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From the Director's Desk...

This Newsletter depicts the importance of Olive Ridley sea turtles of Orissa which is a globally important population. The management practices commonly adopted by the State Government have been brought in to picture. I sincerely hope that the information content of the newsletter enlighten the conservationists and environmentalists of the world on the importance of sea turtles as a flagship species in the coastal waters, seas, oceans and on the beaches and suggest how better protection and management can improve the ecology and sustain the rich biodiversity of these ecosystems. I would like to thank Shri P.N.Padhi, IFS, Principal Chief Conservator of Forests (Wildlife) and Chief Wildlife Warden, Orissa and the Divisional Forest Officers of coastal Forest Divisions for their efforts in protecting the species and their habitats. I am thankful to the ENVIS team and Dr. C.S.Kar, Senior Scientist of the State Wildlife Organisation and Member, IUCN/SSC Marine Turtle Specialist Group, for their contribution and involvement in bringing out this newsletter.



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Sea Turtles of Orissa : A Retrospective Study

INTRODUCTION:

*Since second half of the 20th century, Orissa has acquired a prominent place in the turtle map of the world. The state has been bestowed with a superb credit in having world's largest nesting and breeding ground of sea turtles with particular reference to Olive Ridley Sea Turtles (*Lepidochelys olivacea*). 'Dhamara river mouth - Gahirmatha, Devi river mouth and Rushikulya river mouth' areas of the state are the known mass nesting and mass breeding grounds of the species in Orissa . Along with this credit, Gahirmatha coastal waters has been designated as the first marine wild life sanctuary of Orissa as per notification issued by Forest & Environment Department, Govt. of Orissa. Orissa is the only maritime state in India fortunate to have mass nesting and mass breeding grounds of the Olive Ridley Sea Turtle species. The state has executed different strategies towards conservation and management of sea turtles as Orissa is distinctly singular of having world's largest breeding ground of the threatened Olive Ridley sea turtle.*

The Coastal State of Orissa :

There is evidence in Orissa's history extending to the previous millennium of early knowledge of sailing, for both trade and fishing. The coastal boundaries of the earlier State extended into modern Andhra Pradesh to the south and West Bengal to the northeast, which explains the Andhra and Bengali influences and characteristics that are plainly visible in Orissa's coastal culture today.

Modern Orissa is located between the 17° 48' and 22°34' north latitude and 81° 24' and 87° 29' east longitude. The coastline is 480 km long and the Bay of Bengal forms the eastern coastal boundary of this territory. Being in a tropical zone, the summer months of April and May are incredibly hot, with temperatures often hovering around 40°C, but the coastal tracts are granted some relief by the moderating influence of

the sea. The State is drained by several rivers, the six important ones being the Subarnarekha, the Budhabalanga, the Baitarani, the Brahmani, the Mahanadi and the Rushikulya. Paradip can be taken to be the dividing point between the northern and southern parts of the coast of the State.

The continental shelf of Orissa measures about 24,000 sq km and extends to 120 km off the northern coast, where the Mahanadi, Baitarani and Brahmani rivers bring heavy sediments. Off the southern coast, it is about 40 km wide. The northern coast consists of a complex of deltas, estuaries, marshes, mangrove forests and an extensive tidal area, whereas the southern coast has sandy beaches, open shores and a deeper continental shelf.

The differences in coastal ecological and oceanographic conditions between the north and the south are responsible for the occurrence of different fisheries, different fishing techniques, knowledge, and craft and gear, and also cultural and social practices in the two regions. The various studies conducted by the Bay of Bengal Programme in Orissa in the 1970s and 1980s attest to this. These conditions also determine the presence of specific flora and fauna in the region.

Sea turtle species in Orissa:

A total number of 7 living species of sea turtles are found across the globe. Interestingly four among these occur in Orissa. In order of availability and abundance these are enlisted below:

Sl. No.	Turtle Species	Zoological Name
1.	Olive Ridley sea turtle	<i>Lepidochelys olivacea</i>
2.	Hawksbill sea turtle	<i>Eretmochelys imbricata</i>
3.	Leatherback sea turtle	<i>Dermochelys coriacea</i>
4.	Green sea turtle	<i>Chelonia mydas</i>

The mass nesting ground of these sea turtles is technically known as 'rookery'. Dr. C.S.Kar, an eminent and erudite scholar in his book '*Bhitarkanika: Myth and Reality*' depicts thus : "It was an indication of the great abundance of the olive ridley in the Indian ocean, but no one knew about the migratory behaviour or migratory routes followed by the schools of olive ridleys."

Identifying Sea Turtles :

1. The Olive Ridley Sea Turtle :



Named after H.N. Ridley FRS who first reported the sighting of Olive Ridelys in Brazil in 1887 and their overall olive green colour, Olive Ridelys are the smallest of the marine turtle species in the world. They grow to an average of 70 cms long carapace length and adults weigh approximately 45 kgs. The carapace is tear drop shaped.

The Olive Ridelys are omnivorous, feeding on crustaceans and molluscs. They can dive to great depths and are bottom feeders as well as pelagic feeders. They are highly migratory, covering thousands of kilometers between foraging and nesting grounds.

The most fascinating feature of Olive Ridley is their mass nesting called 'arribada' meaning mass arrival in Spanish. They choose beaches near estuaries and bays to lay eggs during mass nesting. Each adult female lays approximately 100-120 eggs at a time although up to a maximum of 180 eggs were recorded by Dr.C.S.Kar along the Gahirmatha coast. The Olive ridelys nest every year on Orissa beaches. The mating season is between October to January and may extend up to February in some years. The mass nesting is usually from late December to April although higher density sporadic nesting continues in the months of May. Sporadic nesting, however, continues year round in some of the beaches of Orissa.

In India, along the east coast arribada takes place only in the state of Orissa at three known mass nesting grounds such as the Dhamara river mouth - Gahirmatha, Devi river mouth and Rushikulya river mouth areas.

2. The Hawksbill Sea Turtle :



This unique species of sea turtle both physically and environmentally is different from rest of the turtle species. The following properties distinguish the hawksbill from other marine turtles:

- ↪ two pairs of prefrontal scales
- ↪ thick, posteriorly overlapping scutes on the carapace
- ↪ four pairs of costal scutes (the anterior most not in contact with the nuchal scute)
- ↪ two claws on each flipper
- ↪ a beak-like mouth, hence the name.

Coral reefs are the resident foraging grounds for juveniles, sub-adults and adults. Hawksbills exist on the diet of sponges commonly found on the solid substrate of reef systems. Ledges and caves of reef systems

provide these turtles with shelter for resting during the day and night. Hawksbills can be found around rocky outcrops and high-energy shoals, which are optimum sites for sponge growth. Hawksbills reenter coastal waters when they reach about 20-25 cm carapace length. Stranded live Juvenile and sub -adult hawksbill sea turtles are frequently observed along the Orissa coast.

3. The Leatherback Sea Turtle :



Leatherback sea turtles follow the general sea turtle body plan of having a large, dorsoventrally flattened, round body with two pairs of very large flippers and a short tail. Like other sea turtles, the leatherback's flattened forelimbs are specially adapted for swimming in the open ocean. Claws are noticeably absent from both pair of flippers.

The Leatherback's flippers are the largest in proportion to its body among the extant sea turtles. Leatherback's front flippers can grow up to 2.7 meters in large specimens, the largest flippers (even in comparison to its body) of any sea turtle.

As the last surviving member of its family, the leatherback turtle has several distinguishing characteristics that differentiate it from other sea turtles. Its most notable feature is that it lacks the bony carapace of the other extant sea turtles. Instead of scutes, the leatherback's carapace is covered by its thick, leathery skin with embedded minuscule bony plates. Seven distinct ridges arise from the carapace, running from the anterior-to-posterior margin of the turtle's back. The entire turtle's dorsal surface is colored dark grey to black with a sporadic scattering of white blotches and spots. The turtle's underside is lightly colored.

4. The Green Sea Turtle :



The appearance of the green turtle is that of a typical sea turtle. Green sea turtle (*Chelonia mydas*) has a dorsoventrally flattened body, a beaked head at the end of a short neck, and paddle-like arms well-

adapted for swimming. Adult green turtles are known to grow to 1.5 metres (5 ft) long. While individuals have been caught that reached weights of up to 315 kilograms, the average weight of mature individuals is around 200 kilograms. The largest green turtles ever recorded weighed 395 kilograms.

There are a few characteristics that distinguish the green turtle from the other members of its family. Unlike the closely-related hawksbill turtle, the green turtle's snout is very short and its beak is unhooked. The horny sheath of the turtle's upper jaw possesses a slightly denticulated edge while its lower jaw has stronger, serrated, more defined denticulation. The dorsal surface of the turtle's head has a single pair of prefrontal scales. Its carapace is composed of five central scutes flanked by four pairs of lateral scutes. Underneath, the green turtle has four pairs of infra-marginal scutes covering the area between the turtle's plastron and its shell. Mature green turtles front appendages have only a single claw (as opposed to the hawksbill's two), although a second claw is sometimes prominent in young specimens.

The carapace of the Green sea turtle is known to have various color patterns that change over time. Hatchlings of green turtles, like those of other marine turtles, have mostly black carapaces and light colored plastrons. Carapaces of juveniles are dark brown to olive, while those of mature adults are entirely brown, spotted or marbled with variegated rays. Underneath, the turtle's plastron is hued yellow. Limbs of Green sea turtles are dark-colored and lined with yellow, and are usually marked with a large dark brown spot in the center of each appendage.

Sea turtles spend almost all their lives submerged but must breathe air for the oxygen needed to meet the demands of vigorous activity. With a single explosive exhalation and rapid inhalation, sea turtles can quickly replace the air in their lungs. The lungs are adapted to permit a rapid exchange of oxygen and to prevent gases from being trapped during deep dives. The blood of sea turtles can deliver oxygen efficiently to body tissues even at the pressures encountered during diving. During routine activity green sea turtles dive for about 4 to 5 minutes and surface to breathe for 1 to 3 seconds.

Turtles can rest or sleep underwater for several hours at a time but submergence time is much shorter and homing characteristics of the Ridley sea turtles

while diving for food or to escape predators. Breath holding ability is affected by activity and stress, which is why sea turtles drown in shrimp trawls and other fishing gear within a relatively short time and die due to suffocation.

Nesting & Breeding Spots of Sea Turtles :

The biogeographical status of coastal Orissa helps the state to be ranked top in the case of nesting and breeding of sea turtles and Orissa can be studied best in terms of the Olive Ridley sea turtles. There are only three sea turtle rookeries of Olive Ridley sea turtles in Orissa namely at Gahirmatha, Devi Muhana and Rushikulya Muhana.

Gahirmatha is the only marine wildlife sanctuary of Orissa. This was notified as such in Government of Orissa, Forest & Environment Department Notification No. 18805/ F&E dated 27 September 1997 and published in the Orissa Gazette, extraordinary No. 1268 dated 17 October, 1997. It is



located between 86 degree 45'57" to 87 degree 17' 36"- East longitude and 20 degree 17' 32" to 20 degree 45'58" - North latitude. The total area of the sanctuary is 1435.0 km² which includes 1408.0 km² of water body and 27.0 km² of land mass including reserve forests, mud flats and accreted sand bars. The entire sanctuary area comes within the jurisdiction of the revenue district of Kendrapara.

The Devi rookery was discovered in 1981 by Dr. C.S.Kar and is located at the mouth of the river Devi, along the central Orissa coast. The nesting beach extends from the Devi to Kadua river mouths, and is a sandy beach approx. 20 km long and bordered with Casuarinas plantations. Following the discovery of this mass nesting site, mass nesting has been reported only a few times. A lot of changes have already taken place in the beach topography in the last three decades. In recent years a new sandy island of about 7-8 km length has surfaced known as new Devi Nasi island. In recent years although mass mating and congregation is observed in the shallow coastal waters in every season, the mating pairs are heavily disturbed by fishing vessels



and therefore, only higher density sporadic nesting is taking place.

The Rushikulya rookery is the southern most site along the Orissa coast. The Rushikulya rookery of Olive Ridley sea turtles was discovered only very recently in 1994 and is a stretch of approx. 2-4 km long beach located immediately north of the Rushikulya river mouth from Purunabandha to Gokharkuda village. In recent years there has been a shift towards north. The mass nesting during the current year (2009-2010 Season) occurred mostly between Gokharkuda - Kantiagada stretch. Like the Gahirmatha site, mass nesting at the Rushikulya rookery has been regularly recorded during the present decade by the Forest department of Govt. of Orissa. Neither the Devi nor the Rushikulya rookery sites have got the Protected Area status, though the Orissa Forest Department monitors these nesting beaches regularly, during the breeding season and proposals about designating these habitats of sea turtles within the PA network of the state are under active consideration of the state Government

Legal Status of Sea Turtles found in Orissa:

Olive Ridley sea turtles migrate in huge numbers and start arriving from the beginning of October, every year, for mating and subsequently nesting along the coast of Orissa. Gahirmatha coast has the average annual nesting figure between one hundred to five hundred thousand, each year. There has been decline in the population of these turtles in the recent past due to sea fishing related mortalities. Olive Ridley sea turtle has found place in Schedule - I of the Wildlife (Protection) Act, 1972 in India. All the species of sea turtles in the coastal water of Orissa as well as in India are listed as "endangered" as per IUCN Red Data Book. The sea turtles are protected under the 'Migratory Species Convention' and CITES (Convention on International Trade on Endangered species of Wild Flora and Fauna). India is a signatory nation to all these conventions. The 'Homing' instinct

make them more prone to mass casualty. The voyage to the natal nesting beaches is the dooming factor for the sea turtles. Since Gahirmatha coast along with Devi and Rushikulya coast serves as the natal nesting beach for millions of turtles, it has immense importance from turtle conservation point of view.

Threats to the Sea Turtles in Orissa :

The population of sea turtles in Orissa represents about 80% of Indian sea turtles and about 50% of world population of the species. Therefore, protection of this species has now come to the priority list of wild life conservation. This endangered species and its critical habitats can be protected if there will be a strong sense of responsibility among different Government and non-government sectors. The major threats to the sea turtles in Orissa are:

1. Fishing by trawlers and Gill netters in near shore and offshore coastal waters is a vital obstacle for the sea turtles. The sea turtles are hurt and killed by slashing of propellers of mechanised boats. Most of the sea turtles including mating pairs die due to suffocation when they are entangled in trawl nets and gill nets.
2. Artificial lighting from anchoring vessels, ports, harbours, fishing jetties and other coastal developmental activities are having their impact on breeding, nesting and hatching sea turtles as light is known to greatly disorient these sea turtles.
3. Motorisation of traditional country crafts (boats) stands as a barrier. These boats normally use gill nets, the length of which normally exceeds one or two kilometers. When along with trawl nets, hundreds of such gill nets are spread in congregated sea turtle breeding grounds and migratory pathways of sea turtles, the pairing is disturbed and the turtles die due to entanglement and suffocation.
4. Effluents released from intensive prawn farms in the catchments areas along the coast are affecting the fauna of the coastal region and the food chain of sea turtles in coastal waters.
5. Effluents released from chemical and fertilizer factories along the coast are affecting the fauna of the coastal region and the food chain of sea turtles in coastal waters.
6. Excessive net setting on the river mouth and in tidal mud flats are responsible for killing spawns which is affecting the productivity of coastal waters. This is affecting the sea turtles indirectly.
7. Construction of new ports, harbours and fishing Jetties at all river mouths of Orissa.
8. Introduction of improved beach landing crafts and settlement of migratory fishermen from neighboring states on around important nesting beaches resulting in destruction of nesting habitats.
9. Oil spills and sea pollution will inevitably occur in the event of a medium / large port being set up. These also contribute to increased illumination around sea turtle habitats.
10. Dredging of sand for construction of ship channels as well as annual maintenance dredging of the ship channels amounting to several million tones per year greatly influences the coastal equilibrium, sediment transportation, etc. resulting in erosion of many sensitive beaches which are the important nesting and mass nesting habitat of sea turtles.
11. The artificial lighting from anchoring vessels, ports, harbours, fishing jetties, and other coastal developmental activities are having their impact on breeding, nesting, and hatching of sea turtles as light is known to greatly disorient the sea turtles during all phases of its life cycle.
12. Changes in the land use pattern of coastal areas in the vicinity of important nesting as well as mass nesting beaches such as beach loss and beach modification, beach littering, casuarinas plantation close to nesting beaches, increased lighting, etc. have its effect on marine turtles and their habitats.

Similarly, changes in the sea use pattern such as increasing fishing activities, vehicular traffic at sea due to developmental activities, etc. around breeding grounds, feeding and developmental habitats as well as migratory paths, etc. have their influence on sea turtles and their habitats.

Hurdles in protecting Sea Turtles in Orissa :

The important limitation is improper enforcement of the provisions of law due to the absence of the requisite trained manpower, infrastructure and resources. Various other drawbacks relating to protections of sea turtles and their nesting and breeding habitats in Orissa are as follows:

- ↗ Inadequate implementation of legal measures due to the absence of the requisite trained manpower and striking forces, inadequate infrastructure and resources.
- ↗ Inadequacy of transport and communication systems particularly in the near shore as well as off shore coastal waters, in the estuaries and tidal river systems.
- ↗ Lack of adequate budget provisions and lack of sufficient funding support.
- ↗ Fast vanishing mangroves forest of the shore has an adverse effect on turtles as well as other aquatic fauna.
- ↗ Increased sea fishing by mechanised fishing vessels.
- ↗ Increased vehicular traffic.
- ↗ Increased lighting along the coastal areas affecting sea turtles during all phases of their life cycle.
- ↗ Change of beach profile due to natural processes.
- ↗ Change of beach profile due to various developmental activities and anthropogenic interferences.
- ↗ Beach erosion.
- ↗ Damage by predators.
- ↗ Disturbances by people.
- ↗ Changes in the land use pattern of coastal areas.
- ↗ Changes in the water use/ sea use pattern of coastal areas.
- ↗ Intruding fishing boats/trawlers from neighboring states and countries.
- ↗ Govt and non-Govt agencies dealing with the subject of Protection and Conservation of sea turtles and other aquatic/ marine wildlife biodiversity are not fully equipped to deal with the enormity of the potential problems and proper monitoring.

Measures for protection and conservation of Olive Ridley sea turtles in Orissa:

Some key events relating to sea turtle conservation legislation in Orissa, which emphasizes on protection and conservation of species and habitats are as follows. The key legislations in operation in the state are the Indian Wild Life (Protection) Act, 1972, the Orissa Marine Fisheries (Regulation) Act, 1982 and the Orissa Marine Fisheries (Regulation) Rules, 1983. Numerous subsequent interventions and orders have been issued by the judiciary and official committees at the central and State level.

The Fisheries Department have issued notifications prohibiting fishing by trawlers up to a distance of 20 kms towards the sea from the high tide line at the mass nesting sites of Gahirmatha, Devi river mouth and Rushikulya river mouth areas. The Fisheries Department have also issued notifications and have prohibited movement / operation of motorised vessels, trawlers and those using mechanised fishing techniques in the sea turtle congregation areas comprising a zone of 10 Kms into the sea from three specified coasts, namely Dhamara mouth between Shorts' island and Udabali north, Devi mouth between Keluni muhana and new Devi Nasi island north, and Rushikulya mouth between south of Prayagi to north of Arjyapalli. However, it is to be mentioned that as per OMFR Act and rules the first 5 km of the coastal waters from high tide line is exclusively reserved for the traditional fisher folks utilizing traditional crafts and gears and no mechanised fishing vessels are permitted to fish in this zone through out the Orissa coast on a round the year basis.

Species protection records in the state show that till the mid 70's Orissa openly supplied local as well as distant markets like Kolkata with turtle meat and turtle eggs. With enactment of the Wild Life (Protection) Act, 1972, all sea turtles found on the Indian coast were included in the list of protected species under Schedule I of the Act. Subsequently, the Wild Life Protection Act (WLPA) came into force in the state of Orissa in 1974. The WLPA declared the consumption, trade, hunting and injury of turtles as prohibited, and the enforcement of the Act eventually led to the decline in flourishing sea turtle trade in Orissa by the early 1980s.

Significantly, the WLPA does not make a clear distinction between incidental/accidental capture in fishing nets and poaching. Therefore, the fisher folks found with sea turtles in their fishing nets can be penalised in the same manner as poachers, irrespective of whether the catch takes place within or outside a protected area. However, they can not be penalized until and they are caught red handed with turtles in their fishing nets which is often difficult. Enforcing officers are vested with considerable powers and the penalties of the WLPA are heavy, comprising a combination of a term of imprisonment and fines. The nesting beaches and offshore waters at Devi and

Rushikulya, being turtle habitats by definition, are also required to be protected during the breeding and nesting season by the Orissa Forest Department by bring them under the Protected Area Net work of the state and these may also be designated as Marine Protected Areas (MPAs).

During 2009-2010, a separate Budget head in the State Budget has been created viz., "2312-Protection and Conservation of Olive Ridley turtle". Allotment of Rs.10.01 lakh has been made in the Supplementary Budget (2009-10). However, it is necessary to increase the budget allocation in the state budget in order to have an institute to take care of the research and monitoring needs as well as to have dedicated ships, sea worthy vessels, support patrol vessels and vessels which can operate in shallow coastal waters, river mouths and estuaries, tidal rivers and creeks etc.

Conclusion:

It is necessary to launch an exclusive 'Project Sea Turtle' to better protect this species and their habitats as well as to minimise various threats to their survival. The initiation and successful implementation of a "Project Sea Turtle" on the lines of "Project Tiger or Project Elephant" by Government of India with 100% Central assistance will greatly help in wining back the confidence and support of the people for environmentally sound management of the coastal resources. This is highly required for having a balance

between anthropocentric and eco-centric sustainable developments and will help in long term conservation and scientific management of this globally important population including the rookeries, mating and breeding grounds, developmental habitats as well as migratory routes of sea turtles.

Considering the need for research and management of sea turtles and their habitats including other aquatic biodiversity in the state of Orissa, the High Power Committee under the chairmanship of Chief Secretary of the state held on 29th November, 2008 have decided to have an "Olive Ridley Sea Turtle Research and Conservation Centre in Orissa" which will be an autonomous body under the Forest & Environment department with state Govt. funding." Government is also considering for creation of an Olive Ridley Foundation/ Trust in Orissa for the cause of protection and conservation of sea turtles. However, since the state of Orissa is fortunate to have about 80% of the Indian sea turtles and about 50% of world population of the species, setting up of an autonomous "International Institute of sea turtles" in Orissa may be immediately taken up by the Government for facilitating long term studies and research on sea turtles, marine biodiversity and marine ecosystem to suggest and guide conservation actions based on sound scientific principles of conservation and management.

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