Bio-Diversity In Odisha

Biodiversity or Biological Diversity is defined as the variability among living organisms which includes floral, faunal, and microbial diversity. Odisha's unique location in Peninsular India has blessed it with an interesting assemblage of floral and faunal diversity. Odisha state is situated on the east coast of the country, it covers an area of 1,55,707 sq. km which is 4.74% of the geographical area of the country. The State lies between 17°47'N to 22°34'N latitude and 81°22'E to 87°29'E longitude and shares borders with West Bengal, Jharkhand in the north, Chhattisgarh in the west, Andhra Pradesh in the south, and Bay of Bengal in the east. Physiographically, the State can be divided into four regions, viz, Northern Plateau, Eastern Ghats, Central Tableland, and Coastal Plains. The annual rainfall ranges from 1,200 mm to 1,600 mm and the annual temperature varies from 12°C to 42°C. The State is drained by many important rivers, which include Subarnarekha, Brahmani, Baitarni, Mahanadi, Devi, and Rushikulya. The State has 30 districts, among which 12 are tribal districts. Being situated in the Eastern part of India covering three biogeographic provinces, the state of Odisha is bestowed with various natural ecosystems like agrarian, forests, wetlands, and grasslands. About 37% of the state’s geographical area is covered with forests and is credited with five of the sixteen major forest types occurring in India. Primarily, major forests are Northern tropical semi-evergreen forest, tropical moist deciduous forest or monsoon forest, Tropical dry deciduous forest, and Tidal mangrove forest. The important aromatic plants include Kiya (Pandanus fascicularis), Sal (Shorea robusta), Vetiver (Vetiveria zizanioides), Wild lemongrass, and Hyptiss wavelns. Odisha is the second-largest Non-Timber Forest Producing state in India and 37% of its population depend on Non-Timber Forest Produces like leaves, tubers, seeds, fruits, mushrooms, and medicinal plants for their day to day requirements and up to 40% of the income of the rural people comes from the selling of forest products.

To protect and conserve the fragile natural resources, the state government has created 19 wildlife sanctuaries, one national park and one proposed national park, one biosphere reserve, and two Tiger Reserves in the entire state. These Protected Areas comprise 10.37% of the total forest area and 4.1% of the total geographical area of Odisha. Natural barriers like the mangroves and their associate, the sand dunes, the seaweeds and seagrasses, the screw pines, the Casuarinas, and the cashew plantations together formed a coastal bio-shield and protects the Odisha coast from natural calamities.

The state is an abode for over 5174 species of plants and fungi including 2800 species of higher plants together with 300 species of grasses, 153 species of orchids, 178 species of pteridophytes, 22 species of gymnosperms, 63 species of mangroves and their associates, 24 species of seaweeds, 7 species of seagrasses, 17 species of carnivorous plants. About 300 species of bryophytes, 275 species of lichens, and above 1000 species of fresh, marine, and brackish water algae contributes to cryptogam diversity. Thirty species of wild edible mushrooms and

above 450 species of macro-fungi, 300 species of wild relatives of crop plants, and 500 species of medicinal plants also occur in Odisha. Around 117 plant species including 41 medicinal plant species of the state are considered as threatened and 24 species are endemic to Odisha, out of it 7 species each are orchids and grasses. While Saraca asoca and Symplocos recemosa comes under critically endangered category, Litsea glutinosa, Oroxylum indicum, Blepharispermum subsessile, and Embelia ribes are becoming endangered in the state. To protect the medicinal plants of Odisha, 8 Medicinal Plant Conservation Areas have been created.

A terrestrial orchid, Habenaria grandifloriformis in Deomali Plateau

Odisha is having unique biogeographic features, which supports a large diversity of animals. The faunal resources comprise 114 species of Mammals (103 wild and 11 domestic), 537 species of Birds, 131 species of Reptiles, 29 species of Amphibians, about 800 species of Pisces, 584 species of Crustaceans, 366 species of Molluscs, 259 species of Coleoptera, 98 species of Diptera, 265 species of Hymenoptera, 112 species of Spider, about 300 species of Lepidoptera, 102 species of

Odonata and 31 species of Isopteran. A total of 65 globally threatened faunal species are reported to occur in the state which includes 26 species of birds, 20 species of mammals, 18 species of reptiles, and one species of fish.

The endangered Hill Myna sitting on branches of Magnolia champaka

Local communities have been engaged themselves in protecting many plant and animal taxa in different parts of the state. Conservation of Blackbuck in Bhetnoi- Balipadar of Buguda block in Ganjam, protection of endemic Mahseer fish of Mahanadi at Huma and Maneswar in Sambalpur, conservation of tortoise in Gajapati and conservation of fresh water turtles in Champeswar, Athgarh and Golia in Ganjam are some of the examples. The three mass nesting beaches of Olive Ridley Sea turtles including Gahirmatha, Devi, and Rushikulya located along the Odisha coast are of great significance. Living fossils such as two species of Horseshoe crab (Tachypleus gigas and Carcinoscorpius rotundicauda) widely found along the Odisha coast may have existed long before the arrival of dinosaurs. Three Elephant Reserves, 8 important bird areas, several thousands of sacred grooves of the state

have immensely contributed to wildlife conservation in Odisha. Endangered Irrawaddy dolphins and lakhs of migratory birds of Chilika Lake, saltwater crocodile (Crocodylusporosus) of Bhitarkanika, Muggers of Similipal and Gharials of Tikarpara have international repute. A place like Bhitarkanika, Chilika (Nalabana), and Manglajodi is heaven for birds during the winter season and numerous winter migratory species visit annually. Besides these, shorebirds along the coast, different decapods, dragonflies, damselflies, butterflies, sand wasp in sand dune sites are of utmost wildlife importance.

Agricultural biodiversity is an important component of general biodiversity which includes all variety and variability of animals, plants, micro-organisms and ecosystems which are necessary to sustain key functions of the agroecosystem, its structure and processes for food production and food security. Biodiversity is tightly linked to agriculture and its various components. Various plants, animals and numerous microorganisms are closely associated with the agro-ecosystem and help agricultural crops in every stage such as production, protection and improvement.

The diverse agro-climatic zones of the state favor cultivation of several crop varieties of which rice, pulses, oilseeds, jute, sugarcane, coconut, wheat, small millets, bajra, arhar, groundnut, castor, linseed, cashew and turmeric are of great significance. Several varieties of turmeric from Kandhamal district, Millets of Koraput and Maize of Gajapati district are of special importance at the national and international market. Tuber crops like Taro, Elephant Foot Yam, Greater Yam and Sweet potato are cultivated in the tribal belts of Odisha are the major source of livelihood for them. Being the secondary center of origin of cultivated rice, Odisha has the distinction of possessing about 15,000 traditional rice varieties out of 50,000 found in the world.

Acknowledging the years of efforts of tribal people in conserving 130 varieties of indigenous cultivars of rice, Koraput district was declared as a Globally Important Agricultural Heritage System by Food and Agricultural Organization (FAO) in 2012.

Similarly, around 41 different indigenous breeds of domestic animal and birds including the Ghumsuri cattle, Chilika buffalo, Ganjam goat, Kendrapada sheep, etc are designated breeds for Odisha. About 22 such breeds have been registered in the National Bureau of Animal Genetic Resource, New Delhi. These indigenous breeds need to be protected and conserved to develop new and more improved varieties of domesticated animals in the future.

Plectranthus nilghericus, a rare medicinal herb in Mahendragiri Hills

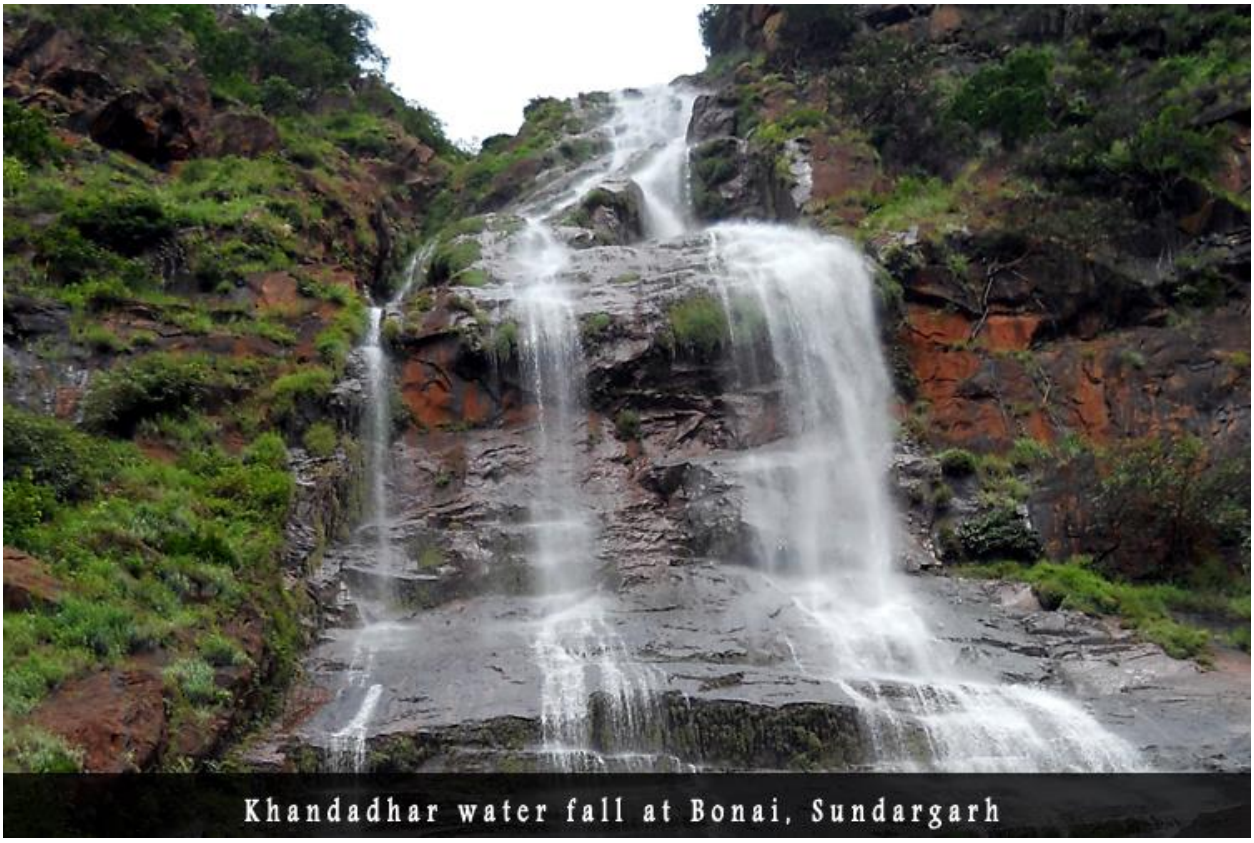
Biodiversity is therefore the natural biological capital for our life support system on the planet Earth. Our survival depends on the web of life created by the interactions of the millions of different animals, plants, fungi, and other microscopic organisms that share the Earth with us. All of these 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.



Khandadhar water fall at Bonai, Sundargarh

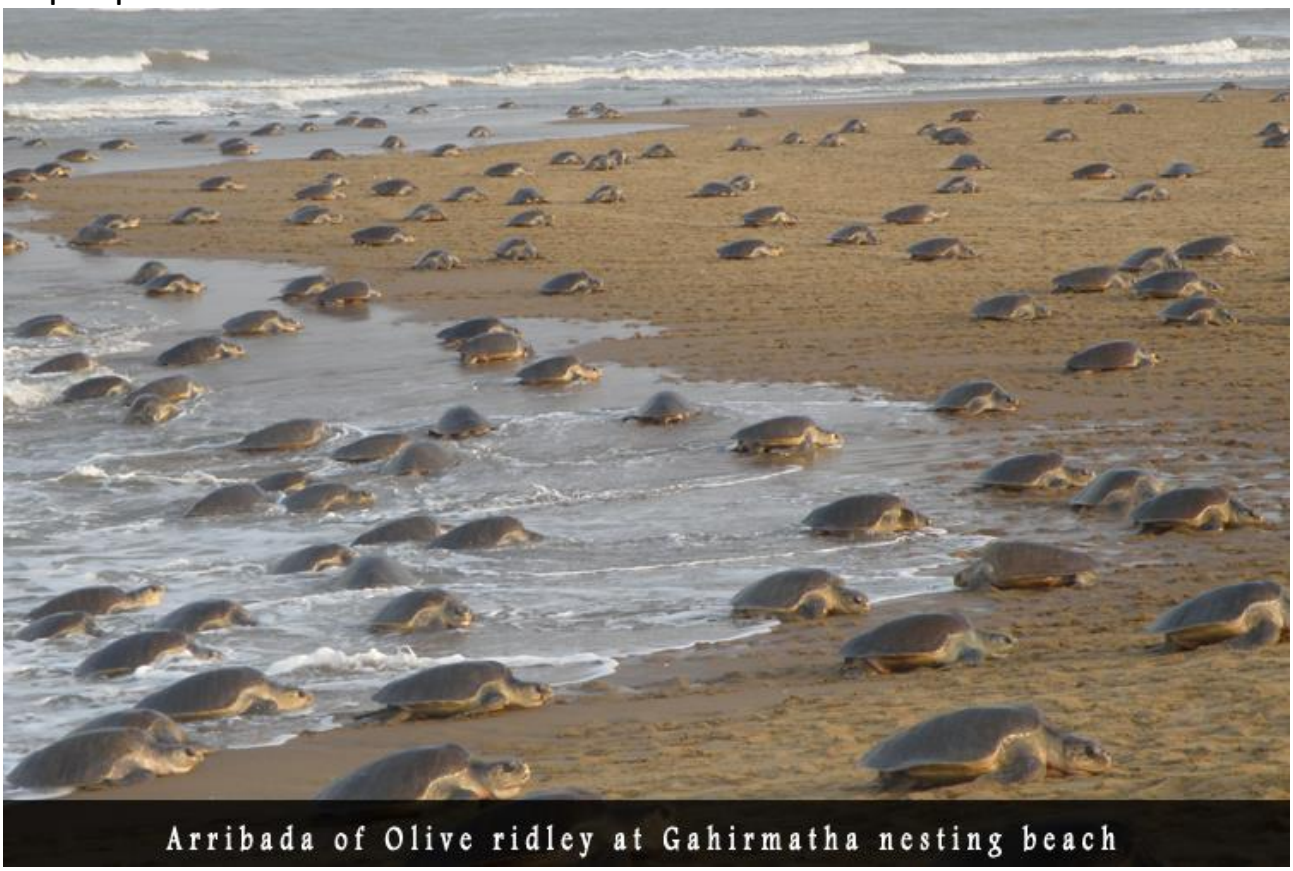
The Eastern Himalayas comprise of tracts of the Darjeeling hills, Sikkim and Arunachal Pradesh in India and eastern Bhutan. Subtropical forests cover the land up to 2,000 m; beyond it laid the temperate mixed forests, mainly comprising of fir, juniper and rhododendron. The eastern Himalayas are home 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 host 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.



Arribada of Olive ridley at Gahirmatha nesting beach

Major biodiversity hotspots in Orissa

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 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 melanoxylon, Diospyros montanna, Mangifera indica, Mitragyana 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, Cpiadessa 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 larget 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).

Lesser flamingos in flight mode at Manglajodi Wetland

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.

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.

A salt water crocodile in basking mood at Bhitarkanika

The common species of mangrove are Avicennia alba, Bruguiera parviflora, Bruguiera cylindrica, Aegialites rotundifolia, Lumnitzera racemosa, Sonneratia griffithii, Sonneratia alba, Ceriops tagal, Aegialites rotundifolia, Xylocar pus granatum, Excoecaria agalocha, Heritiera fomes, Acanthus ilicifolius, Merope angulata, Dalbergias spinosa. The climbers noticed in mangrove forests are Finlaysonia obovata, Derris trifoliate, Tylophora tenuissima and Sarocolobus globosus.The vertebrate fauna of this area is also very rich and harbours the King cobra (Ophiophagus hannah), Kraits, Python, Salt water crocodile (Crocodyldus porosus) and Olive Ridley Sea Turtles (Lepidochelys olivacea), water monitor (Varanus salvator), Horse-shoe crabs(1) Tachypleus gigas (2) Carcinocor pious 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 shew, 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.

Herd of Wild elephants in Kuldiha

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 Wildlife6 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, Woodpeckar, 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.

Rock formation at Malayagiri hills in Pallahara division of Angul