CONSERVATION OF OLIVE RIDLEY TURTLE

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OLIVE RIDLEY TURTLES

Order: Testudines

Family: Cheloniidae

Scientific Name: *Lepidochelys olivacea*

The olive ridley turtles are considered as the smallest and most abundant of all sea turtles found in the world, with an estimated 8,00,000 females nesting annually.

Present Status:

Wildlife (Protection) Act, 1972	Schedule - I
IUCN	Vulnerable
CITES	Appendix – I

Population Trend

Distinctive Features:

- live ridley turtle is a small sea turtle with a mean weight of 40 kg. Females are heavier, but rarely weigh over 50 kg. The adult males are of significantly less body weight (about 33 kg).
- Carapace (top-shell) of an adult is 60-70 cm in length, heart shaped with more than five pairs (5-9 pairs) of costal (between the Centre and outer margin of shell) scutes and four pairs of pore-bearing infra-marginal scutes. Each side of the carapace has 12-14 marginal scutes. The carapace is olive/grayish-green in appearance.
- Although the upperparts are grayish green to olive in color, carapace sometimes appears to be reddish in colour due to presence of certain

algae. The bridge and hinge less plastron of an adult varies from greenish white in younger individuals to a creamy yellow on older specimens.

- It has a medium sized, broad head with concave sides, which appears triangular from above. Presence of a short snout on the upper part of head is a striking feature.
- Forelimbs are modified into paddle-like flippers, each having two anterior claws.
- The hatchlings are blackish brown in appearance and weigh around 28 g with 4.1 cm long carapace.
- Both hatchlings and juveniles have serrated posterior margins, which become smooth with age. Juveniles also have three dorsal keels; the central longitudinal keel gives younger turtles a serrated profile, which remains until sexual maturity is reached.
- Adults are somewhat sexually dimorphic. As contrast to the females, mature males are lighter in weight and have longer and thicker tails, which are used for copulation. In males, the claw on the front flipper is also enlarged and hooked which help them to grasp the female carapace during copulation. Males also possess longer, more tapered, round, dome-like carapace and bear much concave and soft plastron than females.

Distribution:

The olive ridley turtle is one of the most abundant sea turtles in the world with a circumtropical distribution. They inhabit tropical and subtropical warm waters of the Pacific, Indian and Atlantic oceans. In the Eastern Pacific, they occur from southern California to northern Chile; in Indian ocean they are found in tropical warm waters and coasts of India, Sri Lanka, while in the Atlantic Ocean, they have been observed off the western coast of Africa and South America (in the coasts of northern Brazil, Suriname, Guyana, French Guiana, and Venezuela). Olive ridleys often migrate great distances between feeding and breeding grounds. Nesting occurs in nearly 60 countries, while they are believed to use the coastal waters of over 80 countries during migratory movements.

In India, they are reported from several places along the east and west coast, as well as, in the coasts of various islands in the Bay of Bengal and Arabian Sea. They are reported from several coastal areas in the state of West Bengal, Orissa, Andhra Pradesh, Tamil Nadu, Karnataka, Kerala, Maharashtra, Gujarat along with the Union Territories of Goa, Puducherry, Lakshadweep and Andaman and Nicobar Islands. Gahirmatha, Devi River mouth, and Rushikulya are three very important and spectacular nesting sites of the olive ridley turtles (called Arribadas) in the state of Orissa.

Population:

Information on the exact population of these marine turtles is almost non-existent. Due to their vast area of occurrence underwater presence and migratory nature, it is indeed difficult to make a population estimation of

this species. However, wildlife biologists estimate that there are around 8,00.000 nesting females existing in the wild. Every year an average of 3,98,000 females are recorded in the arribadas of Gahirmatha, Orissa which is supposed to be the largest nesting population of these turtles in this country and is also one of the largest arribada nesting sites in the world. However, an indication of declining population trend is noticed in Gahirmatha beach in the recent past (Plotkin, 2007).

Habitat:

Olive ridleys require a range of geographically separated localities and multiple habitats during their entire life cycle (Márquez, 1990) and have been recorded in both benthic and pelagic foraging habitats (Musick and Limpus. 1997). They primarily inhabit coastal waters, but captures far offshore indicate that at least some individuals may be pelagic. They exist in distinct populations and mostly breed annually. They usually migrate annually from pelagic foraging grounds to coastal breeding and nesting grounds and back. They a by and large found within 15 km of mainland shores m protected, relatively shallow (22-55 m deep) marine wales in coastal bays and estuaries, but occasionally occur in open waters over some parts of its range. They have been evet observed in locations more than 4,000 km away from the shore. Juveniles are reported to share some of the adult's habitats (Kopitsky et al., 2000) until they attain sextual maturity (Musick and Limpus. 1997).

Behavioural Biology:

Food and Foraging Behavior: The olive ridley turtle especially the immature ones, are predominantly carnivorous Animal prey consists of protochordates or invertebrate which can be caught in shallow marine waters or estuarine habitats. Common prey items include jellyfish, tunicates, Sea urchins, bryozoans, bivalves, snails, shrimps, crabs, rock lobsters, sipunculid worms and a variety of fishes and the eggs. However, in areas devoid of other food sources, these turtles feed on filamentous algae. Juveniles are believed to Occur in similar habitats as the adults (i.e., pelagic water where they forage on gelatinous prey such as jellyfish, salps and tunicates (Kopitsky et al. 2004). Studies on captive population have indicated some degree of cannibalism. They typically forage off shore in surface waters or dive up to the depth of 500 feet (150 m) to feed on bottom dwelling crustaceans and other "benthic" invertebrates. Additionally, consumption of jellyfish and both adult fish (e.g., Sphoeroides) and fish eggs may be indicative of pelagic (open ocean) feeding. Foraging habitat can range from depths of several metres (Conway. 1994) to over 100 m (Whiting et al. 2005). Apart from one exception. they have not been recorded in coral reef habitat or shallow inshore sea grass flats (Limpus. 2008).

Breeding Behaviour:

Olive ridley turtles display three modes of reproduction: arribada, dispersed nesting. And mixed strategy (Bernardo and Plotkin, 2007).

- **Arribadas:** Olive ridley turtles are best known for their behavior of synchronized community nesting in mass numbers, termed arribadas. Such mass nesting behaviour includes hundreds to thousands of females over a period of days and are reported from relatively few places worldwide. In the northern Indian ocean, arribadas occur on three different beaches along the coasts of India. Majority of the olive ridleys have been reported to nest in two or three large groups near Gahirmatha (35 km stretch) and a small stretch (3 to 4 km) of beach. 100 km south of Gahirmatha between Nandikhia and Akasia mohona (Kar and Bhaskar,1982) in Orissa. Apart from Gahirmatha, two other mass nesting beaches have been located which are on the mouth of rivers Rushikulya and Devi. The other major nesting sites include Gorai. Kihim and Versova in Maharasthra (Tikadar and Sharma, 1985). a 50 km stretch beach south of Madras and Point Calimare in Tamil Nadu (Bhaskar, 1981). Andaman and Nicobar Island. Sundarban and Digha coast of West Bengal (Saha, 1984; 1986).
- **Dispersed nesting**: In addition to these mass nesting sites, minor dispersed nesting sites and solitary nests of the olive ridley turtles have been reported extensively in scattered locations throughout this species range. Such minor and solitary nesting sites are found in the coasts of Goa, Kerala, Gulf of Manner, Andhra Pradesh Lakshadweep islands and Gulf of Kutch (Whitaker 1977). There are number of earlier reports on their nesting in coastal West Bengal extending from Sundarban region in the east to Digha

Shankarpur region in the west. Unlike mass nesting events, there is no apparent synchrony between individual solitary nesting events.

Mixed strategy: Some females even employ a mixed nesting strategy. They lay some of their clutches in the arribadas while lay other clutches in solitary nest during the same nesting season**.** Olive ridley turtles attain sexual maturity around 15 years. Reproductively mature turtles (both males and females) migrate toward coastal zones and concentrate near nesting beaches. Mating is often reported to occur in the vicinity of nesting beaches. However, some males remain in oceanic waters over 1.000 km from the nearest beach and mate with the receptive females enroute to their nesting beaches (Plotkin et al., 1996: Kopitsky et al. 2000). Mating takes place almost daily in swallow water at a distance ranging from 50 m to 5 km from the sea shore during October to December. Prior to peak mating period. large numbers of copulatory pairs swim passively along the surface current. In eastern India, turtle visit the coast in huge numbers from November for nesting and remain till first week of April. Nesting occurs throughout the year with peak nesting events (i.e., arribadas) occurring between September and December. They generally begin to aggregate near nesting beaches approximately two months before nesting season, although this may vary throughout its range. Mass nesting usually occurs in two batches. first major nesting in January to February and second minor nesting in March. They migrate from the Indian Ocean and adjacent areas pass through Tamil Nadu and Andhra coast, reach the mass nesting beaches in Orissa and follow the same route during their downward migration from their breeding ground. These marine testudines usually prefer to nest in the mid zone of relatively

flat beaches which are clean and free of debris. Interestingly, females tend to return to the very same beach from where they first hatched, to lay their eggs. Nesting events are usually nocturnal. But, in mass nesting sites diurnal nesting has also been reported (Ernst et al. 1994). Nesting is undertaken two to three times per nesting season (Spotila, 2004) and they exhibit an inter-nesting period of 17-30 days (Ackerman, 1997) during which the female remains near shore. During each nesting attempt, the females laboriously dig a l.5 feet deep conical pit on the sandy beach with their hind flippers and then lay clutches of eggs. Females can lay up to three clutches per season, but most will only lay one or two clutches. Their mean clutch size is 109, which varies throughout its range and usually decreases with each nesting attempt (Kalb, 1999) found that within a nesting season solitary nester use multiple beaches for oviposition, but arribada nesters display nest site fidelity. In arribadas hundreds to thousands of females come ashore to lay their eggs. Hence, in many nesting beaches the nesting density is so high that the nesting females dig up the previously laid egg clutches of other females to lay their own eggs. The eggs remain under sand for a period of 45 and 5l days under natural conditions, which extend to as long as 70 days in poor weather conditions. Successful incubation of eggs requires the nesting sand temperature to be between 25-33°C (Ackerman, 1997). Sex of the turtle is determined by temperature. It has been found that eggs incubated at 31-32°C will produce only females, while eggs incubated at 28°C or less will produce solely males and incubation temperatures of 29-30°C will produce a mixed sex clutch (Ernst et al. 1994). Olive ridley hatchlings generally, emerge from the nest at night (Spotila, 2004). Hatchlings are dark grey with a pale yolk scar, but appear all black when wet. A thin, white line

borders the carapace, as well as, the trailing edge of the fore and hind flippers. The serrated posterior marginal scutes and central longitudinal dorsal keels in hatchlings and juveniles give them a serrated profile. While the hatchlings synchronously emerge from their nest, then the beaches of the mass nesting sites are almost covered with numerous tiny turtles crawling over the beaches making their first trek towards the vast ocean.

Home Range:

These turtles spend their entire lives in the ocean, and migrate thousands of kilometers between feeding and mating grounds in the course of a year. Whiting et al., (2005) estimated the home range for two adult females as 138 sq km and 1182 sq km respectively.

Social Organization:

Very little is known about the social organization of this turtles. Thousands of females come together on the same beach to lay eggs in their mass roosting sites. In addition to that, many hatchlings and small juvenile turtles occur in the surface waters of the open ocean (Bjorndal, 1997).

Threats to Survival:

- **Commercial and recreational fishing:**
  Accidental killing of adults through entanglement in trawl nets and gill nets due to uncontrolled fishing during the mating season around nesting beaches is considered to be the most severe threat for the turtles. Additionally, incidental captures of olive ridleys occur worldwide in trawl fisheries, long-line fisheries, purse seines, gill

net and other net fisheries and hook and line fisheries (Frazier et al., 2007). These are serious ongoing sources of mortality that adversely affect the species' recovery. Since the early 1980s, many olive ridleys were found dead on the beaches of Orissa, presumably due to the expansion of the shrimp trawling fishery and subsequent incidental capture in shrimp trawls (Pandav, 2000) in the eastern Indian ocean. Gill net fisheries also operate in the region and contributes to their mortality along this coastline. Over 10,0O0 olive ridley carcasses per year have been counted on the Orissa coast since 1999 (Wright and Mohanty, 20X6). Prior to the introduction of Turtle Excluder Devices (TED hundreds of marine turtles were killed annually in trawling activities. Though not well quantified for olive ridley turtles, yet ghost nets (lost and discarded fishing nets) are also considered as a potential threat as they float in the ocean and coastal waters and many marine animals get entangled. Many olive ridley turtles are killed or injured due to commercial harvest and incidental capture (or bycatch). During 1993-2003, more than 1,00,000 turtles were reported dead in Odisha India from fishery-related practices.

- **Boat strike:**

  Other major threats include mortality associated with boat collisions. Fast moving boats have the potential to cause marine turtle injury or death

- **Poaching:** Olive ridley turtles are still extensively poached for their meat, shell and leather and their eggs have a significantly large demand around the coastal regions. Such illegal harvesting of adult

olive ridleys and their eggs continues to be widespread in the Indian Ocean (Frazier et al., 2007). Large. scale exploitation of turtle eggs was done along the beaches of the Indian ocean since remote past for personal consumption and to feed the domestic animals. Despite being legally prohibited at present, still exploitation of eggs continues, particularly in the nesting beaches of these marine turtles, leading to population decline (Cornelius et al., 2007).

- **Predation:**

  Predation pressure on the juvenile olive ridley turtles is very high throughout their distribution range. The juveniles are exposed to predators (like feral dogs, jackals, hyenas. predatory and scavenging birds, as well as, ghost crabs and fiddler crabs) prowling around the nesting sites. They are mainly killed in large numbers while they emerge from their nests and travel across the beaches to the sea water. Feral dogs, jackals and some other predators even al up the nests of the olive ridley turtles to feed on the eggs. Due to very high density of nesting females in the arribadas the previously laid nests are inadvertently dug up and destroyed by other nesting females. Besides, developing eggs are often infested by fly and beetle larvae, which lead to significantly high mortality of embryos. However, adults have relatively few known predators. They are occasionally attacked by crocodiles in the estuaries and are predated upon by the carnivores like sharks and killer whales in the open seas.

- **Diseases:** Very little information is available on the diseases and their effects on olive ridley abundance. Fibropapilloma, caused by a

herpes virus, is the only disease identified in these sea turtles almost throughout the world (Herbst, 1994). However. incidence of fibropapilloma is possibly not alarmingly high among these marine turtles.

- **Marine debris:**

  Death can occur when turtles become entangled in or ingest marine debris. Carr (1987) recorded that fishing line, rope and cord fragments, styrofoam beads, tar balls. plastic bags and balloons are all known to have killed marine turtles through ingestion or entanglement. Habtat loss and degradation: Olive ridleys face serious threats from the destruction and degradation of natural habitat along their nesting beaches. The increasing demands for developmental activities like building of shipyards and docks result in excessive release of oil and gas into these sensitive habitats. In power plants, juvenile and sub adult turtles get entrapped within the saltwater cooling intake systems. Some of the olive ridley's foraging grounds are also contaminated due to sewage, agricultural runoff, pesticides, solvents and industrial discharges. These contaminants have been shown to decline the productivity of the benthic community, which in turn negatively affect the turtles foraging on these communities. Beach erosion has also been cited as potential threat to their nesting grounds. In addition to these, coastal developments (including residential, industrial and tourism infrastructures, growth of existing coastal villages, construction of new aquaculture ponds etc.) and exploitation of nesting beaches for ports can directly destroy or degrade beach habitats used as nesting sites, particularly along the east coast of India (Pandav and

Choudhury, 1999). All these impacts directly or indirectly change the thermal profiles of the beach and lead to increased light pollution (Witherington, 1992).

- **Light pollution:** Coastal development also threatens newly hatched turtles through the effects of light pollution (Karnad et al., 2009) Light pollution on nesting beaches alters nocturnal behaviors in sea turtles. During night, a barren shore is usually darker than the sea. The newly hatched turtles instinctively orient themselves towards the direction which is better illuminated in the night. But, with anthropocentric development and presence of electric lights, the coasts often become brighter than the sea even in the night. As a consequence, hatchlings which use light cues to orient themselves to the sea, get misled or wrongly oriented and instead of heading towards the sea they move in opposite direction. Subsequently, they die from exhaustion and dehydration, slaughtered on roads by speeding vehicles or get killed by its predators prowling on the beach.
- **Global warming and climate change:** Global warming and changing weather patterns associated with climate change has the potential to adversely impact the habitats and ecosystems of olive ridley populations worldwide (Hays et al., 2003; Weishampal et al., 2004). Cyclones and associated storm surges can alter hatchling production in particular seasons by washing away and/or inundating clutches or causing erosion of banks so females cannot emerge to nest (Hamann et al., 2007). Beach erosion, as a consequence of climate driven extreme events, has also been cited

as potential threats to nesting grounds. Besides, the sex of marine turtle hatchlings is determined by the incubation temperature of the eggs. Warmer incubation temperatures lead to the production of female hatchlings and cooler incubation temperatures result in the production of male hatchlings (Spotila, 2004). Climate change may alter the temperature of nesting beaches, thereby affecting the male-female ratio.

- **Slow growth and delayed sexual reproduction:** Olive ridley turtles are also prone to population declines because of certain life history traits like slow intrinsic growth rate and delayed sexual reproduction. These hinder fast population recoveries.

Conservation Initiatives:

Olive ridley considered threatened as they have declined by-more than 30 percent (ranged between 31 and 36 percent) from historic levels and due to their few remaining nesting sites in the world. Hence, they are categorized as Vulnerable by 1UCN. These marine turtles are protected by various international treaties and agreements, as well as, national laws. They have been listed in Appendix I of CITES, which prohibits international trade. This species is also listed in Appendices I and II of the Convention on Migratory Species. The highly migratory behaviour of sea turtles makes them shared turtles are resources among many nations. Thus, conservation efforts for sea turtle populations in one country may be jeopardized by activities in another. Protecting sea turtles on particular nesting beaches and in a particular ocean system alone, therefore, is not sufficient to ensure the continued existence of the species. Conservation

successes for the olive ridley turtles in India have relied on well-coordinated national programmers with cooperation from local communities and non-government organizations, which focused primarily on public outreach and education. Arribada management has also played a critical role in conserving olive ridleys (Plotkin, 2007). Lastly, enforcing the use of "Turtle Excluder Devices" (TEDs) in the shrimp trawling industry has also proved effective in some areas. The TEDs are specially designed nets with an exit cover which allows the turtles to escape while retaining the catch. Uses of such TEDs have been made mandatory for the trawlers in Orissa to reduce accidental killing of turtles. Initially the fishing communities strongly opposed this initiative as they thought that TEDs would result in loss of considerable amount of the catch. However, WWF-India, along with its partners, disproved this theory by conducting a study to measure the loss of catch through TEDs, revealing the loss to be a very small percentage of the total catch. This result, along with regular meetings with the fishing communities, is slowly helping to change their mindset and encouraging them to use TEDS, thereby aiding the conservation of olive ridley turtles. Another major project to preserve the olive ridley turtle population was carried out in Chennai, where the Chennai wildlife team collected close to 10,000 olive ridley turtle eggs along the Marina coast. Once the eggs hatched, the baby turtles were carried to the beach and released. In addition to these major initiatives, a substantial network of communities is working together to quantify the impact of ghost nets on turtle mortality, as well as removing ghost nets from beaches to reduce their negative impact on the survival of the turtles. Several organizations, like WWF-India, along with the fishermen community, are helping in various ways to ensure a safe

passage for the hatchlings to the sea. Gahirmatha coast serves as the natal nesting beach for millions of turtles and is regarded as the world's largest known rookery of these turtles. Thus, considering the ecological significance of diverse faunal and floral resources of Gahirmatha coast and its adjoining waters in turtle conservation, Government of Orissa has declared the beach and its adjoining waters as "Gahirmatha Marine Sanctuary" in September, 1997. The virgin beaches of Gahirmatha Marine Sanctuary stretch over a length of approximately 705m. The marine sanctuary extends from Dhamra river mouth in the north to Mahanadi river mouth in south. It includes a width of approximately 20 km of the sea from the high tide line. The protected area includes 1408 sq km of seascape and 27 sq km of land mass comprising of mudflats, seabeach and mangroves. This is the first and the only Marine Sanctuary of Orissa.

Some other recommendations for threat abatement and proposed conservation initiatives for these marine turtles are as follows:

- More effort should be placed on understanding patterns of nest site selection and how nesting sites may change under different climate regimes Efforts should be made to understand the ecological roles of olive ridley turtles and possible impacts of climate change to their important diet species (Hamann et al., 2007).

- National Recovery Plan for Marine Turtles need to be designed to outline actions for the protection, conservation and management of all marine turtles found in Indian coasts, including the olive ridley turtles.

- Specific guidelines for the Ecologically Sustainable Management of Fisheries need to be designed and implemented along with legislative initiatives and regulatory framework to reduce the threat which coastal fisheries pose to marine turtles by intentionally or accidentally catching them. Modification of fishing hooks should also be made.
- Specific actions to conserve the species need to be implemented through recovery plans, wildlife conservation plans and threat abatement plans.