WHY HEALTHY OCEANS NEED SEA TURTLES

THE IMPORTANCE OF SEA TURTLES TO MARINE ECOSYSTEMS

Only if we understand, can we care. Only if we care, can we help.
Only if we help, we shall be saved- Dr. Jane Goodall, D.B.E.

“People ask: Why should one care about the ocean? Because the ocean is the cornerstone of earth's life support system, it shapes climate and weather. It holds most of life on earth. 97% of earth's water is there. It's the blue heart of the planet — we should take care of our heart. It's what makes life possible for us. We still have a really good chance to make things better than they are. They won't get better unless we take the action and inspire others to do the same thing. No one is without power. Everybody has the capacity to do something.”- *Sylvia A. Earle, Famed Oceanographer and National Geographic Explore-in-Residence*

The ocean serves as home to millions of marine species. Among the various species that live in the ocean, the turtles play a significant ecological role in maintaining the balance between the marine and coastal ecosystems.

The backs of sea turtles are home to many marine species. They carry around barnacles, algae and other similar organisms thus providing a food source for fish and shrimp. Sea turtles themselves are prey to both marine and land animals. Hence they form an important part of the food chain, both on land and at sea.

Today, we face another large and urgent concern - the threats faced by the turtles that arrive near shore for foraging and breeding purposes. Sea Turtles face many threats because of their long migratory paths. They are among the few animals from the sea that depend on the beaches to lay their eggs. Hence their life-cycle process, places them in a vulnerable position.

During mating season between November and February, male and female sea turtles migrate closer to their nesting beach about 5 km offshore. They congregate and stay in these offshore areas while they mate and the females complete their nesting. It is during these months that many male and female turtles get entangled in the trawl fishing nets, gill nets and rays fish nets and wash ashore dead or injured due to entanglement. The female Olive Ridley comes ashore to nest between January and April along the beaches of the east coast. February usually sees the highest number of nests each season. Sea Turtles nest on the majority of beaches in all coastal districts of India. Every year almost 10,000 sea turtles are reportedly found dead along the protected beaches of India and an unaccounted number on other beaches.

As these turtles are protected under the Wildlife (Protection) Act of 1972, we believe that we as guardians of sea turtles and all endangered marine wildlife; it is our responsibility to ensure their protection. The loss of life on this scale of a protected and endangered species is a serious concern.

Watching a sea turtle rise from the waves, lay her eggs, and then disappear into the churning oceans, cannot help but tug at your heart. In the sand beneath us, are her offspring's, unlikely to ever meet the mother that travelled hundreds, perhaps thousands of kilometres to that beach to select the one spot she thought is safe from predators and poachers. There is something so ancient yet so basically sympathetic about these creatures that anyone who witnesses such an event cannot help but worry about their future. All sea turtles are in danger of extinction and many populations are likely to disappear within our lifetimes.

We hope that this booklet ***“Why Healthy Oceans Need Sea Turtles- The Importance of Sea Turtles to Marine Ecosystems”*** would be a simple guide to motivate all of us to preserve our natural heritage, our oceans, our marine life and our sea turtles, the ambassadors of the ocean.

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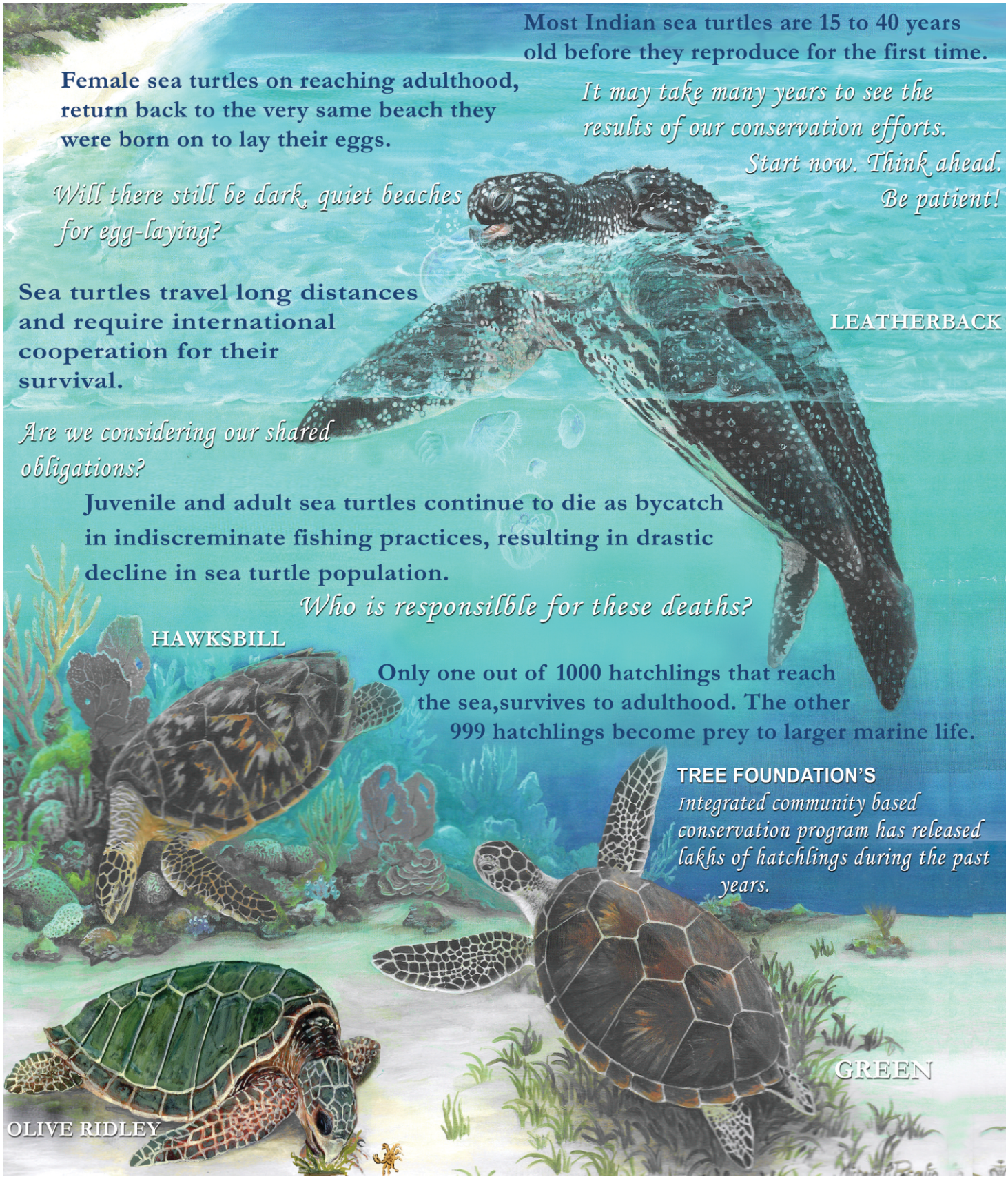
WHY HEALTHY OCEANS NEED SEA TURTLES

THE IMPORTANCE OF SEA TURTLES TO MARINE ECOSYSTEMS


Most Indian sea turtles are 15 to 40 years old before they reproduce for the first time.
Female sea turtles on reaching adulthood, return back to the very same beach they were born on to lay their eggs.
It may take many years to see the results of our conservation efforts.
Start now. Think ahead.
Be patient!
Will there still be dark, quiet beaches for egg-laying?
Sea turtles travel long distances and require international cooperation for their survival.
LEATHERBACK
Are we considering our shared obligations?
Juvenile and adult sea turtles continue to die as bycatch in indiscreminate fishing practices, resulting in drastic decline in sea turtle population.
Who is responsible for these deaths?
HAWKSBILL
Only one out of 1000 hatchlings that reach the sea,survives to adulthood. The other 999 hatchlings become prey to larger marine life.
TREE FOUNDATION'S
Integrated community based conservation program has released lakhs of hatchlings during the past years.
GREEN
OLIVE RIDLEY

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WHY HEALTHY OCEANS NEED SEA TURTLES

EXECUTIVE SUMMARY

Sea turtles have played vital roles in maintaining the health of the world's oceans for more than 100 million years. These roles range from maintaining productive coral reef ecosystems to transporting essential nutrients from the oceans to beaches and coastal dunes.

Major changes have occurred in the oceans because sea turtles have been virtually eliminated from many areas of the globe. Commercial fishing, loss of nesting habitat, poaching of both nesting turtles and their eggs and climate change are among the human-caused threats pushing sea turtles towards extinction. As sea turtle populations decline, so does their ability to fulfil vital functions in ocean ecosystems.

Our oceans are unhealthy and under significant threat from overfishing, pollution and climate change. It is time for us to protect sea turtles and rebuild their populations to healthy levels as a vital step in ensuring healthy and resilient oceans for the future. As sea turtles are highly migratory they need to be protected at all life stages, whether as newly born hatchlings, nesting females, mating partners, foraging off our coast or migrating individuals.

SEA TURTLES NESTING ALONG INDIA'S COAST

Green Sea Turtle *(Chelonia mydas)*
ENDANGERED

Hawksbill Turtle *(Eretmochelys imbricata)*
ENDANGERED

Leatherback Turtle *(Dermochelys coriacea)*
ENDANGERED

Olive Ridley Turtle *(Lepidochelys olivacea)*
ENDANGERED

Five species of sea turtles namely the Olive Ridley, Green, Hawksbill, Leatherback and Loggerhead, inhabit the waters of India's coastline. Only the first four turtles nest on Indian beaches. While the Logger Head turtle swims through the Arabian Sea en-route to the Arabian beach to nest. The above species are listed as either endangered or critically endangered under the IUCN Red List, and all are protected under Schedule I Part II of the Indian Wildlife Act of 1972. Despite ongoing and concerted protection measures by various other organisations, no sea turtle species has recovered enough to be removed from either the IUCN Red List or National Protection and still some local populations continue to decline.

Thus it is imperative that organisations involved in sea turtle conservation and the relevant state and national authorities charged with protecting sea turtles around India work together at every opportunity to conserve existing stocks in any way practical with a view to reversing any population decline in the medium to long term.

IMPORTANCE OF SEA TURTLES TO HEALTHY OCEANS

Humans have caused sea turtle populations to decline significantly all over the world. In the past century direct fishing for sea turtles was the main reason for population declines. Today however, other threats, including injury or death in commercial fisheries, poaching of nesting females and their eggs, habitat degradation and climate change top the list.

The resulting population declines have reduced the species' ability to fulfil their roles in maintaining healthy marine ecosystems, not just in India but globally. Because large sea turtle population declines occurred centuries ago, we lack a proper perspective or a reliable baseline against which to compare their current state. Due to the lack of comprehensive historic information, some of the past ecological functions of sea turtles during periods of great abundance have certainly been forgotten.

Although we cannot now fully understand the roles sea turtles played centuries ago, it is important that we discover as much as possible. Better understanding of these roles will allow us to determine what structure and functions were lost in the ocean ecosystems, the environmental effects of remaining populations, and management and conservation measures required for sea turtles to reach historic levels - and the improvements in ecosystem health that could result from restored sea turtle populations both in India and globally.

What we do know is that sea turtles - even at diminished population levels - play an important role in ocean ecosystems by maintaining healthy seagrass beds and coral reefs, providing key habitat for other marine life, helping to balance marine food webs and facilitating nutrient cycling from water to land.

MAINTAINING HABITAT

Impact of Green Sea Turtles on Seagrass Beds-**Nursery Builders**

Green sea turtles play the role of 'Nursery Builders' as they are one of the few large species of herbivores that eat seagrass, help to maintain healthy seagrass beds. When green sea turtles graze, they increase the productivity and nutrient content of seagrass blades. Without constant grazing, seagrass beds become overgrown and obstruct currents, shade the bottom, begin to decompose and provide suitable habitat for the growth of slime molds.Older portions of seagrass beds tend to be overgrown with microorganisms, algae, invertebrates and fungi.

Sea turtles forage on seagrass just a few centimeters from the bottom of the blades, allowing older, upper portions of the blades to float away. As the turtle's crop and re-crop the same plot, seagrass blades are removed from the area rather than accumulating on the bottom. This results in a 15-fold decrease in the supply of nitrogen to seagrass roots, which impacts plant species, nutrient cycling animal densities and predator-prey relations.

The decline of green sea turtles can result in a loss of productivity in the food web – including commercially exploited reef fish – decreasing the amount of protein-rich food available for people. By cropping sea grass the green sea turtles make the sea grass beds conducive for a variety of fish to spawn. Gulf of Mannar, Gulf of Kutch and Andaman Sea are excellent examples of the importance of green sea turtles on the health of seagrass beds. The die-off of seagrass would be a direct link to the ecological extinction of green sea turtles and other associated species.

When green sea turtles graze, they increase the productivity and nutrient content of seagrass blades.

Hawksbills allow other species, such as coral, to colonize and grow by removing sponges from reefs.

Impact of Hawksbill Sea Turtles on Coral Reefs - **Reef Builders**

Equipped with beak-like snouts, hawksbill sea turtles are known as Reef Builders as they forage on a variety of marine sponges. By doing this, they change the species composition and distribution of sponges in coral reef ecosystems. Sponges compete aggressively for space with reef-building corals. By removing sponges from reefs, hawksbills allow other species, such as coral, to colonize and grow and provide shelter and refuge for variety of marine life.

Without hawksbills, sponges are likely to dominate reef communities, further limiting the growth of corals and modifying the very structure of coral reef ecosystems.

The physical and chemical defenses of sponges prevent most fish and marine mammals from eating them. As hawksbills rip sponges apart during feeding, they expose food to marine species typically unable to penetrate the sponge's exterior, making sponges more vulnerable to predators. Through their selective foraging behavior, hawksbills impact positively upon the overall diversity of reef communities.

Benefits of Sea Turtles to Beach Dunes

Sea turtle eggs directly and indirectly affect the vegetation, species distribution and stability of sandy shorelines. By supplying a concentrated source of high-quality nutrients, sea turtles improve the beaches upon which they nest.

Limited nutrients in dune ecosystems, such as nitrogen, phosphorus and potassium, are partially provided to the ecosystem by unhatched sea turtle eggs. These vital nutrients allow for the continued growth of vegetation and subsequent stabilization of beach dunes.

Plant growth not only helps to stabilize the shoreline, but also provides food for a variety of plant eating animals and therefore can influence species distribution. Sea turtle eggs also provide a food source for many predators, which in turn redistribute nutrients among dunes through their feces.

These nutrients aid the growth of vegetation and stabilization of the dunes. By contributing nutrients to beach ecosystems, sea turtles help to stabilize dunes, and therefore their own nesting habitat. Such stabilization of beach dunes reduces dune erosion thus maintaining healthier and more environmentally diverse beaches.

Sea turtles improve their nesting beaches by supplying a concentrated source of high-quality nutrients.

MAINTAINING A BALANCED FOOD WEB

Sea Turtles and Jellyfish

Leatherbacks, the largest of the sea turtles, travel the farthest of any sea turtle species and have wide ranging effects on the ocean ecosystem. Surprisingly, leatherbacks get their energy and nutritional needs from a small, gelatinous source—jellyfish. Growing up to 9 feet in length and migrating across entire oceans, leatherbacks rely on large concentrations of jellyfish to satisfy their appetites. They have been known to consume up to 200 kgs of jellyfish –nearly the weight of an adult Asian lion each day.

As significant consumers of jellyfish globally, leatherbacks play a pivotal ecological role as a top jellyfish predator. Declines in leatherback turtle populations along with declines in other key predators, such as some commercially valuable fish species, could have repercussions for jellyfish population control.

This is of particular concern since, as a result of overfishing of many finfish populations; jellyfish are gradually replacing once-abundant fish species. Declining fish stocks leave jellyfish with less competition for food, resulting in proliferation of jellyfish around the world. The increase in jellyfish is already proving detrimental to the recovery of fish stocks since jellyfish prey on fish eggs and larvae.

Fewer fish result in more jellyfish, which means even fewer fish in the future. Because leatherbacks consume large amounts of jellyfish, declines in leatherbacks could further shift species dominance from fish to jellyfish. Other sea turtle species, including Olive ridley, loggerhead and green sea turtles, also consume jellyfish.

All sea turtles species are also prey, providing food for other animals both on shore and at sea.

Sea Turtles Provide Food for Fish

By carrying around barnacles, algae and other similar organisms known as epibionts, sea turtles provide a food source for fish and shrimp. Other organisms, such as sheepshead bream, wrasse, angelfish and barber pole shrimp, establish “cleaning stations” for sea turtles to visit. With outstretched limbs and a raised head, sea turtles expose their bodies, offering a meal to eager fish and shrimp. This behavior not only feeds smaller organisms, but also benefits sea turtles by reducing drag and keeping their skin and shells clean and free of parasitic feeders for some time at least. Schools of fish can be seen cleaning sea turtles while they sleep or even following aggregations of sea turtles in transit. Some species obtain their diet strictly from epibiota found on sea turtles. Without this food source, certain species of fish and shrimp might be forced to develop other, less successful methods for obtaining food.

All sea turtle species are also prey, providing food for other animals, both on shore and at sea. Like many marine organisms, sea turtles are most vulnerable to predation as eggs, hatchlings and juveniles. A long list of terrestrial animals – ants, crabs, wild boar, foxes, dogs, mangoose and Monitor Lizard – are known to dig up unhatched nests. The eggs provide a nutrient-rich source of food for these predators. As hatchlings emerge from the nest, they provide another feeding opportunity for natural predators, which includes a variety of seabirds.

While most seabirds are daytime predators, species such as the night heron actually listen for hatchlings emerging from nests. If the hatchlings make it to the water, they face continued predation from seabirds with an aerial view of the tiny turtles as they float near the surface. Scientists believe that only one out of 1000 hatchlings that enter the sea grow to adulthood Reef fish and larger fish, are also common predators of both hatchlings and juvenile sea turtles. In fact, one study of green sea turtles in Australia showed that up to 97 percent of hatchlings are eaten within the first hour of entering the water. Clearly, hatchlings provide a significant source of protein for near shore predatory fish.

As sea turtles grow, the risk of predation decreases. Adult sea turtles have very few natural predators other than killer whales and sharks. Tiger sharks are known to prey upon green sea turtles and great whites have been documented preying on both green and loggerhead and olive ridley sea turtles.

NUTRIENT CYCLING

Olive Ridleys Benefit Ocean Floor Ecosystems

Olive Ridleys though are equipped with omnivorous jaws to feed on hard-shelled prey, such as crustaceans and invertebrates. This allows them to reduce the shells of their prey into fragments that are either discarded on site or further away in the form of feces. By breaking up the shells while foraging, olive ridley increase the rate at which the shells disintegrate and increase the rate of nutrient recycling in benthic or ocean bottom ecosystems.

Olive Ridleys also find prey by clearing away sand to expose their next meal. As they glide along the sea floor in search of food; olive ridleys create trails in the sediment. This foraging behavior is important for both olive ridleys and the habitat. The olive ridleys trails affect the compaction, aeration by releasing oxygen trapped in the sea beds and nutrient distribution of the sediment, as well as the species diversity and dynamics of the benthic ecosystem. When foraging, olive ridleys naturally alter the ocean bottom and benefit the underwater community. They also feed on sea grass, jelly fish, shrimp, squid and small fish.

Olive ridley turtles also provide a type of refuge for many seabirds along our offshore waters , allowing them to perch on their shells as the turtles surface to bask in the sun.

Sea Turtles Improve Nesting Beaches

Female migrations from foraging grounds to nesting beaches are ecologically significant journeys. TREE Foundation is the first NGO in India to place satellite transmitter tags on nesting female turtles allowing us to gain a greater knowledge and understanding of the migratory dynamics of sea turtles found nesting in Tamil Nadu. When females lay their eggs on sandy shorelines, they introduce nutrients and energy from distant and dispersed foraging grounds into relatively small and nutrient poor beaches.

In addition, nesting and the emergence of hatchlings bring egg matter and nest organisms to the surface. These processes help disperse nutrients to small organisms in beach sand. Consequently, the presence of turtle eggs drives community dynamics on nesting beaches.

PROVIDING HABITAT

Many marine organisms rely on sea turtles as a place to call home. These small creatures called “epibionts” attach themselves to solid surfaces in the ocean such as floating debris and sea turtle shells. Turtles play host to the largest and most diverse communities of epibionts. In fact, more than 100 different species of epibionts have been identified on sea turtle carapace (back).

Compared to floating debris, sea turtles provide increased survival rates, enhanced foraging and wider dispersal for attached epibionts. For example, research shows that Columbus crabs (*Planes minutus*) found on loggerheads tend to be larger in size and have higher proportions of female crabs with brooding eggs than those attached to debris.

Furthermore, Columbus crabs found on loggerheads are more successful foragers with a diverse diet, while crabs found on debris mainly consume algae. Columbus crabs feed on other epibionts found on loggerhead shells, particles from the loggerhead's captured prey and the shedding skin and feces of loggerheads. Sea turtles clearly provide numerous benefits to the epibionts they host.

Sea turtles also help to structure their marine habitats through the dispersal of epibionts. Organisms such as plants and crustaceans are transported to and from reefs, seagrass beds and the open ocean. The greatest illustration of sea turtles' impact on dispersal is seen in the range of the Coronulid Barnacle (*Chelonibia testudinaria*), the most common sea turtle epibiont. At any particular time, 94 percent of nesting olive ridleys host at least one species of barnacle.

As an example the olive ridley's migratory routes are believed to play a key role in expanding the barnacle's range and genetic diversity. Species associated with a host, such as sea turtles, are important to generating and maintaining diversity throughout the world's oceans. Continued loss of olive ridleys and other sea turtle species means a decrease in available substrate for the growth and livelihood of such marine diversity.

In the open ocean, miles from shore, sea turtles offer an oasis to fish and seabirds. Similar to floating debris, sea turtles can be used as a place to rest, a foraging ground and even a safe haven from potential predators. Of all the sea turtle species, olive ridleys are most frequently associated with seabirds, particularly in the Bay of Bengal. As they surface to bask in the sun, olive ridleys expose the center of their shell and create a platform for seabirds to perch. Such behaviour by Olive Ridleys can be witnessed only a few kilometres offshore during the mating and nesting season, especially around the mass nesting areas in Odisha.

Some seabirds take advantage of this opportunity to roost if their feathers are not extremely water-resistant. By perching on sea turtles, seabirds that would otherwise be vulnerable to attack, find refuge from sharks. Small baitfishes also use sea turtles for protection, by forming tight schools beneath the turtle's body. These schools of fish then provide a food source for resting seabirds.

Some seabirds occasionally feed on epibionts inhabiting the sea turtle's shell. By offering a location to roost, feast and hide, sea turtles represent an important resource for birds and fish at sea and thus assist in maintaining biodiversity around our oceans.

THE RISK OF ECOLOGICAL EXTINCTION

Sea turtles clearly play important roles in marine ecosystems. Each sea turtle species uniquely affects the diversity, habitat and functionality of its environment. Whether by grazing on seagrass, controlling sponge distribution, feasting on jellyfish, transporting nutrients or supporting other marine life, sea turtles play vital roles in maintaining the health of the oceans. Unfortunately, over the past few centuries, sea turtle populations have experienced significant declines. This is true not just of Indian territories but wordwide. Before a species goes physically extinct, it can become ecologically extinct. Ecological extinction, which occurs when the number of individuals in a species becomes so small that it is unable to perform its ecological role, this happened to Green sea turtles in the Caribbean.

At the time of Columbus' voyages to the Caribbean, sea turtles were so abundant that vessels that had lost their way could follow the noise of sea turtles swimming along their migration route and find their way to the Cayman Islands. Current estimates of Caribbean sea turtle populations at that time range from 33 million to 660 million. Greens in the Caribbean consumed such large amounts of seagrass, sponges and jellyfish that their virtual ecological extinction resulted in major changes in the structure and function of the marine ecosystem.

Sea turtle populations around the world have dwindled in recent centuries and in many places, continue to decline. For some populations, there is risk not only of ecological extinction, but of physical extinction as well. In the words of Aldo Leopold, one of the most influential conservation thinkers of the 20th century, “To keep every cog and wheel is the first precaution of intelligent tinkering.” Applying this principle to the oceans, quite simply, we need to keep all of the species. Natural resource managers are moving towards an “ecosystem approach” to managing the oceans.

The first step in taking an ecosystem approach is to ensure the survival of the key components of the ecosystems, which unequivocally must include sea turtles. The next step is to ensure their populations actually recover. Increased populations of sea turtles are a key step in restoring the balance among ocean species, an essential step toward restoring healthy ocean ecosystems.

Some populations of sea turtles risk not only ecological extinction, but physical extinction.

LEGISLATIONS

Existing Indian Laws:

The Indian Wildlife (Protection) Act, 1972 (WLPA) is a good example of national legislation that has adopted stricter measures than CITES, and even prohibited certain “scheduled species” from being traded or hunted, although CITES measures are weaker. Under the Wildlife (Protection) Act of 1972

No: 53 of 1972- dated 9th September, 1972- Chapter 1-Prelimnary

2. Definitions:

(16) “hunting”, with its grammatical variations and cognate expressions, includes,
- (a) capturing, killing, poisoning, snaring, and trapping or any wild animal and every attempt to do so,
- (b) driving any wild animal for any of purposes specified in sub clause
- (c) injuring or destroying or taking any part of the body of any such animal, or in the case of wild birds or reptiles, damaging the eggs of such birds or reptiles, or disturbing the eggs or nests of such birds or reptiles;

SCHEDULE I

(Sections 2, 8, 9, 11, 40, 41, 48, 51, 61 & 62)

PART II AMPHIBIANS AND REPTILES

4. Green Sea Turtle *(Chelonia mydas)*
5. Hawksbill Turtle *(Eretmochelys imbricata)*
11. Leatherback Turtle *(Dermochelys coriacea)*
12. Loggerhead Turtle *(Caretta caretta)*
13. Olive Ridley Turtle *(Lepidochelys olivacea)*

(2) In this Regulation –

“Turtle” includes the whole or any part of any turtle-

While hunting and other related offences entail up to 6 years of imprisonment along with a fine, any trade in the 'scheduled species' (species included in Part II of Schedule I), entail a stricter punishment of 7 years of imprisonment as well as a fine. All five species of marine turtles documented from India are listed in Schedule 1 of the WLPA as well as in Appendix 1 of CITES.

India has also played a vital role in the finalization of the MoU on the CONSERVATION AND MANAGEMENT OF MARINE TURTLES AND THEIR HABITATS OF THE INDIAN OCEAN AND SOUTH EAST ASIA (IOSEA), under the Convention on the Conservation of Migratory Species of 1979.

The International Union for Conservation of Nature (IUCN) is the world's main authority on the conservation status of species. The IUCN Red List of Threatened Species (also known as the IUCN Red List or Red Data List), founded in 1963, is the world's most comprehensive inventory of the global conservation status of biological species. According to the IUCN Red Data List, six species of marine turtles are listed in its Appendix 1. Olive Ridley Sea Turtles are vulnerable, Green Sea Turtles are endangered, and Hawksbill Turtles and Leatherback Turtles are critically endangered among those sighted or migrating along the Indian Coast.

CONCLUSIONS

As sea turtle populations decline, so does their ability to perform vital roles in maintaining the health of the world's oceans. Death and injury in commercial fisheries, loss of important habitat, poaching, pollution and climate change are among the many human-caused threats pushing sea turtles towards extinction. Integrated conservation measures are needed to protect sea turtles and rebuild their populations to healthy levels so they can fulfill the full extent of their historic roles in ocean ecosystems. At historic levels, sea turtles will help restore the health of our oceans and make them more resilient to future threats. The following actions must be taken to protect and restore sea turtle populations:

Fishing limits

Under the current regulations, mechanized trawl boats are not allowed to operate within 4.32 nautical miles (8 kms) of the shore in Andhra Pradesh, 3 nautical miles (5.5 kms) in Tamil Nadu and 2.5 nautical miles(4.8 kms) in Odisha as per the respective Marine Fisheries Regulation Acts of each state.These limits not only protect the rights of the artisanal fishers who operate in the shallower waters close to shore but also, incidentally, protect sea turtles, which generally congregate in this near shore zone. But Clearly these limits in their current form are not being enforced. Lack of enforcement sends out a clear signal that trawl operators can do as they wish without fear of prosecution. Modus operandi to regulate the same.

Banned Nets

Ray fish nets are banned under law. However their use by all fishermen categories is widespread. This ban needs to be enforced at all levels of fishing and any such nets found should be confiscated on sight. All areas where fish are landed need to be monitored as monitoring only the larger landing sites will lead to fishermen landing their catch in more remote areas.

Turtle Excluder Device

The first step to prevent such mass mortalities of turtles is to enforce current legislation. Trawlers that target shrimp fisheries are required by law to be fitted with Turtle Excluder Devices (TED) yet none of the boats have them. Enforcement of this regulation could be done by simply inspecting all shrimp trawl fish nets when the boats are landing their catch. Boats that have nets that are not fitted with a TED should be impounded until such a time as they fit a TED. Only strong enforcement combined with implementation of TED will work.

Seasonal Marine Protected Areas

As the table below indicates there are presently closed seasons for certain types of fishing vessels however none of these closed seasons take into account the sea turtle nesting season that occurs January to April each year. Areas of foraging and congregation of sea turtles need to be identified and additional seasonal closures need to be implemented within these areas.

State Name	Year of Introduction	Closed Session	Days	Type of Fishing Banned	Type of Fishing Permitted
Tamil Nadu & Pondicherry	2001	15 April-29 May (East Coast) 15 June- 29 July (West Coast)	47	Mechanized Fishing/ Trawlers	All non motorized craft with < 25 hp engine
Andhra Pradesh	2000	15 April – 31 May	47	Trawlers and motorized craft with > 25 hp engine	Traditional and motorized craft < 25 hp engine
Odisha	2000	15 April- 31 May	47	Trawlers and motorized craft with < 25 hp engine	Traditional and motorized craft < 25 hp engine

Vessel Monitoring Systems

All trawl boats should be fitted with, and have turned on at all times while at sea, a Vessel Monitoring System (VMS) to ensure that they are operating only in permitted areas. They provide a simple system of monitoring and surveillance and would discourage trawl boats from operating illegally close to shore. This also helps for surveillance of any anti-social activities at sea.

REFERENCES

1. Abraham, *Hamadryad*, 5, "Preliminary observation on the nesting of the Olive Ridley ,Sea turtle on the Madras coast, South India," 1990, Page.10-12
2. Basker, S.1984. *The Distribution and status of sea turtle in India*.
3. In: CMFRI special issue on management and conservation of sea turtles. Mar. Fish. Infor. Ser., T & E Ser., 50: 33-34 1983.
4. Bhupathy, S & S.Saravanan, *Kachhapa*, "Status of a sea turtle along the Tamil Nadu coast", Issue no.7, 2002, Page. 7-13
5. Bhupathy, S. & R. Karunakaran., Conservation of olive ridley sea turtle Lepidochelys olivacea (Reptilia/Chelonia) along the Ramanathapuram coast, southeast coast of India. Indian Journal of Marine Sciences 32: 168-171. 2003.
6. Bhupathy, S. & S. Saravanan. 2002. Status survey of sea turtles along the Tamilnadu coast. A GOI-UNDP Sea Turtle Project
7. Bhupathy.S, J Subramanean And M Vijay, *Hamadryad*, "Nesting Of Lepedochelys Olivacea Along The South Chennai Coast, With Emphasis On Habitat Characteristics", 2007,Vol. 31, No.2, Page. 274-280
8. Carr Archie, *Bioscience*, Vol.36, No. 2, February 1986, Page. 92 "Among the 28,000 females we have tagged there, we have recorded thousands of returns visits, but none has ever been seen on another nesting beach anywhere in the world, a female we first saw on the beach in 1965.During the next 17 years she returned 26 times, from feeding least 300 miles away and very likely farther .The average distance between her nest sites was a few hundred meters, and some of the nests were almost on top of one another, over the years.
9. Chandra Shekahar Kar & Madhav Chandra Dosh, *The Turtle Paradise*, 1990, Vol. 1, Page. 121-134
10. Chandra Shekahar Kar & S.Bhaskar "The Status of Sea Turtle in the Eastern Indian Oceans", In Journal. (Ed).
11. *The biology conservation of sea Turtle*, Smithsonian Institution press, Washington, D.C., 1982, Page. 365-372
12. Chandra Shekahar Kar, *Notes on marine turtle in Andhra Pradesh Coast*, 1983
13. Dharini, S., Creating awareness about sea turtles at Pulicat- Pazaverkadu (North Chennai), "*Indian Ocean Turtle Newsletter*", No. 5, January 2007
14. Dharini, S., Importance of Temperature in Hatchery Based Hatchery Management in Chennai, "*Indian Ocean Turtle Newsletter*", No. 6, July 2007.
15. Dharini, S., Interaction between Turtle Protection Force and trawl owners and workers at Kasimedu fishing harbor, Chennai, "*Indian Ocean Turtle Newsletter*",No.5, January 2007
16. Dharini, S., Juvenile green and hawksbill turtles in the waters of Nainarkuppam, Chennai "*Indian Ocean Turtle Newsletter*", No. 5, January 2007
17. Dharini, S., My Perspective on DRCI training as a scientist from India, Education, Outreach and Training, "*Nicks 'N' Notches" January 2010, Florida, USA. Annual Summery of the Activities and Findings of the Dolphin Research and Conservation Institute*
18. Dharini, S., Turtle Conservation by Local Communities in Madras, "*Kachhapa* – A News Letter for the Indian Ocean on Sea Turtle Conservation and Management", Issue No. 8, March 2003.
19. James R Spotila, *Sea Turtles, A Complete Guide to Their Biology, Behavior and Conservation,* 2004, Page. 9
20. Moll, E, O, Bhaskar, S. & Vijay, *Update in the Olive ridley on the coast of India Mar*, Rurt, New sl.25, 1983, Page. 2-4
21. Shanker, K. Thirty years of sea turtle conservation on the Madras coast: A review. Kachhapa 8: 16-19. 2003.
22. Shanker, K., *Nature Watch-The Ancient Mariner*, April 1996, Page-54
23. Karthik Shanker, *Kachhapa*, 2001,Vol. IV, Page. 1-28
24. S.Jones & A.Bastian Fernando, Turtle Fishery In the Gulf of Mannar and Palk Bay, pub in Proceedings of the Symposium on Living Resources of the Seas around India, October 1994
25. M.Rajagopalan,E.Vivekanandan,S.Krishna Pillai,M.Srinath,A.Bastian Fernando, Incidental Catch of Sea Turtles in India, pub in Marine Fisheries Information Service, Aug 1996
26. Bhupathy,S., Vijay,M., Nixon,A.M.A., Subramanean,J., Karunakaran,R. & J.Gokulakrishnan, The Status Of Sea turtle Populations On the Tamil Nadu and Kerala coasts Of India, P: 58-70
27. Baslian Fernando,A., Nesting site and hatching of the hawksbill turtle along Tirunelveli Coast of Tamil Nadu, *Central Marine Fisheries Research Institute,Cochin, India,* June1983, P: 33-34
28. Kartik Shanker. & Harry V.Andrews., Towards an integrated and Collaborative sea turtle conservation Programme in India, P: 3-17
29. Silas,E.G., Rajagopalan,M. & A.Bastian Fernando, Sea Turtle Of India – Need for a Crash Programme On Conservation And Effective Management Of the Resource, , *Central Marine Fisheries Research Institute, Cochin, India,* June 1983, P: 1-9

TREE Foundation is an NGO, founded by Dr. Supraja Dharini in 2002, inspired and guided by Dr. Jane Goodall DBE, and driven by compassion and care for the welfare of all animals, environment and communities. TREE Foundation pioneered a successful community based conservation program for the endangered Olive Ridley turtles that nest along the southeastern coast of India. The foundation focuses on the conservation of sea turtles through community education and training. Local young fishermen, who previously were turtle egg poachers, are now engaged as Sea Turtle Protection Force (STPF) members. This provides them with an alternative means of livelihood. They are now the key players in monitoring nesting turtles, relocating eggs into hatcheries, providing protection from poachers and predators, and releasing lakhs of baby turtles to the sea. They are also involved in spreading the conservation message to community members. The have gained recognition from the State Forest Department.

TREE Foundation uses the Olive Ridley as a flagship species to address marine conservation issues within the fishing community. TREE Foundation works jointly with the Wildlife Wing of the Forest Department, the Department of Fisheries of Tamil Nadu, Andhra Pradesh and Odisha, the Indian Coast Guard and the Marine Police. The program covers 40 villages along a stretch of 126 km in Chennai; 45 villages in Nellore along a stretch of 77 km; 4 villages in Krishna District along a stretch of 43 km; 12 villages in Vizianagaram along a stretch of 28 km Andhra Pradesh; and 5 villages along a stretch of 23 km in Ganjam, Odisha.

By conducting education and awareness programs to all stakeholders, TREE Foundation aims to: influence policy makers on larger conservation issues; involve the community in restrictive gear management and seasonal closures at sea; spread awareness of the land/ocean connection; and protect all endangered marine species.

TREE Foundation is expanding its current program to protect turtles at sea and minimize accidental catch of sea turtles during fishing activities, in order to reduce mortality of turtles coming in to nest, in addition to protecting turtle nesting sites and turtle eggs.

TREE Foundation also runs the first of its kind Rescue Rehabilitation Centre for sea turtles in India. When the foundation receives information about a sea turtle that has been stranded or hurt, it rescues and rehabilitates it in its centre with the help of STPF members and volunteers. Once the turtle is nursed back to health, it is released to the ocean.

The Integrated Community Based Sea Turtle Conservation Program of TREE Foundation, involves:

- ***Community- Based Sea Turtle Conservation Program***
  a) Sea Turtle Conservation
  b) Rescue And Rehabilitation
  c) Marine Mammal Rescue And Conservation
  d) Endangered Marine Species Awareness And Conservation

- ***Environment Education***
  a) Networking With Schools, Colleges And Corporate Officials
  b) Marine Life Education Centre
  c) Awareness And Training Workshops For Capacity Building For Fishermen

- ***Community Development***
  a) Alternative Income Generating Projects Within Communities
  b) Safety At Sea Workshops
  c) Medical Camps
  d) Women Empowerment
  e) Bedding/School Kits For Children

- ***Research***
  a) Data Archiving For The States of Tamil Nadu, Andhra Pradesh and Odisha
  b) Provide Internship For Master Degree And Research Students
  c) Marine Mammal Conservation Studies

Together we can make a Difference! **Let's be the change we want to see!**

Let it Live
TREE Foundation

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Jane Goodall's roots&shoots India

INTEGRATED COMMUNITY BASED SEA TURTLE CONSERVATION PROGRAMME

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