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(Forest & Environment Department, Government of Orissa)



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Shri Abasar Beuria, Former Ambassador of India (Centre) releasing the ENVIS newsletter on 10<sup>th</sup> August 2007.

Also present are (R-L), Shri B.K.Patnaik, Director, Environment-cum-Special Secretary to Govt. and Dr. P.Ray, Scientist-in-charge, Regional Museum of Natural History, Bhubaneswar.

## State of Environment: Biodiversity

Biodiversity is a characteristic of life. Rich biodiversity is an indicator of the health of a particular habitat and its potential to sustain life. The biological diversity of many ecosystems remains poorly explored, even today. Biodiversity performs numbers of ecological services for human kind that have economic, aesthetic or recreational value. Environmental ethicists also stress that humans should protect biodiversity because they are the cause for most of the loss of biodiversity through loss of habitat, over exploitation and other perturbations. The state of Orissa is rich in natural resources and has several biodiversity hotspot areas of the Indian sub-continent. This newsletter provides information on biodiversity with special reference to the Stste of Environment.

Biodiversity is a characteristic of life. In its broadest sense it includes taxonomical (variety of species), ecological (intraspecific and interspecific relationships, niches, Ecological pattern etc.), adaptational (different ways of organisms have adapted to their environment of survival, reproduction and continuance), genetic (variations in the genetic make up of species that differentiate one species from another and intraspecific variations), biochemical (the diversity of chemicals synthesized by organisms and the different metabolic pathways) etc. diversities. The Agenda-21 and Article-2 of Rio Conference defines biodiversity as variability among living organisms from all sources including interalia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part. This includes diversity within species, between species and of ecosystems.

Rich biodiversity is an indicator of the health of a particular habitat and its potential to sustain life. Estimates fall between 1.5 and 30 million species of plants and animals in the earth. Between 1.5 and 1.8 million species have been identified. Of the 34 known animal phyla, only one phylum lives exclusively on land while 33 are found in the ocean. Of those 33, 14 are found nowhere else on earth. Of the species that have been described, approximately; 7,50,000 of these are insects, 41,000 are vertebrates and 2,50,000 are plants. The remaining species are comprised of invertebrates, fungi, algae and other microorganisms. The biological diversity of many ecosystems remains poorly explored, even today. These ecosystems include the deep ocean and the tree canopy and soil of tropical forests.

#### **Importance of biodiversity:**

Biodiversity has an intrinsic value. Biodiversity performs a number of ecological services for human kind that have economic, aesthetic or recreational value. Both intrinsic and anthropocentric value of biodiversity need not be contradictory, as they serve the same ultimate purpose. As humans are and were part of nature, they benefited from the evolutionary process. Environmental ethicists also stress that humans should protect biodiversity because they are the cause for most of the loss of biodiversity through loss of habitat, over exploitation and other perturbations. Biodiversity, encompassing genetic diversity, species, populations, communities, ecosystems, land spaces, regions, provides countless benefits to humans at all these scales. Some of these benefits include:

- Economic benefits (both direct & indirect)
- Aesthetic benefits
- Scientific and ethical knowledge
- Insurance of the future

Economic benefits come in the form of goods that can be directly valued and costed because they provide something that can be extracted and sold. These goods include everything from all the domesticated agricultural crops that form the basis of the world's food supply, to medicines that protect and cure us to the fibres that make up the clothe we wear. Biodiversity also provides critical indirect benefits to humans that are difficult to quantify because we have never had to put a price tag on them. These benefits encompass ecosystems services, such as air and water purification, climate regulation and the generation of moisture and oxygen. A group of ecologists who recently attempted to quantify the price of replacing these ecosystem services calculated that they would cost over \$3 trillion. That's greater than the entire global GNP ! The world can not afford to replace these services, therefore we must work to protect our ecosystems.

Aesthetic value is not necessarily equated to biodiversity; some of the most aesthetically pleasing landscapes are poor in diversity of habitats and species (e.g. swamps and wetlands). While there are hundreds of examples of known economic and aesthetic benefits of biodiversity, biologists and other scientists frequently outline that more is unknown than known. Important ecosystem services and uses for plant and animals are still unknown and await discovery. Many of our valuable goods, from species to critical medications have been discovered accidentally because plants or animals produced chemicals for defence or attraction.

#### **Status of biodiversity in India:**

India is the seventh largest country in the world and Asia's second largest nation by geographical area. Physically the massive country is



Deer herd, Nandankanan;  
Photograph by Gahar Abedin

divided into four relatively defined regions – the Himalayan mountains, the Gangetic river plains, the southern (Deccan) plateaus and the islands of Lakshadweep, Andaman and Nicobar. India has the confluence of three major realms – the Indo-Malayan, Eurasian and Afrotropical. It has two out of twenty five biodiversity hotspots in the world.

There are 92 National Parks, 492 Sanctuaries, 5 World Heritage Sites, 12 Biosphere Reserves and 19 Ramsar Wetlands.

<b>Biological diversity of India</b>			
<b>Taxa</b>	<b>Number of species</b>		<b>Percentage of India to the world</b>
	<b>India</b>	<b>World</b>	
Pteridophyta	1100	13000	8.46
Gymnosperma	64	750	8.53
Angiosperm	17500	250000	7.00
Mollusca	5050	70000	7.21
Arthropoda	60383	1065000	5.67
Other invertebrates	8329	87121	9.56
Pisces	2546	21723	11.72
Amphibians	206	5145	4.00
Reptiles	485	5680	8.54
Aves	1228	9672	7.08
Mammals	372	4629	8.03

The key factors for major threats to biodiversity in India:

- ❑ India has 16% of World's population with 2% land area in the world.
- ❑ Annual populations growth is 2.3%.
- ❑ The per capita forest area is 0.11 ha.
- ❑ High dependence on natural resource for sustenance.
- ❑ Quest for rapid development.
- ❑ Diversion of forest lands for non-forest purposes.



Pine forest, Koraput;  
Photograph by Gahar Abedin

The state of Orissa located on the eastern coast of Indian Peninsula is quite rich in natural resources and has several biodiversity hotspot areas of the Indian subcontinent. It has varied and wide spread forests harbouring dry deciduous, moist deciduous forests as well as mangroves with several unique, endemic, rare and endangered floral and faunal species. Orissa is one of the richest biodiversity regions in Southeast Asia. It has seven major river deltas of varied sizes and shapes formed by the rivers Subranarekha, Budhabalanga, Baitarani, Brahmani, Mahanadi, Rushikulya and Bahuda. This region has 5 major morphological zones – the coastal plains, the middle mountainous and high lands region, the central plateaus, the western rolling uplands and major flood plains. The largest Ramsar sites (Brackish water Chilika

lake and the mangrove forests of Bhitarkanika), which attract the largest populations 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 found in the state.

As per the 2003 assessment of forest cover by Forest Survey of India, the state has recorded forest area of 58,136.23 sq. km. which is 37.34% to land area. The total forest cover is 48366 sq. km. out of which 288 sq. km. is very dense forest.

<b>Forest cover of Orissa</b>	
Recorded forest area	58,136.23sq. km.
Very dense forest	288 sq. km.
Moderately dense forest	27882 sq. km.
Open forest	20196 sq. km.
Mangrove forest	207 sq.km.

Source- State Forest Report 2003 by FSI

Per capita forest area is 0.16 Ha. The existing mangrove forest is concentrated in the districts of Balasore, Bhadrak, Jagatsinghpur and Kendrapara. These are commonly found in discontinuous patches in very small deltaic area of Mahanadi, Brahmani and Baitarani rivers and their tributaries mostly between Dhamra and Devi river estuaries. 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 agalocha*, *Heritiera foines*, *Acanthus ilicifolius*, *Merope angulata* and *Dalbergias spinosa*. Besides, climbers noticed in mangrove forests are *Finlaysonia abovata*, *Derris trifoliata*, *Tylophora tenuissima* and *Sarocolobus globosus*.

Similipal Biosphere Reserve, Gandhamardan forests & the forest of Badrama forest range, Chilika and Bhitarkanika Mangrove forests are the important habitats of Orissa.

The uniqueness of Similipal as hotspot of biodiversity lies with the geographical formation, phyto sociological feature and climatic situation of the area. It shelters 1076 species of plants, 94 species of orchids, 12 species of amphibians, 29 species of reptiles, 264 species of birds and 42 species of mammals. Endemism is very high among tree ferns, orchids and many other plants among invertebrates specially insects. Tiger population is over 50% of the entire tiger population of Orissa and the elephant population is the largest in Central India.

Forest ranges of Western Orissa includes the important Gandhamardan forests and the Badrama forests. These areas are also very rich in biodiversity both floral and faunal. Badrama forest range comprises of 120 species of plants. The Gandhamardan hill range harbour very rich medicinal flora.

Chilika is one of the Ramsar wetland sites in India. The lake is the largest winter ground for migratory birds specially water fowl. It is also considered one of the hotspot of biodiversity in the country. Chilika contains some 43 species of phyto planktons, 22 species of algae and 150 species of vascular plants. Chilika has also very rich faunal diversity. The important faunal component comprises of

dolphins and many fishes. Nalabana (A patch of chilika lagoon & a habitat for varied migratory birds) within Chilika was notified as a wildlife sanctuary in 1987. During monsoon, Nalabana is entirely under water with only reeds.

The Ramsar convention is an international treaty for the conservation and sustainable utilization of wetlands i.e. to stem the progressive encroachment on and loss of wetlands now and in the future, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific and recreational value. It is called Ramsar Convention because the convention was held in Ramsar, a town in Mazandaran province of Iran, at the Caspian Sea. The mangrove forests of Bhitarkanika is the second largest compact patch of mangroves after Sunderban of West Bengal.

Orissa is also rich in orchid flora. Out of 1200 species found in India, 130 species of orchids are found in Orissa. Orissa harbours very rich vertebrate and invertebrate fauna. Many threatened taxon of wildlife are found in the state and comprising of 17 species of reptiles, 15 species of birds and 22 species of mammals. The important wildlife found in Orissa are the Elephant, Tiger, Panther, Wild buffalo, Wild boar, Blue bulls, Sambar, Deer, Black buck, Langur, Myna, Parakeet, Hornbill, Woodpecker, Sea turtles. Especially Olive Ridleys, Chameleon, Monitor lizards, Crocodile, Muggar, Gharial, Python, Cobra, Viper, Kraits, Irrawady Dolphin, Harse-shoe crabs, Chilika crabs, Tiger prawns, Fresh water terrapins etc.

Ramsar site in India		
Sl. No.	Site Name	Desig'n Date
1.	Chilka Lake	1-Oct-81
2.	Keoladeo National Park	1-Oct-81
3.	Wular Lake	23-Mar-90
4.	Harike Lake	23-Mar-90
5.	Loktak Lake	23-Mar-90
6.	Sambhar Lake	23-Mar-90
7.	Kanjli	22/01/02
8.	Ropar	22/01/02
9.	Ashtamudi Wetland	19/08/02
10.	Bhitarkanika Mangroves	19/08/02
11.	Bhoj Wetland	19/08/02
12.	Deepor Beel	19/08/02
13.	East Calcutta Wetlands	19/08/02
14.	Kolleru Lake	19/08/02
15.	Point Calimere Wildlife and Bird Sanctuary	19/08/02
16.	Pong Dam Lake	19/08/02
17.	Sasthamkotta Lake	19/08/02
18.	Tsomoriri	19/08/02
19.	Vembanad-Kol	19/08/02
20.	Chandertal Wetland	08/11/05
21.	Hokera Wetland	08/11/05
22.	Renuka Wetland	08/11/05
23.	Rudrasagar Lake	08/11/05
24.	Surinsar-Mansar Lake	08/11/05
25.	Upper Ganga River (Brijghat to Narora Stretch)	08/11/05
		Source- <a href="http://www.ramsar.org">www.ramsar.org</a>

## BIODIVERSITY HOTSPOTS OF ORISSA

### Bhitarkanika

Bhitarkanika is a hotspot of biodiversity. It's home to largest population of giant Saltwater crocodile in India. Also home to more than 215 species of avifauna including amazing eight varieties of Kingfishers. It harbours more than 70 species of Mangrove and its associates and it is the second largest viable Mangrove Ecosystem in India after Sunderbans. It provides home to over 215 species of birds including winter migrants from Central Asia and Europe.



Saltwater Crocodile, Bhitarkanika;  
Source: PCCF (Wildlife)

### Chilika

Chilika is the largest lagoon along the east coast of India. The lagoon is a unique assemblage of marine, brackish and fresh water eco-system with estuarine characters. It is one of the hotspots of biodiversity and shelters a number of endangered species. Along with a variety of phytoplankton, algae and aquatic plants, the lagoon region also supports over 720 species of non-aquatic plants. The Nalaban Island within the lagoon is notified as a Bird Sanctuary under Wildlife (Protection) Act. The lagoon is a highly productive ecosystem and with it's rich fishery resources sustains the livelihood of more than 1,50,000 fisher folk who live in and around the lagoon.



A view from Chilika;  
Photograph by Gahar Abedin

### Similipal Biosphere Reserve

The uniqueness of Similipal as hot spot of biodiversity lies with the geological formation, phyto sociological feature and climatic situation of the area. The Biosphere reserve is a part of Mayurbhanj district comprising of northern tropical semi-ever green forest, northern tropical moist deciduous forest, dry deciduous hill forests, high level sal forests, grass land and Savannah. It is the abode of 94 species of orchids and about 3000 species of other plants. These include 2 species of orchids which are endemic, 8 plants which are endangered, 8 species whose status is vulnerable and 34 other rare species of plants. Similipal is also the abode of the black and melanistic tiger which is rare. The diversity of fauna includes 12 species of amphibians, 29 species of reptiles, 264 species of birds and 42 species of mammals. The Biosphere reserve has 845 Sq.Km. of core area and 1905 Sq.Km of Buffer area. The census of wildlife in the reserve records 101 nos. of tiger, 127 nos. of Leopard, 465 nos. of Elephant, 1243 nos. of Bison, 14538 nos. of Wild boar, 10185 nos. of Sambar, 3548 nos. of Chital, 12278 nos. of Barking Deer and 4013 nos. of Mouse Deer.



A view from Similipal;  
Photograph by Prashanta Nayak

## Threat to Biodiversity:

A number of factors posing threat to biodiversity of Orissa. The forests of the state are vulnerable to a host of natural and man-made factors such as insect and fungal attack, diseases, grazing, forest fires etc. Rapid industrialization clubbed with semi-urbanization has increased the demand for forest materials particularly timber. The emergence of new industries is posing threat to the flora and fauna, since forest area are being diverted for non-forestry purposes. Large forest areas in the state are subject to encroachments. As per Forest Survey Report 2003, 3967.25 ha of forest area are under encroachment after 1980. Many forest areas have poor regeneration. Shifting cultivation is also putting pressure on the biodiversity. The state has witnessed a series of natural



Mangrove, Source : PCCF (Wildlife)

calamities in past few decades. Droughts & floods are frequent in the state causing threat to biodiversity. Poaching of wild animals is also affecting the biodiversity status. Increase in cattle population results in overgrazing. Orissa harbours very rich vertebrate and invertebrate fauna. As per IUCN Red Data Book / Schedule-I of Wildlife Act, 1972, 17 species of reptiles, 15 species of birds and 22 species of mammals are found in Orissa which are threatened taxon of wildlife. Similarly, 85 species of plants found in Orissa are under threatened taxon.

### Biodiversity in the International Agenda:

Six international conventions focus on biodiversity issues.

- ❑ The Convention on Biological Diversity (CBD, entered into force in 1993)
- ❑ The Convention on Conservation of Migratory Species (CMS)
- ❑ The Convention on International Trade in Endangered Species (CITES) of Wild Fauna and Flora (1975)
- ❑ The International Treaty on Plant Genetic Resources for Food and Agriculture (2004)
- ❑ The Ramsar Convention on Wetlands (1971)
- ❑ The World Heritage Convention (1972)

Each of the biodiversity related conventions works to implement actions at the national, regional and

international level in order to reach shared goals of conservations and sustainable use.

**CBD** – The objectives of the Convention on Biological Diversity (CBD) are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising from commercial and other utilization of genetic resources. The agreement cover all ecosystems, species and genetic resources.

**CITES** – The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) aim to ensure that international trade in specimens of wild animals and plants does not threaten their survival. Through its three appendices, the convention accords varying degrees of protection to more than 30,000 plant and animal species.



A snap from Nandankanan;  
Photograph by Prashanta Nayak

**CMS** – The Convention on the Conservation of Migratory Species of Wild Animals (CMS, or the Bonn Convention) aims to conserve terrestrial, marine and avian migratory species throughout their range.

International Treaty on Plant Genetic Resources for Food and Agriculture – The objectives of the Treaty are the conservation and sustainable use of plant genetic resources for food and agriculture and the fair and equitable sharing of the benefits arising out of their use, in harmony with the Convention on Biological Diversity, for



Teak Forest, Satakosia;  
Photograph by Gahar Abedin

sustainable agriculture and food security. The treaty covers all plant genetic resources for food and agriculture, while its Multilateral System list of 64 crops and forages. The treaty also includes provisions on Farmer’s Right.

**Ramsar** – The Convention on Wetlands (The Ramsar Convention) provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. The convention covers all aspect of wetland conservation and wise use, recognizing wetlands as ecosystems that are extremely important for biodiversity conservation in general and for the well-being of human communities.

**WHC** – The primary mission of the World Heritage Convention (WHC) is to identify and conserve the world’s cultural and natural heritage, by drawing up a list of sites whose outstanding values should be preserved for all humanity and to ensure their protection through a closer cooperation among nations.

**Government Strategies** – The strategies for conservation and sustainable utilization of biodiversity have comprised of providing special status and protection to biodiversity-rich areas by declaring them as national parks, wildlife sanctuaries, biosphere reserves, ecological fragile and sensitive areas. Other strategies include offloading pressure from reserve forests by alternative measures of fuel wood and fodder need satisfaction by afforestation of degraded areas and wastelands and creation of ex-situ conservation facilities such as gene banks.

Major central acts relevant to biodiversity include Forest Act, 1927; Wildlife (Protection) Act, 1972; Forest (Conservation) Act, 1980; Environment (Protection) Act, 1986 and Biological Diversity Act, 2003. The various central Acts are supported by a number of state laws and statutes concerning forests and other natural resources. The policies and strategies directly relevant to biodiversity include National Forest Policy amended in 1988, National Conservation Strategy and policy statement for Environment and Sustainable Development, National Agricultural Policy, National Land Use Policy, National Fisheries Policy, National Policy and Action Strategy on Biodiversity, National Wildlife Action Plan and Environmental Action Plan.



Photograph by Prashanta Nayak

Sanctuaries, National Parks & Botanical Garden in Orissa	
National Parks	Nandankanan, Bhitarkanika, Similipal
Wildlife sanctuaries	Bhitarkanika, Similpal, Satkosia Gorge, Hadagarh, Nandankanan, Baisipalli, Kotagarh, Chandaka-Dampada, Khalasuni, Balukhand-Konark, Kuldiha, Debrigarh, Lakhari Valley, Chilika(Nalaban), Badrama, Sunabeda, Karlapat, Gahirmatha (Marine)
Bird Sanctuaries	Chilika Lake
Botanical Garden	State Botanical Garden
Zoological Parks	Nandankanan
Source- State Environment Report	

**The Biological Diversity Act, 2003:**

The Act was enacted to provide for conservation of biological diversity, sustainable use of its components and fair and equitable sharing of the benefits arising out of the use of biological resources, knowledge and for matters connected therewith or incidental thereto. India is a party to the United National Convention on Biological Diversity signed at Rio de Janeiro on the 5<sup>th</sup> day of June, 1992. The Act makes provisions for the use of diversities within the species or between species and the eco-systems in a manner which would meet the needs and aspirations of the present and future generations. It has a provision to set up three authorities under the act, namely; the National Bio-diversity Authority, the State Bio-Diversity Board and the Biodiversity Management Committee. The function of these authorities is to regulate the biological resources occurring in India for research purposes, commercial utilization and bio-utilization of resources, such as drugs, cosmetics, colors, food flavors, genes used for improving crops and livestock by genetic interventions.

### Conservation of Biodiversity in Orissa:

To avoid threats to the biodiversity in the State some measures have to be adopted. Natural habitat, especially, forests, wetlands and grasslands are to be protected. Tree felling is only permitted in forest areas diverted for non-forestry purposes. This should be enforced strictly. The immediate goal of forestry in the state is to protect the existing dense forests with their rich bio-diversity and wildlife from degradation and to restore their vigor through appropriate treatment for natural regeneration. The people are to be motivated towards active participation in forest protection and management through a Samrakhyan Samiti and awareness for the value of forests is to be spread among the local people. As per the State Forest Report, 2003-04, 420 VSS (Forest Protection Council) have been formed and they are involved in various plantation programme in (Kalahandi, Bolangir & Koraput) KBK districts. The illegal hunting/ poaching is to be completely banned. The endangered and threatened species are to be allowed to live and breed comfortably in Sanctuaries and national parks. Grazing by domestic animals in the forest zone is to be banned or regulated strictly. To reduce the human interference, cultivation in and adjacent areas of sanctuaries is to be banned. There are some milestones achieved by the State towards wildlife conservation. A State Board for wildlife was constituted in the year 2003. The Nandankanan Zoological Park was established in 1960 in a natural setting over an area of 3.62 Sq.Kms. Ministry of Environment & Forests (MoEF) decided to set

up four conservation centres to arrest the rapid decline in population of vultures. Nandankanan is one of them. The conservation measures include captive breeding, an awareness campaign on ill effects of Diclofenac on these natural scavengers and a study to examine the effect of meloxicam, an alternative of Diclofenac, on the vultures and other bird. Similipal was chosen as one of the prime locations for tiger conservation under the "Project Tiger". The Crocodile conservation programme was launched in the state in 1974-75. The Gharial species has now a very successful breeding record in captivity. The population of saltwater crocodile has reached at 1358 in Bhitarkanika Sanctuary. A 23 foot long crocodile was found from the estuaries of Bhitarkanika wildlife Sanctuary. It has been recorded in the Guinness World Record in 2006. Elephant conservation programme under Project Elephant was launched in the year 1991. Three Elephant Reserves, namely, Mayurbhanj Elephant Reserve, Mahanadi Elephant Reserve and Sambalpur Elephant Reserve were notified in the years 2001 to 2002. Now the Elephant Reserve Network is being expanded to 14884 Sq. Kms to offer protection to over 90% of the elephants in the state. Sea turtle conservation was started in the year 1976. About 50% of the total world population of Olive Ridleys that equals to about 90% of the Indian population of the sea turtles uses the Orissa coasts for nesting. The Coast guard, State Fisheries Department and the FAO/UNDP have been brought into collaborate in turtle conservation activities. More Botanical / herbal gardens are to be developed in different regions of the state. Captive breeding in the Zoos is to be expanded. Guidelines of Biodiversity Act are to be followed on priority basis.

## Feedback

*We would appreciate if you send us comments and suggestions.*

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Sri G.K.Pujari, Programme Officer (CES) and P. M. Dash, Programme Officer (ENVIS) have prepared this newsletter

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