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From the Director's Desk...

Dissemination of information on various issues related to environment of the State is the main objective of establishment of our ENVIS Centre. We have discussed on various issues in our earlier publications. In this issue we have focused on one of the important topic "Biodiversity". I hope the information will be useful. I appreciate the efforts of our ENVIS team for collecting information and publication of this issue.

My special thanks to Dr. Siba Prasad Parida for his contribution and involvement in bringing out this Newsletter.



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BIODIVERSITY

INTRODUCTION:

E.O. Wilson was one of the original popularizers of the term 'biodiversity' (Wilson 1992, 1993; 1994) and his definition captures the essence of most views of the notion: "*The variety of organisms considered at all levels, from genetic variants belonging to the same species through arrays of species to arrays of genera, families and still higher taxonomic level; includes the variety of ecosystems, which comprise both the communities of organisms within particular habitats and the physical conditions under which they live.*" (Wilson 1992)

Biodiversity is therefore the natural biological capital for our life support system on the planet Earth. Our survival depends on the web of life created by the interactions of the millions of different animals, plants, fungi, and other microscopic organisms that share the Earth with us. All of these species together make up our natural heritage, which we call biological diversity, or "biodiversity." Because of human activities that pollute or destroy natural habitats, we are losing species at an alarming rate. We are, so to speak, erasing nature's hard drive without even knowing what data it contains. The aim of the Convention on Biological Diversity (CBD) and its 190 Contracting Parties is to significantly reduce the loss of biodiversity by 2010. This goal can only be achieved through the concerted of all sections both national and international alliances between policy makers, science, the public and business.

Biodiversity Hotspots

The Eastern Himalayas, including parts of Nepal, India and Bhutan; the Western Ghats in India (mountain ranges running along west coast of India up to the southern tip); and the Western Ghats in Sri Lanka have the distinction of being designated as three of the 25 biodiversity hotspots in the world.

The mountains of the Western Ghats of south-western India representing one of the eight bio-

geographical zones of the Indian subcontinent, two main centers of diversity, the Agastyamalai hills and Silent Valley in the Indian Western Ghats, are home to nearly one-third of all the flowering plants found in India. Of this, nearly 40 % is endemic. The faunal diversity of the region includes 146 species of amphibians (116 or 80 % are endemic); 259 of reptiles (161 or 62 % endemic); 528 of birds (7.5 % endemic); and 140 of mammals (38 or 27 % endemic). Total number of terrestrial vertebrate species stands at 1,073 (355 or 33 % endemic), and of vascular plant species at 4,780 (2,180 or 45 % endemic). The fauna includes the tiger, leopard, sloth bear, barking deer, mouse deer, Nilgiri langur, Lion-tailed macaque, Nilgiri tahr, Spotted deer, Giant squirrel, etc. The Indian portion of the Western Ghats is also home to 250 species of orchids, of which 100 are endemic and 150 species of grasses. The Western Ghats act as the gene bank of mycorrhizal fungi (13,000 species) as well.

The Eastern Himalayas comprise of tracts of the Darjeeling hills, Sikkim and Arunachal Pradesh in India and eastern Bhutan. Subtropical forests cover the land up to 2,000 m; beyond it laid the temperate mixed forests, mainly comprising of fir, juniper and rhododendron. The eastern Himalayas are home to a large number of endemic fauna including the Slow Loris, One-horned Rhinoceros, Golden langur, Tiger,

Indian civet, Red panda, Snow leopard, Clouded leopard and golden cat. Birds include the snow pigeon, snow cock, white-winged wood duck, pheasants, bar-headed geese and the black-necked crane. The region is particularly rich in endemic plant species. The Indian part of the eastern Himalayas accounts for about 5,800 plant species of which about 2,000 (36% are endemic). In India, Sikkim alone accounts for 4,250 plant species of which 2,550 (60 % are endemic). Of the 12,000 plant species found in Nepal and Bhutan, 1,300 are endemic to the eastern Himalayan region.

The Eastern Ghats too display a rich floral diversity, with about 2,000 species of flowering plants (angiosperms), few gymnosperms such as *Cycas* and *Gnetum scandens*, and 30 species of ferns. The floral diversity in this region is threatened, though some rare plants and trees still survive. Among these are *Andrographis beddomei*, *Andrographis nallamalayana*, *Dicliptera beddomei*, *Brachystelma glabrum*, *Brachystelma volubile*, *Boswellia ovalifoliolata*, *Chrysopogon velutinus*, *Pimpinella tirupatiensis* and *Cycas beddomei*. (Rajamani, 1998).

Orissa's biodiversity

Orissa ranks fourth amongst State/Union Territories of the country in terms of area under forest cover. The total forest area of the State is 58,135 sq.km. which is 37.34% of the State's geographical area and about 7.66% of country's forests. Orissa hosts rich biodiversity in variety habitats. The largest Ramsar sites (Brackish water Chilka lake and the mangrove forests of Bhitarkanika), which attract the largest population of migratory birds from very distant



lands, the largest egg laying beaches of Gahirmatha for Olive Ridley Sea turtles, some of India's closed green forests, floral and faunal diversity of Similipal biosphere, rich medicinal plants in Similipal and Gandhamardan forest ranges and many tribal races of people are also found in the state of Orissa.

Major biodiversity hotspots in Orissa

Similipal Biosphere Reserve:

The uniqueness of Similipal as hot spot of biodiversity lies with the geological formation, phytosociological feature and climatic situation of the area. The area lies on the northern limit of Deccan plateau and Southern limit of lower gangetic plains adjoining Chhot Nagpur high lands. Similipal, practically is a very large ecotonal zone with an annual rainfall varying from 1200 cm to 2000 cm. The Similipal massif has an average height of about 550 m, the steeper slopes towards southern and east and the gradual sloping terrain towards north and west. The soil contains volcanic lava which holds large amount of ground water and feeds the waterfalls and river systems. Similipal was a part of Gondwana land in the Paleozoic era and the rocks are Metamorphosed, Sedimentary and Igneous. The unique position of the



mountain range acts as a barrier to south west monsoon and brings heavy rain to the area and moisture loaded wind moves to south-west region of the state bringing rain to south western region of Orissa. It is rightly said that, "Similipal to Orissa, part of Bengal and Bihar is as the Himalayas to India". The Biosphere reserve comprises northern tropical semi ever green forest, northern tropical moist

deciduous forest, dry deciduous hill forests, high level sal forests, grass land and Savannah. The Biosphere reserve is abode of 1076 species of plants, 94 sp. of orchids, 12 sp. of amphibians, 29 sp. of reptiles, 264 sp. of birds and 42 sp. of mammals. Endemism is very high among tree ferns, orchids and many other plants and among invertebrates specially insects. The model eco race of tassar silk worm *Antheraea mylitta* and *A. paphia* are unique to Similipal. Tiger population is over 50% of the entire tiger population of Orissa state and the Elephant population is the largest in Central India. The Chawsingha deer and the giant squirrel are common in Similipal and also harbour more than 200 sp. of medicinal plants. Many of the IUCN endangered, vulnerable and threatened species and animals and wildlife listed under Schedule-I of Indian Wildlife Act, 1972 are found in Similipal.

Western Orissa

The western region of Orissa includes the important Gandhamardan forests and the forests of Badrama forest range. These areas are very rich in biodiversity, both floral and faunal diversity. The famous Hirakud dam reservoir is also located in this region and attracts lakhs of migratory birds in winter. Badrama forest range comprises of 120 species of plants belonging to 46 families. The forest tree vegetation is categorised as *Shorea terminalia*. The area is also significant for large wildlife. The Gandhamardan hill range harbour very rich medicinal flora. The area comprises semi ever green forests, dry deciduous dense forest, bamboo forests, dry deciduous open forests, scrub wood land, barren rocky areas etc. and the common plant species are; *Acacia torta*, *Albizzia procera*, *Albizzia odoratissima*, *Adina cordifolia*, *Careya arborea*, *Diospyros melanoxydon*, *Diospyros montana*, *Mangifera indica*, *Mitragyna parviflora*, *Tamarindus indicus*, *Terminalia arjuna*, *T. tomentosa* etc. and other deciduous species like *Anogeissus latifolia*, *Buchanania lanzan*, *Haldina cordifolia*, *Madhuca indica*, *Cleistanthus collinus*, *Terminalia alata* and many others with *Dendrocalamus strictus* forming the upper storey. The middle storey is composed of small trees and shrubs of which *Andisia salanacea*, *Cassia fistula*, *Emblica officinalis*, *Cpidadessa baccifera* and *Holarrhena antidysenterica* are predominant.

Chilika Lagoon



It is situated on the east coast of India from Southwest corner of Puri and Khurda districts to the adjoining Ganjam District in the state of Orissa. It is the largest brackish water lagoon in Asia with estuarine character and the largest wintering ground for migratory water-fowls found on the Indian sub-continent. It is one of the biodiversity hot spots of the country, and some rare, vulnerable and endangered species listed in the IUCN Red List of threatened animals inhabit the Lake area for at least a part of their life cycle. This list includes a number of rare, threatened and endangered species such as Irrawady dolphins (*Orcella brevirostris*) and the limbless skink (*Barakudia insularis*). The lagoon is a highly productive ecosystem with rich in Chilika crabs (*Scylla serrata*) etc., Prawns (*Penaeus monodon*, *P.indicus*) and many variety of fishes etc. are important faunal component. Based on its rich biodiversity, Chilika Lagoon was designated by the Government of India as a Ramsar Site in 1981, especially as an important Water-fowl habitat. Nalabana Wildlife Sanctuary covering an area of 15.53 sq.km. within Chilika was notified in 1987 as a Wildlife Sanctuary under the Wildlife Protection Act. Nalabana literally means "forest of reeds" that is covered with aquatic plants, predominant species being *Phragmites karka*. At the beginning of the migratory season in October-November, long legged waders and diving species are predominant. Subsequently, small wading species congregate on the island. A large flock of flamingoes feeding in the shallow waters of the Lagoon is most fascinating.



(Phytoplankton - 399 Sp., Algae - 22 Sp., Plants (27% Of State's Flora; 8 Rare & 11 Endemic Sp.) - 720 Sp., Zooplankton - 170 Sp., Protozoa - 61 Sp., Porifera - 7 Sp., Coelenterates - 7 Sp., Nematodes - 37 Sp., Mollusca - 136 Sp., Annelids - 31 Sp., Crustacea - 28 Sp., Decapoda - 34 Sp., Echinodermata - 5 Sp., Protochordata - 1 Sp., Fish - 268 Sp., Amphibians - 7 Sp., Reptile - 30 Sp., Birds - 225 Sp., Mammals - 18 Sp.)

Bhitarkanika Mangrove

The mangrove forest of Bhitarkanika in the Brahmani-Baitarani-Dhamra rivers deltaic regions comprise a single continuous and compact forest patch and is the second largest compact patch of mangroves after Sunderban of West Bengal. Being a deltaic region, the area bears large number creeks and rivulets. These are considered to be a serial sub-type under the Tropical semi-evergreen forest type with vivipary germination. In respect of species diversity, probably the mangroves of Orissa rank first in India. The common species of mangrove are *Avicennia alba*, *Bruguiera parviflora*, *Bruguiera cylindrica*, *Aegialites rotundifolia*, *Lumnitzera racemosa*, *Sonneratia griffithii*, *Sonneratia alba*, *Ceriops tagal*, *Aegialites rotundifolia*, *Xylocarpus granatum*, *Excoecaria agallocha*, *Heritiera fomes*, *Acanthus ilicifolius*, *Merope angulata*, *Dalbergias spinosa*.



The climbers noticed in mangrove forests are *Finlaysonia obovata*, *Derris trifoliata*, *Tylophora tenuissima* and *Sarcocobus globosus*.

The vertebrate fauna of this area is also very rich and harbours the King cobra (*Ophiophagus hannah*), Kraits, Python, Salt water crocodile (*Crocodylus porosus*) and Olive Ridley Sea Turtles (*Lepidochelys olivacea*), water monitor (*Varanus salvator*), Horse-shoe crabs (1) *Tachypleus gigas* (2) *Carcinocarpicus rotincauda*. Besides Leopard, Striped hyaena, Chital, Deer, Sambar and wild Boar are found in the Bhitarkanika sanctuary. Among the small mammals, common mongoose, Smooth coated Indian Otter, the small Indian Civet, common palm civet, Grey musk shrew, the striped palm squirrel, the Indian porcupine, short nosed fruit bat, Indian pipistrelle and Temminck, fiddler crab (Envis 2009) and mud skippers are also found. In Gahirmatha coastal waters, back waters and estuaries, the gangetic dolphin, Humpback dolphin, Irrawady dolphin and the little Indian finless porpoise are found. These aquatic mammals are scheduled animals as per The Wildlife (Protection) Act, 1972. Some 156 species of birds are also found in the sanctuary. The sanctuary has been declared as a National Park (145 sq.km. area) and recently been declared as a "Ramsar Site". Bordering the Sanctuary, 1435 sq.km. area has been declared as Gahirmatha Marine Wildlife Sanctuary in 1997 and it covers two reserve forest blocks of Mahanadi delta mangroves comprising 27 sq.km. Gahirmatha Sea beach is the largest rookery for Olive Ridley Sea Turtles in the world.



Orissa is very rich in floral diversity and some of the threatened taxon of plants of Orissa. Orissa is rich in Orchid flora. Out of 1200 sp. found in India, 130 species of Orchid are found in Orissa. Five non-domesticated rice species are also found in Orissa. Orissa harbours very rich vertebrate and invertebrate fauna. Many threatened taxon of wildlife (Appendix-I) as per IUCN Red Data Book/Schedule-I of Wildlife

Act, 1972 are found in the state and they comprise 17 species reptiles, 15 sp. of birds, and 22 sp. of mammal., they may be considered threatened and require conservation measures. The Chilika and mangrove crab, *Scylla serata* is also highly exploited. The tasar silkworms *Antheraea mylitta* and *Antheraea paphia* are found in the wild and are also domesticated in Orissa. They have commercial importance. There is paucity of data on invertebrate fauna of Orissa. Data on aquatic invertebrates and terrestrial -arboreal invertebrates especially, butterflies, moths, wasps, bees, beetles etc. are available. The soil Oligochaete fauna is rich.

Wildlife in Orissa:

The important wild animals found are the Elephant, Tiger, Panther, Wild buffalo, Wild boar, Bear, Sambar, Spotted Deer, Black buck, Langur, Myna, Parakeet, Hornbill, Woodpecker, Sea turtles especially Olive Ridleys, Hawksbill Salt water Crocodile, Muggar, Gharial, Python, King cobra, Cobra, Viper, kraits, Chameleon, Monitor lizards, Irrawady Dolphin, Striped dolphin, Bottlenose dolphin, Finless Porpoise, Whale, Whale shark, Horse-shoe crabs, Chilika crab, Tiger prawns, Fresh water terrapins, butterflies, spiders etc.



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Biodiversity Novelties

With perhaps one in ten species of the Earth's eukaryotic organisms having been discovered, it should not be surprising that strikingly novel and wholly unexpected new taxa should continue to be discovered among the 15,000 to 20,000 new species that are annually described. Even for relatively well-known areas like the United States, the rate of discovery suggests that no more than a third to a half of the estimated total 500,000 to 750,000 species of organisms have yet been discovered. For flowering plants, perhaps 1000 new species await discovery in addition to the 18,000 already known to this country (Ertter, 2000). The number of new species has been rising over the past decade to levels comparable to those of the mid-eighteenth to late nineteenth century (Donoghue and Alverson, 2000). Much of this discovery, as for mammals, seems to be directly correlated with serious exploration of new areas. Thus, fieldwork over the last decade in the Annamite Mountains on the border of central Vietnam and Laos has brought to light a new bovid and at least three new species of muntjac deer, together with what seems to be a new genus of rabbit (Ginsberg, 2001). Similar trends have been demonstrated for other groups of vertebrates (Donoghue and Alverson, 2000). Some of the new discoveries are of evident economic importance, such as a species of maize, *Zea diploperennis*, from the state of Jalisco in western Mexico, which is inter fertile with cultivated maize but unique in its perennial habit; it is restricted to a disturbed area about the size of a football field and was discovered only 25 years ago (Iltis et al., 1979). Even a few new phyla and classes of eukaryotic organisms are being found each decade, mostly from marine habitats. The continued exploration of southern Mexico and Central America has led to the discovery of two new families of plants during the past two decades, one of them (Ticodendraceae) a

locally fairly abundant tree species (G´omez-Laurito and G´omez . 1989) and the other (Lacandoniaceae) comprising a slender, parasitic, achlorophyllous root-parasite, with a unique floral structure in which the pistillate organs surround the staminate ones (Mart´nez 1989). Occurring at a single locality in Chiapas, the latter plant is in danger of extinction. Other remarkable botanical examples, all newly discovered palms from Madagascar [narrated by Prance *et al.* in (2000)], include the smallest palm (less than 27 cm in height), *Dypsis tenuissima*; an aquatic palm, *Ravenea musicalis*, with fruit and seeds with adaptations for flotation and aquatic dispersal and known only from a single population of about 450 plants along a river; and *Satranala* sp. nov. with a peculiar, hard endocarp that features flanges unlike those of any other palm endocarp, which may have facilitated the dispersal of its seeds by the recently extinct giant elephant bird. Additional bizarre discoveries include many organisms, catalogued by Donoghue and Alverson (2000), with unique life styles: an agaric fungus that fruits under the ice of lakes in far southern South America; an Australian frog that raises its tadpoles in its stomach; and a Brazilian caecilian that is three times the length (up to 0.8 m) of the largest lungless amphibian previously known. Most striking among the terrestrial invertebrates is the recent report of a new order of the class insecta from the Afrotropics (Klass et al., 2002)! This new order, the Mantophasmatodea, is represented by insects that look like a cross between a cricket and a stick insect, and it is the first of this taxonomic hierarchy to be discovered for more than 80 years. Once it was discovered in the field in Namibia, museum specimens collected over a period of more than a century were recognized from other parts of southern Africa. And the list goes on and on! Clearly we live in an age of discovery; one in which the geographic exploration of rapidly dwindling natural areas, coupled with increasingly deep phylogenetic analyses, is revealing much that has been

unsuspected about the nature of life on Earth. 353 new species have been discovered in the Eastern Himalayas between 1998 and 2008, equating to an average of 35 new species finds every year for the last 10 years. The discoveries include 242 plants, 16 amphibians, 16 reptiles, 14 fish, 2 birds and 2 mammals, and at least 61 new invertebrates.



The herpetofauna of Orissa is represented by 23 species of lizards, 3 species of crocodylians, more than 45 species of snakes and 12 species of fresh water turtles and tortoises. This excludes the sea turtles and sea snakes. Detailed field studies, specifically in the unexplored forest areas reveals several species of frogs, snakes, lizards and turtles new to sciences or were not recorded earlier. Some of these taxa include lizards: *Ophisops* sp, *Hemidactylus subtriadrus*, *Geckoella* sp., *Calodactylodes aureus*; frogs; *Philautus similipalenissi*, *Fejervarya orissaensis*, *Fejervarya* sp, *Rana malabaricus*, *Microhyla* sp, *Polypedates teraiensis* and *Chirixalus* sp; snakes: *Boiga forsteni*, *Boiga orchracea*, *Oligodon affinis*, *Sybnophis sagittarus*, *Lycodon striatus*, *Lycodon* sp, *Elephabelna monticolaries*, *Trimmeresurus gramineus*, *Ahetulla pulverulentus* etc. (Mohapatra *et al.*2004)



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