colour, it breaks it off and escapes, while the predator's attention is still directed towards the twitching blue tail.

### *Ophiomorus*

In the evening, if you happen to walk on the sand dunes in Rajasthan, it is quite possible that you might see a sinusoidal continuous track on the sand, which may



end at the base of a bush. If you start digging at the end of the track or around the roots of the bush, you might find a beautiful snake-like skink, locally called '*doodh gilabari*', with a very elongated body and highly reduced limbs. *Ophiomorus* are nocturnal and move just below the surface of sand. They use their limbs to push through sand, in a manner that resembles swimming in water, which leaves behind the characteristic sinusoidal track on the surface of the sand.

### *Dasia*



*Dasia* are one of the few skinks that are arboreal. They are known to have remnants of adhesive pads, and use claws to climb. This genus contains eight species, spread across South and Southeast Asia. As of now, only two species of *Dasia* are found in mainland India, and two species in the Nicobar Islands, with many more in Southeast Asia. These skinks are found in tropical forests and even along beaches on the crowns of the coconut trees at a height of around 3-5 m. They feed on insects found in the canopy and rarely come down to the ground.

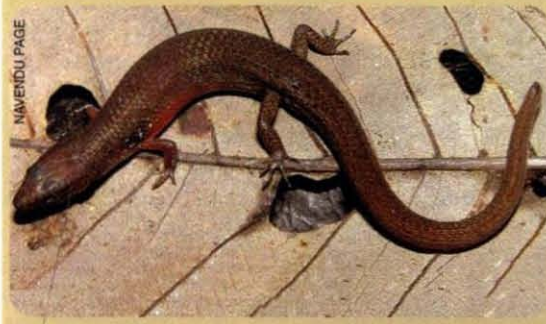
### *Tropidophorus*

*Tropidophorus*, also called the aquatic skink is a fascinating lizard. Found in the vicinity of water (streams) they jump right into water, unlike any other skink, when disturbed! *Tropidophorus* includes many species, most of which are found in the Southeast Asian region. In India, there is a single species, *Tropidophorus assamensis*, found in the North-eastern region of India.





### *Ristella*



*Ristella* is one of two endemic skink genera of the Western Ghats. It includes four species which are found in the wet regions on the western slopes of the Western Ghats. They can be seen quite frequently on the forest floor where there is a considerable amount of leaf litter, and are often seen near streams. These skinks are unique as they possess retractable claws which resemble that of a cat, giving them their common name – cat skinks. Unlike cats, which can actually retract the claws into the foot voluntarily, *Ristella* possess a sheath of scale, or an extra scale which covers their claw at the end of the toe. They can voluntarily retract this sheath of scale. It is unclear why they possess such an ability and for what they may use it. Even though these skinks are abundant in some areas of the Western Ghats, they have not been studied in detail.

### *Eutropis*



*Eutropis* is one of the more widespread genera found in India, with *Eutropis carinata* and *Eutropis macularia* being the most common species, found almost all over India. They have a relatively broad dorsum and well-developed limbs, and are terrestrial, but on occasions can be seen hiding in tree holes or under the barks of large trees close to the ground.

### *Lygosoma*

*Lygosoma* is one of the more widespread genera among the Indian skinks. One of the species, *Lygosoma punctata* is common almost all over India. All the members of this genus have an elongated body with reduced limbs. There are a few endemic species of this genus in the Western Ghats as well as the Eastern Ghats.



### *Sepsophis* and *Barkudia*

One of the most enigmatic Indian skinks is *Sepsophis*. This genus is endemic to the Eastern Ghats with a single species, *S. punctatus* (image alongside), and is especially unique because of the complete reduction of limbs. The limbs in this genus are either vestigial or are absent, so are not used in locomotion. These skinks primarily live in burrows and can be found under rocks. They can be mistaken for snakes or Dibamids (another family of limbless lizards) found in the north-eastern region of India. *Sepsophis* was rediscovered recently in Orissa by Prof. S.K. Dutta and his group; the only earlier report of this skink was from Andhra Pradesh about 100 years ago.

*Barkudia* is another fascinating genus of completely limbless skink endemic to the Eastern Ghats. The name *Barkudia* comes from Barkud island in Orissa situated at Chilka lake near Bhubaneswar. *Barkudia* consists of two species, *B. insularis* and *B. melanosticta*.



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The shifting dunes near Sam are home to a number of reptile species (*Bufoinceps*, *Ophiomorus*, *Trapelus* and *Crossobamon*)

# Reptiles of the Thar Desert

*Desert lizards have fascinated me ever since I read Eric Pianka's seminal papers and books on desert lizards. While deserts across the world are well-studied, there is a dearth of studies in the Thar. Reptiles, in particular, have only rudimentary checklists and basic distributional data. This fascination with desert lizards, combined with how little was known about them, finally led me to study the lizard community in the Thar Desert, as a part of my Master's degree from the Wildlife Institute of India.*



Ishan Agarwal, an alumnus of the Wildlife Institute, is a Ph.D. student at the Centre for Ecological Sciences. His interests are primarily in systematics and biogeography of reptiles.





Text and Photographs: **Ishan Agarwal**

I arrived in Jaisalmer in November 2006. I was to spend the next six months in Sam, a village on the fringes of the Desert National Park. My master's work focused on habitat relationships and resource partitioning in the lizard community of the area, but as a herpetologist, I was also keen on documenting all the reptiles of the area.

The Desert National Park (DNP) is one of the largest protected areas in India, spread across 3,162 sq. km in western Jaisalmer and Barmer districts of Rajasthan. The Park is still pending final notification, and there is a sizeable human presence there.

All I knew about the reptiles of the Thar up until then, was based on work done by R.C. Sharma in Rajasthan and Sherman Minton in Pakistan, as well as information from Shomen Mukherjee, an alumnus of the Wildlife Institute, who had worked on rodents in the same area eight years ago. Some of the unique desert species I hoped to encounter included the Thar endemic Rajasthan Toad-headed Agama *Bufoinceps laungwalaensis* and Sindh Owl-headed Snake *Lytorhynchus paradoxus*, the western subspecies of Saw-scaled Viper *Echis carinatus* and Desert Monitor *Varanus griseus*.

My first day in Sam was spent in conducting an extremely important exercise – locating a house. It was then that I had my first sighting. Brilliant black and yellow stripes and a blue tail, that moved

sinuously back and forth. It was a juvenile Indian Fringe-toed Lizard *Acanthodactylus cantoris*, a common lacertid seen in sandy areas of western India. I was only allowed a brief glimpse, I moved from there onto houses in the centre of the town, where a surprise awaited me. I was inquiring about accommodation at the local *Madarasa*, but was told that I had been beaten to it by a snake, a lovely Glossy-bellied Racer *Platyceps ventromaculatus*! The old occupant had just had its meal, so I carefully moved it out and into a bag for counting scales. Though this seemed like an auspicious room, I finally picked one that had an attached water tank, and though the room was filled with a layer of sand about six inches high, I thought it held promise!

My first day was also the day I met the Khichis. Shomen had suggested I contact Chayan Singh Khichi, a forest guard at Sam, to help me in the field and introduce me to the area. Shomen had practically lived in his house when he was in Sam, and so I was optimistic that he would be of help. I met Chayan Singh, Jamal Khan and Hajara Ram, all wonderful people at the forest chowki. And before I knew it, Chayan Singh's son Tarun was designated as my field assistant! I wasn't very sure about this as he was a young boy of only about 17-18.

It was soon evident that Tarun was the right choice, as he had sharp eyes and a keen interest in being in the field. He took me to some concreted

water storage tanks near his house, one of which had a Saw-scaled Viper and some sand boas, and another a Monitor Lizard. The first tank, which was supposed to have the Monitor, looked empty from above. But Tarun was insistent, so we lowered a ladder into the tank and climbed down to about 6 m. to the bottom of the tank. I could see some monitor tracks, but there was just sand and mud at the bottom of the tank, and a few insect burrows. Tarun had started digging and raking away the sand. Then I



The Indian Sandfish *Ophiomorus raithmai* is a nocturnal skink that lives under the surface of the sand, only emerging briefly at night





heard him shout “Gho”, the local word for monitor, and a monitor it was! In fact, it was a beautiful specimen of the desert monitor. The other tank yielded a huge, 60 cm long Saw-scaled Viper; one dead and another injured Earth Boa *Eryx johnii*. Later that night, I also sighted the Warty Rock Gecko *Cyrtopodion scabrum*.

A few days later, Jamal Khan promised to help me find the Indian Sandfish *Ophiomorus raithmai*, a burrowing skink found in sandy areas. I was not too optimistic. It is rare that people who promise to show you rare reptiles actually deliver! In any case, we set off sitting on Shah Rukh Khan – one of the forest department camels! We reached a patch of dunes, where we began walking around. *Ophiomorus* leave distinct tracks as they burrow through the sand, but these skinks can move over 50 m in a night! So digging up the tracks can prove to be a futile exercise. However, Jamal insisted that he would show me one. As Tarun and I had moved a lot of sand earlier that day, we were reluctant, but continued digging, when a sudden flash of pink



A juvenile Rajasthan Toad-headed Agama *Bufoniceps laungwalaensis* in a threat display. This monotypic genus is endemic to the Thar Desert, restricted to the barren dunes

caught my eye. There was a sandfish! We actually unearthed two from under that same bush. A good first couple of days!

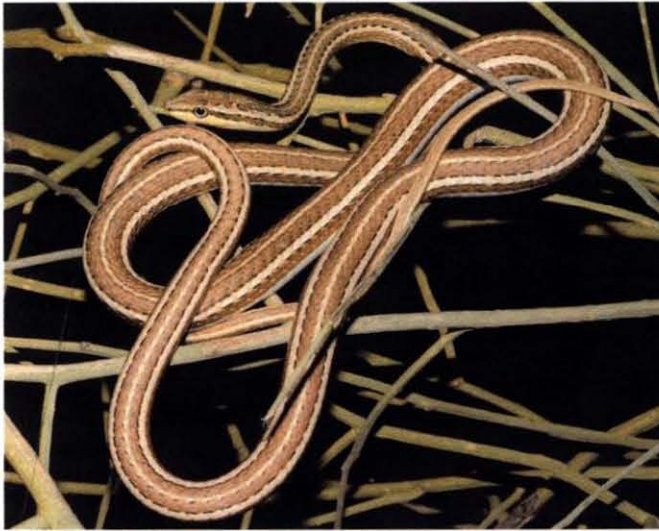
The reptile habitats within walking distance of Sam were barren dunes, stabilized dunes and grasslands. While *Acantbodactylus* was very abundant, there was little other lizard activity in this cool weather. The only other lizard that was occasionally active was the Brilliant Agama

*Trapelus agilis*. But, I was yet to see the Rajasthan Toad-headed Agama, and we spent many days walking back and forth across the barren dunes hoping to catch a glimpse of one of these. Tarun finally spotted the first of these lizards, a striking juvenile, sand-coloured above with blue spots on the throat. These remarkable lizards are endemic to the Thar, and live exclusively on barren dunes. They have fascinating escape behaviour – with rapid shivering movements of its body the animal sinks rapidly into the sand. Sometimes, only the head or anterior portion of the body may be buried, like the proverbial ostrich with its head in the sand!

As the weeks began to fly by, the weather got cooler and cooler. That year saw a particularly severe winter, with the night temperatures dropping down to below 5° C and daytime temperatures often remaining below 20° C. Consequently, reptile activity was very poor and there were only a few additions to my checklist until mid-January.



The Sindh Awl-headed Snake *Lytorhynchus paradoxus* is a burrowing snake that is endemic to sandy areas in the Thar Desert



The partially arboreal Afro-Asian Sand Snake *Psammophis schokari* was sighted in sandy and gravelly areas



The beautiful Red-spotted Diadem *Spalerosophis arenarius* is one of the more strikingly coloured snakes in this area

It seemed more and more likely that I would not have enough data. I decided to survey the rocky hills habitat, at Nabh Dongar, about 35 km from Sam. This alien landscape had huge clumps of *Euphorbia*, the first real trees I had seen in months, eroded gullies and ravines, rocks of various hues, and the gut feeling that this place held something special. The very first day yielded two additional lizard species, the relatively widely

distributed Lacertid *Ophisops jerdonii* found across arid areas of North-west India, and the Persian Gecko *Hemidactylus cf. persicus*.

As the weather began to warm, I had my first sightings of some beautiful snakes, the Red-spotted Diadem *Spalerosophis arenarius* and the Afro-Asian Sand Snake *Psammophis schokari*. Just as I began to believe that I might still be able to salvage enough data, it began

to rain. Rain? In the desert? Seems unlikely, but it rained every month through the six months I spent in Sam! I had just 2 ½ months left and no useable data! Finally, after a long delayed visit from my supervisors, Dr. Goyal and Qamar Qureshi, we were able to finalise a sampling methodology and I could begin systematic sampling.

Now began the real back-breaking work – laying plots and recording soil



A juvenile Desert Monitor *Varanus griseus*. Within India, this species is found only in the Thar



One of the smallest Indian geckos, the Sindh Dwarf Gecko *Tropicolotes persicus euphorbiacola* lives in the rocky deserts. This was the first record of this genus from India

and vegetation characteristics. The increasingly warmer days were spent in laying grids across habitats for quantitative analysis. Once the grids had been laid and the plots sampled for habitat characteristics, it was time to begin actually sampling for lizards. This would allow me to understand how different lizard species' abundance, varied with habitat characteristics, as well as how each species used microhabitats within and across habitats

Day-time temperatures had risen to well above 30° C by then, and reptile activity was steadily increasing. The Spiny-tailed Lizards *Uromastyx hardwickii* came out of hibernation and could be seen feeding on grasses in the open areas outside Sam, while more snakes were also sighted. I also had some visitors at home, a couple of Long-eared Hedgehogs, a Glossy-bellied Racer and even a juvenile *Echis*!

Temperatures had shot up by April



The Glossy-bellied Racer *Platyceps ventromaculatus* is one of the most common snakes around Sam

as summer was setting in, which meant the sand was 50° C by 9:00 a.m., and above 60° C by 11:00 a.m. Air temperatures went up to a high of about 43° C, though in the desert that feels like a whole lot more. The reptiles of the desert came alive in summer, and there was a burst of activity unlike any I had ever seen. The desert was alive with lizards, with reptile tracks trailing across every inch of sand. The dunes were alive with activity at night in summer with *Echis* tracks and some beautiful burrowing scorpions. That was our cue to wear boots from then on! The scorpions were unlike any I had encountered before, and one turned out to be new to science. A friend, Aamod Zambre is in the process of formally describing this species.

Perhaps the most fascinating place in summer was Nabh Dongar. This area had the most different lizard species, including five geckos, one skink and lacertid, and two agamids. The most beautiful inhabitant of this area, as well as one of the more interesting and rare species was the Sindh Dwarf Gecko *Tropicolotes persicus euphorbiacola*. I had read about this species in Minton's HERPETOLOGY OF PAKISTAN, and was optimistic about sighting it. So much so that I let the first one I saw escape – simply because I was sure that I would sight another soon! Thankfully, we did spot seven more. This genus and species was not previously known from India, and it capped an amazing six months in the desert.

Looking back, what was most striking about the Thar and its reptiles and human inhabitants was how well the latter knew the former. All the snakes and lizards I saw had a unique local name, and most people knew these names well. The other remarkable feature was the adaptations of the reptiles of the Thar to these inhospitable conditions. The same lizards that could tolerate surface temperatures above 50° C were also active through winter, while the sheer abundance of lizards is unlike anywhere else in India. 2

## Training Programme at Manipur

A five-day capacity strengthening training programme, on Monitoring of Waterbirds and Wildlife Management was organized for the Manipur Forest Department officials by the BNHS Bird Migration Study Centre of Point Calimere, from June 1-5, 2010, in Imphal. Principal Chief Conservator of Forests, Government of Manipur, Dr. S. Singait (IFS) inaugurated the training programme. Dr. S. Balachandran, Assistant Director, BNHS, elucidated the role of wildlife officials in biodiversity conservation and policy making in India. A total of 32 participants, including two conservators of forest, 14 district forest officers, seven forest range officers, four college lecturers and two wildlife photographers from across Manipur, three scientists and an assistant conservator of forests from Loktak Development Authority, attended the training programme. One of the highlights of the training programme was the participation of the Chief Wildlife Warden of Manipur, Mr. A. Kharshi-ing (IFS).

A six-member team including P. Sathiyaselvam, Junior Scientist, BNHS and P. Gangaiamaran, Senior Researcher, BNHS, headed by Dr. S. Balachandran participated as resource personnel in the training programme.



Participants at the Training Programme

Lectures covered topics such as wild bird identification, counting techniques, threatened birds of India, threatened birds of Manipur state, bird migration, bird migration study techniques, results of satellite tracking studies in India, economic importance of wild birds, wild bird study and management techniques, potential and existing Ramsar sites in India, National Wetland Conservation Programme — Guidelines for Conservation and Management of Wetlands in India, wetland management techniques, disease outbreak in wild birds, and scientific wetland management case studies of Chilika Lake and Point Calimere. 🍀

## Monsoon Magic and other CEC-Mumbai Activities



Children enjoying at one of the monsoon trails of CEC, Mumbai

After the scorching heat of summer, Conservation Education Centre-Mumbai, BNHS, welcomed the monsoon with great joy and enthusiasm. When nature at its best, transformed from brown to a refreshing green, Conservation Education Centre conducted the first in a series of interactive and thematic “Tantalizing Trails” on July 25, 2010, after an overwhelming number of school visits. Based on monsoon flora, the event was an invigorating day out for families.

From the August 7-8, 2010, CEC inaugurated the new online courses — Leadership Course in Biodiversity Conservation and Basic Course in Entomology — with an introductory camp. Attended by 27 enthusiastic participants, the overnight camp proved to be a weekend of edu-tainment with presentations, exploratory sessions, several trails and a light trap at night. 🍀



## BNHS to study the effects of the oil spill on marine and coastal life

On August 14, 2010, the Union minister of State for Environment and Forests, Mr. Jairam Ramesh, did a survey, accompanied by Dr. Asad R. Rahmani, Director, BNHS, along the sea near Mumbai that was affected by an oil spill, when two ships collided near the city's coast. After this survey, he also visited the Collections Department at the BNHS headquarters, Hornbill House, and was enthralled to see the magnificent natural history collection of BNHS. He handled a couple of specimens himself and showed keen interest in learning from this national treasure housed in BNHS. He appreciated the efforts taken by BNHS staff in maintaining this collection, as well as the pioneering research conducted by the Society in various fields of natural history. During the same visit, he assigned to BNHS, the task of studying the impact of the



Jairam Ramesh (centre), the Union minister of State for Environment and Forests studying the Reptile collection at BNHS

oil spill on marine life and coastal life. BNHS is conducting a rapid environmental assessment and a one-year long study of the affected areas in

Mumbai and Raigad. The Minister's visit will go a long way in strengthening the ties between the government and BNHS. 🍀

## Ruth Padel's enthralling lecture at BNHS

On July 22, 2010, Ruth Padel the well-known British poet and author, and also, the great-great grand-daughter of Charles Darwin, visited BNHS to deliver a lecture on nature and science on the basis of her works as an author. Her talk, accompanied by her reading excerpts from her books, explained the relationship between the nature, science and literature. She read from her latest book *WHERE THE SERPENT LIVES* and also from her book, *TIGERS IN RED*

WEATHER. Her books explain her experiences in the jungles of India and her understanding of the culture and natural history of this country. She also referred to excerpts from her great-great grand father's diaries which made the discussion ever so interesting and informative.

There was media presence and press meetings which were followed after the talk. The media response was overwhelming which made her talk a huge success. 🍀

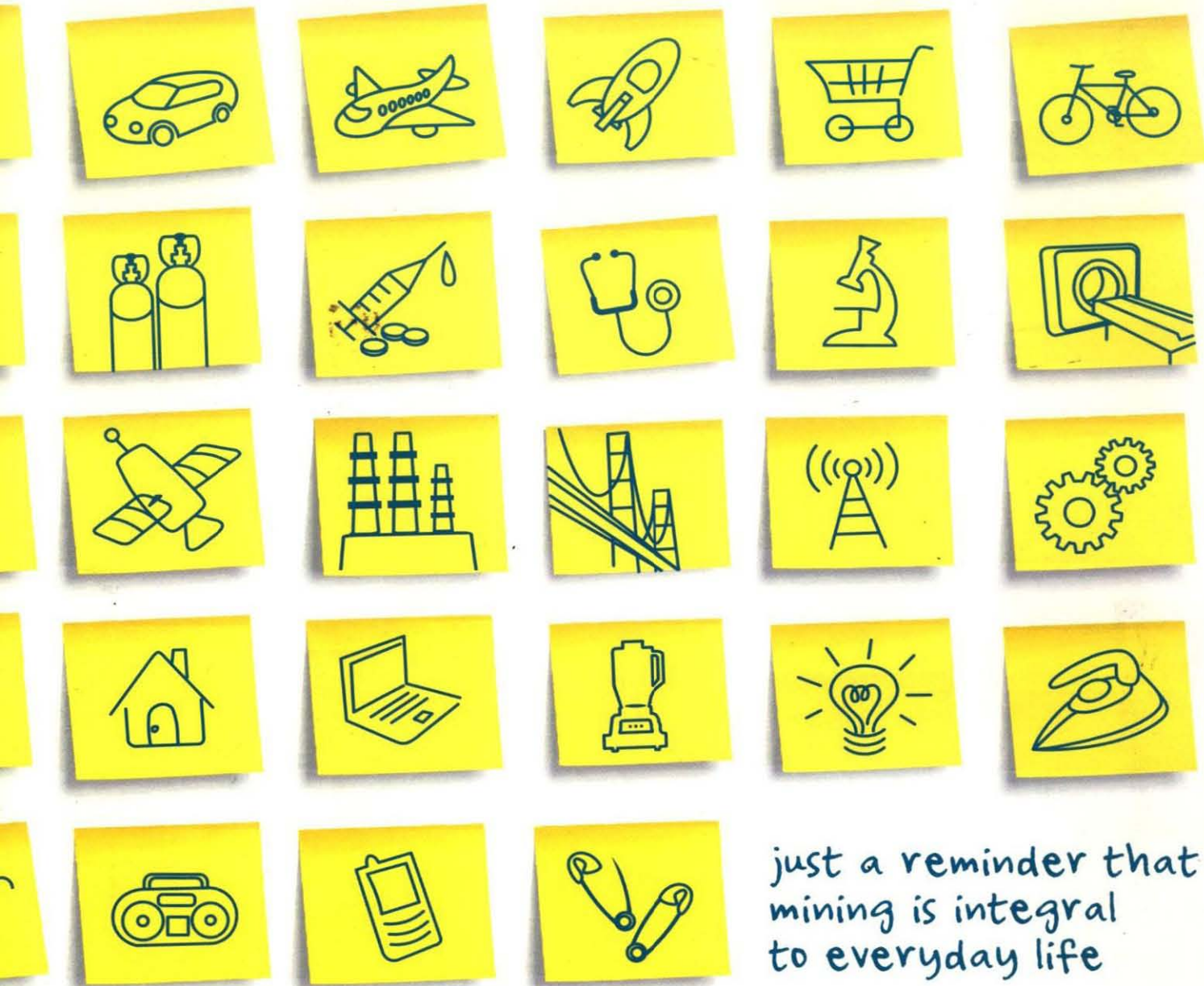


Ruth Padel, is a well-known British poet and author

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Mining is a vital industry. From safety pins to satellites nothing would exist without mining. Mining has made possible many of mankind's giant leaps. It has constantly kept pace with change and changing priorities of the world.

The industry has leveraged modern technology, computers, advances in geochemistry, to embrace responsible mining and established systems to independently verify compliance with environmental, human rights and social standards.

Mining continues to add value to nature's resources in a sustainable way.