HORNBILL

DISCOVER THE LIVING WORLD

APRIL-JUNE, 2010

BNHS INDIA CONSERVING NATURE SINCE 1883

BOMBAY NATURAL HISTORY SOCIETY

TARIQUE SANI

Ashy Prinia
Prinia socialis

Ashy Prinia was formerly known as Ashy Wren-warbler and is commonly found throughout India. This bird's name can be attributed to the ash-colour seen on the major portion of its body. An interesting characteristic of this bird is the constant shaking of its tail (which is generally in upright position). Males and females are similar in plumage and size. It has a sharp call, which gets more shrill as it flies higher. In fact, it even produces a crack-like sound, similar to that of an electric spark, apparently with its wings.

This bird is smaller in size than the sparrow. It is a grey-crowned, black-billed prinia with extensively rufous underparts. Ear-coverts of the bird are extensively pale and its eyes are red in colour. The bird has a dark cap with sharply defined edges. In breeding season, this tiny bird's plumage usually lacks supercilium and has blackish crown and cheek. In the case of non-breeding plumage, it has fine short white brow and longer tail.

It is usually solitary or sometimes seen in pairs around grasslands and gardens. Throughout the country, one can see Ashy Prinia. It breeds at different times throughout the year depending on the area. Nest is an oblong purse of grass and fibres supported by grass, weeds or bushes. The Ashy Prinia builds its nest close to the ground in a shrub or tall grass and lays 3-5 eggs. The nest consists of leaves stitched together with webs and hair with the entrance towards the side.

The resident Prinia shows biannual moult, which is rare among passerines. Biannual moult is theorized to be favoured when ectoparasite loads are very high, however, no investigations have been made. Like most warblers, the Ashy Prinia is insectivorous.

Fortunately, Ashy Prinia is common and widespread, and not a threatened species. It is listed as Least Concern in the Red list for birds prepared by International Union for Conservation of Nature (IUCN).

It is seen in many NPCIL sites such as Tarapur Atomic Power Station (TAPS) in Maharastra, Kakrapar Atomic Power Station (KAPS) in Gujarat, Rajasthan Atomic Power Station (RAPS), Rawatbhata in Rajasthan, and Narora Atomic Power Station (NAPS) in Uttar Pradesh.

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

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

Nuclear Power Corporation of India Limited
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CONTENTS

The Economics of Ecosystems and Biodiversity (TEEB)

Pavan Sukhdev, a banker and now the Leader of the study on The Economics of Ecosystems and Biodiversity, popularly known as TEEB, is a multi-faceted personality. He has, during the last one year, through the TEEB programme, published highly commendable reports. His preface of the interim report of TEEB starts with a profound statement which I am tempted to share with the readers of *Hornbill*.

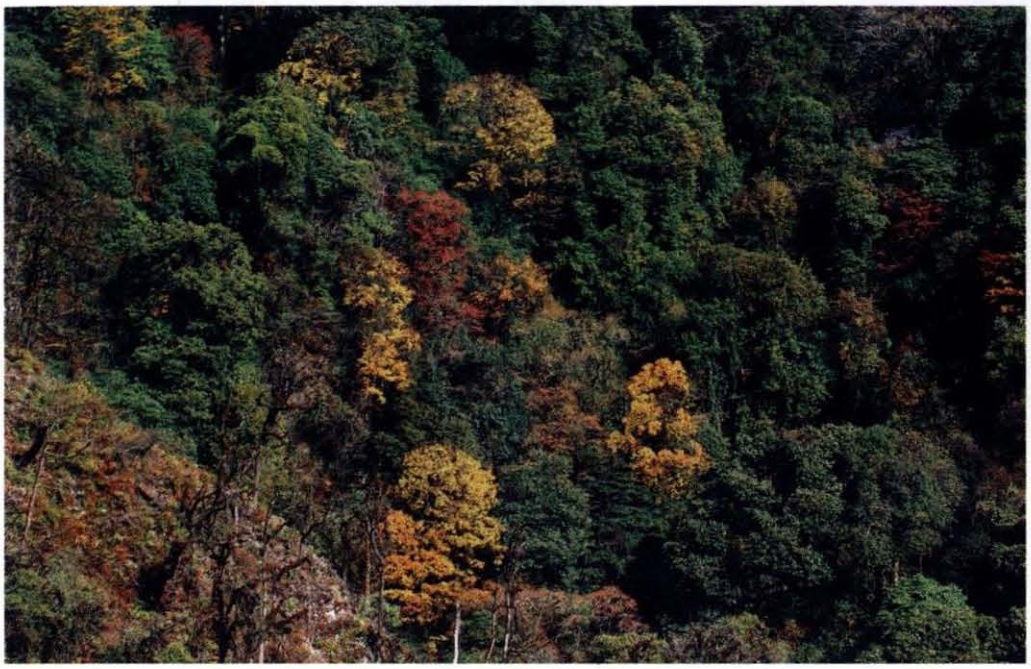
"*Not all that is very useful commands high value (water, for example) and not everything that has a high value is very useful (such as a diamond).*"

I am always surprised by the value system of human beings; we give more importance to man-made creations (for example, look at the money we spend on modern 'art' and compare it with the money spent on saving threatened species) than those of Mother Nature. Nature's bounties are taken for granted and rarely valued, e.g., the fertile soil (result of bacteria, nematodes, earthworm, ants, termites etc.) on which man grows his food, the clean water that he drinks (purified naturally by filtration and/or by water plants and planktons), the pure air which he breathes (purified by trees). The majority of us are too oblivious to the abuses which we have been putting Mother Nature through for the last 200-300 years, perhaps more. Biodiversity conservation is still not the mainstream issue for the majority of us.

Even individuals who enjoy a wildlife safari with their family and friends, in a well-managed national park do not put money or other resources to see to it that such natural areas survive and flourish. Corporate Social Responsibility (CSR) has become more like a ritual for which a percentage of profit is to be allocated, rather reluctantly in most cases. The so-called "Green technology", highlighted to get government subsidies and permissions, is more of a 'green' eye-wash. For many corporates and even government schemes (e.g., Green India Mission), planting trees is the end of their social responsibility towards Nature. Very few are interested in stopping biodiversity loss or restoration of ravaged ecosystems. There are, however, exceptions and some Indian corporates are genuinely interested in nature conservation.

TEEB and many other reports such as the Millennium Development Goal and Millennium Ecosystem Assessment have proved the consequences of biodiversity loss and their disproportionate but unrecognized impact on the world's poor. There is a direct connection between poverty alleviating and maintaining a healthy ecosystem.

Pavan and his team's main objective is to document the economic value of ecosystems and biodiversity and put it across to economists, corporates, decision makers and world leaders grown on Adam Smith's economic theories. There are too many examples regarding the importance of nature and human welfare. I will mention some examples from the TEEB reports: approximately half of synthetic drugs have a natural origin, including 10 of the 25 highest selling drugs in the USA; three quarters of the world's population depend on natural traditional remedies; protected areas could produce benefits from goods and ecosystem services worth between 4,400 and 5,200 billion US$ a year; biotechnology, whose market size from public companies alone was 70 billion US$ in 2006, derives many products from natural resources (e.g., enzymes, microorganisms).



ISAAC KEHIMKAR

In my earlier editorial (e.g., Biomimetics, *Hornbill January-March, 2009*) I have written about the use of biodiversity for human welfare and why biodiversity should be protected, so I will not repeat it here. To learn more about the economic values of ecosystems and biodiversity, I suggest that members of BNHS read the complete reports of TEEB. These can be downloaded at www.teebweb.org.

I will end with another profound statement from the TEEB report "*Nature is the source of much value to us every day, and yet it mostly bypasses markets, escapes pricing and defies valuation. This lack of valuation is, we are discovering, an underlying cause for the observed degradation of ecosystems and the loss of biodiversity.*"

In this *International Year of Biodiversity* if we start valuing our biodiversity and the ecosystem services that Nature provides, I think the purpose of this year's celebration will be served. If this happens, then Pavan and his team will have achieved their objective.

Asad R. Rahmani

Pavan Sukhdev was the Managing Director and Head of Global Markets, Deutsche Bank, and Special Advisor to the United Nations Environment Programme's Green Economy Initiative. He is also Founder and serving Director of the Green Accounting for Indian States Project, an initiative of the Green Indian State Trust (GIST), and co-founder, and now Trustee, of the Indian Environment Trust. His TEEB report intends to do for Ecosystems and Biodiversity what the "Stern Review" did for Climate Change.

Diversity featuring in this issue

Centipede

Bryophytes

Stink Bug

Canara Chromide

Dwarf Gourami

Blue tail tip Damselfly

Bryophytes include mosses, liverworts and hornworts

Retracing Evolution, Bountiful Biodiversity

After marine invertebrates and the first of the photosynthetic organisms in the earlier Hornbill, let us now take a look at the flora and invertebrate fauna on land. Also discussed is the first vertebrate fauna to come into existence in our vast oceans, which was a major step in the course of evolution.

Compiled by: **Priyanka Iyer**
Photographs: **Vishal Bhave**
Experts consulted: **Mr. Isaac Kehimkar, Dr. Ranjit Manakadan, Dr. Swapna Prabhu, Mr. Sagar Satpute**

Sources: INSECTS, SPIDERS AND OTHER TERRESTRIAL ARTHROPODS by George C. McGavin, TREE OF LIFE edited by S. Blair Hedges and Sudhir Kumar

I'm quite sure that as kids, all of us have had the experience of slipping while trying to climb over a wall in the rainy season. On investigating further, the reason has almost always turned out to be a green slippery "mass", manifested out of 'nowhere' on the wall. Believe it or not, this slippery 'mass' or, more scientifically termed, Bryophyte is the ancestor of our trees of today! Let us understand these little 'pranksters' better ...

Bryophytes are among the first few groups of plants that require land as well as water for survival on our planet. Bryophytes are non-vascular plants (use cell walls for conduction of food and water, not vessels). They grow closely packed together in mats or cushions on rocks, soil, or as epiphytes, i.e., plants that grow on trunks of forest trees. This group includes mosses, liverworts and hornworts.

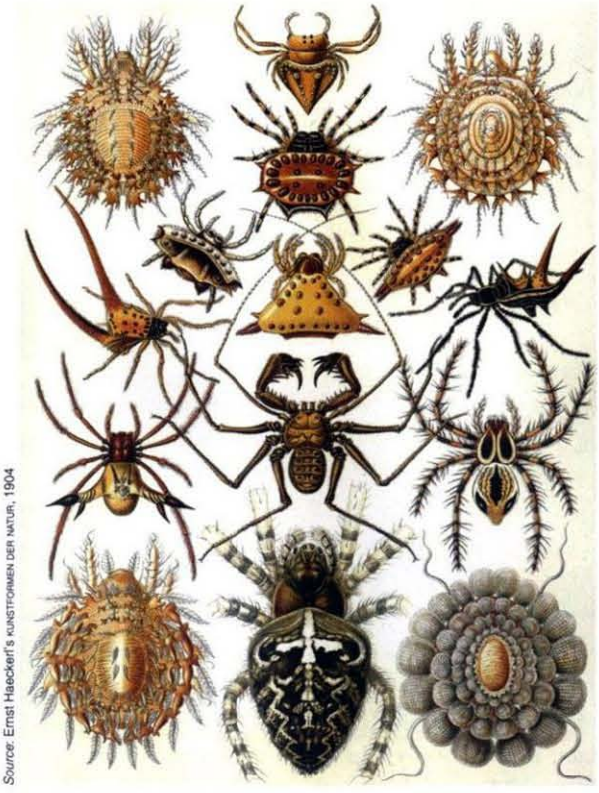
Mosses are the most diverse group of bryophytes. They are normally attached to the ground by delicate, colourless or brown thread-like structures called rhizoids. They reproduce via spores, which are microscopic. These tiny spores are so effectively dispersed by the wind that many mosses are extremely wide in their distribution. If a spore reaches a suitable habitat, it germinates and soon a bud appears and develops into the mature organism.

Liverworts are small and moss-like, and are generally extremely minute in size. In appearance they can look leaf-like (leafy liverworts) or form large flat sheets (thallose liverworts). Thallose liverworts are quite distinctive and are easily recognised, but the leafy ones are a different story being easily mistaken for mosses and it can take careful examination to tell the difference. These primary plants function in much the same way as mosses and grow in the same places, often intertwined with each other.

Hornworts are similar to liverworts, but differ in their reproductive stage. They generate spores inside a green horn-like capsule atop a stalk. When the spores mature the stalk splits, releasing the spores.

These wonderfully soft carpets of green are, in fact, nature's second line of attack in its 'war' against rocks. After lichens created a foothold on rocks the mosses moved in, ultimately becoming a layer of topsoil for higher plants to take root. The mosses also hold loose dirt in place. Mosses prefer damp places and have evolved special methods of dealing with long dry periods.

Along with flora, faunal life also started moving to land. One of the most prominent success stories in evolution of primitive life on land are Arthropods. Living arthropods comprise of over 1 million species and represent majority of



Source: Ernst Haeckel's KUNSTFORMEN DER NATUR, 1904

Uniquely structured arachnids and other arthropods

the earth's animal diversity. Essentially, arthropods are characterised by possessing jointed limbs and an exoskeleton. The exoskeleton may illustrate what life was like at the time. It is of a defensive, protective nature to possess a shell, thus this suggests that competition was quite fierce in the Cambrian era, both from parasites and potential predators. The arthropods exhibit advanced receptors in the form of eyes (photoreceptors) and the development of various chemoreceptors that could be used in both the external and internal environment. Such developments have naturally been advantageous over time. This phylum includes insects, arachnids (spiders, scorpions and ticks), centipedes, millipedes and the list is endless ...

Insects are the key pollinators of most plant species

About one in three insects, today, is a beetle and they have successfully colonized every sort of terrestrial and freshwater habitat. They range from tiny insects less than 1 mm to tropical giants measuring 180 mm. Although beetles vary enormously both in their shape and their coloration, a major distinguishing feature is their toughened forewings, also known as 'elytra'. These hard forewings protect the larger membranous hindwings that are folded underneath.

Spiders, scorpions and ticks are not insects but arachnids. All arachnids are distinguished from insects as they have eight legs. Although it is possible that, in some species of spiders the front pair may evolve to a sensory function. Spiders molt in order to grow; they shed one exoskeleton and then a new larger one hardens around the spider. When ready to moult, the spider stops eating for a few days. Then it lies on its back and literally steps out of its old exoskeleton. When you see the spider on its back, it may not necessarily be dead - just moulting!

The appearance of first true backboned animals millions of years ago in the waters was a big step in the course of evolution of vertebrate life on earth. These first fish had no jaws like the ones of today. What they did have in abundance was bone; they had bony plates which probably saved them from sea scorpions and other invertebrates. The jawless fish are thought to have relied on filter feeding to capture their food, and most likely would have sucked water and debris from the seafloor into their mouth, releasing water and waste out of their gills. Additionally, these early fish did not have paired fins.

These jawless fish all went extinct by the end of the Devonian period. Yet today there are some species of fish that lack jaws (such as lampreys, and hagfish). These modern day jawless fish are not direct survivors of the Class Agnatha but are instead distant cousins of the cartilaginous fish.

The armoured fish belonging to Class Placodermi too lacked jaw bones but possessed paired fins. The armoured fish diversified during the Devonian period but declined and fell into extinction by the end of the Permian period.

Cartilaginous fish, Class Chondrichthyes, better known as sharks, skates, and rays evolved and survived the test of time and changing conditions. Cartilaginous fish have skeletons composed of cartilage, not bone. They also differ from other fish in that they lack swim bladders and lungs.

Members of the Class Osteichthyes or more commonly called bony fish, first arose during the late Silurian period. The majority of modern fish belong to this group. Bony fish diverged into two groups, one that evolved into modern fish, the other that evolved into lungfish, lobe-finned fish, and fleshy-finned fish.

Modern day fish are very diverse and have colonised almost every water body on earth. In fact some can even survive out of water or crawl across land to a different water source in case of a drought. Fish, certainly have been victorious over many challenges and had laid the foundation for evolution vertebrate fauna on earth.

In fact, fish not only laid the foundation but also did much more. Many fish like the mudskipper, however, adapted to crawl over land... and that is where life evolved to next – land!

Union Bank
of India

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Stink Bug *Cantao ocellatus*

The Unknown World of Insects!

Rahul Khot is a Research Assistant at BNHS and works in the Entomology section of the Collection at the Society.

Man's achievements and knowledge about the universe are highly commendable — the exact distance between the Sun and the Earth is 14,94,76,000 km, the total weight of Earth is 5.9736 × 1024 kg. But, if asked, 'how many insect species are present on Earth?' …

Text: **Rahul Khot**

The answer would not be so precise, because our information is limited when it comes to these astonishing creatures. About one million insect species are known to inhabit every nook and corner of our planet, except seas and oceans. Scientists believe that there maybe about nine million insect species waiting to be discovered!

Insects represent an interesting branch in the tree of life. Their development equals, if not excels, that of any other branch. In terms of diversity, insects are the dominant life forms on land; there are about 61,500 known species of insects in India alone. They are of different shapes, size and colour, and remarkable adaptations. Naturally a question arises in our mind as to why this diversity? At this point, it becomes imperative for us to understand the process of evolution of insects ...

It is not a surprise that evolution of insects is an unsolved puzzle! The reason being lack of concrete fossil records to prove its most primitive ancestor's identity. The oldest known definite insect fossil is from the Devonian Era *Rhyniognatha hirsti*, estimated at 396-407 million years. It is interesting to know that this species had mandibles (a mouth part, jaw) which are similar to that of winged insects which are similar to some insects that are present today. So, we can conclude that there were insects prior to the Devonian period.

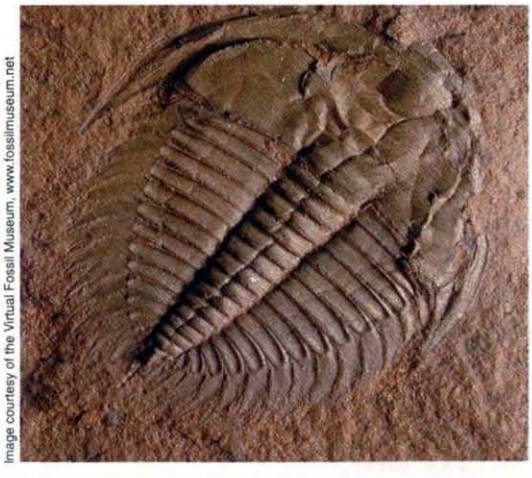

Image courtesy of the Virtual Fossil Museum, www.fossilmuseum.net

This particular fossil is of a Trilobite, an extinct group of marine arthropods, and was found in Canada

According to the accepted theories of evolution, insects, like other animals, have descended from more primitive forms of life that existed in earlier geological periods. But the preservation of insect fossils are relatively poor and limited to only a few sites unlike mammals, reptiles and trilobites (extinct marine arthropods). The reason for this scarcity of insect fossil is the poor preservation potential of an insect's exoskeleton. Like other Arthropods, the insect exoskeleton is made up of chitin (a type of carbohydrate), and a tough protein. This material is not hard (calcified) like the exoskeleton of a trilobite. Hence, in spite of abundant insect fossil there is a complete absence of evidence to trace the primitive stages of insect evolution.

The gap in fossil evidence leaves insect evolution open to several speculations. There are three aspects of insect evolution that several evolutionists are still working on, i.e., their wings, compound eyes and metamorphosis. Let us try and understand these critical aspects of insect evolution...

Insect wings are made up of chitin, which is extremely light, but amazingly strong. The wings are strengthened by a complex set of veins, that not only provide support but also resist bending and twisting of wing during flight. Insects possess some 30-odd wing muscles in their thorax which are known to be the most powerful muscles in any animal, in per square millimeter of cross-section area. Although, on an average, insects can beat their wings 200 times per second, they can go as fast as 1,000 times per second! Wings are also opened to absorb heat. In case of birds, it has been concluded that their wings are modified limbs. However, in case of insects, it is only assumed that their wings are developed from a body part; a process better known as co-option, but it is difficult to determine which organ could have been co-opted.

Now coming to the insect eye, it is a complex structure consisting of a large number of closely packed 'lenses' also known as ommatidia. Insects like honey bees and some flies may have 4,000 lenses in each eye. Apart from a pair of compound eyes many insects have two or three spot like eyes called *ocelli*. Compound eyes can detect the sky's plane of polarization which helps

ISAAC KEHIMKAR

ISAAC KEHIMKAR

Praying mantis are master predators of the insect world with grasping forelegs and compound eyes that facilitate deadly strike

them to navigate. These eyes are also very sensitive to movement.

One of the most characteristic and magical features of insects is metamorphosis! Insects almost always hatch in a condition morphologically different from that of the adult. In order to reach to adulthood they consequently have to pass through changes of form (Larva > Pupa > Adult) which are collectively termed as metamorphosis. Hence, a caterpillar is different from a butterfly not only externally but it also differs in internal anatomy. Many insects show complete a metamorphosis involving larva, pupa and adult stages. The evidence of complete metamorphosis is found early in the fossil record, but no record of its evolution has ever been found.

ISAAC KEHIMKAR

Giraffe Weevil - This weevil gets its name from an extended neck that looks much like that of the giraffe

- In the rainforests, number of insects per square mile is equal to total human population of earth.
- In order to produce 543.59 gm of honey, a honey bee must visit 2 million flowers.
- Dragonfly eyes contain up to 30,000 individual lenses. Human eyes only have one. Excellent and strong fliers, they can hover, and fly backwards.
- The praying mantis is the only insect that can turn its head 360 degrees.

INSECT AND PLANT INTER-RELATIONSHIP

There is another very interesting facet to insect evolution. Understandably, fossil records show that diversity of insects is directly related to the diversity of angiosperms (flowering plants)! It is highly significant, that no highly evolved pollinators such as Lepidoptera (butterflies and moths) and bees had been found before the angiosperms appeared. It is considered, that Lepidoptera must have evolved at the same time as the early angiosperms. Evolution of land plants (especially flowering plants) is the major force driving the diversity of insects, i.e., with the increase in the diversity of land plants, the diversity of insects increases too. The interaction between plants and insects is an appropriate example of co-evolution on Earth.

Co-evolution is the mutual evolutionary influence between two species (the evolution of two species totally dependent on each other) where each of the species involved, prefer each other from several choices, and therefore evolve together.

Insects and plants are engaged in an arms race of evolution, since they first appeared on Earth. Plants have developed many defence mechanisms like chemical toxins, physical barriers, to protect themselves from herbivorous insects. But sometimes they resort to a symbiotic relationship with the insect. Such co-evolution can occur between 1) a single plant and a single insect, 2) between a single plant and a group of insects, or 3) between a group of insects and a group of closely related plants. This interaction may be beneficial to both (mutualism), or is beneficial to one but harmful to another (predation).

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This bug secretes a sweet liquid for the ant and in return the ants protect these tiny insects

- About 80% of the Earth's animals are insects. If all the insects of the world are put to scale they will out weigh all living things.
- Locusts can eat their own weight in food in a day. For human being it takes half a year.
- Many insects including ants can carry 50 times their own body weight.
- Atlas moth, one of the largest moths of the world never feeds during its adult stage and lacks mouth parts and digestive system.
- A flea can jump 150 times its size, i.e., equivalent to a human jumping over 300 m.

Several moth-pollinated plants have long spurs or tubes which are of the exact length of a certain moth's "tongue" or proboscis. For example, Charles Darwin predicted the existence of a moth (Darwin's Hawk Moth *Xanthopan morganii*) in Madagascar based on the size and shape of a flower (Darwin's Orchid *Angraecum sesquipedale*) which he had seen there. This did turn out to be true but was discovered about 40 years after Darwin's prediction.

In many cases, plants try to reduce the attack of insects and insects counteract and take the battle a step forward. This type of co-evolution can be observed between plants and their insect predators. The plant kingdom shows the

ISAAC KEHIMKAR

Stick insects, as the name suggests, look like sticks and are masters of camouflage

GLIMPSE OF INSECT BIODIVESITY

Order	Common names within orders	Number of species	Number of species reported from India
Colombola	Springtail	2,000	210
Odonata	Dragonflies and Damselflies	>5,500	499
Blatttaria	Cockroaches	3,700	180
Mantodea	Mantids	>1,800	162
Isoptera	Termite	2,000	253
Orthoptera	Grasshoppers, crickets and locusts	25,000	1,750
Hemiptera	True bugs	82,000	6,500
Hymenoptera	Ants, bees, wasps	1,30,000	10,000
Coleoptera	Beetles	3,50,000	15,500
Diptera	True flies, mosquitoes	2,40,000	6,093
Lepidoptera	Butterfly and Moths	1,80,000	15,000

Biological evolution is genetic change in a population from one generation to another. The speed and direction of change is variable with different species at different times. Continuous evolution over many generations, result in the development of new species. Likewise, failure to evolve in response to environmental changes can, and often does, lead to extinction.

Technically, in the classification of living things, insects form a class Insecta of the phylum Arthropoda (animals with joint appendages, e.g. millipedes, centipedes, scorpions etc.).

The science which deals with the study of insects is known as entomology and that which deals with the study of extinct insects and their fossil is known as paleoentomology.

Study of :

- bees - Apiology (or Melittology)
- beetles - Coleopterology
- flies - Dipterology
- true bugs - Hemipterology
- moths and butterflies - Lepidopterology
- ants - Myrmecology
- grasshoppers, crickets, etc. - Orthopterology
- caddis flies - Trichopterology

presence of a large number of chemicals used by the plants to reduce the impact of herbivores on their survival and reproduction. These chemical defences can act as repellents or toxins to herbivorous insects to reduce plant digestibility. But in some cases, these herbivores too, have evolved different ways to use plant defences for their own benefit. By accumulating toxic compounds from their food, the insects protect themselves from predators (sequestering). For example, the larva of Plain Tiger Butterfly *Danaus chrysippus* feeds on the Milkweed plant (*Calotropis* sp.). The *Calotropis* has defensive chemicals which are ingested and stored in the body of the caterpillar. These chemicals remain in the adult butterfly making it unpalatable. Thus, the toxic chemical present in the plant is used by the butterfly for its own defence.

There are also some plants that feed on insects (refer 'Predatory Plants' *Hornbill* January-March, 2010). These plants derive essential nutrients from the trapped insects.

Image courtesy of the Virtual Fossil Museum, www.fossilmuseum.net

An ancient insect fossil found in Brazil, 108-92 million years ago, belonging to the order Hemiptera - referring to true bugs

Pitcher plant, venus flytrap, sundews and bladderworts are the best known examples of insectivorous plants. These plants either trap insects by trickery or when the trigger hair is touched. On one hand, it is seen that sometimes only one or few insects can feed on a specific plant (Milkweed plant and Plain Tiger Butterfly). On the other hand, insects like grasshoppers adapt to eat almost any plant. There are also insects that learn to eat plant parts avoiding the harmful toxins.

ISAAC KEHIMKAR

The tiger beetles are a large group of beetles known for their predatory habits and speed

INSECT DIVERSITY AND ITS SIGNIFICANCE

Insects dominate terrestrial ecosystems in terms of species, biomass, number of individuals, and importance of ecological roles. It is believed that 80% of all living animals are insects.

People today, generally overlook insects due to their small size and so-called inconsequential existence. But in reality, insects play a vital role in the smooth functioning of our ecosystem. Their importance can be highlighted by giving only a single example; about 95% of pollination is done by insects. Thus, insects are indispensable for the survival of every form of life present on Earth! We generally consider them either 'useful' or 'harmful'. But, insects provide useful services like pollination, honey, silk and lac. Numerous insects also work as 'natural cleaners' by feeding on dead and decaying animals and plant remains; thus playing a vital role in the circulation of energy and matter within the ecosystem. Hence, it can be said that every aspect of human life have been affected by insects. In fact, within their enormous world they even somehow manage to control their numbers so no one insect species ever dominates.

ISAAC KEHIMKAR

Giant water bugs, as the name suggests, are large with piercing mouth parts and are known to hunt down even fish

Though it may sound strange, but conservation of insects is a need of the hour. Our developmental activities are responsible for environmental degradation. Such activities are causing severe threat to biological diversity and insects are an essential part of the food chain. Thus, loss of insect species will result in the collapse of the entire ecosystem, ultimately causing extinction of most of the life forms from earth including human beings.

Only time has answers to the questions which we find difficult to answer today, regarding insect evolution. Maybe good fossil evidences or molecular research will unravel the mystery of insect evolution. The next time you see insects, do not neglect them but thank them for being there and making our existence possible on this planet!

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Damselflies are dainty insects with weak flight

Old is Gold

P. Jeganathan is with Nature Conservation Foundation, Mysore. He coordinates conservation education programs at Rainforest Restoration Research Station at Valparai.

'Old is Gold' – and true to the essence of the proverb, I bumped into an old friend recently and this chance meeting meant more to me than the entire world's gold. Our association dates back to my boyhood days when I was in school and first met him in the meadows near my school. He was called Usi Thattaan by my classmates.

Text: **P. Jeganathan**

Thereafter, I often spotted him silently moving about in the green grass there. I didn't know him too well then, but developed a certain fondness for him; his striking appearance left an indelible picture on my mind. With time like most adults I got caught in the grind of life and those carefree days became a memory.

I started working as a wildlifer and got deeply mesmerized by the many aspects of diversity of wildlife. I remembered my old friend six months ago when my passion for odonates was aroused by the book DRAGONFLIES OF INDIA – A FIELD GUIDE by K. A. Subramanian. Initially, this new found interest was restricted to watching and photographing them. It became an obsession only after I met David Raju, an expert on odonates, during his visit to Valparai. His passion for this group of organisms was contagious and I instantly became a victim. Damselflies and dragonflies are collectively termed as 'Odonates', and watching them is called oding. Once I learnt more about them, I appreciated them better. I now longed to look for my long lost friend *Usi Thattaan.*

Going down memory lane, my first memory of seeing dragonflies was when they entered the house at night and flew around the illuminated bulbs and tube lights. I often got distracted by the buzzing sound of their wings when studying. There were several instances when I saw them being preyed-on by house geckos and spiders hiding behind the tube lights.

Of the three odonates that I frequently came across since my school days, *Usi thattaan* was my favourite. It had a thin golden yellowish coloured body and a blue tail tip and the beautiful lively colours on its body fascinated me. The second odonate known to me was green or yellowish-green, while the third one was blue. Incidentally, the last two are called *Thattaan. Usi Thattaan* is Damselfly (*Usi* – needle [in Tamil]), appropriately named as damselflies have very thin abdomens compared to dragonflies, and *Thattaan* is Dragonfly.

Watching photographs of wildlife, irrespective of the medium, is one of my favourite hobbies. Needless to say the most used book in my library in recent times is DRAGONFLIES OF INDIA – A FIELD GUIDE. This field guide helped me identify the three odonates I had seen as a boy. I identified the yellowish-green dragonfly as a Ground Skimmer (female) *Diplocodes trivialis* and the blue one as the male of the same species. My excitement knew no bounds when I identified my long lost friend *Usi Thattaan* , better known in English as the Golden dartlet *Ischnura aurora.*

KEDAR BHIDE

Pied Paddy Skimmer can be seen commonly around agricultural land, pond and lakes

ISAAC KEHIMKAR

Wandering Glider - This common dragonfly is capable of migrating between India and Africa

Ground Skimmer (male)

Ground Skimmer (female)

successfully too for about six months until one afternoon, when I visited my hot spots for oding. There he was – my old friend, the Golden Dartlet. He was silently moving about in the grass like olden times. He hadn't changed even a bit. His tiny yellow body glistened in the sunlight with the unmis-takable blue tip at the rear end of the abdomen. Total length including his eyes and thorax would be not more than 20-23 mm. A closer look revealed that he had black and green stripes on his thorax and two beautiful azure blue spots on top of his head. The meeting with my old friend gave me immense pleasure and this time he obliged me with a photo-graph of his. Though the meeting was brief, it brought back old memories and this time on, I will keep in regular touch with him since I knew where to look for him.

Now that I knew more about him, I longed to see my friend again and searched for him in all his favourite habitats. But he eluded me and

Dragonflies and Damselflies are collectively called odonates. They are an interesting group of ancient insects. Although dragonflies and damselflies belong to two different groups, their lifestyle (breeding habits and dependence on water) is similar. However, they differ morphologically. Dragonflies spread out their wings when at rest on perches, whereas damselflies perch with their wings held together over their body. Another difference is that the eyes of the damselfly are separated while the large eyes of most dragonflies touch each other in front of the face. Dragonflies are found around aquatic habitat as well as drier areas, whereas damselflies are found mainly around water bodies.

How and where can we watch them? Once trained to see them, sighting them is not difficult. One can almost say that they are 'omnipresent' – playgrounds, parks, gardens, ponds, streams or any other water sources. Species such as Ground Skimmers, Ditch Jewels, and Wandering Gliders are commonly sighted in these habitats. Paddy fields are a repository of dragonflies and damselflies. Here, several species can be seen flying around. Rivers, lakes, ponds, streams and wells can also be visited to look for them. Clear, sunny days are the best time to watch them.

The life history of odonates is closely linked with water bodies. They use a wide range of flowing and stagnant water bodies to lay their eggs. Odonates breeding in rivers select either slow flowing or fast flowing sites depending on the ability of their larvae to cope with moving water. Many pool breeders are deceived by smooth shining surfaces, such as bonnets of cars and wet roads and they often try to lay eggs in these deceptive sites.

Damselflies insert their elongate and cylindrical eggs into an aquatic plant. Their elaborate ovipositor is serrated and adapted for making incisions in the tissues of plants and placing the eggs in them.

The larva is a sophisticated predator. Their cryptic colouration and keen eyesight make them highly effective. Some larvae systematically stalk their prey with the same determination as any other large predator. When they are in the striking range they shoot-out their formidable jaws. When ready to moult, they stop feeding and crawl up to emergent vegetation or rock. The newly emerged adults are wet and delicate, and as the day warm up, they become dry and fit for their maiden flight.

Among these newly emerged male and female odonates, generally, males travel farther than females. Damselflies complete their maturation period in about a week or less whereas dragonflies take approximately two weeks. During the maturation period, sequential changes occur in the colour of the body and wings.

Odonates surpass all other groups of insects in their flying skills. Odonates have uncoupled wings, that is unlike moths, butterflies, wasps and bees, fore and hind wings are unattached to each other and they beat independently. The powerful thoracic muscles help them in long sustained flight and good maneuverability. Odonates can hover and turn 180° while in flight and can fly backwards.

P. JEGANATHAN

Curious Case of a Centipede

Ushma Shukla is a student of Wildlife Biology and interested in studying ecology, natural history and wildlife conservation in India.

Spells of rain showers graced my week-long visit to Havelock Island (South Andaman) in November 2009. Knowing that rains mean great weather for reptiles and that too with the high endemism on the islands, I was quite excited about my visit.

Text and photographs: Ushma Shukla

On November 8, 2009, there were heavy showers around 9:00 p.m. I, alongwith my friend Harshada Pethe and her colleagues, Steve and Maurice had planned a trail in the evening on that day; only to see our plans getting soaked with the rains.

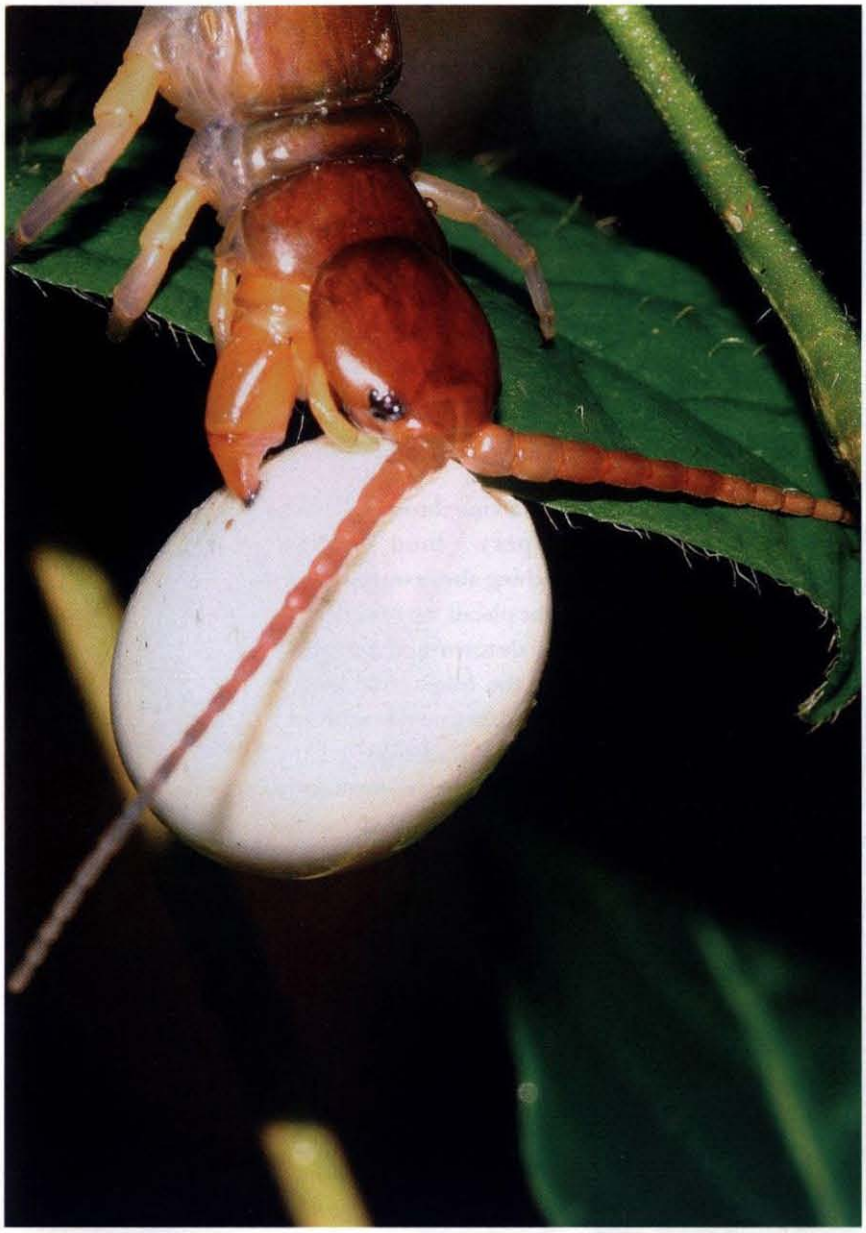
However, around 11:00 p.m., the rain decided to show a little mercy and slow down to a light drizzle. Although all of the others, excluding me, had to turn up for their jobs on the island the next morning, with a quick voting it was decided that we should indeed set out on the trail as planned.

Harshada and I had already made a short trip to the area in the afternoon and decided on a particular path leading off-road; we wanted to scan for reptiles and other interesting activity after dark. This trail was particularly interesting since it started in an open area outside a village, led through a thick forest and ended on a beach. It also had small streams criss-crossing through some areas in the forest.

Centipedes have adapted to eat a variety of different available prey items

Walking through the wet, slippery mud almost reaching above our ankles in some places, we made a slow but determined progress into the forest. Suddenly I saw something bright and colourful caught in my torchlight in the bushes on the side of the path ahead. It was a centipede, about 10 cm long, on the leaves of a plant, a little above 1 m in height. Although finding the centipede at this height instead of the ground was interesting, what caught my attention was a flash of white in between its forelegs.

On closer inspection, I found it to be an egg of a gecko, probably smuggled by this centipede. The egg was held by its claw on the foreleg and was broken on the top by the centipede, which was already feasting on the contents within the egg. The centipede was almost hanging mid-air between the leaves of the plant. Increasingly interested by this event, I took the privilege of capturing the moment on my camera. With the centipede absorbed



Centipedes feeding habits are not well known because of their cryptic lifestyle

Centipedes (*centi* "hundred", and *pedis*, "foot") are arthropods belonging to the class Chilopoda. Centipedes are found in an array of terrestrial habitats from tropical rainforests to deserts. Within these habitats, centipedes require a moist micro-habitat because they lack the waxy cuticle of insects and arachnids, and so lose water rapidly through the skin. Accordingly, they are found in soil and leaf litter, under stones and deadwood, and inside logs. Centipedes are predators, and mainly use their antennae to seek out their prey.

in its feast, and not really interested in our presence, I managed to capture a few frames of this event.

A few minutes later, we continued our trail till the early hours of next morning wherein our sightings totalled to 2 Andaman pit vipers, an Andaman cat snake, an Andaman Keelback, and toads, along with this interesting event of the night involving the centipede.

Like other lesser fauna of our highly diverse country, very little is known about the feeding habits and other behaviour of centipedes. It is still unknown whether eggs of geckos are a regular part of the diet for the centipedes or whether this was a rare event!

Some men come by the name of genius in the same way as an invertebrate comes by the name of centipede - not because it has a hundred feet, but because most people can't count above fourteen.

— Georg Christoph Lichetenberg (German Physics Prof. and scientist - 1742-1799)

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RISHAD NAOROJI

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to support the publication of *Hornbill*

Tigers - here today, gone tomorrow?

My trip to Bandhavgarh Tiger Reserve in May 2010 was extremely rewarding with regard to tiger sighting that we had, during our three day visit to the sanctuary. We had concluded with a positive feeling, 'Yes! Tigers will continue to survive in India', but little did we know that we were in for a rude shock. A tigress with its three eight month old cubs was hit by a vehicle and was dead in the following few hours . I was happy the forest officers were particular about the number of vehicles limited for the morning and evening safari (being 45 vehicles), including the number of persons per vehicle, all in the interest of conservation. But to hear that the 30 month old tigress was dead the following week was tragic and heart-breaking. When the country is counting on every tiger, this is extremely shocking. What will happen to the cubs? Who would train them to hunt? Or will they end up in a zoo? Can we afford to lose them?

This incident will remain in my memory, as I had watched this tigress accompanying her cubs for almost 10 minutes crossing the forest road. I hope the forest officials will be successful in at least saving the cubs!

Dr. Hemalatha Nair
BNHS Life Member

Nawabs of the Jungle!

contd...

This is with reference to the letter of Lt. Gen (Retd.) Baljit Singh in the "Readers Space" column of *Hornbill*, January-March, 2010. In this, he has given credit to Lord Curzon for conservation of lions in the Gir Forest, because he refused the invitation for shooting of lions during Christmas holidays despite having been invited by the Nawab of Junagarh.

In this connection, may I quote Lt. Col. A.H. Mosse from his article, "The Lion of the Gir" written in 1957 from the book THE LIONS OF INDIA (published by Black Kite and edited Divyabanusinh):

"During the late Lord Curson's Viceroyalty, a certain amount of pother arose over an announcement that he was about to visit Junagadh for the purpose of shooting one of the few remaining lions. The feelings aroused on the subject found voice in some lines published in the leading Bombay daily of these I remember but a word or two contained in a plea that the lions of the Gir should be allowed to remain in their last retreat undisturbed by "Viceroy or Vandal"..... Great men must of necessity expected to be called hard names...but George Nathaniel Curzon a Vandal!"

"Whatever the method, the desired result was attained. Curzon went out to shoot no lion...."

It appears from the above words of Lt. Col. Mosse, that credit must go to the writer of the letter or article in the leading daily of Bombay, which persuaded Lord Curzon to abandon his programme of lion hunt in the Gir forest. Could the newspaper be *The Times of India*? If so, efforts could be made to retrieve the full article/letter from the archives of the Newspaper and the name of the gentleman could also be found out, who dared to call Lord Curzon a Vandal, which prompted him to cancel the Lion hunt.

Narendra Singh,
Jaipur.

ABOUT THE POSTER

Red Velvet Mite

Though an Arachnid, mites are often mistaken to be insects. The largest amongst mites (12 mm), Red Velvet Mites are seen at the onset of the rains. The emergence of these slow-moving conspicuous mites coincides with the emergence of winged ants and termites on which they feed. The complex life cycle of these mites has several instars of larvae, which are parasitic on insects such as grasshoppers, beetles, and aphids. The bright red colour warns prospective predators of distasteful encounters. Red Velvet Mites are harmless to humans.

Mites are among the most diverse and successful of all the invertebrate groups. They have exploited an incredible array of habitats, and because of their small size (most are microscopic) go largely unnoticed. Many live freely in the soil or water, but there are also a large number of species that live as parasites on plants, animals, and some that feed on mould.

Red Velvet Mite
Dinothrombium sp.

ISAAC KEHIMKAR

Incredible Insects!!

Text : Isaac Kehimkar

Evolved to be the most numerous and diverse group among the Earth's creatures, insects represent more than half of all identified animal species. More importantly, insects occupy a critical niche in the ecology of this planet. Their ability to adapt and evolve to overcome natural as well as artificial barriers, is possibly the key to being one of the most successful creatures surviving today. Here we explore this most astonishing group that has several amazing dimensions of adaptations for survival. Sensitivity to temperatures and humidity is vital to their very survival. Besides these, their specialised behavioural pattern and physical appearance too, contributes to their successful survival despite being the largest living prey base in the food web. But long distance travelling takes time, and insects are not long-lived. To overcome this problem, the distance is covered by not one generation of insects, but it takes three or four generations to complete the journey and return to the point of origin. This is just a peek into the wonderful world of insects that invites you to explore and know more about the amazing creatures inhabiting our planet.

Atlas Moth

Insects have been communicating using several forms of communication much earlier than man. A feathery antenna of the male Atlas moth detects the presence of the newly emerged female kilometers away who has 'broadcast' chemical signals in form of pheromones, with which he approaches her.

ISAAC KEHIMKAR

ISAAC KEHIMKAR

Centaur Oakblue Caterpillar and Red Tailor Ant

Defenceless caterpillars of some Lycaenid butterflies have evolved to use the strengths of other insects to protect themselves from their predators. The caterpillar exudes a sugary solution as a reward to the ants which escorts the caterpillar as bodyguard. This is a perfect example of symbiotic associations seen in nature.

Web Spinner

This insect has the ability to weave silk from the gland on its enlarged forelegs. They live in this woven pouch or gallery of silk tunnels and chambers in the cracks of the tree bark. The males are winged and females are wingless. Female Web Spinner guards her eggs and cares for her young.

ISAAC KEHIMKAR

Leaf Insect

A classic example of how nature has sculpted this forest insect to make it almost invisible! Its adaptive coloration plays an important role in its survival. Related to the Stick Insect, leaf insects are exclusively seen in the moist evergreen forests (Western Ghats and North-east India).

ISAAC KEHIMKAR

Aphids

Aphids are fragile and small in appearance, but in large numbers can cause viral diseases in plants, crop fields and orchards. They reproduce sexually as well as asexually and can lay eggs or at times give live birth. Ants often protect aphid colonies in return for the honeydew the aphids exude.

ISAAC KEHIMKAR

ISAAC KEHIMKAR

Stag Beetle

The beetle gets its name from the large mandibles that resemble a stag's antlers. Among insects, Stag Beetles are known for their mating rituals, during which the male stag beetle displays his 'antlers' wide as he struts and two males will fight for a female. The stronger male throws its rival on its back to display its strength and dominance.

ISAAC KEHIMKAR

Firefly

Bioluminous insects, fireflies are well-known for their twinkling green light. This cold light is created due to a chemical reaction in its abdomen. In this beetle form, males are winged, the female is wingless. The female is a carnivore and feeds on snails and males of other species after luring them.

ISAAC KEHIMKAR

Bumblebee

Bumblebees dwell in high hills (Western Ghats and Himalaya) Related to honey bees, bumblebees too live in colonies by nesting in burrows in the ground made by other animals or among grass clumps. It is a valuable insect in pollinating crops and orchards.

ISAAC KEHIMKAR

Asian Dune Cricket

These are rare burrowing crickets that dwell along the sandy river banks. They live in deep burrows, only to emerge in the night. They are known to feed on other insects, at times with cannibalistic behaviour. **Its curled wing tips are characteristic of this cricket.**

Cicada

Adults feed on the sap of trees and lianas and nymphs feed on plant roots, remaining underground This noisy insect's sound producing organs, are two hollow cylinders on its chest,covered with hard plates, that vibrate each time the air gushes in. Male cicadas 'sing' to advertise and the female probably selects the loudest male!

Nymph moult

Freshly emerged adult

SAMEER KEHIMKAR

Termites

Nicknamed as "white ants", termites are not ants, but are closely related to cockroaches. Termites are known to be the best architects among insects. They build huge 'air-conditioned' mounds by recycling their own faeces, which has intrigued the study of architecture.

ISAAC KEHIMKAR

Water Scorpion

Water Scorpion is a winged aquatic bug that has a breathing tube at the tip of its abdomen that sticks out of the water surface to breathe. As the name suggests it resembles a fearsome scorpion, but is actually a harmless bug.

ISAAC KEHIMKAR

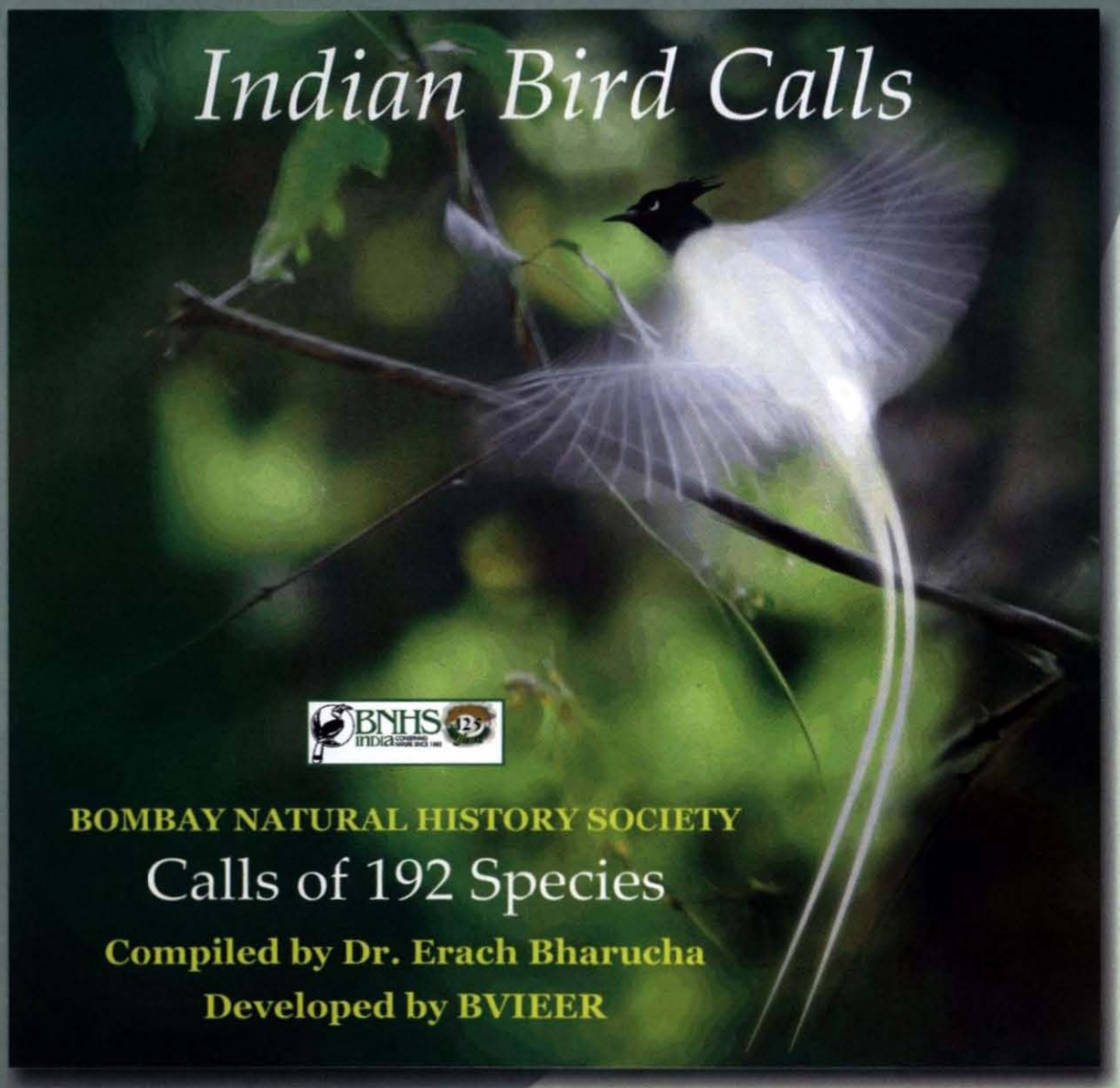
Bristletail (Silverfish and Firebrats)

A unique feature of these unheard primitive insects is that, an adult Bristletail continues to moult throughout its life. They have evolved to feed on cellulose, which is why they bore holes on scratchy surfaces like books, papers, and wallpapers.

ISAAC KEHIMKAR

Isaac Kehimkar is an avid naturalist, nature photographer and author.
He is a Fulbright scholar and presently the General Manager (Programmes) at the BNHS.

The DVD has 192 Indian Bird Calls with distribution, habitat, scientific and common names, behaviour, pictures and illustrations, distribution maps and sonograph



COMING SOON

BNHS India CONSERVING NATURE SINCE 1883

Canara Chromide *Etroplus canarensis* was thought to be extinct until its rediscovery in 1992. It is now known to be endemic to the Western Ghats of Karnataka

Exploring Freshwater Fish of India

F*rom canopied mountain streams, cascades,*
R*ivers, lakes, ponds, open fields and derelict drains,*
E*verywhere I can thrive in harmony with man and nature.*
S*ource of food, medicine have I been and a source of recreation,*
H*eartless and inhuman is the response from this fellow creation,*
W*ith dams, mining, reclamation of water bodies and deforestation*
A*dding to the cause is pollution and over exploitation.*
T*hreatened am I with habitat loss, mighty mahseers and minnows all alike*
E*ndangered and driven to the brink of extinction,*
R*ods and lines - a thing of the past with the mighty mahseers a Red listed lot.*
F*oolish men in greed have exploited me and my habitat clean*
I*nvasive species brought in by him have decimated many of my clan, yet*
S*wimming, leaping, splashing and entertaining is not a far fetched dream, with*
H*abitat restoration, afforestation, and pollution free streams, I bet*
E*ndless bounty you are sure to reap, and entertainment an added treat*
S*ave me will you for your own good – isn't that a good bait you brute.*

— Rema Devi

K. Rema Devi, senior scientist, Zoological Survey of India, has been working on fish for over three decades and has described several new species. She is currently the Regional Co-Chair of the Freshwater Fish Specialist Group, (FFSG-IUCN-WI) for South Asia.

Text: **K. Rema Devi, V.M. Sathish Kumar, M. Beta, Ranjit Manakadan**
Photographs: **M. Beta**

More than 70% of our planet's surface is covered by water, but mankind has named it Earth – what an irony! When one thinks of water, one naturally thinks of fish, and there are quite a lot of them! Estimated at around 28,000 species, it is expected to go up to cross 32,000 in the future with new discoveries. Startlingly, about 43% of these live in freshwater ecosystems, like lakes and rivers that cover only 1% of the Earth's surface and account for a little less than 0.01% of its water!

When in salt water, fish need to keep the salt concentration of the body lower than that of the surroundings, and vice versa in fresh water. Freshwater fish have gills that are able to diffuse dissolved gases while keeping the salts in the body fluids stable.

A pristine fish habitat at Parambikulam Wildlife Sanctuary

So what are the adaptations required for freshwater and marine environments, considering the most obvious difference being in levels of salinity? Many species evolved by associating and adapting to different habitats with different stages of life. At the same time, some species, visit their ancestral home for breeding. So, while freshwater and marine fish needed a range of physiological adaptations, species migrating between marine and fresh waters needed special adaptations for both environments. And these 'little heroes' are termed accordingly; the fish that go back to marine environments to spawn and return are known as catadromous, as seen in the eels of *Anguilla* spp. On the contrary, species that prefer the sea and come to fresh water to breed are termed anadromous, as in the case of *Hilsa*.

Fish occur in all kinds of aquatic habitats and therefore, need extreme modifications of the external and internal body parts found in no other group. Be it the highest mountain streams or subterranean waters, the ocean depths, ranging from the tropics to the polar regions, hot springs and soda lakes, either confined to one system or being migratory, they have seen it all. They have adapted to life in highly oxygenated waters to murky, derelict water bodies. Hence, they range from the typical spindle, to round and flat and even bizarre forms, from brilliantly coloured to drab, showing extreme modifications in structures like fins, scales and eyes to suit their habitats. The migratory *Anguilla* eels have snake-like elongated and muscular bodies which help in their long migratory journey from mountain

The gobies are groups of fish which are found in the seas, estuaries and freshwater. Most prefer estuaries, but some appear to be unsure; the *Glossogobius* spp., are at home in estuaries and freshwater streams. There are even a few representatives of this family in the mountain streams, e.g., *Sicyopterus griseus.*

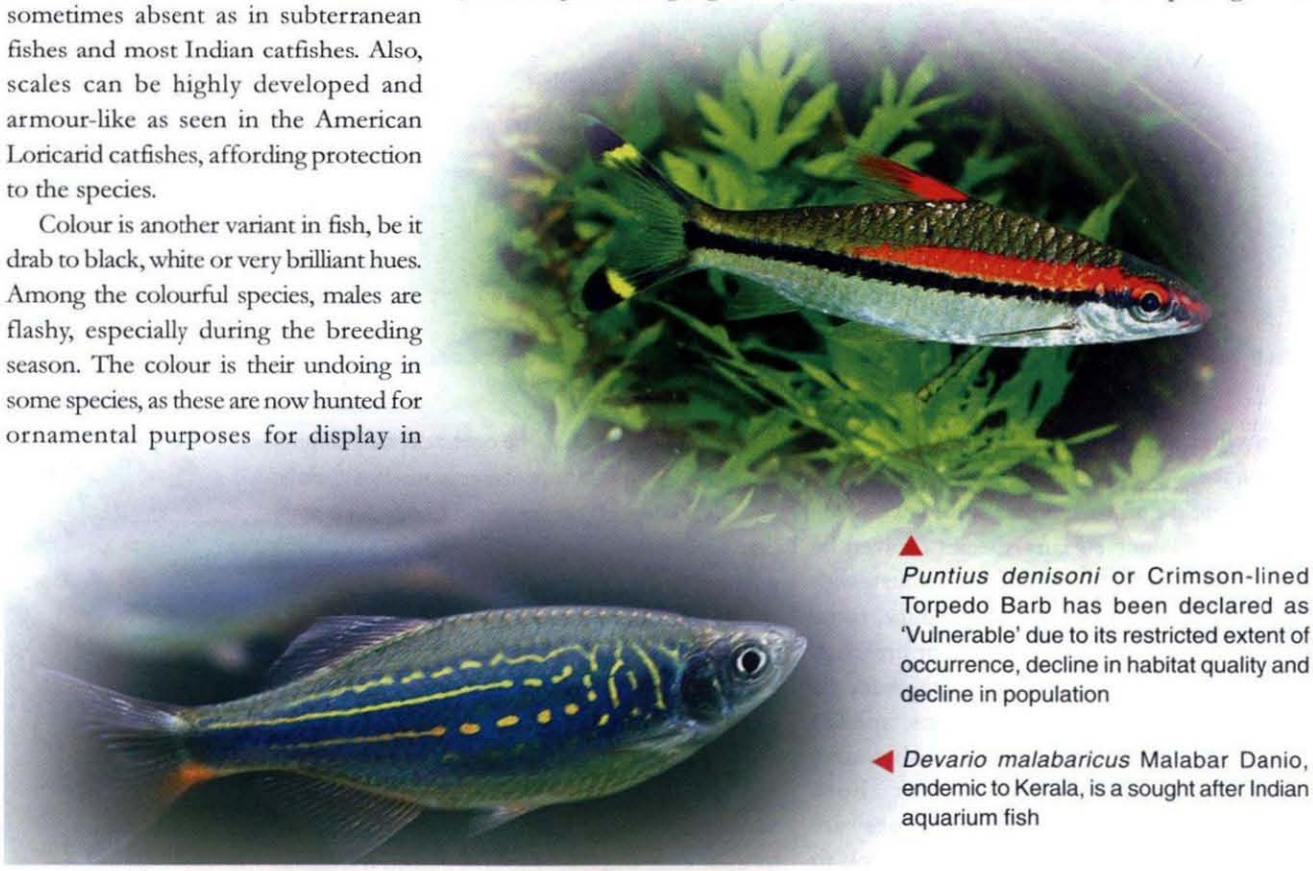
streams to the sea to breed. Those that are adapted to life in weedy habitats have a compressed body, which helps in meandering through water plants. Species that have taken to a bottom habitat have highly depressed flat bodies some with both eyes on the dorsal surface as in sole fishes. But it doesn't end here; there is more to the amazing adaptations in fish ...

Scales are characteristics of a typical fish, but then this structure has undergone extreme changes. Being much reduced or buried under the skin as in the stone loaches (which live under pebbles in mountain streams), scales are sometimes absent as in subterranean fishes and most Indian catfishes. Also, scales can be highly developed and armour-like as seen in the American Loricarid catfishes, affording protection to the species.

Colour is another variant in fish, be it drab to black, white or very brilliant hues. Among the colourful species, males are flashy, especially during the breeding season. The colour is their undoing in some species, as these are now hunted for ornamental purposes for display in aquariums. One victim of this trade is the most sought after 'Miss Kerala' the Crimson-lined Torpedo Barb *Puntius denisoni.* Various protective measures are currently being taken by the Kerala Government to save the species from impending extinction. Other colourful Indian species that are popular in the aquarium trade are the Dwarf Gourami *Colisa lalia*, Zebra Danio *Danio rerio*, Malabar Danio *Devario malabaricus,* Blue Danio *Devario aequipinnatus,* Winged Danio *Chela laubuca*, Melon Barb *Puntius fasciatus*, Flying Barb *Esomus danricus* and species of spiny eels. However, most aquarium fish species originate from the vast expanse of the Amazon River, and recently, the colourful and bizarre cichlids of the Rift Valley lakes of Africa are becoming popular.

Based on the adaptations and the different habitats that fish inhabit they have a wide range of feeding guilds. Planktivorous fish pick plankton (microscopic floating organisms) out of the water column. Some species capture surface prey (mainly terrestrial and emerging insects) and drift (benthic invertebrates floating downstream). From the surface going all the way to the bottom, some species prey primarily on immature insects, but will also consume other benthic invertebrates. Top predators consume fish and/or large invertebrates. Omnivores (animals that consume plants and animals) ingest a wide range of prey. Last but definitely not the least, we come to the parasites like lampreys that live off their host species, typically other fish. We can see how fish are flexible in their feeding roles, capturing different prey with regard to seasonal availability and their own developmental stage. This may allow them to occupy multiple feeding guilds in their lifetime.

Our nation, due to its variety of ecological habitats, harbours a rich diversity of ichthyofauna or commonly termed fish fauna, comprising about



▲ *Puntius denisoni* or Crimson-lined Torpedo Barb has been declared as 'Vulnerable' due to its restricted extent of occurrence, decline in habitat quality and decline in population

◀ *Devario malabaricus* Malabar Danio, endemic to Kerala, is a sought after Indian aquarium fish

2,500 species, of which 930 species are freshwater inhabitants. The high species diversity is also because of India's confluence of the three bio-geographical realms (Indo-Malayan, Palaeartic and Afro-Tropical), and thus, it has representatives from all these three regions. This boundless diversity includes the largest of the freshwater fish of India the masheers *Tor* spp. and the Goonch *Bagarius yarelli*. In fact, there are species that can crawl on land (to some extent) and move to other water bodies when wetlands dry up during summer, the most well-known being the Indian Climbing Perch *Anabas testudineus* (see photo on page 43). India also has its share of fish that are blind – blind fish are generally found in caves. In the 1950s, a blind catfish *Horaglanis krishnai* was recorded in the wells of Kottayam, and recently, some more species have been discovered from the subterranean waters of Kerala. And, there are counterparts of marine pufferfish in freshwater that can inflate themselves to a larger size on approach of predators. Such is the diversity of freshwater fish in India.

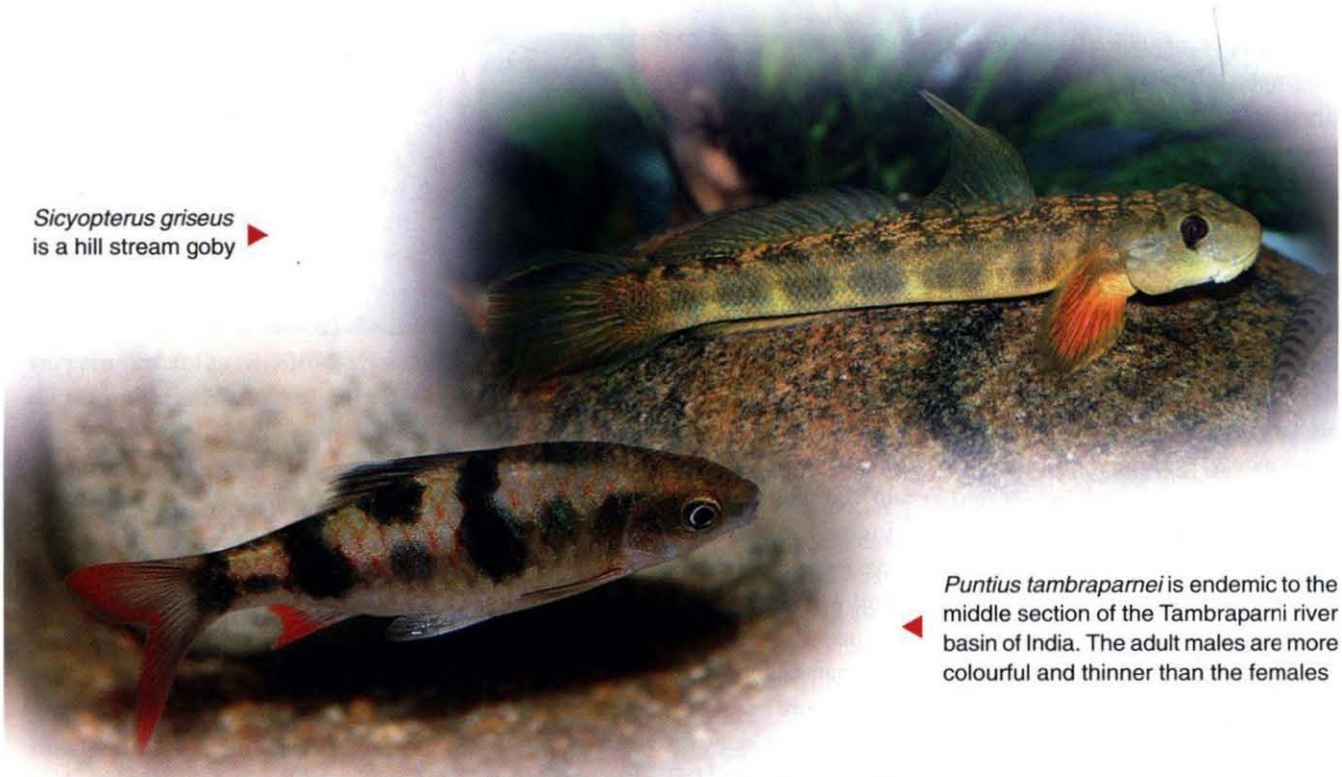
Biodiversity Hotspots are places identified across the world with a rich concentration of biodiversity under threat by humans. These Hotspots must contain at least 1,500 species of vascular plants (> 0.5 percent of the world's total) as endemics, and it has to have lost at least 70 per cent of its original habitat. Of the 25 biodiversity hotspots of the world, India harbours three hotspots, Himalaya, the Western Ghats and the North Eastern Region (Indo-Myanmar). The diversity of fish fauna in these regions is also rich, from the tiny freshwater puffer fish of Kerala not growing to more than 25 mm to the Giant Mahseer *Tor putitora*, which attains a size of 2.7 m. Interestingly, the tiny 36 mm *Pangio goaensis* and *Pangio bashai* that inhabit the rivers of Western Ghats have their nearest known relative only from South-east Asia and nowhere else in the world. Very recent discoveries include a new barb species *Puntius exclamatio* from southern Western Ghats and a loach *Nemacheilus stigmofasciatus* from the torrential streams of Karnataka. These two regions seem to be treasure houses of fish diversity with new species being discovered from the little explored and still pristine mountain streams. The level of endemism is also very high in these two regions.

Another (*Schismatogobius*) prefers to live among pebbles and sand, along with the stone loaches (Noemacheilids and Balitorids). Stone loaches and the Sisorids (sisorid catfishes) are the most highly evolved of hill-stream dwelling species. The ventral portion of its mouth is modified as a sucker or the chest has large, hosepipe-like paired fins for providing more surface for attachment onto rocks sprayed by the gushing mountain streams.

The discovery of any new species is based on identification attributes. Fish identification, till recently, primarily involved morpho-metric and meristic analysis, such as the relative proportion of body characters, the number of fin rays or scales, type of scales, the number of lateral rows of the scales, and the number of lateral line pores on the scales. However, DNA is now playing an increasing role in fish identification and the National Bureau of Fish Genetic Research (NBFGR) at Lucknow is part of the International Barcode of Life (IBOL) the world's largest genomic exercises aimed at understanding biodiversity by DNA barcoding all the world's species. DNA barcoding of all the species of the world will remove the ambiguity pertaining to the taxonomical identification of species, which was till now done on the basis of appearance. Barcoding may lead to the 'discovery' of new species, till now thought to belong to another species based on their looks.

As fish live underwater they are more difficult to study than terrestrial animals and plants, and information about fish populations and their decline is often

Nemacheilus stigmofasciatus and *Schistura* cf. *nilgiriensis* are of the loach family which are bottom dwelling fish



Sicyopterus griseus is a hill stream goby

Puntius tambraparnei is endemic to the middle section of the Tambraparni river basin of India. The adult males are more colourful and thinner than the females

unknown. Freshwater fish seem particularly more threatened because they often live in relatively small water bodies. Dams, draining and land-fills of wetlands, agricultural and industrial expansion, drainages flowing from our towns and cities, mining and removal of sand and stone all contribute to habitat destruction and pollution of our wetlands. Over exploitation and destructive fishing are also problems. A new threat is the influx of (alien) invasive fish species, which especially pose a threat to our endemic fish species. It is estimated that India has 327 freshwater fish species that are threatened. Among these, *Osteobrama belangeri* is extinct from the wild and *Gymnocypris biswasi* is extinct, 45 critically endangered, 91 endangered, 81 vulnerable, 66 low-risk near threatened, 16 low-risk least concern, and 26 data deficient.

Several Acts have been enacted beginning with the Fisheries Act 1987 to the Biological Diversity Act 2002 for the conservation of the biodiversity of India. The conservation of fish germplasm resources by the National Bureau of Fish Genetic Resources is a major step towards protection of fish species as a specific group. However, with India now being one of the most populous countries in the world and with the heavy pressures on its natural resources including wetlands, the fate of our wetlands and their fish fauna faces peril!

Fish that live in murky water, such as in the anabantid *Anabas* sp. and the catfish *Heteropneustes* sp., have highly specialised air-breathing organs over the gills that allow them to gulp air from the surface of the water and breathe. In some species, the tail and in others, the gut, help in oxygen intake.

A beautiful stream at Bhadra Wildlife Sanctuary

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SAMEER KEHIMKAR

Invasive fish
- a threat to fish diversity

Ranjit Manakadan has been working with the BNHS since the early 1980s. He is presently an Assistant Director at the Society.

One pleasant evening, I and my friends trekked down the hill near our neighbourhood in Singapore. On reaching the lake there, we set our rods and lines to start fishing. Like anglers know, there are days when fish do not bite, but that day, the fish took the bait in suicidal fashion ...

Text: **Ranjit Manakadan**

We were bringing in fish within seconds of casting the line. It had rained very heavily through the day and maybe therefore, the fish were 'cold and hungry' and desperate for food leaving caution aside.

All that we caught that day were the 'ikan jepun' or Japanese Fish, but better known as Mozambique Tilapia *Oreochromis mossambicus*, a species native to East Africa. This was the first invasive fish species that I had personally encountered. Invasives are exotic or non-native species of plants or animals that thrive in their new habitat competing, dominating or even eliminating local species, thus resulting in the loss of diversity. In India, classic examples of invasives are the *Lantana camara*, *Parthenium hysterophorus* and *Prosopis chilensis* (earlier *P. juliflora*) among land plants, the Water Hyacinth *Eichornia crassipes* among aquatic plants, and the Mozambique Tilapia among fish.

Invasive fish, either through intended or accidental introductions, have been the bane for native fish species. They impact native fish by changing the ecology of the waters (eating or uprooting plants, disturbing the soil and increasing turbidity by their feeding and nest building activities, occurring in high densities, etc.), through spread of disease and parasites, and/or causing extinction of native fish (or other aquatic fauna) by predation and resource competition. Thus, release of exotic fish species into wetlands is a serious offense in some countries, and extermination drives are launched to destroy them when detected, to safeguard the future of native species. However, it is difficult to keep a check, and who can prevent a man from dumping his aquarium fish down the storm-water drain after abandoning the hobby. Most fish hobbyists do not have the heart to destroy the fish, so they choose to drop it into the nearest well or pond, not realising the consequences on the native fish species. Unintended introductions also take place during floods, when fish farms get connected to water courses and wetlands.

The Mozambique Tilapia, first introduced as a food fish in 1952, now runs wild in many parts of India, occurring in freshwater and brackish water habitats. A hardy species, it tolerates high salinity and I recorded them in high abundance in low- and medium-salinity condensers of industrial salt works in the Great Vedaranyam Swamp (Tamil Nadu) where other species do not survive. The Mozambique Tilapia has the capacity to wipe out local species (especially in

Courtesy: Wikipedia

The Dwarf gourami, *Colisa lalia* inhabits slow moving streams, rivulets and lakes with plenty of vegetation

SAMEER KEHIMKAR

small isolated waterbodies), not by its aggressiveness (a relatively peaceful species in aquariums) but due to a combination of high fecundity, rapid growth and voracious feeding habits. Temple tanks in southern India tend to have only this species, except for large native predatory fish that prey on Tilapia fingerlings; the smaller and peaceful fish species must have gone into oblivion.

The Convict Cichlid, *Amatitlania nigrofasciata* is an exotic notorious 'fin-nipper' which can be a trouble for docile species like the *Botia striata*

Courtesy: Wikipedia

Botia striata or Striped Loach is an Indian species that is undergoing range-expansion due to the aquarium fish trade

The Mozambique Tilapia also has another characteristic: in conditions of high densities and especially in small water bodies, its growth gets stunted, resulting in significantly smaller sized individuals. In large water bodies, and where predators or fishermen keep the population in check, the fish get bigger. I once 'played God' and maintained an aquarium of dwarf-like (less than two inches) adult Tilapias by first over-crowding them as fry in a small aquarium. The breeding, black dwarf males with red fin edges and yellow operculum were much sought after by my aquarists' friends. This size reduction has been a bane for fish farmers, and sterile fry are created (through hybridization with other Tilapia species) to ensure larger fish for the markets.

Other than the Mosambique Tilapia, one of the most commonly cited examples of the negative effects that invasive alien species can have on ecosystems, was the introduction of the Nile Perch *Lates niloticus* in Lake Victoria in the 1950s to increase its fishery potential. This very large (up to 2 m and 200 kg) alien predator is attributed with causing the extinction or near-extinction of several hundred native species, besides ecological damage and socio-economic impact on the people. An old case of introduction of an exotic, large, food fish in India, albeit a plant-eater, is the Giant Gourami *Osphronemus goramy*. A native of Indochina, Malaysia and Indonesia, it was first introduced into Chennai in 1866. It now mainly occurs in the waters of Kerala. Among the smaller invasives introduced into India are the Guppy *Poecilia reticulata* and Gambusia *Gambusia affinis* of the Americas. These were introduced to control malaria. The Guppy is also an extremely popular aquarium species with many colourful strains. Both the species are livebearers ('give birth' to live young and do not lay eggs) and hence breed easily and multiply quickly. The Gambusia has proliferated to such an extent that it is now sold as live food for carnivorous aquarium fish in Chennai. These two 'apparently' harmless exotics are attributed to the decline or elimination of our indigenous larvivorous fish species, namely, *Aplocheilus* (panchax) and *Oryzias* (ricefish) spp. Popular aquarium species like platys, swordtails and gouramis are also reported to have become naturalized in some areas of southern India.

Significantly, more people have taken to the aquarium hobby in India in the 21st Century and much more exotic species are available to aquarists with the advent of globalization. It is estimated that around 300 exotic species are traded in India, and there is practically no regulation on this trade. One can buy piranhas of South America, the sleek, silvery arowanas of South America and Asia, queer-looking suckermouth and other attractive catfishes of the Amazon, and a variety of colourful cichlids from Africa in Chennai – presently the major aquarium fish breeding and trade centre in India. The other southern states are catching up fast with more and more people taking a keen interest in maintaining aquariums and to get the supposedly positive vibes of *feng shui*. This development is great news for Indian fish fanciers and a money churner too, but many of these species could turn into 'demons' once in our waterways.

Most of the fish that dominate the aquarium trade originate from tropical

America, Africa and Southeast Asia. Hence, they are susceptible to cold (as most aquarists know) and those that now occur in Indian waters are largely found in peninsular India. As for cold water species introductions, which consisted mostly of game and food fish, the British took persistent efforts to introduce trout into the high altitude lakes and streams of the Nilgiris, other sites in the Western Ghats and the Himalayas. These now occur in the wild in these areas. Other cold water species introduced by the British into the Peninsula hills are the Tench *Tinca tinca*, Golden Carp *Carassius carassius* and Common Carp *Cyprinus carpio*.

In addition to exotics, there are also hybrids being churned out by aquarists with regularity, some of which are fertile. Since, oddities, monstrosities and bright colours have always fascinated the human race, genetic engineering is also taking place with luminescent fish being created with infusion of DNA of jellyfish! Ominous is the development of the Flowerhorn, an extremely aggressive, large, carnivorous fish, which is usually condemned to a life all alone in its own tank as it is inimical to even its own kind. It gets its name from the rosy coloration and horn-like projection on the head. It is a hybrid of a few South American cichlids, with reports of involvement of genetic engineering also. Good specimens cost thousands of rupees and there is no dearth of buyers in India. This species already occurs in the wild in Malaya (where it was first 'created'), and it has been recently reported from Red Hills Lake in Chennai. One will have to wait for a few more years to know its impact on our native fish species and other aquatic invertebrates. The voracious, flesh-eating Red-bellied Piranha *P. nattereri*, a common species in the aquarium trade in Chennai, is another looming threat. Even some of the smaller exotic species can be very destructive, and a few have the reputation of biting off the eyes of even larger fish. Most cichlids in the aquarium trade now, and especially the assortment of attractive and colourful ones from the Rift Valley lakes of Africa, are aggressive and territorial species. These also indulge in fin-nipping of other aquarium and local species, which leads to ill-health, tremendous stress and death.

The African Sharp-tooth Catfish *Clarias gariepinus* (100-150 cm), a much larger version of our Magur *C. batrachus* (30 cm), is a notorious, recent entrant among food fish species. It is a voracious eater which consumes food rapidly and this habit makes it a particularly harmful invasive species. An air-breather and extremely hardy, it has even been recorded in highly polluted water bodies, oxidation ponds or even urban sewer systems. Because of its wide mouth, it is able to swallow relatively large prey whole and has been known to capture and eat even waterfowl, and there is also an (exaggerated?) newspaper report of a large specimen killing a kid in Bangladesh! For its extremely pugnacious nature and being a threat to local fisheries and fish culture, it is a banned species in India, as in many other countries. However, law enforcement is a difficult thing in third world countries. It now appears to be eliminating the Mozambique Tilapia in the temple tanks of southern India (e.g., Kapaleeswar temple in Chennai. The Mozambique Tilapia is also probably facing another threat from one of its congener, the larger and similar looking Nile Tilapia *Oreochromis niloticus*. It (or its hybrids?) appears to be replacing the Mozambique Tilapia in the freshwater fish markets in Chennai. In fact, there is already a report of the Mozambique being endangered by the Nile Tilapia in Africa! Another African cichlid, the Blue Tilapia *Oreochromis aureus* has been recently reported in Chennai waters. The suckermouth catfishes of South America with armour-like plating get quickly dumped into local wetlands as they grow rapidly to a large

The African Knifefish is nocturnal and uses the nerve-filled pits running down its body to navigate lightless waters. Its large eyes provide it with excellent night vision

SAMEER KEHIMKAR

RANJIT MANAKADAN

Anabus testudineus is one of the hardy native species of India

Indian snakeheads are now invasives in North America

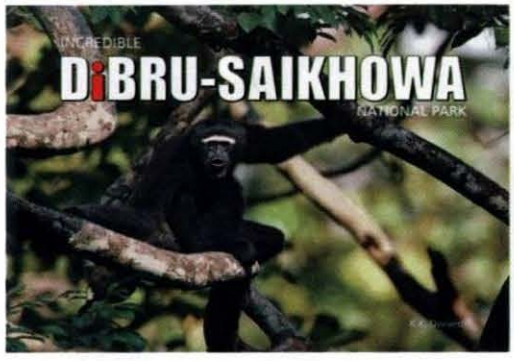
size in aquariums. There are increasing reports of these species from waters of southern India and it could finally end up finally as a poor man's (due to its ugliness) food fish. This is already the case of a popular aquarium fish, the Shark Catfish *Pangasius hypophthalmus*, as I recorded it in the fish markets of Kuppam (Chittoor district, Andhra Pradesh). The Shark Catfish is more of a food fish than an aquarium species in its countries of origin in Southeast Asia. And, I do not think the day will be too far off for one to order fried piranhas in Indian restaurants.

It is not only the exotics from foreign countries that pose a threat to Indian species. Most of the commercial species of carps of northern India (Rohu *Labeo rohita*, Catla *Catla catla* and Mrigal *Cirrhinus mrigala*) are now common in the river systems of southern India. Strictly speaking, these should also be regarded as exotics as they are aliens in the new regions of transplantation. The transport of fry of these species for fish culture has also helped the spread of other non-commercial fish species. For example, the Freshwater Grey Mullet *Rhinomugil corsula* of the Ganges has spread as far south as the Vaigai River near Madurai. Many other such accidental introductions of other fish species through 'contamination' of fry stocks for fish culture must have taken place in the past or are happening now. Conservationists have also faulted in conservation initiatives for the endangered mahseers by introducing them into rivers where they do not occur. This may affect native mahseer species and encourage hybridization.

The aquarium trade in Indian species is another culprit for the spread of native species. The Dwarf Gouramy *Colisa lalia,* a popular aquarium fish from northern India, is now known to occur in the wild in and around Chennai. Many more Indian fish species like the barbs, danios and loaches have, or will be undergoing range extensions through the aquarium trade. One of the most surprising experiences of my life as far as fish is concerned was seeing breeding pairs of the estuarine Orange Chromide *Etroplus maculatus* in a stretch of shallow stream deep inside the heartland of Andhra Pradesh near the Rollapadu Widlife Sanctuary. Later, I read that this and another brackish water species, the Pearlspot (or Green Chromide) *E. suratensis* had been introduced into this area and other inland waters during the early part of the last century!

Unlike birds and mammals, for which population declines are more noticeable, the fish fauna of our wetlands and the threats they face from exotics largely remain hidden beneath its waters – except for the discerning local fishermen. The fish fauna and other aquatic invertebrates of our wetlands already face a number of threats due to loss of wetlands through draining and land fills, pollution, withdrawal for irrigation, damming of rives, over-fishing, infestation by exotic weeds, etc. The proposed linking of the major rivers of India will be a major threat to fish conservation as it can result in loss of species diversity, decline or extinction of rare and endemic species, and permit range extensions of hardy species affecting similar local species. This is already happening via the Telugu Ganga Canal, which sources the waters of the Krishna river to Chennai with new species being reported there. With all these 'internal problems', the threats from invasive fish species is now rearing its head in frightening dimensions with the invasion of exotic aquarium and food fish species from all corners of the world. There are many more 'ikan jepuns' in Indian waters now, threatening the very survival of our native species and their habitats.

Reviewed by Asad R. Rahmani



Incredible Dibru-Saikhowa National Park,
by K.K. Dwivedi. 2009.
Published by Dibru-Saikhowa Conservation Society, Tinsukia, Assam.
Size: 30 x 21.5 cm, Pp. 151
Price: Rs. 2,000/-.

Assam is endowed with some of the finest protected areas of India. Most conservationists and tourists know only Kaziranga National Park, thanks to its large population of Great Indian One-horned Rhinoceros, but the equally important and incredibly beautiful Dibru-Saikhowa is hardly visited by tourists, and is almost neglected by the Government. Hopefully, this wonderful book will change the situation.

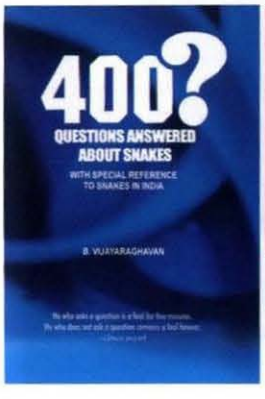
Dibru-Saikhowa was declared a wildlife sanctuary in 1986 mainly to protect the Critically Endangered Bengal Florican and the unique Salix forest. But unfortunately the entire riverine tract of the Brahmaputra and Lohit rivers, and the famous and extremely important Amarpur grassland were excluded as they didn't have forest areas! This reduced the area from 640 sq. km to 340 sq. km. In 1997, the whole sanctuary and fringe villages totalling 765 sq. km was declared Dibru-Saikhowa Biosphere Reserve, the third in Assam. Thanks to the efforts of Dr. Anwaruddin Choudhury, the then Deputy Secretary of the Assam Forest Department, in 1999 Dibru-Saikhowa became a national park.

Dibru-Saikhowa is identified as an Important Bird Area, Assam Plains Endemic Bird Area, and Indo-Burma Global Biodiversity Hotspot. Besides the big fives (tiger, leopard, elephant, wild buffalo and feral horses), it has the National Aquatic Animal - Gangetic Dolphin, in the Brahmaputra and Lohit rivers, and extraordinary birdlife. As much as 25% of the India's globally threatened species, as listed by BirdLife International (2008) are found in Dibru-Saikhowa. Just to give you an example, 5 out of 12 Critically Endangered Indian birds find refuge in this incredible wilderness. They are Slender-billed Vulture, White-backed Vulture, Red-headed Vulture, Bengal Florican, and White-bellied Heron. I can continue describing the mind-blowing biodiversity of Dibru-Saikhowa.

When you are writing about a place like Dibru-Saikhowa, it has to be superlative. This large-sized coffee-table book is lavished with brilliant pictures by Dhritiman Mukherjee, each better than the other. I leave it to the readers to select their personal best; my favourite is of an Oriental Darter tossing a fish in the air to gulp it head first (page 49). Mr. K. K. Dwivedi is also a good photographer. He has converted a routine sunset picture into a piece of art (pages 132-133).

Mr. K.K. Dwivedi is an IAS with a D. Phil. degree, and presently the District Magistrate of Tinsukia. He is a very keen wildlife photographer, founder president of Dibru-Saikhowa Conservation Society and promotes ecotourism as a conservation tool. Although this fantastic book is his brainchild, he has given credit to a large number of people who have contributed the text or photographs. It is certainly a unique gesture which proves that Mr. Dwivedi is not only a good writer, photographer, administrator and a visionary, but also a kind gentleman. I wish we have more such Dwivedis, in India.

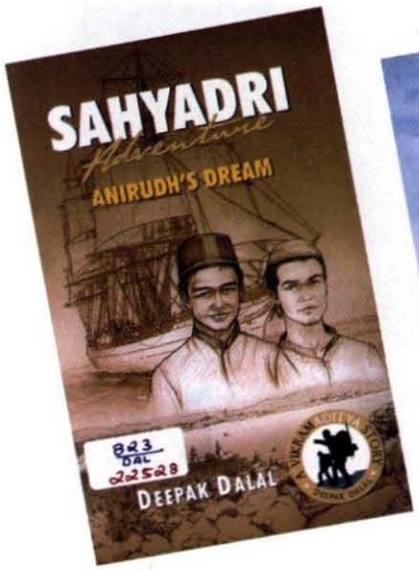
At Rs. 2,000/- this ia an expensive book for most Indians, but if you are a reader who enjoys good text and photographs, then do purchase this incredible book. ■

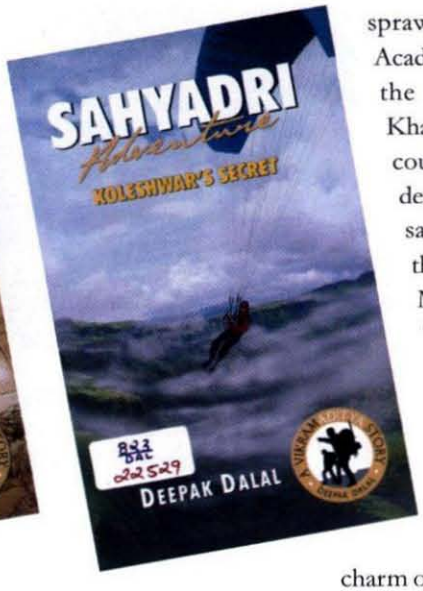


400 Questions Answered about Snakes
by B. Vijayaraghavan. 2010.
Published by The Chennai Snake Park Trust, Chennai, India.
Size: 15.5 x 23 cm, Pp. 231
Price: Rs. 120/-

Reviewed by J.C. Daniel

This is a fascinating book; the author covers the world of snakes in 400 questions and their answers. Whatever aspect of snakes one seeks an answer, the book obliges. What fascinates me is the author's erudition in the search for answers to the 400 questions. The book serves as a useful handbook for those seeking information on the world of snakes and do not have the time or inclination to search for themselves. A valuable addition to the author's several other books on snakes. Proof reading can be tiresome but has been well done except for two minor errors on page 127 and 216, and a glaring error on page 131 where the Gaboon viper is said to have 13 cm fangs; surely the author intended to say 13 mm, otherwise it would be a Sabre toothed tiger among the snakes. ■





Sahyadri Adventure –
ANIRUDH'S DREAM - Pp. 273
KOLESHWAR'S SECRET - Pp. 251
by Deepak Dalal. 2010.
Published by Tarini Publishing, Gulab,
13 Gulmohar Park, Aundh, Pune 411 007.
Size: 13 x 20 cm
Price: Rs. 195/- each

Reviewed by Atul Sathe

Sahyadri Adventure is a unique and perhaps the first of its kind adventure fiction in India. It is a part of a series of adventures across various locations in India. Sahyadri Adventure consists of two books, viz. Anirudh's Dream and Koleshwar's Secret. The books are a welcome change in adventure fiction, which till now was largely set in localities in US or Europe. The refreshing change to which Indian readers can relate to is that all locations of the series are set in the jungles, swamps, grasslands, mountains and seas of India.

Sahyadri Adventure is set in the region of Mumbai, Pune and Mahabaleshwar with the imposing Sahyadri or Western Ghats spread out in between in all their glory. Thus, it is a *desi* adventure with *desi* atmosphere and background. It blends the natural world and its phenomenon like south-west monsoon with fiction. There is excitement in the situations in the story and it takes one close to nature, thus blending culture, history, nature and adventure.

In the book Anirudh's Dream, the reader is transported to the mist-clad mountains surrounding the Khadakvasla dam near Pune. The initial part of the adventure is set in the sprawling and green campus of National Defence Academy (NDA). The author is successful in recreating the charm and the spirit of a rainy day on the Khadakvasla lake beautifully. There is action, emotion, courage, presence of mind and friendship that are depicted in this tale of adventure. After the initial sail boat race at Khadakvasla, the scene shifts to the mountain forts of Sahyadri with a bit of Shivaji Maharaj's history added to the trekking adventure. The observations of the author pertaining to the flora, fauna and culture of the place are very minute. Dialogues throughout the book are lively.

Suddenly there is a twist in the storyline and the characters and locations change in flashback that is shown as a dream sequence. The reader is transported back to the old world colonial charm of Mumbai and its surroundings that were teeming with greenery and wildlife in those times (probably 150 years ago). The main protagonist – Anirudh (Irfan in the dream sequence, which sounds like the past birth of Anirudh) is a mixed personality, daring in some situations and afraid in others. His band of friends completes a youthful spirit of adventure.

Further on in the flashback Irfan and his friends ride one adventure after another, at times along with the British police commissioner of Mumbai. The story keeps taking twists and turns as Irfan's fortunes wax and wane in the backdrop of 1857 war of independence. Then circumstances change in such a way that Irfan is forced to leave Mumbai and that is where the second book "Koleshwar's Secret" comes into picture.

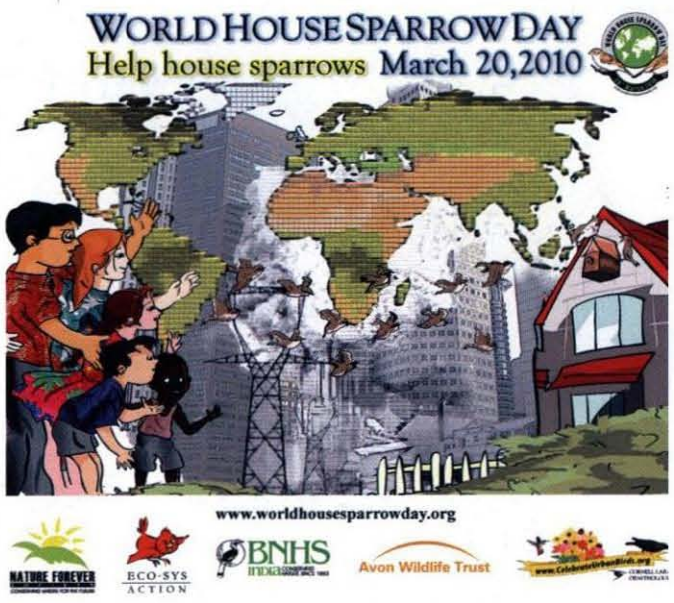
In Koleshwar's Secret the drama unfolds in the Sahyadris in its full glory with vivid descriptions of Irfan's adventure in the quest to protect a treasure. Typical fauna of the Sahyadri like *gaur*, tiger, leopard, barking dear, hornbill and snakes add to the thrill and mystery quotient of the story. On the misty cloud-shrouded wild slopes of the Sahyadris the story moves back to the present day from the dream sequence and the reader is riveted to the adventure, which ends with the unraveling of Koleshwar's secret.

However, the books have a few drawbacks such as lengthy descriptions in some places where it becomes boring at times and too much jumping between the present and the past (through dream sequence). Moreover, the author seems to be sympathetic towards the British imperialism when he describes the 1857 war of independence as revolt and mutiny. But despite that the book succeeds in providing good leisure reading, while informing the reader to some extent about the socio-economic and environmental conditions of the present and the past in western India. ■

BNHS celebrates World House Sparrow Day in Delhi

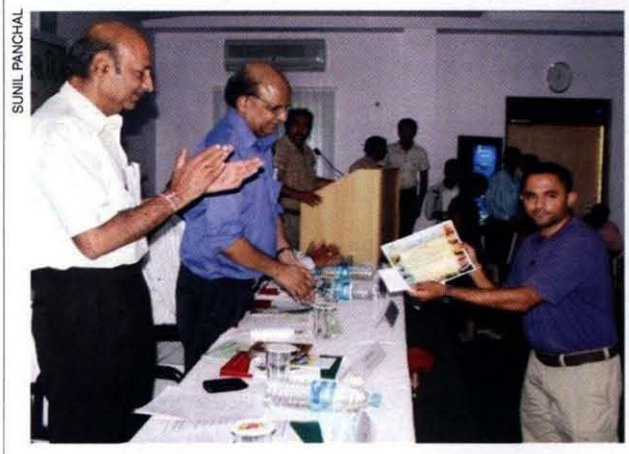
World House Sparrow Day (WHSD) was celebrated in Delhi on March, 20, 2010, in the presence of the Hon'ble Chief Minister Ms. Sheila Dikshit. The event was organized by Nature Forever Society in association with Bombay Natural History Society, Cornell Lab of Ornithology of USA, Eco-sys Action Foundation of France, Avon Wildlife Trust of UK, and other organizations to highlight the plight of house sparrows, due to human activities..

With the efficient help and contribution of Mohammad Dilawar (Project Officer of Project Sparrows, BNHS), the WHSD was celebrated to bring together individuals and organizations working on the conservation of House Sparrow and urban biodiversity. It also helped in drawing the attention of government agencies, media and scientific communities towards conservation issues and the measures taken towards it. ■



An interesting creative artwork of the World House Sparrow Day celebration

BNHS Education Officer awarded on World Environment Day



SUNIL PANCHAL

Bhavik Patel, Education Officer, BNHS (extreme right) receiving the award

Bhavik Patel, Education Officer (Project Mangroves) of BNHS, was awarded the 3rd prize in a photography competition held on the occasion of World Environment Day. On June, 5, 2010, the Gujarat Ecological Education and Research Foundation (GEER) and Gujarat Forest Department organized a Photography Competition which followed the theme 'Many Species, One Planet, One Future', wherein a diverse range of wildlife was portrayed by the 40 entries from across Gujarat. Bhavik Patel's photograph of Giant Wood Spider (*Nephila* sp.) which won a prize was photographed at the botanical garden in Ahwa (Dang district). Shri C.N. Pandey (IFS), Ad. PCCF, was present at the award ceremony. The awards were given by Dr. Sinha (IAS), Secretary of Department of Forest and Environment, Government of Gujarat, and Shri Pradeep Khanna (IFS), CCF. ■

BNHS receives Vasundhara Mitra Award

Shri B.G. Deshmukh (retd. IAS) President, BNHS received the Vasundhara Mitra Award presented to BNHS at the Vasundhara International Film Festival on February, 21, 2010, at Y.B. Chavan Hall, Mumbai.■

Warming Oceans – Bleached Corals

SALAHUDDIN V.K.

The white corals (seen in the above image) are the bleached corals

Coral bleaching due to El Niño is a critical yet little studied natural phenomenon occuring world over, but the damage caused by it is unprecedented. In 1998, El Niño created havoc with over 50-80 per cent reefs destroyed in the short span of a month.

Coral bleaching occurs when the symbiotic relationship between algae (zooxanthellae) and their host corals break down under certain environmental stresses. Coral bleaching can be triggered and sustained under various environmental stresses. Ambient water temperatures as little as 1 to 2 °C above the coral's tolerance level, indicated by summer monthly mean temperatures, can cause coral bleaching. Reefs that are partially- to totally-bleached for long periods often die. Severe bleaching events have dramatic long-term ecological and social impacts, including loss of reef-building corals, changes in benthic habitat and, in some cases, changes in fish populations. Even under favourable conditions, it can take decades for severely bleached reefs to recover. The 1998 El Niño and subsequent coral bleaching affected Lakshadweep islands with over 80% coral mortality. Lakshadweep reefs have shown recovery (30-80 %) from this episode in the last 12 years.

El Niño Southern Oscillation

El Niño-Southern Oscillation, or ENSO, is a climate pattern that occurs across the tropical Pacific Ocean on average every five years and is therefore, widely and significantly, known as "quasi-periodic". ENSO is composed of an oceanic component, called El Niño (or La Niña, depending on its phase), which is characterized by warming or cooling of surface waters in the tropical eastern Pacific Ocean, and an atmospheric component, the Southern Oscillation, is characterized by changes in surface pressure in the tropical western Pacific. The two components are coupled: when the warm oceanic phase (known as El Niño) is in effect, surface pressures in the western Pacific are high, and when the cold phase is in effect (La Niña), surface pressures in the western Pacific are low.

El Niño of 2010

Reefs in many regions are affected this year due to El Nino Southern Oscillation. India, Maldives, Oman, Muscat, American Samoa, Virgin Islands, Palau, Lakshadweep, Andaman and Nicobar reefs are badly affected this year. Reefs like Kavaratti and Agatti in Lakshadweep appear like a mosaic of white structures, indicating total bleaching. Besides corals, most of the zooxanthallae associated species like sea anemones and giant clams, are completely bleached. The extent of the damage at this point of time is unknown! ■

Published on July 30, 2010, by Dr. Ashok Kothari for Bombay Natural History Society, Hornbill House, Dr. Sálim Ali Chowk, S.B. Singh Road, Mumbai 400 001, Maharashtra, India.

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hand in hand

At the Baldota Group, responsibility walks hand-in-hand with capability and it has been ingrained in our ethos that we are not owners of wealth but privileged trustees to serve the community with it. We are staunch believers in protecting and preserving mother earth and approach our responsibilities towards the community with the same thoroughness and commitment as any other aspect of business.

Our ultimate aim is to make the community self-sufficient so that it can support itself and in extreme conditions always depend on us for immediate relief. Way back in 1976, we formed the Abheraj Baldota Foundation to ensure that the benefits of the wealth generated by us percolates to the societal grassroots.

Healthcare	Education	Community	Environment
			
Abheraj Baldota Cancer Detection Centre Smt. Vasantidevi Baldota Blood Bank Cardiac Camps Eye Camps Cardiac Ambulance	Notebook Distribution School Infrastructure Scholarships & Awards Computers Sports Facilities	Village Adoption Women Self Help Groups Children's Park Drinking Water Sanitation Facilities	17 Lakh Trees Planted Soil & Water Conservation Zero Waste Management Waste Water Disposal Conserving Biodiversity

BALDOTA

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