

RANGER HANDBOOK

for Sea Turtle Conservation

By Yayasan Penyu Indonesia

BASIC LEVEL

MODULE 1

The World of Sea Turtles



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Supported by

**Ministry of Marine Affairs and Fisheries
of the Republic of Indonesia**



Funded by the UK Government through
The Darwin Initiative



Additional funding support
European Outdoor Conservation Association



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BASIC LEVEL MODULE 1 The World of Sea Turtles



This book belongs to

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MODULE 1 The World of Sea Turtles

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Director of Species and Genetic Conservation - MMAF

We give praise to God Almighty for the completion of the Ranger Handbook for Sea Turtle Conservation in Indonesia. This handbook serves as a comprehensive guide for sea turtle conservation efforts on the frontlines to safeguard the nation's valuable marine biodiversity.

Sea turtles are marine species that play a vital ecological role, yet their existence is increasingly threatened. In accordance with the Ministry of Marine Affairs and Fisheries Decree No. 66 of 2025 on Protected Fish Species, all sea turtle species in Indonesia have been designated as Fully Protected Species.

The Directorate of Species and Genetic Conservation – Ministry of Marine Affairs and Fisheries extends its deepest gratitude to all those who have contributed their insights to the preparation of this handbook. May this handbook serve as a guiding light for our colleagues in the field as they carry out their noble mission to ensure the sustainability of our marine resources.

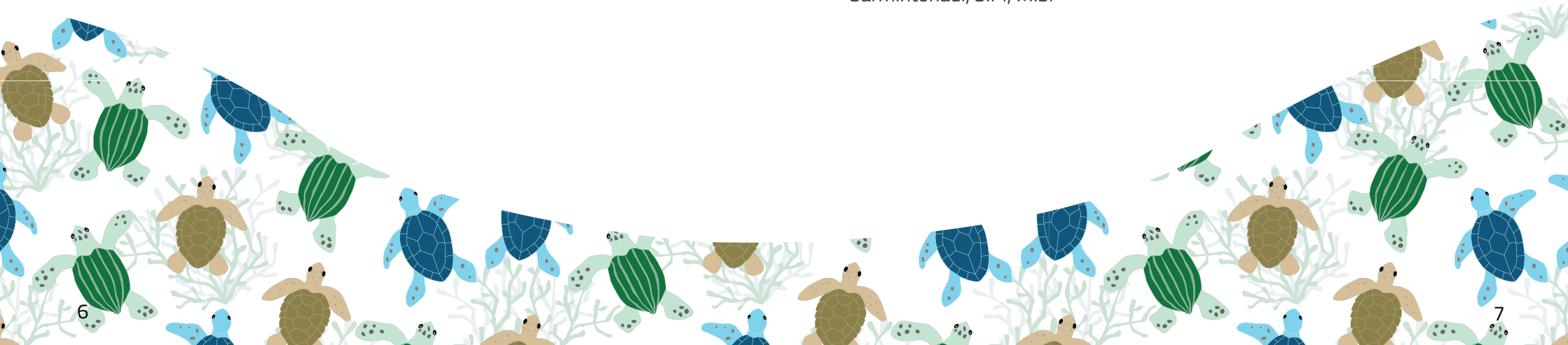
Protect Sea Turtles, Preserve the Ocean for Future Generations!

Jakarta, March 2026

Director of Species and Genetic Conservation
Directorate General of Marine Management
Ministry of Marine Affairs and Fisheries of the Republic of Indonesia



Sarmintohadi, S.Pi, M.Si



Managing Director of Yayasan Penyu Indonesia (YPI)

We are grateful to announce the publication of the Ranger Handbook for Sea Turtle Conservation as an important step in strengthening sea turtle conservation efforts in Indonesia. This handbook has been compiled to serve as a practical and comprehensive guideline for rangers, volunteers, and all those involved in sea turtle conservation in Indonesia.

The material presented covers three levels of learning, ranging from basic to advanced. At the basic level, readers are provided with knowledge about the world of sea turtles, conservation of sea turtles in Indonesia, and beach surveys and daily monitoring. The intermediate level delves deeper into technical skills such as working with nesting females and hatchery programmes. Meanwhile, the advanced level focuses on building capacity in research, community education, and ranger training.

We hope this handbook will not only serve as a technical reference, but also as a source of inspiration to strengthen our dedication and expertise in safeguarding sea turtles. Collaboration, consistency, and a shared commitment are the keys to our success.

Lastly, we would like to thank everyone who contributed and supported the development of this handbook. We hope that our efforts will have a tangible impact on the future of sea turtles and coastal ecosystems in Indonesia.

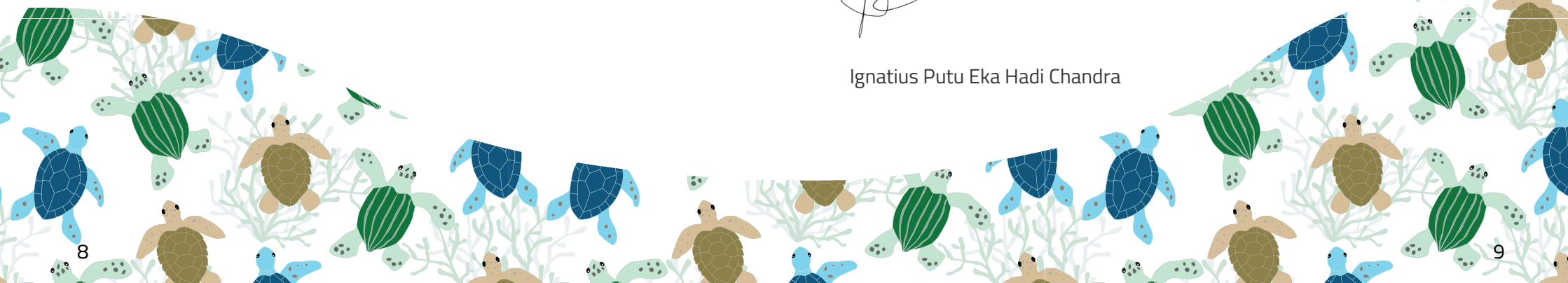
Let us protect sea turtles and their habitats!

Denpasar, March 2026

Managing Director of Yayasan Penyu Indonesia



Ignatius Putu Eka Hadi Chandra





Sea turtles are ancient marine reptiles that have lived in the oceans for over 110 million years, long before the extinction of the dinosaurs and far earlier than the appearance of humans. While many species once existed, only seven species remain today: the green turtle (*Chelonia mydas*), loggerhead turtle (*Caretta caretta*), leatherback turtle (*Dermochelys coriacea*), hawksbill turtle (*Eretmochelys imbricata*), olive ridley turtle (*Lepidochelys olivacea*), Kemp's ridley turtle (*Lepidochelys kempii*), and flatback turtle (*Natator depressus*). These species vary in size, shape, and diet; for example, leatherbacks are the largest, capable of weighing over 500 kg, while Kemp's ridleys are the smallest.

Sea turtles inhabit every ocean on the planet except the Arctic and Antarctic, where the water is too cold to survive. Each species exhibits distinct behaviours and ecological roles, contributing to the health of the marine ecosystems they inhabit, such as coral reefs and seagrass beds. Despite their ecological importance and cultural significance, they face numerous threats from human activities—including habitat loss, pollution, climate change, and accidental capture in fishing gear (bycatch).

Sea Turtle Species at a Glance



Today, conservation efforts are underway across the globe to protect these fascinating and endangered animals. Sea turtles have become one of the most widely recognised symbols of wildlife conservation, with active protection programmes in more than 80 countries. These charismatic creatures serve as powerful ambassadors for the ocean, helping to connect people to the marine world and acting as flagship species for global marine conservation efforts.

BIOLOGY OF SEA TURTLES

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Sea turtles are air-breathing reptiles uniquely adapted to life at sea. Like all reptiles, they are cold-blooded, breathe with lungs, have thick scaly skin, and rely on land only to lay their eggs. Their bodies are streamlined, with paddle-shaped, flipper-like limbs that make them strong and efficient swimmers.

Their shells consist of two main parts: the upper shell (carapace) and the lower shell (plastron). Almost all sea turtles have hard, bony shells covered with scutes, except for the leatherback, which has a soft, leathery and flexible shell. The number and patterns of scutes vary from species to species for hard-shelled turtles and are commonly used for identification.

These extraordinary adaptations enable them to undertake long-distance migrations between feeding grounds and nesting beaches—sometimes crossing entire ocean basins. In fact, sea turtles are the only reptiles known to migrate such vast distances. Unlike tortoises and freshwater terrapins, sea turtles cannot retract their heads or limbs into their shells.

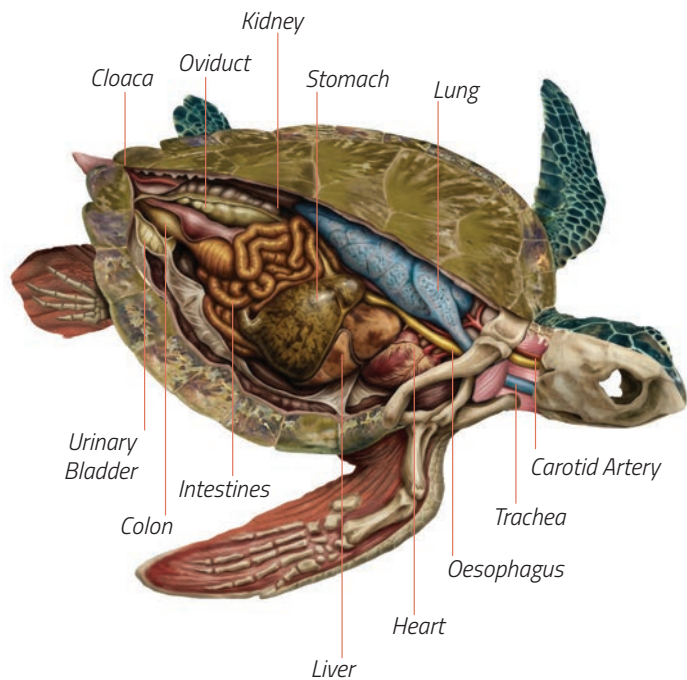
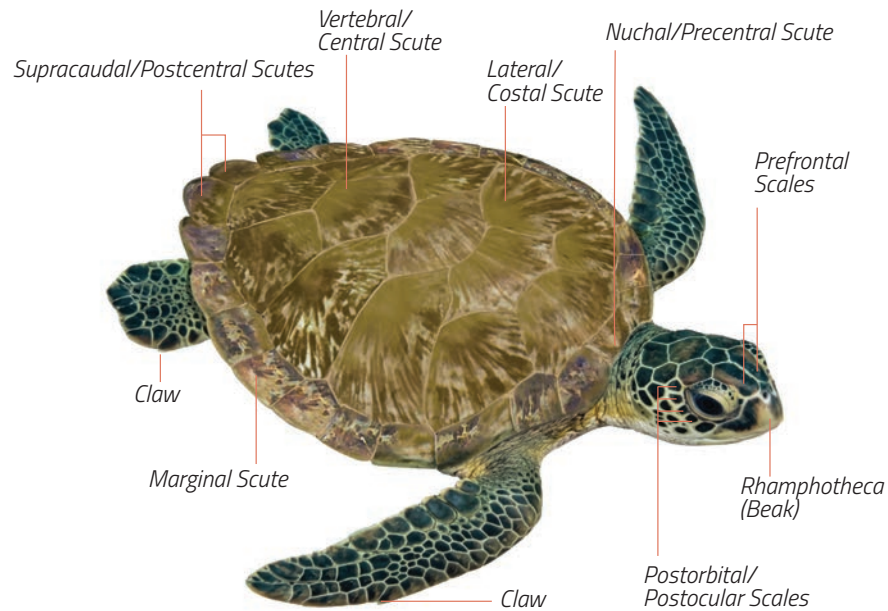
Sea turtles also have complex life cycles that include several distinct stages: hatchling, juvenile, subadult, and adult. After emerging from eggs laid in sandy beaches, the baby turtles, known as hatchlings, make their way to the ocean, where they spend several years drifting in the open sea. As they grow, the turtles eventually settle in specific coastal or pelagic habitats where they feed and mature.

DID YOU KNOW



Remarkably, adult females are known to return to nest along the same regions where they hatched, a behaviour known as natal homing.

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Shaped by over 110 million years of adaptation, sea turtles have evolved for life in the ocean. Their physical features, internal systems, and sensory abilities allow them to thrive in both coastal and open-ocean environments.

1. Streamlined Body & Flippers

Forelimbs: Large, paddle-shaped flippers provide powerful propulsion for swimming.

Hind flippers: Smaller, used for steering, stability and nest digging.

2. Shell Structure

Carapace: Upper shell, which in hard-shelled sea turtles is covered with scutes—hard, keratinous plates.

Plastron: Lower shell, connected to the carapace by bony bridges.

Leatherback: The only sea turtle that lacks a hard carapace and plastron; instead, it has a flexible, leathery shell reinforced with bone which prevents collapse during deep dives.

3. Breathing & Diving Adaptations

Large lungs: Located near the top of the body for rapid breathing and buoyancy control.

Diving ability: Slow metabolism and the capacity to divert blood flow to remain submerged for hours.



4. Salt regulation

Salt glands: Located near the eyes, these excrete excess salt from seawater and this adaptation eliminates the need for fresh water.

5. Sensory Systems

Vision: Eyes optimised for underwater colour vision, including blue-green and yellow wavelengths.

Hearing: Internal ears sensitive to low-frequency sounds and vibrations.

Smell: Highly developed sense of smell for finding food and detecting predators.

Magnetic navigation: Ability to sense Earth's magnetic field for long-distance migration.

6. Feeding Adaptations

Hawksbill: Narrow, pointed beak for extracting sponges from reef crevices.

Green turtle: Serrated jaws for cutting seagrass.

Leatherback: Scissor-like jaws and backward-pointing throat spines for catching jellyfish.

Loggerhead: Exceptionally strong jaws to crush crustaceans and molluscs.

DID YOU KNOW



The "tears" that are visible during nesting are the excess salt excreted from the salt gland that is located behind the eyes.



Sea turtles occupy a wide range of marine and coastal habitats during different life stages, each critical for survival and development. These habitats include:

Nesting Beaches

Female sea turtles return to sandy beaches—often to the same geographical area or the very ones where they were born—to lay their eggs. Nesting habitats are highly vulnerable to erosion, pollution, coastal development, artificial lighting, and human disturbance.



Open Ocean (Pelagic Zone)

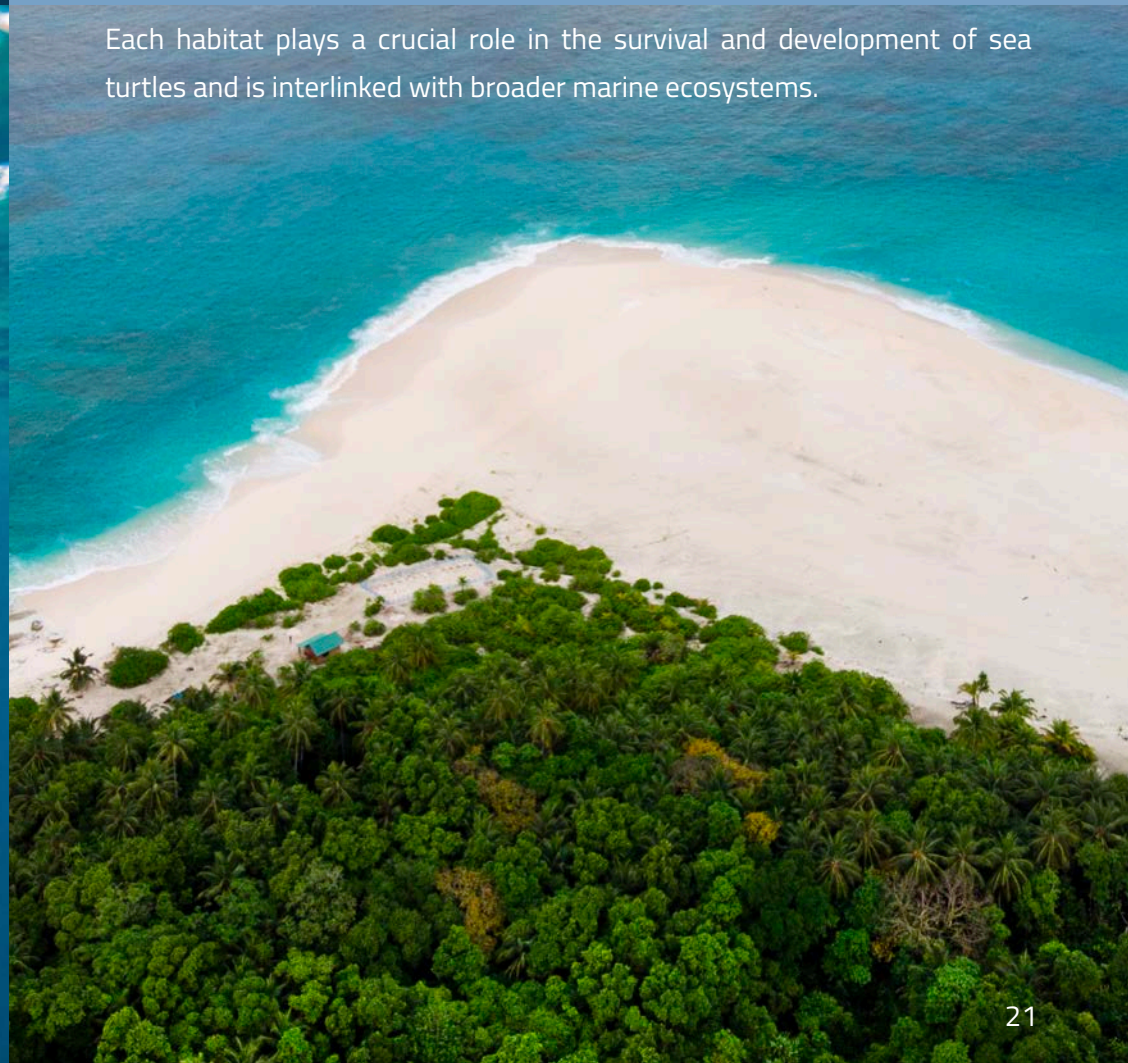
After hatching, young sea turtles head out to sea, entering the pelagic zone where they drift with ocean currents for several years. This early life stage sees juveniles feeding on floating prey such as jellyfish, small fish, seaweed and algae, while avoiding predators in the open water. Leatherback sea turtles are the most pelagic of all sea turtles and spend almost their entire lives in this zone.



Coastal and Neritic Zone

As turtles mature, certain species move into coastal areas where food is more abundant and habitats more stable. Different sea turtle species occupy specific types of neritic (coastal) environments. Green turtles graze in seagrass beds, hawksbills forage around coral reefs, loggerheads and ridleys frequent sandy or muddy bottoms, and estuaries and mangroves provide important shelter and feeding grounds for juvenile turtles.

Each habitat plays a crucial role in the survival and development of sea turtles and is interlinked with broader marine ecosystems.



ECOLOGICAL ROLES

Sea turtles are not only flagship and iconic marine animals but also play key ecological roles. Each species contributes uniquely to ocean health and in the ecosystems they inhabit:



Seagrass Maintenance

Green turtles graze on seagrass beds, keeping the vegetation short and healthy. This promotes faster growth, higher productivity, and better habitat conditions for other marine life such as fish, invertebrates, and shellfish.



Coral Reef Health

Hawksbill turtles feed primarily on sponges, which compete with corals for space on reefs. By controlling sponge populations, hawksbills help maintain reef diversity and structure, making them critical for coral reef ecosystems.



Jellyfish Control

Leatherback turtles feed almost exclusively on jellyfish. By keeping jellyfish populations in check, they help maintain balance in open ocean food webs and indirectly support fisheries that would otherwise be affected by jellyfish overpopulation.



Nutrient Cycling

When nesting, sea turtles bring marine nutrients to coastal ecosystems. Unhatched eggs, eggshells, and hatchlings lost to predation provide food for a variety of beach-dwelling animals and enrich the nutrient profile of coastal ecosystems.

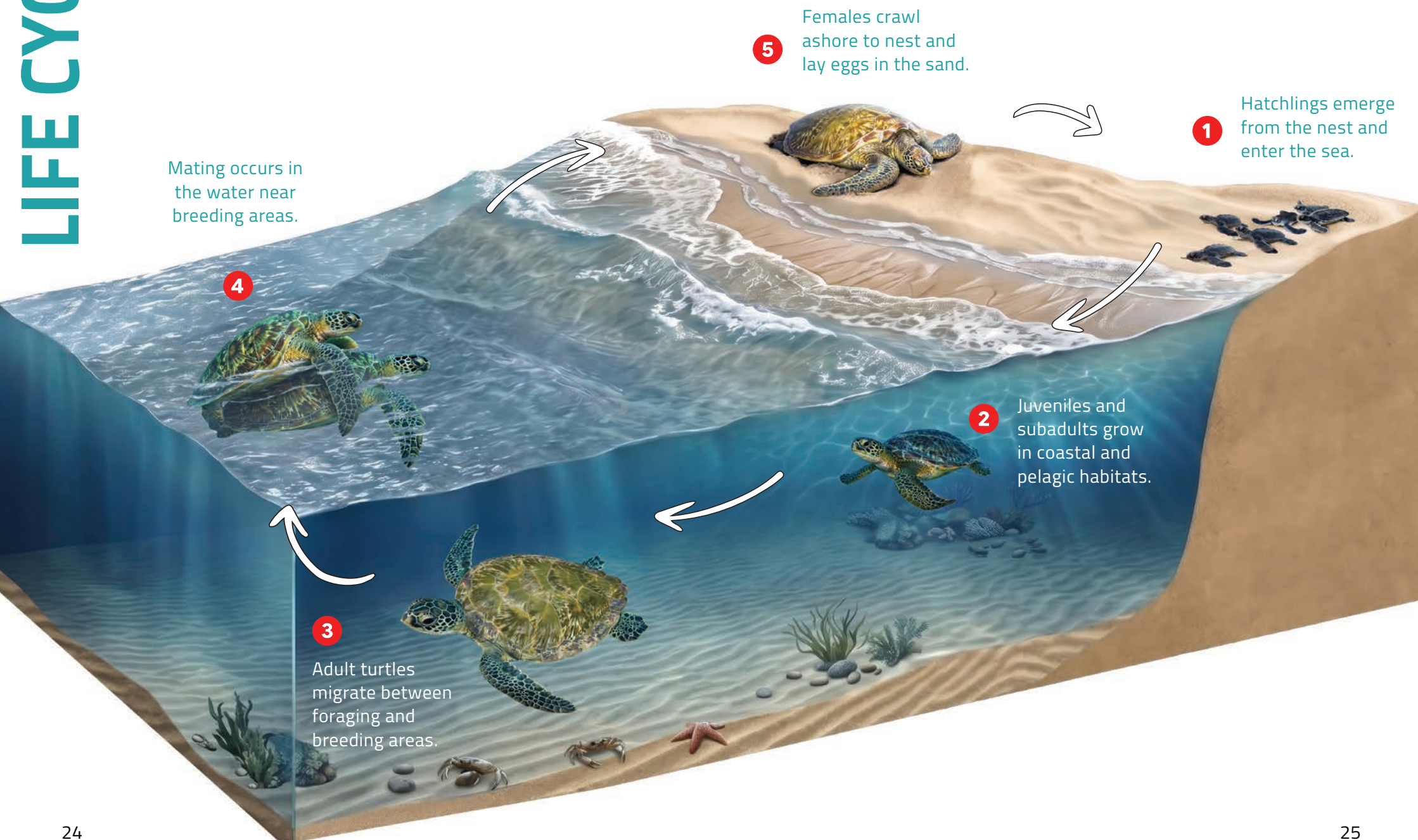


Food Web Support

As eggs and hatchlings, sea turtles are a vital food source for predators such as crabs, birds, monitor lizards, fish and other marine animals. Their presence helps sustain a variety of coastal and marine species across trophic levels.

By fulfilling these roles, sea turtles help maintain the balance and productivity of the ecosystems they inhabit. Conserving sea turtles thus protects the broader health of marine environments—benefiting countless other marine and coastal species, including humans reliant on healthy oceans.

LIFE CYCLE





Hatchlings

The life of a sea turtle begins inside a nest on a sandy beach where the female lays her eggs. After the incubation period, hatchlings use their temporary, sharp egg tooth (called the caruncle) to break open the eggshells. Once several hatchlings have pierced the eggshell, they work together to dig their way to the surface, a process that can sometimes take a few days. Hatchlings typically emerge from the nest at night, when cooler temperatures and darkness reduce the risk of predation.

They instinctively crawl toward the brightest horizon, which under natural conditions is the ocean, illuminated by the reflection of the moon, stars, and sky on the water's surface. This natural brightness cue ensures that most hatchlings are oriented seaward. Upon entering the sea, they enter a swimming frenzy, continuously swimming for 24–48 hours to reach oceanic currents that carry them away from the coastal zone into open ocean habitats. Their energy during this phase is fuelled by residual yolk reserves. The transition from hatchling to juvenile can last nearly a decade, during which they drift among floating seaweed mats such as Sargassum, which provide food and shelter. Their diet is omnivorous, consisting of pelagic vegetation, small invertebrates and fish larvae.

Juvenile and Subadults

After spending the early years adrift in the open ocean and feeding on floating prey, sea turtles enter the juvenile phase. Marked by their transition from the pelagic environment to neritic zones, they begin to adopt new foraging habitats, establish territories, interact more actively with their environment, and move with greater purpose. They exploit new, richer food sources and become less vulnerable to predators as they gradually develop from juveniles into subadults and adults.

This phase is not only important for individual growth but also for the overall success of sea turtle populations, as survival through these years sets up the possibility of reaching adulthood and eventually contributing to the species' reproduction. The time to maturity is highly variable—ranging from about 15 to 50 years—and is determined not just by species, but also by specific population characteristics, such as habitat quality, food availability, temperature, and even genetics. All these factors influence the growth rate, maturation, and population dynamics of sea turtles.



Adults and Reproduction



All sea turtle species, except the leatherback, grow and reach sexual maturity in these neritic areas. Now, it is easy to distinguish between adult males and females: males have a long tail that extends well beyond the carapace, while females have a short tail. Adult sea turtles begin to migrate to breeding areas once they have stored enough energy in the form of fat reserves to fuel long-distance migration, often returning to their birth beach or region—a process known as natal homing. At these breeding sites, males will try to mate with as many females as they can before returning to their foraging grounds, while females remain close to their nesting beach during the nesting season. After the nesting season ends, females migrate back to their feeding grounds, where they spend the next two to three years foraging and replenishing energy reserves before repeating the breeding cycle.

DID YOU KNOW



Flatback turtles are the only species that lack an oceanic phase and inhabit the neritic zone through all their life stages, from hatchling to adult.

Nesting and Incubation

Female turtles typically crawl up onto the shores at night to lay their eggs. They crawl above the high tide line and begin the nesting process by using their flippers to dig a body pit. They will then use the fore flippers as anchors while the rear flippers carve out a round bottom egg chamber, which is anywhere between 45-70 cm deep. During this nesting phase, they are susceptible to disturbance and may abandon the nesting attempt. They may crawl around on the beach and create a new body pit and nest chamber if another suitable site is found, or they may even return to the sea without successfully laying their eggs—referred to as a false crawl.



Once the egg chamber is complete and suitable, depending on the species, a female sea turtle can lay between 50-200 eggs. The eggs are soft shelled, to withstand the drop from the cloaca to the bottom of the nest and to allow for oxygen exchange. During oviposition, the female is usually in a trance-like state and lays the eggs in batches of two to three at a time. Once egg laying is completed, she uses her rear flippers to fill the egg chamber with the sand that was carved out and begins to camouflage the nest by throwing sand around the nesting area using her fore flippers. Depending on the species, a female may lay 2 to 7 clutches per season with a gap of several days or weeks.



The eggs incubate in the nest for about 45-70 days, which varies among species and environmental conditions. Typical to reptiles, the sex of hatchlings is not predetermined at fertilisation. The temperature of the nest and its surrounding environment plays a vital role in determining the sex of hatchlings in a phenomenon known as temperature-dependent sex determination (TSD). In general, cooler incubation temperatures produce males, while warmer temperatures produce females across sea turtle species.

Incubation below approximately 27°C produces mostly males, above 31°C produces mostly females and temperatures within this range yield mixed sex ratios. The ranges vary slightly among species, nesting sites and even among different populations within a species. However, small changes in sand temperature can significantly skew the sex ratio of hatchlings, which has serious implications for population dynamics under climate change and habitat alteration.



A look inside the nest: This cross-section illustration is a detailed view of sea turtle hatchlings breaking out from their eggs at the base of the chamber and beginning their collaborative journey up through the sand column toward the surface.

Sea turtles are grouped into two main lineages: the extinct family *Protostegidae* and the superfamily *Chelonioidea*. *Protostegidae* includes large prehistoric sea turtles that lived between 145 to 66 million years ago, notably *Archelon*, the largest documented turtle, measuring up to 4.5 metres. The superfamily *Chelonioidea* encompasses all modern-living sea turtles and represents the only surviving lineage of marine-adapted turtles today. *Chelonioidea* is divided into two families: *Cheloniidae* (hard-shelled sea turtles), and *Dermochelyidae* (leathery-shelled sea turtles).

CHELONIIDAE

Cheloniidae includes all six species of hard-shell turtles—green, hawksbill, loggerhead, olive ridley, Kemp's ridley, and flatback.

DID YOU KNOW



The Kemp's ridley is the smallest and most endangered sea turtle species as they are restricted to the Gulf of Mexico (also now known as Gulf of America).



KEMP'S RIDLEY

Scientific Name: *Lepidochelys kempii*

Status in Indonesia: Not present

Size: 60-70 cm

Weight: 30-45 kg

Diet: Carnivorous; Invertebrates (crabs, other crustaceans, and molluscs) and some jellies

Distribution: Gulf of Mexico and western Atlantic

In-water habitat type: Coastal, estuaries

Track width: 70-80 cm

Track pattern: Asymmetrical

Nesting frequency: 1-3 clutches

Clutch size: 90-130 eggs

Incubation Duration: 50-60 days

Re-nesting interval: 14 days

Remigration interval: 1-3 years

Nesting beach type: Wide, open

IUCN status: Critically Endangered



OLIVE RIDLEY

Scientific Name: *Lepidochelys olivacea*

Status in Indonesia: Nesting species

Size: 60–70 cm

Weight: 35–70 kg

Diet: Omnivorous; Benthic invertebrates (crabs, other crustaceans, and molluscs) and occasionally jellies

Distribution: Globally distributed in the tropical regions of the Atlantic, Pacific, and Indian oceans

In-water habitat type: Coastal, estuaries

Track width: 70–80 cm

Track pattern: Asymmetrical

Nesting frequency: 1–3 clutches

Clutch size: 90–150 eggs

Incubation Duration: 45–50 days

Re-nesting interval: 14 days

Remigration interval: 1–2 years

Nesting beach type: Wide, open

IUCN status: Vulnerable



HAWKSBILL

Scientific Name: *Eretmochelys imbricata*

Status in Indonesia: Nesting species

Size: 70–95 cm

Weight: 45–80 kg

Diet: Omnivorous; Sponges and other invertebrates (corals, molluscs, tunicates, crustaceans, sea urchins, jellyfish), marine algae, and small fish

Distribution: Circumglobally in the tropics

In-water habitat type: Coral reefs

Track width: 70–85 cm

Track pattern: Asymmetrical

Nesting frequency: 2–5 clutches

Clutch size: 130–160 eggs

Incubation Duration: 50–60 days

Re-nesting interval: 14–15 days

Remigration interval: 1–4 years

Nesting beach type: Small, secluded, low and high-energy beaches, beaches with a rocky approach and commonly within beach vegetation

IUCN status: Critically Endangered



DID YOU KNOW

Olive ridleys are famous for their mass nesting events called arribadas, where thousands of females come ashore simultaneously to lay eggs — one of the most spectacular sights in nature! Arribadas are exclusive to both Kemp's and olive ridleys.

Hawksbill turtle shells, beautifully patterned and made of overlapping scutes, often called “tortoiseshell”, are highly prized for jewellery and ornaments, which led to global trade and massive population declines.



FLATBACK

Scientific Name: *Natator depressus*

Status in Indonesia: Non-nesting,
occasional foraging in southern Indonesia

Size: 80-95 cm

Weight: 70-100 kg

Diet: Carnivorous; soft-bodied invertebrates,
shrimp, molluscs, jellyfish

Distribution: Northern Australia and Australian
continental shelf

In-water habitat type: Inshore waters, lagoons
and bays with soft-bottomed seabed

Track width: 90-100 cm

Track pattern: Symmetrical

Nesting frequency: 2-3 clutches

Clutch size: 50-70 eggs

Incubation Duration: 45-55 days

Re-nesting interval: 9-15 days

Remigration interval: 2-4 years

Nesting beach type: Open, low-energy
beaches

IUCN status: Data Deficient



DID YOU KNOW

The flatback turtle is the only species of sea turtle that nests exclusively in Australia and nowhere else in the world.

LOGGERHEAD

Scientific Name: *Caretta caretta*

Status in Indonesia: Non-nesting
(occasional stranding)

Size: 80-110 cm

Weight: 70-200 kg

Diet: Omnivorous; benthic
invertebrates, crabs, molluscs, jellyfish

Distribution: Subtropical &
temperate oceans

In-water habitat type: Coastal bays,
estuaries, continental shelves

Track width: 70-100 cm

Track pattern: Asymmetrical

Nesting frequency: 2-5 clutches

Clutch size: 80-120 eggs

Incubation Duration: 50-60 days

Re-nesting interval: 10-15 days

Remigration interval: 2-4 years

Nesting beach type: Wide sandy,
high-energy beaches

IUCN status: Vulnerable



Loggerhead turtles have the strongest jaws among sea turtles!



GREEN

Scientific Name: *Chelonia mydas*

Status in Indonesia: Nesting species

Size: 80-120 cm

Weight: 100-250 kg

Diet: Herbivorous; seagrass, algae

Distribution: Tropical & subtropical seas of the world

In-water habitat type: Seagrass beds, reefs, lagoons

Track width: 90-130 cm

Track pattern: Symmetrical

Nesting frequency: 2-5 clutches

Clutch size: 80-120 eggs

Incubation Duration: 60 days

Re-nesting interval: 12-15 days

Remigration interval: 2-4 years

Nesting beach type: Open sandy beaches, small and large islands

IUCN status: Least Concern



DID YOU KNOW

Adult green turtles are mostly herbivorous, and their plant-based diet gives their body fat a greenish colour, which is how they got their name.

DERMOCHELYIDAE

Dermochelyidae is represented by only one species, the leatherback, distinguished by its leathery carapace. It is the only turtle that does not have a hard-shell.

LEATHERBACK

Scientific Name: *Dermochelys coriacea*

Status in Indonesia: Nesting species

Size: 130-180 cm

Weight: 300-700 kg

Diet: Gelatinous zooplankton; jellyfish

Distribution: Global, from tropics to sub-polar seas

In-water habitat type: Pelagic, open-ocean

Track width: 150-200 cm

Track pattern: Symmetrical

Nesting frequency: 3-7 clutches

Clutch size: 60-90 eggs

Incubation Duration: 60-65 days

Re-nesting interval: 9-11 days

Remigration interval: 2-4 years

Nesting beach type: Open sandy, deep-water approach beaches

IUCN status: Vulnerable



Leatherbacks are the only species of sea turtle that do not have a hard shell. Their leathery shell allows them to dive deeper and travel to colder water than any other species!



IDENTIFICATION GUIDE



Leatherback

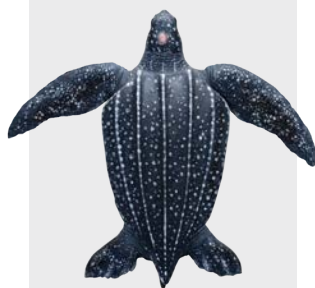
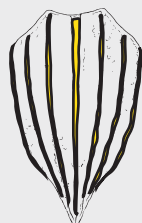
Dermochelys coriacea

CURVED CARAPACE LENGTH:
140 - 190 CM (4.5 - 6.5 FEET)

WEIGHT: 300 - 700 KG

HEAD:
NO HEAD SCALES,
DEPIGMENTED PINK
SPOT ON THE HEAD

CARAPACE:
LEATHERY SHELL,
NO HARD SCUTES,
7 LONGITUDINAL
RIDGES

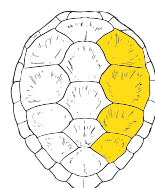


Green

Chelonia mydas

CURVED CARAPACE LENGTH:
90 - 120 CM (3 - 4 FEET)

WEIGHT: 100 - 250 KG



HEAD:
1 PAIR OF
PREFRONTAL
SCALES, ROUNDED
HEAD WITH
SERRATED JAWS

CARAPACE:
4 PAIRS OF LATERAL
SCUTES, BROADLY
OVAL



Loggerhead

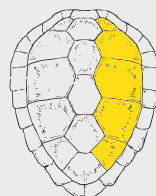
Caretta caretta

CURVED CARAPACE LENGTH:
80 - 110 CM (2.5 - 3.5 FEET)

WEIGHT: 90 - 180 KG

HEAD:
2 PAIRS OF
PREFRONTAL
SCALES, LARGE
TRIANGULAR HEAD

CARAPACE:
5 PAIRS OF LATERAL
SCUTES, LONGER
THAN WIDE
CARAPACE

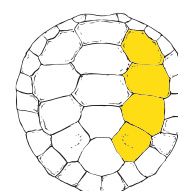


Flatback

Natator depressus

CURVED CARAPACE LENGTH:
80 - 95 CM (2.5 - 3 FEET)

WEIGHT: 70 - 100 KG



HEAD:
1 PAIR OF
PREFRONTAL SCALES,
ROUNDED HEAD
WITH SERRATED JAWS

CARAPACE:
4 PAIRS OF LATERAL
SCUTES, BROADLY OVAL



Hawksbill

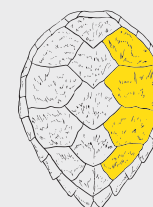
Eretmochelys imbricata

CURVED CARAPACE LENGTH:
70 - 90 CM (2.3 - 3 FEET)

WEIGHT: 45 - 90 KG

HEAD:
2 PAIRS OF
PREFRONTAL SCALES,
NARROW HEAD WITH A
SHARP HOOKED BEAK

CARAPACE:
4 PAIRS OF LATERAL
OVERLAPPING SCUTES
AND SERRATED
POSTERIOR MARGIN

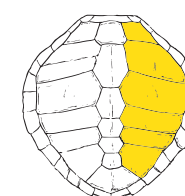


Olive Ridley

Lepidochelys olivacea

CURVED CARAPACE LENGTH:
60 - 75 CM (2 - 2.5 FEET)

WEIGHT: 35 - 55 KG



HEAD:
2 PAIRS OF
PREFRONTAL SCALES,
TRIANGULAR HEAD
WITH A SMALL BIRD
LIKE BEAK

CARAPACE:
6-9 PAIRS OF LATERAL
SCUTES OFTEN
ASYMMETRICAL,
NEARLY CIRCULAR



Kemp's Ridley

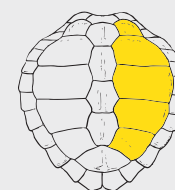
Lepidochelys kempii

CURVED CARAPACE LENGTH:
60 - 70 CM (2 - 2.3 FEET)

WEIGHT: 30 - 50 KG

HEAD:
2 PAIRS OF
PREFRONTAL SCALES,
TRIANGULAR HEAD

CARAPACE:
5 PAIRS OF LATERAL
SCUTES, SOMETIMES
6, NEARLY CIRCULAR



THREATS TO SEA TURTLES



Sea turtles have withstood predation and dramatic natural changes that have eliminated countless other species for millions of years. While sea turtles, eggs and hatchlings have always faced threats from predators and environmental stress, in modern times they are facing more severe obstacles—human-induced threats.

Human-induced pressures including accidental capture in fishing gear through industrial fishing practices, destruction of nesting areas through the rapid expansion of coastal development, illegal hunting and commercial exploitation, and plastic pollution have significantly reduced several sea turtle populations worldwide. Accelerated change to the climate and ecosystems further threatens the essential ecological role sea turtles play in marine environments.

Sea turtles are fundamental to sustaining productive and resilient ocean ecosystems. Recognising the dangers is crucial both for conserving sea turtles and for supporting the health of our oceans.



Major Threats



Fisheries Bycatch

Accidental capture in fishing gear such as longlines, gillnets, and trawlers is the leading cause of sea turtle deaths and decline in populations globally. As sea turtles are air-breathing reptiles, they need to come to the surface to breathe. If they are accidentally caught during fishing activities, they might drown or suffer severe injuries. Although global estimates indicate over 250,000 sea turtles die each year, bycatch is very rarely reported and therefore such estimates only represent a portion of total bycatch.

DID YOU KNOW



In Indonesia, bycatch affects all species except the Kemp's ridley, as fishing fleets operate widely in areas that overlap with key sea turtle habitats.

Coastal Development & Artificial Lighting



Coastal development has significant adverse impacts on sea turtles and their habitats, affecting both their ability to nest successfully and more importantly the survival of hatchlings. Loss and degradation of nesting habitats occur due to beachfront construction that also accelerates erosion and increases artificial lighting. Artificial lighting from buildings, streets, and beach resorts disorients hatchlings. Instead of using the natural light cues to navigate to the ocean, hatchlings end up crawling towards these artificial lights, away from the ocean. This disorientation increases mortality due to exhaustion, predation, or straying into dangerous landward areas. In addition, beach furniture, debris, and other construction create physical barriers that disrupt nesting behaviour and lead to unsuccessful nesting. Coastal defences like seawalls and development of jetties or ports disrupt natural sand movement, leading to erosion or permanent loss of sandy beaches.

Illegal Take and Commercial Exploitation

Sea turtles are illegally poached for their meat, eggs, oil, and shells, and commercially exploited for local use and international trade. The illegal and commercial exploitation of turtles, especially of eggs and adults on nesting beaches, has contributed to drastic declines of many populations. This is particularly evident in green turtles, sought after for their meat and hawksbill turtles, targeted for their highly valued shells. In many regions, sea turtle eggs are considered an aphrodisiac and nutritious snack. Large-scale harvesting directly reduces hatchling recruitment and population survival. However, the consumption of turtle meat and eggs is common in many coastal communities for food and traditional medicine. These practices are sometimes also linked to cultural, traditional, and ritual purposes. Despite some decline in global poaching rates in the last few decades, illegal take and commercial exploitation continue to threaten the survival of many sea turtle populations especially in Southeast Asia, Africa and Latin America.

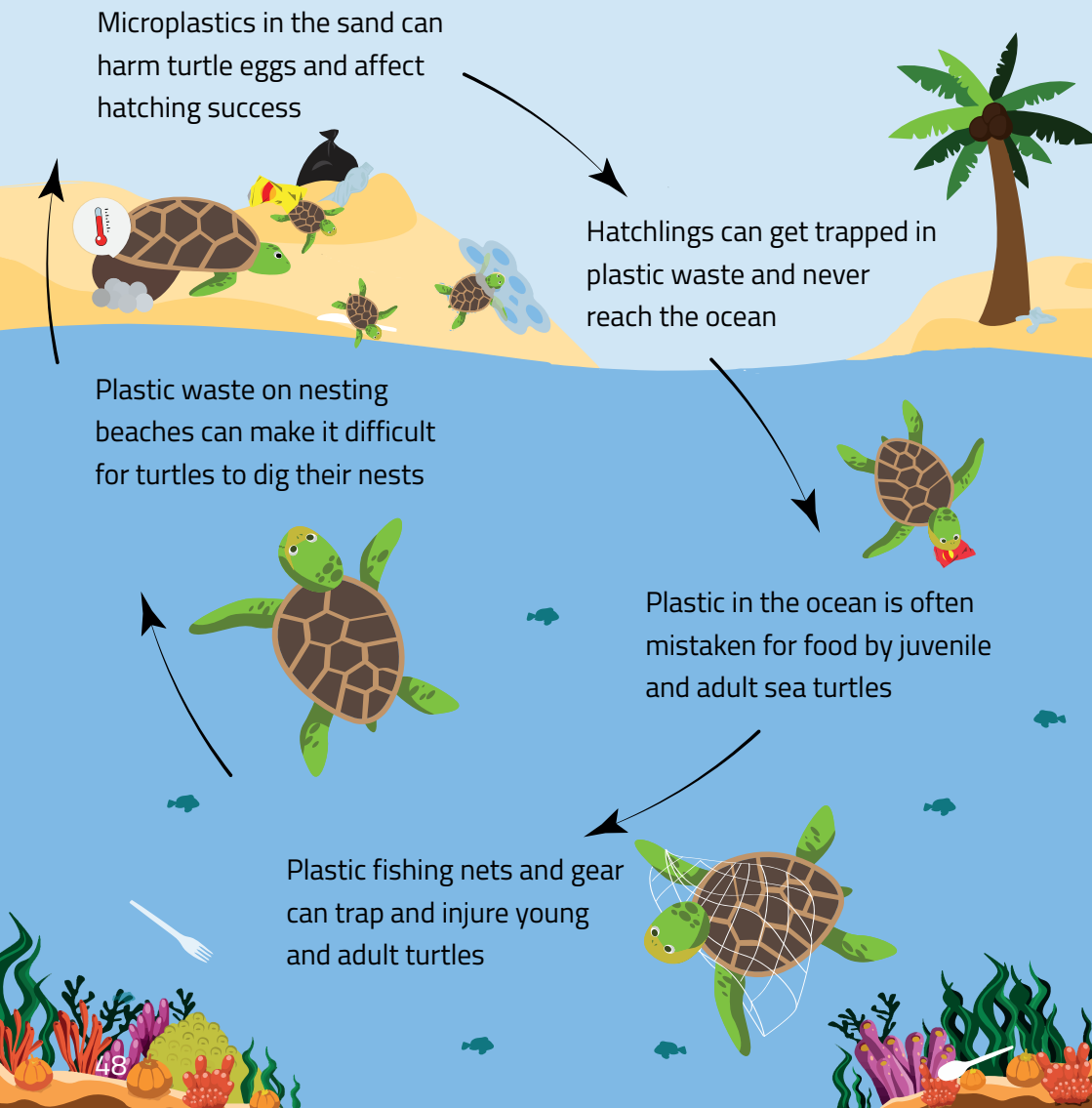


Pollution

Pollution, particularly plastic debris, and discarded fishing gear pose severe threats to sea turtles throughout their life cycle, adversely affecting their health, survival, and reproductive success. Sea turtles often mistake plastic debris such as bags, cups, balloons, and microplastics for jellyfish or algae. Ingesting plastic can lead to intestinal blockages, internal injuries, absorption of harmful chemicals and heavy metals, and reduced appetite, which can result in starvation and death. Additionally, sea turtles are frequently entangled in discarded fishing gear, known as "ghost nets," as well as plastic ropes and other debris, which restrict their mobility and can cause drowning or injury.

PLASTIC KILLS!

Plastic waste poses a major threat to sea turtles at every stage of their lives.



Climate Change

Climate change poses significant direct and indirect threats to sea turtles across their entire life cycle. Increasing global temperatures directly impact nesting beaches. Excessively hot incubation temperatures are known to cause embryo mortality, affect hatching success, and skew sex ratios. Global warming is also causing a rise in sea level and eroding nesting beaches. Warming seas are altering ocean currents, impacting migration and dispersal, and increasing the frequency of extreme weather events that further deteriorate nesting habitats and affect sea turtle behaviour and ecology. For instance, if coral reefs and seagrass meadows are suffering from impacts of climate change, this will also further threaten sea turtles that rely on these marine habitats for food and growth.



DID YOU KNOW

Global warming and increasing temperatures might produce a higher number of female hatchlings.

Other Threats



Natural Predation and Invasive Species

Eggs and hatchlings are heavily preyed upon by crabs, birds, mammals, and various fish. The introduction of invasive predators—such as rats, feral pigs, and dogs—to nesting beaches further amplifies these losses. Adult sea turtles have relatively few natural predators, but they can be attacked by sharks, orcas, and crocodiles. Tiger sharks are the most significant natural predator of adult sea turtles, having evolved specialised teeth for eating turtles. Orcas and large sharks, such as great white and bull sharks, also occasionally prey on adults, though less frequently. Certain predators like jaguars, alligators, feral pigs and dogs are known to opportunistically attack nesting females when they are vulnerable and unable to move quickly.



Oil spills

Oil floating on the ocean surface poses critical risks to sea turtles by physically coating their bodies and contaminating their environment. When coated in oil, turtles can experience clogged nostrils, eyes, and mouths, impairing respiration and feeding. Inhalation of oil vapours further damages lung and heart function, reducing diving and migratory abilities. Sea turtles often ingest oil either directly while feeding or indirectly via contaminated prey, causing internal injuries, digestive blockages, toxic contamination, and impaired metabolism. Furthermore, oil contamination on nesting beaches can coat turtle eggs, interfering with oxygen exchange and resulting in lower hatch rates, embryo mortality, or deformities in hatchlings.

Boat Strikes

Sea turtles have poor vision and hearing above water, making them vulnerable to boat collisions, particularly in coastal and shallow waters where turtles surface frequently for breathing, basking, or feeding, especially during breeding and nesting seasons. Boat strikes represent a growing threat as coastal boating activity increases globally and the impacts of boat collisions can range from minor injuries to fatal blunt-force trauma or propeller wounds.



Diseases



Sea turtles, like other wildlife, are vulnerable to several diseases that affect their health, survival, and reproductive success. The most notable is fibropapillomatosis (FP), a disease linked to a herpesvirus. FP causes external and internal tumours that can impair vision, swimming, feeding, and overall health. It is most common in green turtles and has been reported worldwide, particularly in polluted or degraded habitats.

Arribada: A mass or synchronised nesting event where a large number of female sea turtles come ashore at the same time to lay their eggs, generally over a period of several days on the same beach.

Axillary Scute: A small scale on a sea turtle's shell, located where the fore flippers meet the body, between the carapace and the bottom part of the shell.

Carapace: The hard bony shell or shell that covers the dorsal (top) side of a sea turtle, protecting its back and internal organs.

Cheloniid: Hard-shelled sea turtle species (green, loggerhead, olive ridley, Kemp's ridley, flatback, and hawksbill) belonging to the family Cheloniidae.

Claw: A curved, pointed keratinous structure found on the flippers of hard-shelled sea turtles. Males have longer claws on the fore flippers than females. These are used to grasp the female during mating.

Cloaca: The common cavity/opening under the tail of a sea turtle through which the digestive, urinary, and reproductive systems discharge; also, the opening through which eggs are laid.

Clutch: The group of eggs laid by a female sea turtle in a single nesting event.

Costal/Lateral Scute: The large external scutes or plates located on each side of the carapace, between the vertebral (central) scutes and the marginal (outer) scutes.

Critically endangered: A category defined by the International Union for Conservation of Nature (IUCN), indicating that a species is facing an extremely high risk of extinction in the wild.

Curved Carapace Length (CCL): The measurement of a carapace taken along the curve of the shell using a flexible measuring tape. CCL can be measured in two ways: (i) CCL minimum – from the notch at the anterior of the carapace to the notch at the posterior end where the last two marginal scutes meet; and (ii) CCL n-t – from the notch at the anterior to the tip of the last posterior marginal scute.

Curved Carapace Width (CCW): The measurement of the widest part of a carapace, taken along the curve from one side to the other using a flexible measuring tape.

Data Deficient: A category defined by the International Union for Conservation of Nature (IUCN), indicating that there is inadequate information to make a direct or indirect assessment of the risk of extinction based on a species distribution or population status.

Dead Hatchling in Pipped Egg (DPE): A hatchling that broke through the eggshell (pipped) or started emerging but died in the nest before fully emerging from the egg.

Dead in Nest (DIN): A fully formed hatchling that has emerged from the egg but died inside the nest before reaching the surface.

Dermochelyid: A sea turtle species with a soft or leathery shell, belonging to the family Dermochelyidae, which includes only one living species—the leatherback turtle.

Embryo: A developing baby turtle inside the egg, from the time the egg is laid until hatching.

Emergence Success: The proportion of hatchlings that have successfully broken out of their eggs and reached the surface of the sand. Formula: $(\text{number of emerged hatchlings} / \text{total number of eggs}) \times 100\%$.

Emergence: (a) The act of a female sea turtle leaving the water and coming ashore to nest. (b) The act of hatchlings digging through the sand from the nest and reaching the surface.

Endangered: A category defined by the International Union for Conservation of Nature (IUCN), indicating that a species is facing a very high risk of extinction in the wild.

Endemic: A species that is naturally found in only one specific geographic location and nowhere else in the world (e.g., the Australian flatback turtle).

Ex Situ: A Latin term meaning “out of place”, the practice of protecting sea turtles outside of their native habitat. This includes the practice of relocating nests to a hatchery.

False Crawl (FC): When a female sea turtle comes ashore but returns to the sea without successfully laying eggs.

False Crawl with nesting attempt (FCA): A specific type of false crawl in which a female begins the nesting process but abandons it before laying eggs.

Fidelity: A turtle’s tendency to return to the same beach or area to nest or forage across multiple years.

Foraging: The act of searching for or feeding on food. Areas where turtles feed are referred to as foraging or feeding habitats/grounds.

Hatchery: A human-made artificial structure or enclosed area where sea turtle nests are relocated for incubation.

Hatching Success: The percentage of eggs in a nest that successfully produce live hatchlings. Formula: $(\text{number of hatched eggs} / \text{total number of eggs}) \times 100 \%$.

In Situ: A Latin term meaning “in place”, referring to the protection or management of sea turtles within their natural environment—without relocating them.

Incubation: The period during which sea turtle eggs develop in the sand until the hatchlings emerge.

Internesting: The interval (number of days) between a female’s successful nesting and her next nesting attempt within the same nesting season.

Least Concern: A category defined by the International Union for Conservation of Nature (IUCN), indicating that a species is widespread and abundant and currently not at risk of extinction.

Live Hatchling in Pipped Egg (LPE): A live hatchling that has broken through the eggshell (pipped) or started coming out of the egg but has yet to reach the surface.

Live in Nest (LIN): A fully formed hatchling that has fully come out of the egg and is still alive inside the nest but is yet to emerge to the surface.

Marginal Scutes: The outermost scutes that form the edge (margins) of the carapace, running along the sides from front to back.

Natal Homing: The return migration by an adult sea turtle to its birth beach.

Near Threatened: A category, defined by the International Union for Conservation of Nature (IUCN), indicating that a species does not qualify for Critically Endangered, Endangered, or Vulnerable now, but is close to qualifying in the near future.

Neritic: The shallow part of the ocean that lies above the continental shelf, extending from the low tide mark to a depth of about 200 metres.

Pelagic: Refers to the open ocean or water column, away from the coast and the sea floor.

Philopatry: The tendency of sea turtles to return or remain in a specific area, often their birthplace, for nesting.

Pivotal Temperature: The specific incubation temperature at which an equal number of male and female hatchlings are produced.

Plastron: The flat bony shell or bottom part of a turtle's shell, covering the ventral (bottom) and protecting its internal organs.

Prefrontal scale: The scales located between a sea turtle's eyes, just above the beak and in front of the frontal scales on the head. They are used in species identification.

Relocation: The process of moving sea turtle eggs from their original nesting site to a safer or more suitable location, such as a hatchery or a more secure spot on the beach.

Remigration: The return of a female sea turtle to land to nest again in a different season, after time spent foraging at sea.

Rookery: A site where sea turtles nest—typically referring to a beach or coastal area used by females of the same or multiple species.

Scale: Small, hard, keratinous plate-like structures on head, neck, and limbs of sea turtles and other reptiles, providing protection.

Scutes: Large, hard horny scales that cover a sea turtle's shell (both the carapace and plastron). Made of keratin—the same material as human fingernails.

Sex ratio: The proportion of males to females in a sea turtle population or in a group of hatchlings from a nest.

Shelled Albumin Gobs (SAG): Small, non-fertile eggs found in sea turtle nests, particularly those of leatherbacks.

Straight Carapace Length (SCL): The straight-line distance from the front to the back of a sea turtle's carapace measured using callipers, not following the curve of the shell. SCL is measured in three ways, (i) SCLmin: minimum straight carapace length, (ii) SCLn-t: notch to tip and (iii) SCLmax: maximum straight carapace length.

Straight Carapace Width (SCW): The maximum width of a sea turtle's carapace measured in a straight line across the widest part of the shell using callipers.

Temperature-dependent sex determination: A biological process in which the temperature at which eggs are incubated determines the sex of the hatchlings.

Vertebral: The central scutes of the carapace which overlie the backbone of the turtle. Also known as central or neural scutes.

Vulnerable: A category, defined by the International Union for Conservation of Nature (IUCN), indicating that a species is facing high risk of extinction in the wild.

Yolk Sac: A nutrient-rich sac, remnant from the egg, attached to newly hatched sea turtle hatchlings, which serves as a natural source of food for the first few days.

Yolkless Eggs: Undeveloped eggs laid by sea turtles that lack a yolk and therefore cannot develop into embryos or hatchlings.

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Foundational Knowledge and Nesting Beach Monitoring

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Module 2: Conservation of Sea Turtles in Indonesia

Module 3: Beach Surveys and Daily Monitoring

INTERMEDIATE LEVEL

Nesting Turtles and Nest Protection

Module 4: Working with Nesting Turtles

Module 5: Nest Protection and Hatchery Management

ADVANCED LEVEL

Sea Turtle Research, Outreach and Ranger Training

Module 6: Advanced Sea Turtle Research and Conservation Methods

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ACKNOWLEDGEMENTS

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Page 11: Illustration by Ujan Dutta
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Page 51: Kristaps Ungurs
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Page 53: Nils Gemünden
Page 62-63: Illustration by Kaewta Sirimongkolwattana

Layout & Design by Akshaya. R

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