Sea Turtles

G D R Jayatunga
Scientific Classification

1. KINGDOM : Animalia
2. PHYLUM : Chordata
3. CLASS : Reptilia
   - Reptilia is a class of exothermic (cold-blooded) vertebrates (have a spine) that includes snakes, lizards, crocodiles, and turtles.
   - All reptiles have scaly skin, breathe air with lungs, and have a three-chambered heart.
   - Most reptiles lay eggs, although some produce eggs that hatch internally.
4. ORDER : Testudines
   This order includes all turtles and tortoises. It is divided into three suborders:
   - Pleurodira (side-necked turtles)
   - Cryptodira (all other living species of turtles and tortoises)
   - Amphichelydia (all extinct species)
5. SUBORDER : Cryptodira
   This suborder includes
   - freshwater turtles
   - snapping turtles
   - tortoises
   - soft-shelled turtles
   - sea turtles.

Cold-blooded: having a body whose temperature varies with that of the environment. releasing heat
Scientific Classification

6. FAMILY: Cheloniidae or Dermochelyidae

- Family Cheloniidae includes sea turtles with shells covered with scutes (horny plates).

- Family Dermochelyidae includes only one species of sea turtle who has leathery skin rather than a shell covered with scutes.
Most scientists recognize eight living species of sea turtles. Each sea turtle has both a scientific name and a common name. The scientific name identifies the genus and species, and the common name typically describes some characteristic of the turtle's body.
Sea Turtle Species of the World

- Hawksbill sea turtle (Eretmochelys imbricata)
- Flatback sea turtle (Natator depressus)
- Loggerhead sea turtle (Caretta caretta)
- Leatherback sea turtle (Dermochelys coriacea)
- Green sea turtle (Chelonia mydas) - male
- Kemp's ridley sea turtle (Lepidochelys kempii) - female
- Olive ridley sea turtle (Lepidochelys olivacea)
- Black sea turtle (Chelonia agassizii)
Sea Turtle Species of the World

Green

Black

Loggerhead

Kemp

Hawksbill

Leatherback

Olive ridley

Flatback
An Introduction to Sea Turtles

- Sea turtles are beautiful & efficient.
- They are large, air-breathing reptiles that inhabit tropical and subtropical seas throughout the world.
- Their shells consist of an upper part (carapace) and a lower section (plastron).
- Sea turtles come in many different sizes, shapes and colors.
- The upper shell, or carapace, of each sea turtle species varies in length, color, shape and arrangement of scales.
- They hear best at low frequencies, and their sense of smell is excellent.
- Their vision underwater is good, but they are nearsighted out of water.
- Their streamlined bodies and large flippers make them remarkably adapted to life at sea. However, sea turtles maintain close ties to land.
- They travel through the world's oceans and know to return to the natal beach for nesting. Nesting seasons occur at different times around the world.
- Sea turtles are awkward and vulnerable on land.
An Introduction to Sea Turtles

- All sea turtles begin their lives as tiny hatchlings on land. Males rarely return to land after crawling into the sea as hatchlings.
- Each species of sea turtle eats, sleeps, mates and swims in distinctly different areas. Sometimes their habitats overlap, but for the most part they each have different preferences.
- The first turtles appeared during the Triassic period, 245 to 208 million years ago.
- The earliest known sea turtles appear in the fossil record in the Late Jurassic period, 208 to 144 million years ago. Scientists believe that modern sea turtles are derived from marsh-inhabiting ancestors that lived during the Late Triassic period.
- Fossil records show that the now-extinct sea turtle *Archelon ischyros*, from the Late Cretaceous period, 144 to 65 million years ago, was one of the largest turtles that lived and reached a length of 3 to 4 m (9.8 - 13 ft.).
- They have been in existence for millions of years and flourished until the last 100 years.

- Over the past 50 to 75 years, they have become endangered due to human activities.
- It is important to aware people about how both turtles and people can use ocean resources safely.
Researchers do not yet know how long baby turtles spend in the open sea, or exactly where they go.

It is theorized that they spend their earliest, most vulnerable years, floating around the sea in giant beds of sargasso weeds, where they do little more than eat and grow.

Once turtles reach dinner-plate size, they appear at feeding grounds in nearshore waters. They grow slowly and take between 15 and 50 years to reach reproductive maturity, depending on the species.

Scientists are still researching sea turtle longevity. Once sea turtles reach sexual maturity, they may have an estimated reproductive life of about 30 years and an 80-year lifespan is feasible.

Currently there is not an adequate method to determine age of sea turtles. The most accepted method is to study growth rings of the scales on the carapace and plastron. Scientists count the rings and use a mathematical formula to estimate a turtle's age.
General Behaviour Patterens of Sea Turtles

- Sea turtles are not generally considered social animals.
- Sea turtles are generally solitary creatures that remain submerged for much of the time they are at sea.
- Decades of research, including observations at sea, has produced useful insights into daily activities and behaviors such as courtship, mating and nesting.
- Sea turtles can sleep at the surface while in deep water or on the bottom under rocks in near shore waters.
- Hatchlings typically sleep floating on the surface, and they usually have their front flippers folded back over the top of their backs.
- Sea turtles may migrate hundreds or even thousands of miles.
- Even when large numbers of turtles gather on feeding grounds or during migration, there is little behavioral exchange among individuals.
- Green sea turtles are considered solitary and are abundant in sea grass or algae in shallow waters. Divers have observed green turtles sleeping under ledges in reefs and rocks.
- Flatback turtles may spend hours at the surface floating, apparently asleep or basking in the sun. Frequently, seabirds perch on the backs of the flatbacks.
- Hawksbill turtles spend some time resting or sleeping wedged into coral or rock ledges.
- Olive ridleys have been observed basking on beaches, and floating in front of their nesting beaches.
- Leatherback turtles tend to dive in a cycle that follows the daily rising and sinking of the dense layer of plankton and jellyfish.

Plankton: Tiny organism living in the sea.
Physical Characteristics

Size:
- Adult males and females are equal in size.
- Green sea turtles reach about **78 to 112 cm** and **68 to 186 kg**.
- Black sea turtles reach about **59 to 117 cm** and **42 to 126 kg**.
- The Kemp's ridley and olive ridley are the smallest species, and reach about **55 to 65 cm** and **30 to 50 kg**.
- Loggerheads reach about **82 to 105 cm** and **66 to 101 kg**.
- Flatbacks reach about **81 to 97 cm** and **60 to 84 kg**.
- Hawksbills reach about **53 to 114 cm** and **27 to 86 kg**.
- The leatherback is the largest of all living sea turtles. Mature leatherbacks reach about **1.2 to 1.9 m** and **200 to 506 kg**. The largest leatherback recorded was 916 kg. (2,019 lb.)

The leatherback turtle is the largest sea turtle species; the Kemp's ridley is one of the smallest. Compare their sizes to the size of a human.
Physical Characteristics

**Body shape:**
- Sea turtles are characterized by a large, streamlined shell and non retractile head and limbs.

**Coloration:**
- Depending on the species, sea turtles range in color. They may be olive-green, yellow, greenish-brown, or black.

**Flippers:**
- Flippers are adapted for swimming.
- Foreflippers are long and paddlelike.
  - Long digits are fused throughout the flipper.
  - Only one or two claws are present on each foreflipper.
  - A sea turtle swims with powerful winglike beats of its foreflippers.
- Hind flippers serve as rudders, stabilizing and directing the animal as it swims. The hind flippers of some species are quite dexterous in digging nests in the sand.
- Flippers help them speed through the water as fast as 15 miles (24 km) per hour.

**Head:**
- A sea turtle cannot retract its head under its shell as a land turtle can.
- Sea turtles have large upper eyelids that provide protection for their eyes.
- They do not have visible ears but have eardrums covered by skin.
- Sea turtles lack teeth. Jaw shape varies among species. Each species has a jaw shape adapted for its diet.
Physical Characteristics

Shell:
- The large, bony shell provides protection from predation and abrasion.
- In all species except the leatherback, the shell is covered with a layer of horny plates called scutes.
  - Scutes are firm but flexible, not brittle.
  - Scientists can identify sea turtle species by the number and pattern of scutes.
  - The leatherback turtle has a thick and oil-suffused skin, which is an excellent insulator allowing this species to venture into colder waters.
- The dorsal (top) side of the shell is called the carapace.
  - Depending on species, the adult carapace ranges in shape from oval to heart-shaped.
  - In all species except the leatherback, the bony shell is composed of broadened, fused ribs, and the backbone is attached to the carapace.
  - The leatherback's carapace is composed largely of cartilage raised into prominent longitudinal ridges. A layer of thousands of small dermal bones lies just below the leathery skin.
- The ventral (bottom) side of the shell is called the plastron.

In all species except the leatherback, the backbone is attached to the carapace.
**Nesting, Incubation and Emergence**

**Habitats:**
- Very little is known about why sea turtles nest on some beaches and not on others.
- This nesting distribution may reflect conditions that existed centuries ago, when temperature, beach profiles or the lack of predation made some areas preferable to sea turtles.
- Today, humans are affecting the places where sea turtles nest.
- These changes will likely to have ill effects on future nesting patterns.
- The more we understand about how, where and when sea turtles nest, the better we will be able to protect their nesting habitat.

**Beach Selection:**
- Most females return faithfully to the same beach each time they are ready to nest.
- Not only do they appear on the same beach, they often emerge within a few hundred yards of where they last nested.
Nesting, Incubation and Emergence

**Nesting Behavior:**
- Nesting by females occurs most often at night.
- The female crawls out of the ocean, pausing frequently as if carefully scoping out her spot.
- Sometimes she will crawl out of the ocean, but for unknown reasons decide not to nest.
- This is a "false crawl," and it can happen naturally or be caused by artificial lighting or the presence of people on the beach.
- Most females nest at least twice during the nesting season.
- A female will not nest in consecutive years, typically skipping one or two years before returning.
- Nesting is an exhausting task for female turtles.

**Constructing the Nest:**
- The female turtle crawls to a dry part of the beach and begins to flings away loose sand with her flippers.
- She then constructs a "body pit" by digging with her flippers and rotating her body.
- After the body pit is complete, she digs an egg cavity using her rear flippers.
- The egg cavity is shaped roughly like a tear drop and is usually tilted slightly.
Nesting, Incubation and Emergence

Laying and Burying the Eggs:

- When the turtle has finished digging the egg chamber, she begins to lay eggs.
- Two or three eggs drop out at a time, with mucus being secreted throughout egg-laying.
- The average size of a clutch ranges from about 80 to 120 eggs, depending on the species.
- Because the eggs are flexible, they do not break as they fall into the chamber.
- This flexibility also allows both the female and the nest to hold more eggs.
- Nesting sea turtles appear to shed tears, but the turtle is just secreting salt that accumulates in her body.
- A sea turtle is least likely to abandon nesting when she is laying her eggs, but some turtles will abort the process if they are harassed or feel they are in danger.
- For this reason, it is important that sea turtles are never disturbed during nesting.
Nesting, Incubation and Emergence

**Laying and Burying the Eggs:**
- Once all the eggs are in the chamber, the mother turtle uses her rear flippers to push sand over the top of the egg cavity.
- Gradually, she packs the sand down over the top and then begins using her front flippers to refill the body pit and disguise the nest.
- By throwing sand in all directions, it is much harder for predators to find the eggs.
- After the nest is thoroughly concealed, the female crawls back to the sea to rest before nesting again later that season or before beginning her migration back to her feeding ground.
- Once a female has left her nest, she never returns to tend it.

**Incubation:**
- Incubation takes about 60 days, but since the temperature of the sand governs the speed at which the embryos develop, the hatching period can cover a broad range.
- The hotter the sand surrounding the nest, the faster the embryos will develop.
- Cooler sand has a tendency to produce more males, with warmer sand producing a higher ratio of females.
Emerging from the Nest:

- Unlike baby alligators, which are liberated from their nest by their mother, sea turtle hatchlings must do it all themselves.
- To break open their shells, hatchlings use a temporary, sharp egg-tooth, called a "caruncle." The caruncle is an extension of the upper jaw that falls off soon after birth.
- Digging out of the nest is a group effort that can take several days.
- Hatchlings usually emerge from their nest at night or during a rainstorm when temperatures are cooler.
- Once they decide to burst out, they erupt from the nest cavity as a group.
- The little turtles orient themselves to the brightest horizon, and then dash toward the sea.
- When artificial lighting is present, hatchlings can get disoriented and head toward the lighted area rather than to the water.
Emerging from the Nest:

- If they don't make it to the ocean quickly, many hatchlings will die of dehydration in the sun or be caught by predators like birds and crabs. Hatchlings cannot defend themselves against terrestrial predators.
- Once in the water, they typically swim several miles off shore, where they are caught in currents and seaweed that may carry them for years before returning to near shore waters.
- There are many obstacles for hatchlings in the open ocean. Sharks, big fish and circling birds all eat baby turtles.
- Also they die after accidentally eating tar balls and plastic garbage.
- The obstacles are so numerous for baby turtles that only about one in 1,000 survives to adulthood.
Sea-finding by hatchling sea turtles

Several different possibilities are listed below.

- Water reflects more light than land; thus, more ambient light is reflected from the ocean, making that region brighter.
- The beach slopes down in the direction of the water; thus, going downhill would usually lead turtles toward the sea.
- Waves breaking on the sand might provide an auditory cue that hatchlings can use to find the ocean.
- Towards land, the dunes and associated vegetation form a dark silhouette (outline image). Thus, the seaward horizon is LOWER than the landward horizon.
Diet and Eating Habits

Food preferences and resources:
Diet varies with species. Sea turtles may be carnivorous (meat eating), herbivorous (plant eating), or omnivorous (eating both meat and plants). The jaw structure of many species indicates their diet.

- Green and black sea turtles have finely serrated jaws adapted for a vegetarian diet of sea grasses and algae. In adulthood, they are the only herbivorous sea turtles, but in an aquarium environment all sea turtle species can be maintained on a carnivorous diet.

- Loggerheads' and ridleys' jaws are adapted for crushing and grinding. Their diet consists primarily of crabs, mollusks, shrimps, jellyfish, and vegetation. (Mollusks are soft-bodied animals that may have a hard external shell, a hard internal shell, or no shell at all. Mollusks are taxonomically related to segmented worms) and deep-sea tube worms).

- A hawksbill has a narrow head with jaws meeting at an acute angle, adapted for getting food from crevices in coral reefs. They eat sponges, tunicates, shrimps, and squids.

- Leatherbacks have delicate scissorlike jaws that would be damaged by anything other than their normal diet of jellyfish, tunicates, and other soft-bodied animals. The mouth cavity and throat are lined to help them swallow soft foods allowing this species to venture into colder waters.

- Researchers continue to study the feeding habits of flatbacks. There is evidence that they are opportunistic feeders that eat seaweeds, cuttlefish, and sea cucumbers.
Diet and Eating Habits

Eating habits:

- Some species change eating habits as they age.
- Sea turtles do not have teeth, but their jaws have modified "beaks" that are specially formed to help them eat the foods they like.

A loggerhead's jaws are adapted for crushing and grinding (left). A leatherback's delicate jaws would be damaged by anything other than soft-bodied animals (right).
Migration

- The ability of a sea turtle to migrate hundreds or even thousands of miles from its feeding ground to its nesting beach is one of the most remarkable acts in the animal kingdom.
- That adult females return faithfully to nest on the natal beach makes more amazing.
- Research into where and how sea turtles migrate has been a focus of scientists for decades.
- Sea turtles undergo migration throughout their lives, beginning with the first frenzied swim as a hatchling.
- During its first critical 48 hours, a hatchling must travel from the beach to a secure place in the ocean where it is relatively safe from predators and where it can find food.
- Once they reach adulthood and sexual maturity, it is believed that they migrate to a new primary feeding ground where adult turtles probably remain throughout their lives, except during nesting season.
- This periodic migration will continue throughout their lives.
- One promising new theory on how sea turtles navigate suggests that they can detect both the angle and intensity of the earth's magnetic field. Using these two characteristics, a sea turtle may be able to determine its latitude and longitude, enabling it to navigate virtually anywhere.
- However, of all the places where sea turtles travel throughout their life cycle, the least amount of time is spent on the nesting beach.
- Migration habits differ not only among species but also among different populations of the same species.
Study of Migration

- Most sea turtle research has been carried out on nesting beaches. These areas are easier for researchers to access, and what occurs on the nesting beach (production of new sea turtles) is extremely important to the species' survival.
- To fully protect sea turtles throughout their range, more must be known about their migratory patterns and their behavior in the water.
- Several methods are used by researchers to determine where sea turtles move.
- One of the simplest methods involves placing a small, harmless metal tag on one of the turtle's flippers when she comes ashore to nest. Each tag includes a coded number and a message asking people to return the tag to a certain address if it is found. When people return a tag, they get a reward and are asked where the turtle was encountered. In this way, researchers gradually learn about the many places to which turtles migrate. Although this method yields information on migration destinations, it does not reveal travel routes.

*Migration habits differ among sea turtle species. Migrations may range from a few to thousands of kilometers.*
Study of Migration

**Satellite Telemetry:**

- Researchers have recently begun utilizing satellites to track sea turtles in the open ocean.
- The transmitter is glued directly to the turtle's carapace, behind the head, where the unit's small flexible antenna can break the surface to transmit when the turtle comes up to breathe.
- A passing *Argos* satellite receives the information and transmits it back to researchers on earth.
- After 8-10 months, the transmitter quits working and eventually falls safely off the turtle.
- Using computer mapping programs, researchers can then see where the turtles migrate, what routes they travel and how fast they generally swim.
Sea Turtle Threats

Human-Caused Threats

*Human impact:*
- Some people illegally collect turtle eggs for food and aphrodisiac.
- Sea turtles are illegally hunted for their meat and shells, which are used to make turtle products such as combs, eyeglass frames, aphrodisiacs, and curious.

*Commercial Fishing:*
- Thousands of sea turtles getting entangled and drown in fishing nets each year.
- In addition, entanglement in drift nets has become an increasing cause of mortality for sea turtles worldwide.

*Marine Debris - Ingestion & Entanglement:*
- Nesting females and hatchlings are disturbed by the presence of trash on nesting beaches. If trash impedes its crawl up the beach, a female returns to the sea instead of nesting.
- Thousands of sea turtles die from eating or becoming entangled in nondegradable debris each year. Leatherbacks are especially susceptible to ingesting plastic, mistaking it for jellyfish.
- Turtles are affected potentially by entanglement in persistent marine debris, including discarded or lost fishing gear, synthetic and natural rope, plastic onion sacks and discarded plastic netting materials.
Sea Turtle Threats

Human-Caused Threats

**Artificial Lighting:**
- Artificial lighting on beaches may misrepresent the time of day to turtles attempting to nest since most turtles are nocturnal nesters.
- Lights from seaside streets, condominiums, houses and hotels discourage females from nesting and cause hatchlings to become disoriented and wander inland.

**Coastal Armoring:**
- Coastal armoring includes structures such as sea walls, rock revetments and sandbags that are installed in an attempt to protect beachfront property from erosion.
- These structures often block female turtles from reaching suitable nesting habitat.

**Beach Activities:**
- Human use of nesting beaches can result in negative impacts to nesting turtles, incubating egg clutches and hatchlings.
- The most serious threat caused by increased human presence on the beach is the disturbance to nesting females.
- The noise and activity of people on the beach can prevent sea turtles from emerging on the beach and may cause females to return to the sea instead of nesting.
- Propeller and collision injuries from boats are more frequent in areas with a high level of recreational boating and fishing areas.
Sea Turtle Threats

Human-Caused Threats

*Beach Nourishment & Dredging*:

- Beach nourishment consists of pumping, trucking or otherwise depositing sand on a beach to replace what has been lost to erosion.
- If the sand is too compacted or the sand filled is drastically different from native beach sediments, it can negatively affect nest-site selection, digging behavior, incubation temperature and the moisture content of nests.
- If renourishment is allowed to proceed during nesting season, nests can also be buried far beneath the surface or run over by heavy machinery.
- Dredging can cause direct threats to sea turtles and their near shore marine habitats.

*Pollution*:

- Pollution can have serious impacts on both sea turtles and the food they eat.
- Research has revealed a disease called *fibropapillomas* now killing many sea turtles, may be linked to pollution in the oceans and in nearshore waters.
- It may develop lobed tumorlike growths on the skin.
- These growths can result in reduced vision, obstruction of normal swimming and feeding, and increased susceptibility to secondary parasitism and infection.
Sea Turtle Threats

*Deforestation*:  
- Deforestation may indirectly threaten sea turtle nests.  
- Without the forests to draw up ground water, the water table will rise beneath the beaches and drown nests.

Natural threats (Predators)

- In nature, sea turtles face a host of life and death obstacles to their survival.  
- Predators such as raccoons, crabs and ants raid eggs and hatchlings still in the nest.  
- Once they emerge, hatchlings make bite-sized meals for sea birds, crabs and a host of predators in the ocean.  
- More than 90% of hatchlings are eaten by these predators.  
- After reaching adulthood, sea turtles are relatively immune to predation, except for the occasional attacks by sharks and whales.  
- These natural threats, however, are not the reasons sea turtle populations have plummeted toward extinction. To understand what really threatens sea turtle survival, we must look at the actions of humans.
Status of the Species

- They had navigated throughout the world's oceans in groups too numerous to count.
- But in just the past 100 years, demand for turtle meat, eggs, skin and colorful shells has dwindled their populations.
- Destruction of feeding and nesting habitats and pollution of the world's oceans are all taking a serious toll on remaining sea turtle populations.
- Many breeding populations have already become extinct, and entire species are being wiped out.
- Existing species are categorized as threatened, endangered or critically endangered by considering the population and impact of extinction.
- There could be a time in the near future when sea turtles are just an oddity found only in aquariums and natural history museums.

**Threatened**: likely to become endangered

**Endangered**: in danger of extinction within the foreseeable future

**Critically Endangered**: facing an extremely high risk of extinction in the immediate future
Green Sea Turtle

*Chelonia mydas*

**Family:** Cheloniidae  
**Status:** *Endangered* in Florida waters and the Pacific Coast of Mexico including the Gulf of California. *Threatened* elsewhere.

- Head with serrated jaw
- 1 claw on front flipper
Green Sea Turtle

- Their name comes from the greenish color fat tissue called calipee under its shell. The fat has a green color because the adult turtle’s diet consists of sea grass and algae.
- Their carapace is covered with large non overlapping scales (small overlapping plates protecting the skin) called scutes and has 4 lateral scutes.
- Their carapace can be shades of black, grey, green, yellow or brown with a radiant pattern stripes (flecks) or irregular spots of black and white.
- They sometimes do look greenish because of algal growth that covers part of the carapace.
- Their belly is creamy white or yellow.
- The green sea turtles are the largest of the hard-shelled sea turtles (Cheloniidae family), but their head is comparatively small and blunt with a serrated jaw.
- While hatchlings are just 2 inches long, these large turtles can reach up to 500 - 600 pounds and approximately 4 - 6 feet in length.
- These turtles have been hunted for many years for their tasty flesh and for popular Green turtle soup.
- Although protected by law, green turtle eggs