Marine Turtles, Mammals and Seabirds

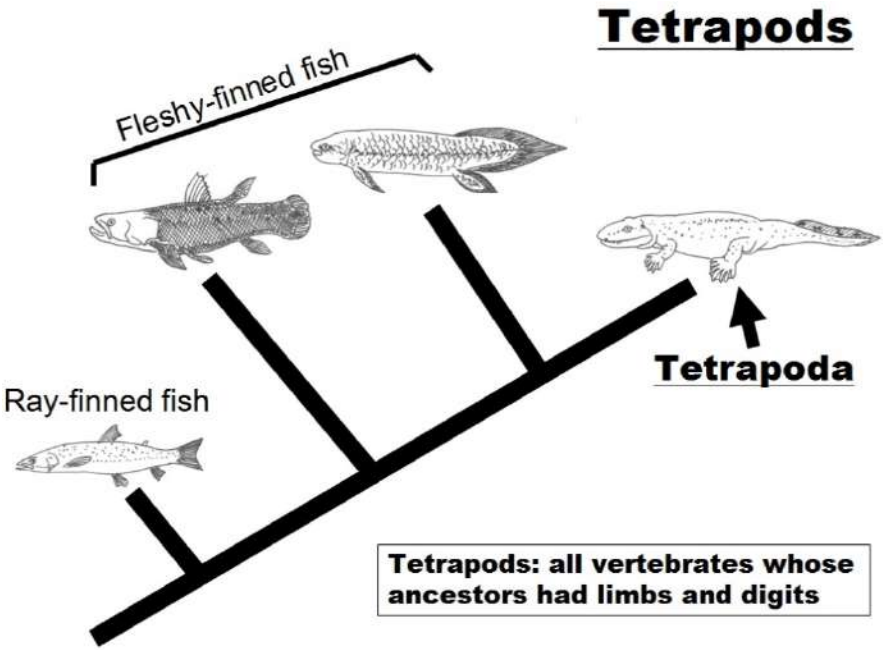
Chapter 9

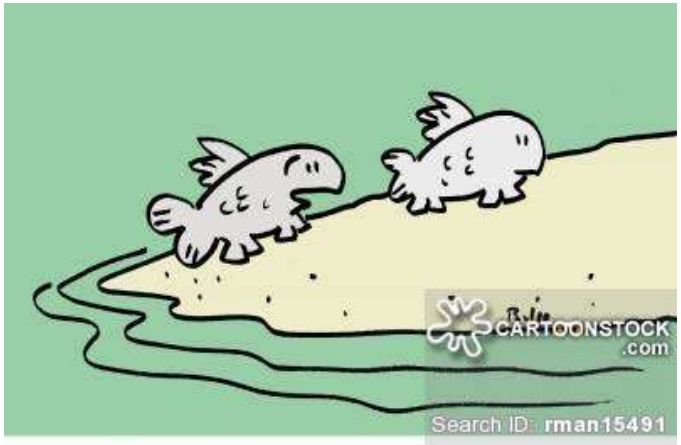
Tetrapods

- As land vertebrates moved from water to land, they lost structural support from water

  - Developed ways to crawl

  - Evolved from fish-like vertebrates called tetrapods (four-footed)





"Are you sure we don't need *visas* or something?"

Tetrapods

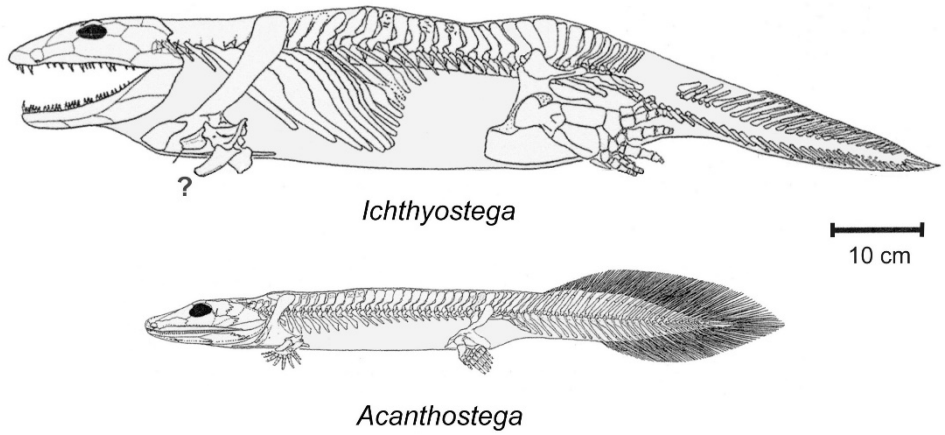
- Other adaptations and structures land vertebrates developed

-Lungs for breathing

-Various ways to prevent desiccation (drying out)

-Ways to protect delicate eggs

*Amphibians are the only group that has not solved this problem



Tetrapods

- Groups of reptiles, birds, and mammals have reinvaded the oceans
  - Sea turtles are examples of groups of animals that have not fully made the transition back into oceans (e.g. lay eggs on land)
  - Whales have made the fully transition (e.g. streamlined body shape similar to fish)

Marine Reptiles

Four types of marine reptiles exist today:

1. Sea Turtles
2. Sea Snakes
3. Marine Iguana
4. Saltwater Crocodile

Marine Reptiles

- Key characteristics
  - Dry scales on body to prevent desiccation
  - Eggs have leathery shell (prevents desiccation) on land
  - Poikilotherms and ectotherms
    - Metabolism and activity will vary with environmental temperature

Sea Turtles

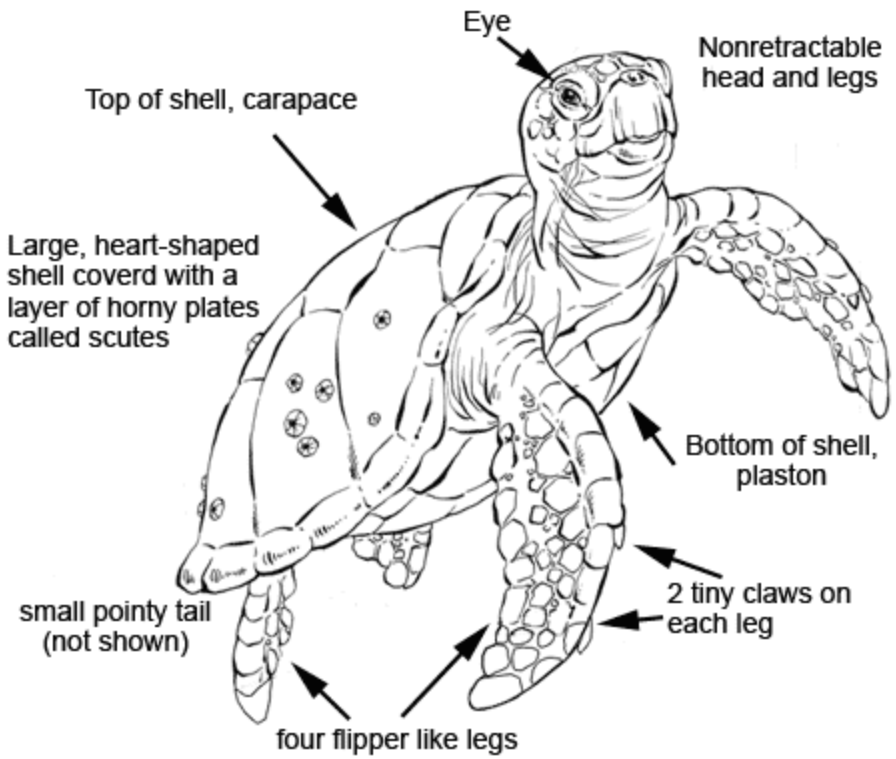
- All species of sea turtles are threatened or endangered
- Endangered means that a species is under direct threat of species survival (extinction is a definite threat)
- Threatened means that the species may become endangered
- Both designations give these species protection under the Endangered Species Act

Sea Turtles

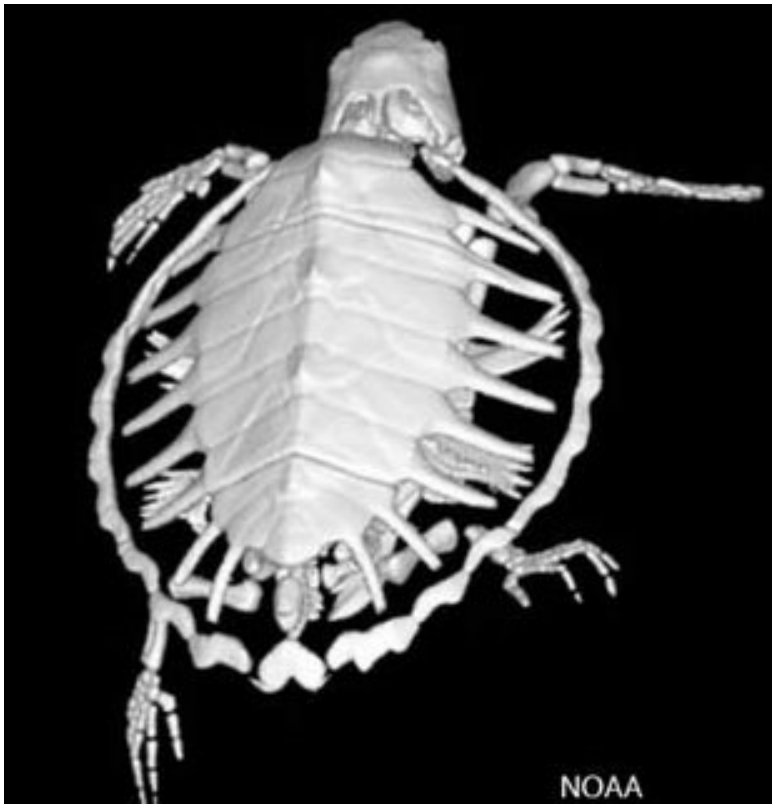
- Seven or eight species of sea turtles exist today:
  - Leatherback sea turtle
  - Loggerhead sea turtle
  - Hawksbill sea turtle
  - Olive ridley sea turtle
  - Kemps ridley sea turtle
  - Australian flatback sea turtle
  - Green sea turtle
    - some biologists recognize two species of green turtles, the Pacific green turtle and the Atlantic green turtle (this is the reason for the 7 or 8 species discrepancy)

Sea Turtles

- Anatomy of a sea turtle
  - an upper shell known as the carapace
  - a lower shell known as the plastron
- The ribs are expanded in size and fused to their shell



Modified from http://www.nationalgeographic.com/coloringbook/sketch_loggerheads.html
Illustrated by Natalya Zahn, National Geographic Society


NOAA

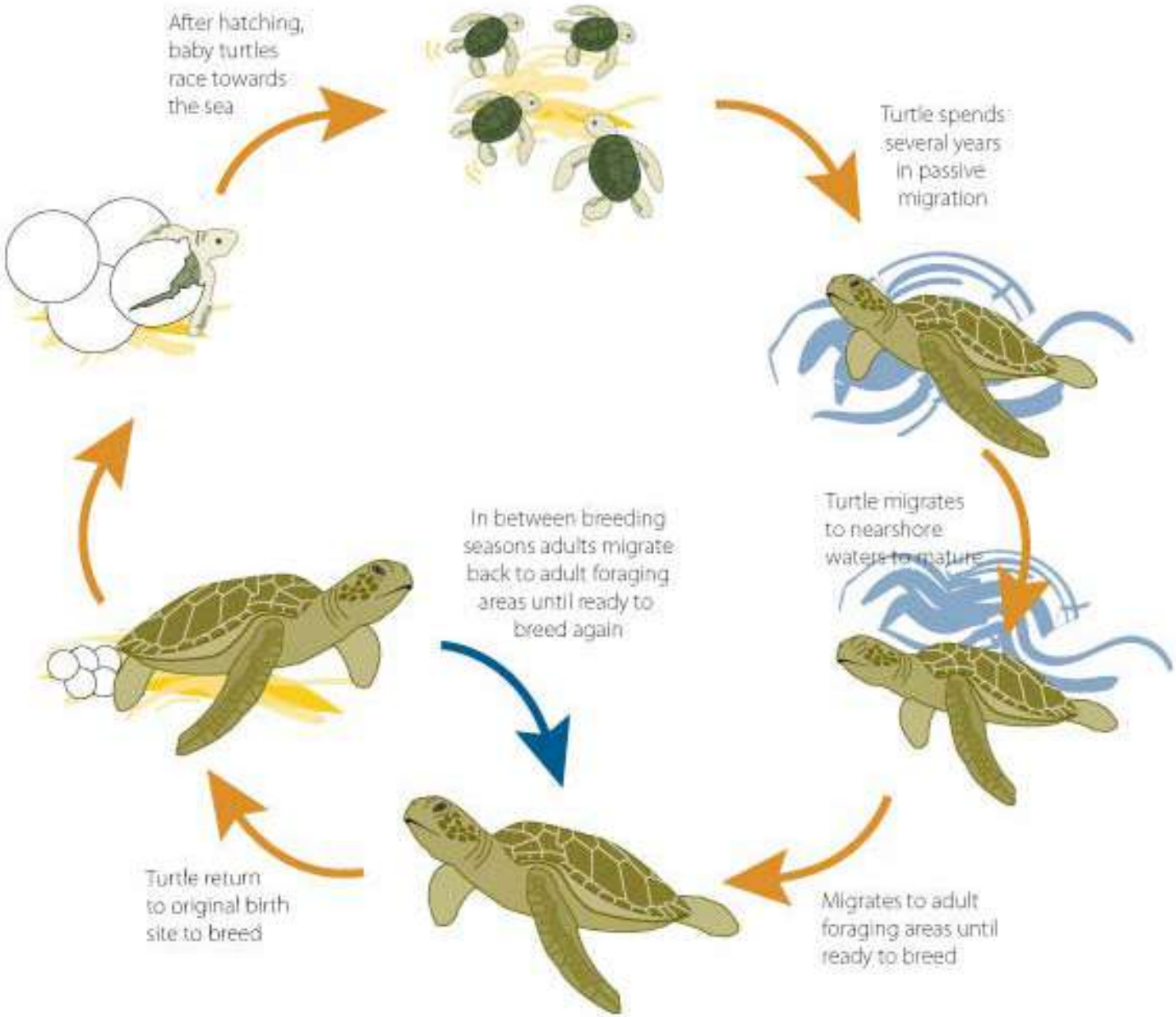
Sea Turtles

- All sea turtles have powerful jaws, but no teeth

- Like other reptiles, sea turtles are poikilothermic and ectothermic
  - Exception: the leatherback sea turtle is so large that its body temperature is normally several degrees above the ambient water temperature

Sea Turtles

- Sea turtles breed at sea
- Internal fertilization occurs – males use their long tails as well as the claws on the front flippers to “grip” the female during reproduction
- Females can store sperm
- One clutch (group) of eggs can have multiple paternity – males and females are not monogamous


After hatching, baby turtles race towards the sea
Turtle spends several years in passive migration
Turtle migrates to nearshore waters to mature
Migrates to adult foraging areas until ready to breed
In between breeding seasons adults migrate back to adult foraging areas until ready to breed again
Turtle return to original birth site to breed

Sea Turtles

- Females normally breed every 2-4 years
- These females must return to land to deposit their eggs near the dune line (above the high tide)
- Females dig a hole in the sand using only the back flippers

Sea Turtles

- During their breeding year, females may lay up to 7 clutches of eggs
- Each clutch of eggs normally has an average of 120 eggs, although large variations in these numbers have been recorded

Sea Turtles

- The eggs have a typical incubation period of around 60 days – although this varies according to air temperature.
  - Warmer temperatures means eggs will develop faster
  - Colder temperatures elongate the incubation process (a range of 45-75 days is not unusual)

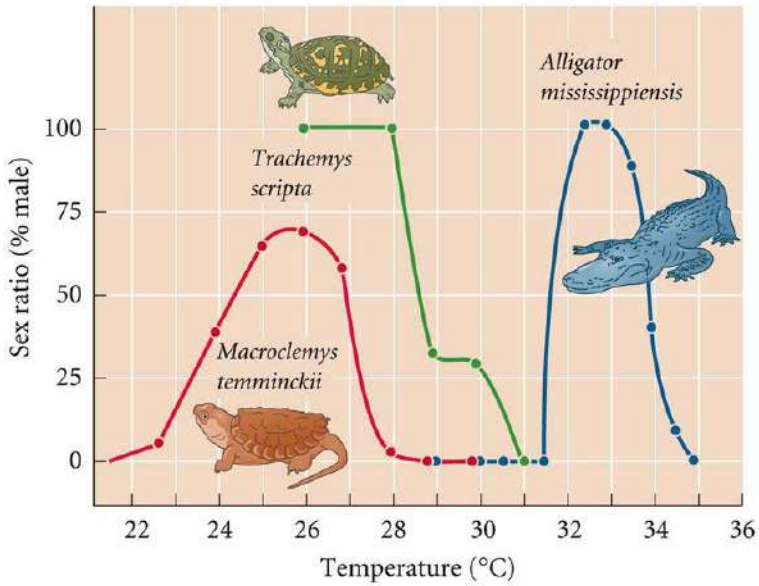
Sea Turtles

- The eggs are very leathery at the time the mother lays the eggs
- As they incubate, they become more brittle, making it easier for the hatchlings to escape the egg

Sea Turtles

- Sea turtles, like many reptiles, exhibit temperature dependent sex determination
- This means that the gender of the hatchling is not genetically predetermined

Figure 14.22 Temperature-dependent sex determination in three species of reptiles



DEVELOPMENTAL BIOLOGY, 9e, Figure 14.22

Sea Turtles

- Gender is determined by the temperature of the environment in which the egg was incubated

- For each species, there is a “pivotal” temperature that will generate 50% males and 50% females
  - temperatures higher than pivotal will produce more females, temperatures lower than pivotal will produce more males

Sea Turtles

- The leatherback is the largest of the sea turtles reaching over 6 ft and 1000 lbs

- Sea turtle diets can range from eating seas grass to eating molluscs, jellyfish, sponges, etc…

Sea Snakes

- There are 55 species of sea snakes
- These snakes are found only in the Indian and Pacific Ocean
- These snakes have a laterally flattened body with a paddle-like tail for propulsion through the water
- Most species are 3-4 feet in length as adults

Sea Snakes

- Most totally marine and lack belly scales
- Sea snakes breed at sea and most species are ovoviviparous
- A few species still return to land to lay eggs

Sea Snakes

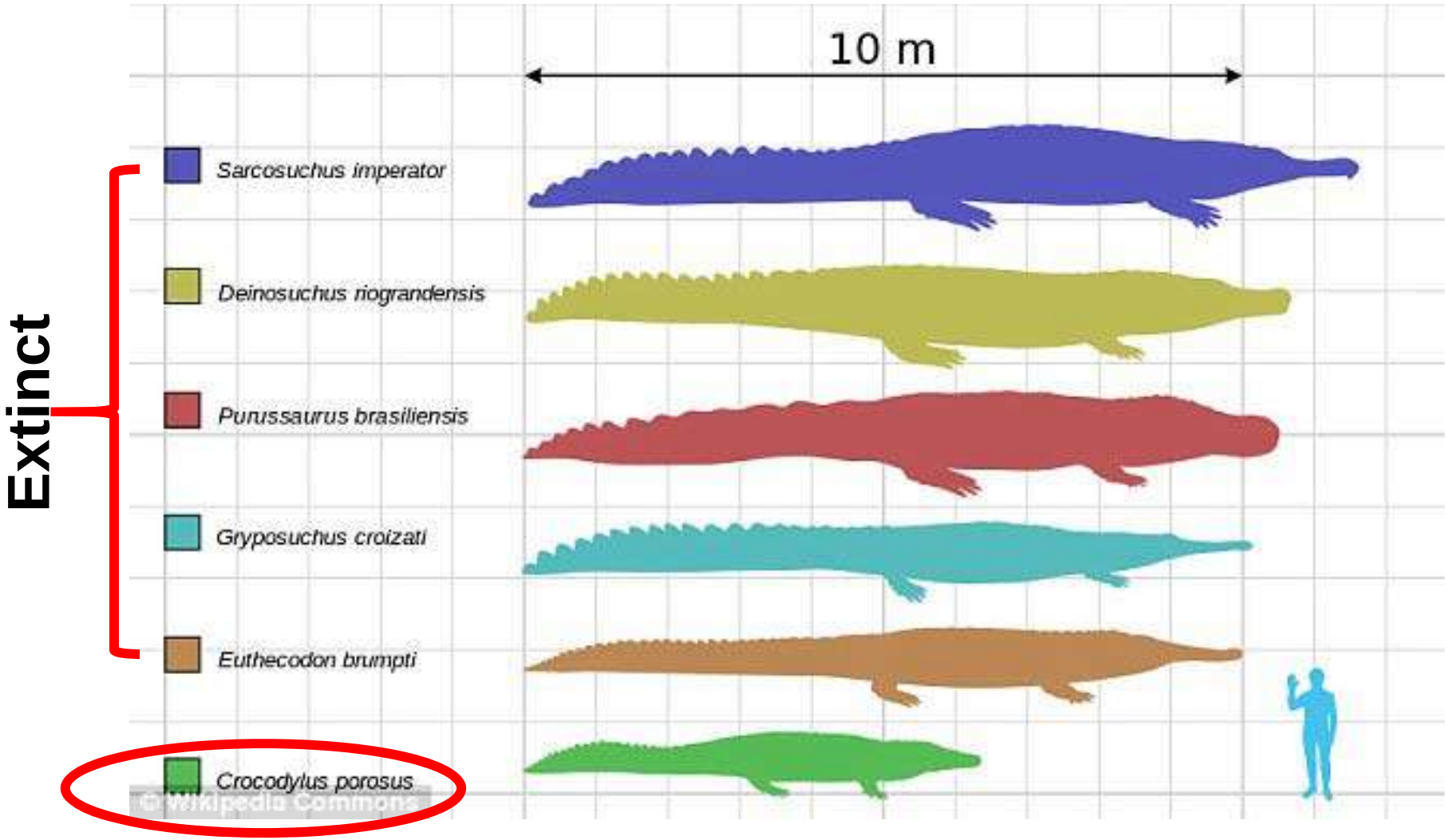
- Bites from sea snakes can be fatal for humans
  - –related to the cobra and have a powerful venom
- Fortunately, sea snakes are not known to be aggressive
- Sea snakes are carnivorous and mainly feed on fish

Saltwater Crocodile

- This species is found in Australia, the Indian Ocean and some Western Pacific Islands
- It can be found in estuaries, mangrove swamps, rivers and the open ocean

Saltwater Crocodile

- It is a predatory species that eats all types of prey items including humans
- The saltwater crocodile is a large species reaching lengths of over 30 feet (although individuals over 20 feet are rare)
- This species is not secretive like the American Crocodile, but is an aggressive hunter


Extinct
10 m
Sarcosuchus imperator
Deinosuchus riograndensis
Purussaurus brasiliensis
Gryposuchus croizati
Euthecodon brumpti
Crocodylus porosus
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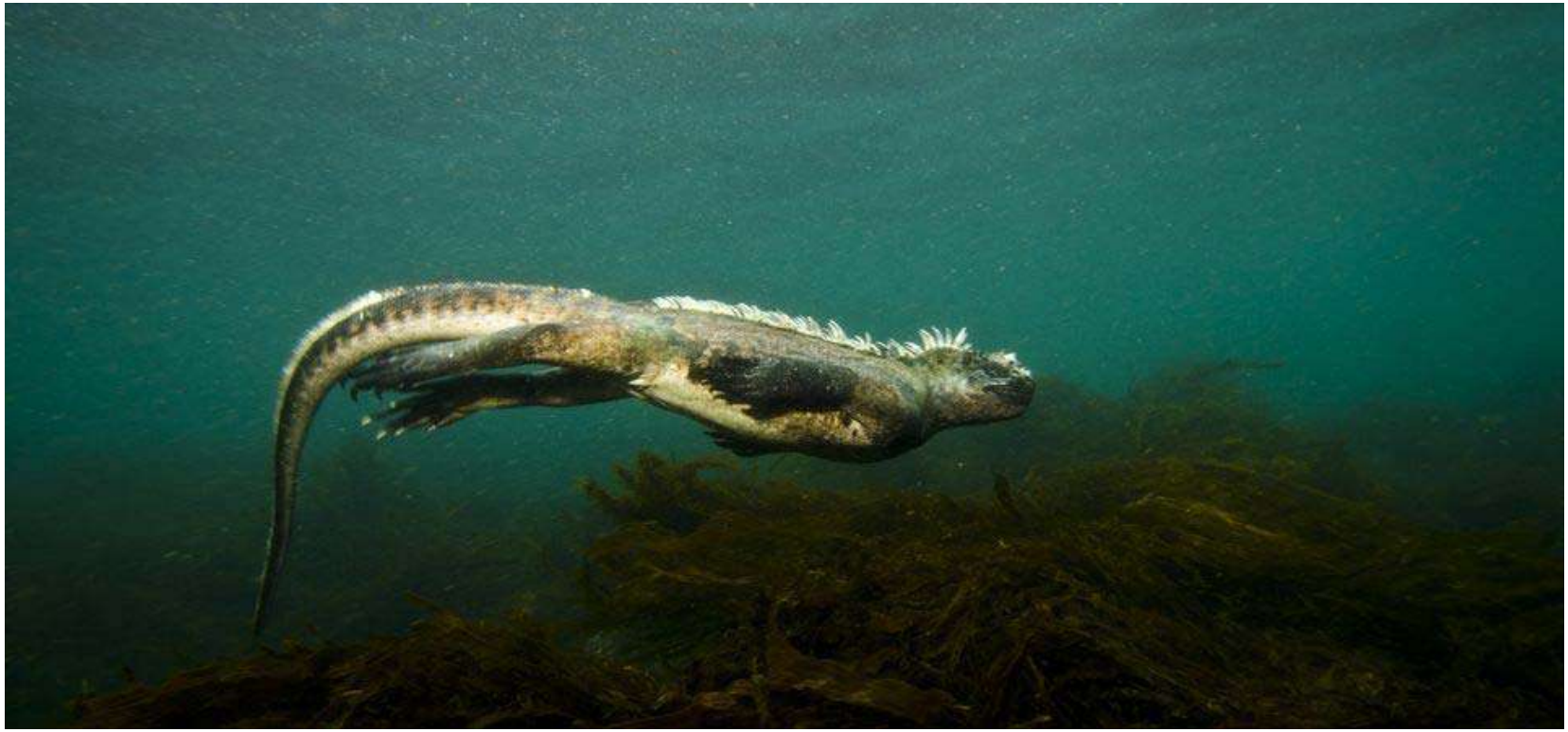
Marine Iguanas

- Marine iguanas live on the Galapagos Islands
- While they are called marine, they only spend a portion of their time in the water
- They dive to feed on seagrass near the shore



Marine Iguanas

- A large portion of their day is spent basking on the shore to warm up from their dives in the cold water surrounding the Galapagos
  - Basking is a way for maintaining constant body temperature by means of sitting in the sun