# 12. Diversity and Taxonomy of Sea Turtles in India

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Globally, scientists recognize seven extant species of sea turtles, categorized into six genera across two families. Of these, five species are found along India's coastline: the Olive Ridley, Green turtle, Hawksbill, Loggerhead, and Leatherback turtle. However, sea turtle populations are rapidly declining due to human-induced threats, including overexploitation, habitat degradation, pollution, vessel strikes, and bycatch in fishing gear.

### Sea Turtle Habitats in India:

India's coastal regions serve as crucial nesting and migratory zones for sea turtles. The Tamil Nadu coast is especially significant as it is the only Indian state where all five species are recorded. The coasts of Andhra Pradesh and Tamil Nadu act as key migratory routes for Olive Ridley turtles, while Odisha's Gahirmatha beach is home to the largest Olive Ridley rookery in the world, making it a vital conservation area.

### **Conservation and Protection:**

All five sea turtle species in India are safeguarded under Schedule I of the Indian Wildlife (Protection) Act, 1972, granting them the highest level of legal protection. Despite this, conservation challenges persist, highlighting the need for stronger enforcement, community engagement, and alternative livelihood programs to reduce human impact.

A key conservation measure is the Turtle Excluder Device (TED), designed to minimize accidental sea turtle deaths in trawl nets. While TEDs have been widely introduced in India and worldwide, their success relies on strict enforcement and the cooperation of fishing communities. Policies such as economic incentives for TED adoption, including better market prices for TED-compliant catches or fuel subsidies, could further encourage their use. A co-management approach involving all stakeholders is critical to ensuring long-term conservation success (Boopendranath et al., 2006; 2010).

# Scientific Research and Species Identification:

The Central Marine Fisheries Research Institute (CMFRI) has played a significant role in marine research and sea turtle conservation in India. The studies have contributed to understanding sea turtle biology, nesting behaviours, and hatchling survival rates (Silas, 1984; Rajagopalan, 2000).

Species identification in Indian waters is based on distinct morphological features, such as carapace length, costal scutes, prefrontal scales, and vertebral scute shape. For instance, in loggerheads and ridleys, the first costal scute contacts the nuchal scute due to narrow scutes, whereas in green and hawksbill turtles, rhomboid vertebral scutes prevent this contact. When species identification is uncertain, clear photographs of the carapace and head are recommended for accurate classification.

### The Way Forward:

With increasing threats to sea turtles, conservation efforts must focus on habitat protection, reducing bycatch, mitigating pollution, and community-driven conservation programs. Strengthening research initiatives, enforcing protective regulations, and promoting responsible fishing practices will be essential in ensuring the long-term survival of India's sea turtles.

# Taxonomy of Sea Turtles in India

Sea turtles belong to the order **Testudines** and suborder **Cryptodira**, with most species classified under the family **Cheloniidae**, while the leatherback turtle is the sole member of the family **Dermochelyidae**. Their taxonomy has been an ongoing area of research, with advancements in molecular techniques providing deeper insights into their evolutionary relationships and genetic distinctions among species. These studies have helped refine classification systems and improve our understanding of their evolutionary history, migration patterns, and conservation needs.

### **Key Taxonomic Features**

Each species exhibits distinct morphological traits that aid in identification:

- **Carapace shape and size**: Varies from the broad, heart-shaped Green turtle to the narrow, pointed carapace of the Hawksbill.
- **Coloration**: Sea turtles display a wide range of colours, from the olive-green Olive Ridley to the dark brown and black Leatherback.
- **Beak shape**: Turtles like the Hawksbill possess a sharp, beak-like structure, while others, such as the Loggerhead, have a robust, wide head designed for crushing prey.

**Species Account:** 

# **Olive Ridley Turtle**



Figure 1. Olive ridley turtle: 1a. Dorsal (left) and ventral (right) views (Illustration from *Sea Turtles of India*, 2011). 1b. Illustrated Lateral View of *Lepidochelys olivacea* (Image courtesy of NOAA Fisheries.)

- The most common sea turtle species in India, particularly known for its mass nesting behavior known as "arribada."
- Nesting sites: Odisha (Gahirmatha), Andhra Pradesh, and Tamil Nadu.
- Characteristics: Small size, olive-green carapace, and heart-shaped body.

The Olive ridley turtle (*Lepidochelys olivacea*) is a fascinating marine species with a widespread distribution in tropical waters across the globe. Renowned for their unique behaviors and characteristics, these turtles nest on tropical beaches, particularly favouring mainland shores and barrier islands, often near river mouths. In India, their nesting sites are distributed along the mainland coast, including the Andaman and Nicobar Islands, and to a lesser extent, the Lakshadweep Islands.

Adult Olive ridleys typically weigh around **50 kg** and are characterized by a short, wide, and smooth carapace that is elevated, forming a distinctive **tectiform (tent-shaped)** structure. Their coloration ranges from mid to dark olive green, giving them their name. Key identifying features include **5 to 9 pairs of asymmetrical costal scutes**, a large triangular head, two claws on each flipper, and a creamy yellow plastron with a pore near the rear margin of the inframarginal scutes. Like other sea turtle species, their narrow vertebral scutes (centrals) ensure that the first costal scute contacts the nuchal scute.

Olive ridleys exhibit **nocturnal nesting behavior**, laying **1 to 3 clutches per season**, with each clutch containing **100 to 120 eggs**. The eggs are approximately **4 cm in diameter**. The re-nesting interval ranges from **20 to 28 days**, and the re-migration interval is typically **1 to 2 years**. Their nesting tracks, measuring **70 to 80 cm wide**, are light and display asymmetrical oblique marks made by their forelimbs. The tail drag mark is either absent or inconspicuous, adding to the distinctiveness of these remarkable turtles.

# **Green Turtle**



**Figure 2.** Green turtle: 2a. dorsal (left) and ventral (right) view (Illustration from *Sea Turtles of India*, 2011). 2b. Illustrated Dorsal View of *Chelonia mydas* (Image courtesy of NOAA Fisheries).

- Primarily found in the warm waters of the Indian Ocean.
- Known for their large size and herbivorous diet.
- Nesting sites: Lakshadweep Islands, Andaman and Nicobar Islands.
- Characteristics: Broad, oval carapace with a heart-shaped appearance.

The Green turtle (*Chelonia mydas*) is a fascinating marine species inhabiting tropical and subtropical waters across the globe. Known for its distinctive traits, this species primarily nests on tropical shores, including both mainland and remote island beaches. They are frequently spotted on a range of nesting sites, from expansive open beaches to secluded coves, with significant nesting grounds found along Gujarat's coastline and the beaches of Lakshadweep and the Andaman Islands.

Adult Green turtles can weigh up to 250 kg and possess a broadly oval carapace with a scalloped but non-serrated edge. Their coloration varies, with juveniles displaying brown shades with radiating streaks, while adults exhibit more diverse color patterns. Key identifying features include four pairs of costal scutes, a rounded head, a single claw on each flipper, and a white plastron in hatchlings that turns yellowish as they mature. Notably, their large vertebral scutes prevent the first costal scute from making contact with the nuchal scute.

Green turtles are nocturnal nesters, typically laying 4 to 6 clutches per season, each containing 100 to 120 eggs. Their nesting tracks, measuring 100 to 130 cm in width, display symmetrical diagonal imprints created by the forelimbs, with a tail drag forming a solid or broken line. These characteristics make the Green turtle a vital and intriguing species within the marine ecosystem.

# Hawksbill Turtle



Figure 3. Hawksbill turtle: 3a. dorsal (left) and ventral (right) view (Illustration from *Sea Turtles of India*, 2011). 3b. Illustrated Dorsal View of *Eretmochelys imbricata* (Image courtesy of NOAA Fisheries).

- Characterized by its narrow, pointed beak and beautiful shell patterns.
- Found in tropical coral reefs.
- Nesting sites: Lakshadweep, Andaman Islands, and the east and west coasts of India.

The Hawksbill turtle (*Eretmochelys imbricata*) is a remarkable marine species found in tropical waters worldwide. Known for its distinct characteristics, this species predominantly nests on remote island beaches, preferring narrow shorelines where offshore reefs often obstruct access. Key nesting locations in India include the Lakshadweep and Andaman Islands, as well as select beaches in Nicobar, such as Indira Point on Great Nicobar Island. Unlike ridley turtles, which favour open nesting areas, Hawksbills are known to nest beneath overhanging vegetation.

Adult Hawksbill turtles typically weigh around 150 kg and are distinguished by their oval carapace with a strongly serrated posterior margin and thick, overlapping (imbricate) scutes. Their striking coloration consists of brown shades with prominent amber and brown variegations. Identifying features include four pairs of costal scutes with a jagged rear edge, a narrow and straight bird-like beak, and two claws on each flipper. The plastron ranges from light yellow to white, while large vertebral scutes prevent the first costal scute from touching the nuchal scute.

Hawksbill turtles exhibit flexible nesting behaviour, laying eggs both during the day and at night. Each nesting season, they deposit 3 to 5 clutches, with clutch sizes ranging from 120 to 150 eggs, though some nests may contain up to 180 eggs. The eggs, approximately 3.5 cm in diameter, are laid at intervals of 12 to 14 days, with a re-migration interval of 2 to 5 years. Their nesting tracks, measuring 70 to 85 cm wide, are shallow and characterized by asymmetrical (alternating) oblique forelimb marks, with tail impressions varying from present to absent. While their tracks may resemble those of ridley turtles, Hawksbills prefer different nesting environments, further distinguishing them within the marine ecosystem.

# Loggerhead Turtle



**Figure 4.** Loggerhead turtle: 4a. dorsal (left) and ventral (right) view (Illustration from *Sea Turtles of India*, 2011). 4b. Illustrated Lateral View of *Caretta caretta* (Image courtesy of NOAA Fisheries).

- A rare species in India but occasionally found in coastal waters.
- Known for their large heads and powerful jaws.
- Nesting sites: Not reported in India, though sightings have been recorded.

The Loggerhead turtle (*Caretta caretta*) is a notable marine species typically found in tropical waters but primarily nesting in temperate regions, with some nesting sites extending into subtropical and tropical zones. While Loggerheads are not known to nest in India, they do find nesting grounds in nearby regions like Sri Lanka. These turtles prefer large mainland beaches or barrier islands for laying their eggs.

Adult Loggerheads usually weigh about 200 kg and have a moderately broad carapace, with a slightly serrated edge at the back in younger turtles. A distinctive feature in adults is the thickened area near the base of the fifth vertebral scute. They are generally reddish-brown without markings in both subadults and adults. Distinguishing traits include five pairs of costal scutes, a broad, triangular head, and two claws on each flipper. Their plastron is typically yellow to orange, and the narrow vertebral scutes allow the first costal scute to connect with the nuchal scute.

Loggerheads are nocturnal nesters, laying between 3 to 5 clutches each season, with each clutch containing around 100 to 120 eggs, which are about 4 cm in diameter. The interval between nestings ranges from 12 to 16 days, with a re-migration interval of 2 to 3 years. Their nesting tracks, about 70 to 90 cm wide and moderately deep, are characterized by asymmetrical diagonal marks from the forelimbs, and a tail drag mark is typically absent. These features highlight the Loggerhead's unique role within marine habitats.

# Leatherback Turtle



**Figure 5.** Leatherback turtle: 5a. dorsal (left) and ventral (right) view (Illustration in Sea turtles of India. 2011). 5b. Illustrated Right Lateral View of *Dermochelys coriacea* (Image courtesy of NOAA Fisheries).

- The largest of all sea turtle species, known for its leathery carapace.
- Nesting sites: Andaman and Nicobar Islands.
- Characteristics: Large, rounded body with a ridged back.

The Leatherback turtle (*Dermochelys coriacea*) is an extraordinary marine species found across all the world's oceans, from sub-arctic to tropical waters. Recognized for its immense size and unique characteristics, this species prefers nesting on tropical beaches, particularly

those with wide shorelines, steep slopes, and a deep-water approach free of rocks. In India, Leatherback turtles primarily nest in the Andaman and Nicobar Islands, with key nesting sites located at Galathea on the east coast and various beaches along the west coast of Great Nicobar, Little Nicobar, and Little Andaman Islands.

Adult Leatherbacks can exceed 500 kg in weight and are distinguished by their elongated, tapering carapace with seven prominent dorsal ridges. Unlike other sea turtles, they lack costal scutes and possess a triangular head with two maxillary cusps. Their predominantly black coloration is accented by white speckles, while the base of the neck and flippers may feature distinctive pink or bluish markings.

These turtles are nocturnal nesters, typically laying 4 to 6 clutches per season, with each clutch containing around 80 to 100 eggs. Their nesting tracks, ranging from 150 to 200 cm in width, are marked by symmetrical diagonal impressions left by their forelimbs and a deep central groove created by their long tail. These distinctive features make the Leatherback turtle a significant and intriguing species within marine ecosystems.

# Interesting Facts about Indian Sea Turtles, Focusing on Their Feeding Habits, Reproduction, and Other Fascinating Behaviours

### **Unique Nesting Behavior of Olive Ridleys**

**Arribada Phenomenon**: The **Olive Ridley sea turtles** are famous for their **mass nesting event** known as *arribada*, where thousands of females gather on the same beach to lay eggs simultaneously. This event typically occurs on **Gahirmatha Beach** in Odisha, one of the largest mass nesting sites in the world. The synchronization of this event is still a subject of study, but it's believed that it may be influenced by lunar cycles and ocean currents.

# Long Migration Journeys

**Incredible Migration**: Sea turtles, especially the **Loggerhead** and **Leatherback**, are known for their long-distance migrations. Leatherbacks, in particular, can travel **thousands of kilometers** across the ocean, from nesting sites in places like the **Andaman and Nicobar Islands** to feeding areas in the **South Pacific**. Their migration is one of the longest of any reptile.

# Feeding Habits: Special Diets

- Olive Ridleys: These turtles primarily feed on jellyfish, which helps control the jellyfish population and maintain the balance of marine ecosystems. However, their diet can include a variety of invertebrates and small fish.
- Green Turtles: Known for their herbivorous diet, Green turtles primarily feed on seagrass and algae. This helps maintain the health of seagrass beds, which are essential habitats for many marine species.
- Hawksbills: Their beaks are perfectly adapted to feeding on sponges that grow on coral reefs, which few other animals can feed on. This unique feeding behaviour

makes them key to maintaining coral reef health by keeping sponge populations in check.

# **Reproductive Strategy: Nesting and Egg Laying**

- Incubation Period: The incubation period for sea turtle eggs typically lasts between 45 to 70 days depending on the species and environmental conditions. Temperature plays a critical role in determining the sex ratio of the hatchlings—warmer temperatures tend to produce females, while cooler temperatures lead to more males.
- **Multiple Clutches**: Female turtles often lay **multiple clutches** of eggs in a season (usually 3 to 6), with each clutch containing around 80 to 120 eggs. Interestingly, after laying their eggs, female turtles return to the ocean, leaving the eggs to incubate without any parental care.
- **Natal Homing**: Sea turtles have an extraordinary ability known as **natal homing**, where they return to the same beach where they were born to lay their eggs. This remarkable navigation ability is thought to be guided by the earth's magnetic field.

# **Unique Adaptations for Ocean Life**

- Leatherback's Gigantic Size: The Leatherback turtle is the largest of all sea turtles, growing to over 2 meters in length and weighing more than 700 kilograms. Their unique leathery shell (instead of a hard carapace like other turtles) allows them to dive to extraordinary depths—up to 1,200 meters—where they feed on jellyfish.
- Hawksbill Turtle Shell: The Hawksbill turtle has a beautiful, patterned shell that has been historically prized by humans, though this has contributed to their endangered status. The shell's unique design is thought to help them blend into coral reefs, providing camouflage from predators.

# **High Hatchling Mortality**

**Predation Threats**: A large percentage of sea turtle hatchlings do not survive to adulthood due to various threats such as **predation** by birds, crabs, and fish, as well as **light pollution**, which can disorient hatchlings, leading them away from the sea. Only about **1 in 1,000** hatchlings will survive to become adults.

# **Amazing Longevity**

Long Life Span: Sea turtles are known to have long life spans, often living **50 to 100 years** or more. They take many years to reach sexual maturity, sometimes not breeding until they are **30 years old** or older. This makes them particularly vulnerable to threats, as they need a long time to replenish their populations.

### Conclusion

Sea turtles, as ancient marine creatures, play an essential role in maintaining the health of our oceans. Their nesting behaviour on tropical beaches across the globe forms a crucial part of the intricate marine ecosystem. However, with ongoing threats like over-exploitation, habitat destruction, and accidental capture, the need for comprehensive conservation efforts is more critical than ever. Legal frameworks, such as the Indian Wildlife (Protection) Act of 1972, provide a foundation for protection, but the success of these efforts depends largely on collaborative actions involving various stakeholders, local communities, and dedicated research institutions.

Addressing ongoing challenges such as habitat loss, developmental impacts, and high rates of incidental catch requires continuous and collective action. The combined efforts of governmental agencies, non-governmental organizations, and local communities are vital for the survival of sea turtles and the promotion of sustainable practices that support both marine ecosystems and human societies. As caretakers of our oceans, the responsibility to safeguard and conserve sea turtles rests with us. Positive outcomes in some regions demonstrate that with persistent effort, meaningful change is achievable.

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