Turtles & Tortoises

I WHAT IS A TURTLE OR TORTOISE?

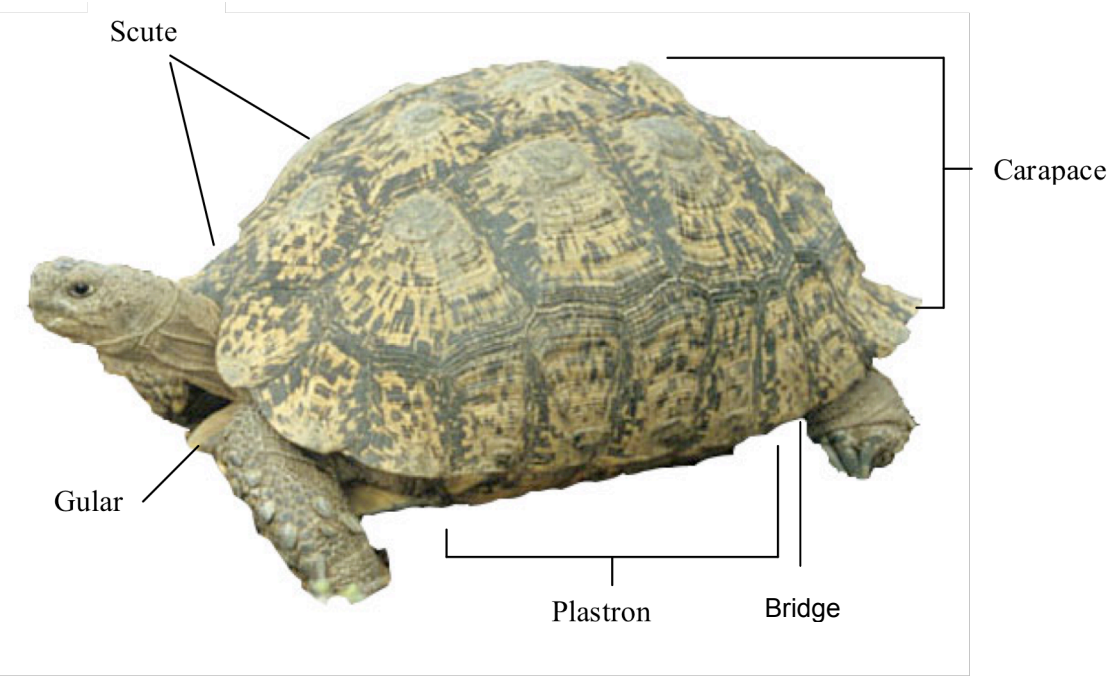
Over 200 million years ago chelonians with fully formed shells appeared in the fossil record. Unlike modern species, they had teeth and could not withdraw into their shells. Because of the weight of the shell, running, jumping, and flying chelonians were not evolutionary options. Beginning as semi-aquatic marsh dwellers, the tortoises evolved to become totally terrestrial. In order to lower energy cost for locomotion, they developed lightweight shells. Their shells also became high-vaulted so that tortoises could withdraw into them in defense against predators. Since tortoises are slow on land, they developed sharp ridges instead of teeth and became almost entirely vegetarian. At the same time, turtles became more aquatic. Bones of their shells decreased in size, making them more buoyant. They also developed lower, more streamlined shells that offered less water resistance during swimming. Turtles became toothless omnivores who waited for their prey to come to them.

Today there are approximately 250 species of turtles and tortoises.

II PHYSICAL CHARACTERISTICS

A The Shell

Comprised of 59-61 bones, a turtle shell consists of two parts: a carapace that covers the animal's back and a plastron that covers its belly. These are connected on each side by a bony bridge formed by extension at the sides of the plaston. The shell is made of an outer layer of horny shields called scutes, and an inner layer of bony plates. The true skeleton is inside this inner layer. Some of the bone, such as ribs, vertebrate, and breastbone, are fused to the inside of the shell. So unlike popular belief, turtles cannot leave their shell.



B Defense Mechanism

The shell is a chelonians only means of defense. The soft-boned young of certain species have evolved prominent epidermal spines that protrude out from the edge of the shell to discourage predators. The shells of the matamata and alligator snapping turtle are disguised with bumps and ridges giving them a non-turtle-like appearance and help them with camouflage. Soft-bodied turtles are pigmented to match their environment, providing them with camouflage. Various turtles, including box turtles, have a special hinge on the plastron allowing them to completely close their shells, which is their best defense against predators.

C Growth

Growth rates of chelonians vary considerably even within members of the same clutch. Habitat, temperature, climate, and food type are all associated with growth rate in chelonians. Generally, a species grows rapidly to sexual maturity. In later years, small species may stop growing completely but larger turtles continue to grow throughout life.

Turtles actually carry growth records with them on the scutes of their shells. Each year a growth ring depression forms on each scute, much like an annual ring on a tree trunk. Most terrestrial and semi-aquatic species do not shed their scutes, and in those species a permanent record of age accumulates. Many aquatic species regularly shed their scutes and the growth rings fade.

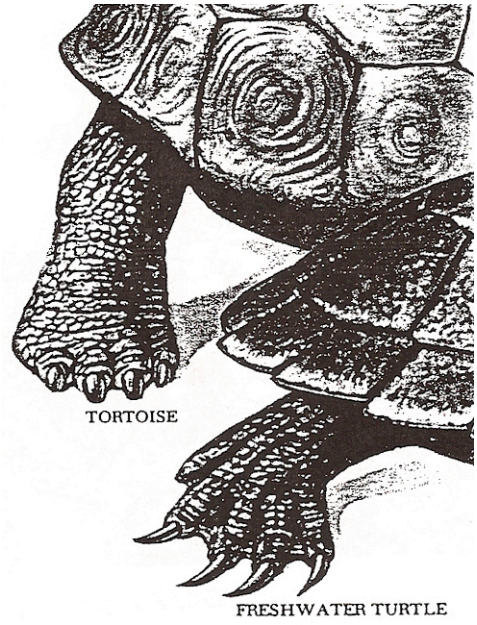
Growth rings of a tortoise

- The larges chelonian is the leatherback, which reaches up to 183 cm (72 in) in length and about 906 kg (2,000 lbs) in weight.
- Among the smallest chelonians are the speckled cape tortoise, flattened musk turtle, and the bog turtle with a maximum shell length of 12 cm (4.7 in).

C Locomotion

The limbs of a turtle are good indicators of their habitat and means of locomotion. Tortoises have elephantine feet, in which the toes are very short and lack all traces of webbing. In the burrowing desert tortoise, the front limbs are flattened and serve as digging scoops. The feet of the aquatic turtles differ by having longer toes joined together by a fleshy membranous web providing the feet with additional thrust through water. Sea Turtles and the pig-nosed soft-shell turtles are the most specialized swimmers. Their forelimbs are modified into flipper-shaped blades.

- The desert tortoise moves at speeds of 0.22-0.48 km/hr (0.13-0.3 mph).
- Charles Darwin clocked a Galapagos giant tortoise at 6.4 km (4 miles) per day.
- Sea turtles have swimming speeds in excess of 30km/hr (18.6 mph).



D Respiration

Lungs are not the only organs of respiration in turtles. Aquatic species can also breathe their skin, the lining of their throat, and through thin-walled sacks in the cloaca. The degrees to which these other methods of breathing are used vary with each species. For example in African soft-shell turtles, which lack sacks in the cloaca, 70% of the breathing is through the skin and 30% through the throat. How long a turtle can stay under water depends on the species, water temperature, and the amount of oxygen dissolved in the water. Sliders can survive submerged in water for up to 28 hours.

E Feeding Behavior

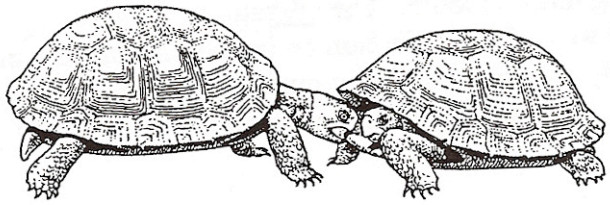
Tortoises are almost entirely herbivorous, while some turtles are omnivorous. Diets of omnivorous species often change with age. Typicallly, juveniles tend to be highly insectivorous while adults are more herbivorous and may exploit a more specialized diet, such as mollusks.

Many turtles have special strategies and techniques for obtaining food. One method is ambush, where the turtle lies in wait rather than pursuing its prey. Ambush feeders, like the snapping turtle, have long muscular necks that can strike out for prey at some distance. Another method of feeding is “gape and suck”. By quickly opening their mouth and simultaneously expanding their throat, suction is created, which can pull small food items into the waiting turtle’s mouth. The alligator snapping turtle uses a lure to attract fish. It has a small worm-like projection on its tongue that becomes bright pink with filled with blood. By moving underlying muscles, the lure can be made to wriggle. This often attracts fish and gives the snapping turtle a tasty treat.

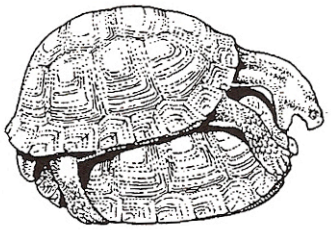
III REPRODUCTION

Sexing turtles is often difficult. Males usually have longer, thicker tails, longer nails, and the vent is further back than the females. In many aquatic species, the males are considerably smaller than the female. Males in terrestrial and semi-aquatic species tend to be as large or larger than the female. To accommodate the female's high shell during copulation, the male's plastron is often concave. Research has indicated that in the five families of chelonians, the temperature of egg incubation affects the sex ratio of hatchlings. This is similar to the American alligator where lower temperatures product females and higher temperatures produce males.

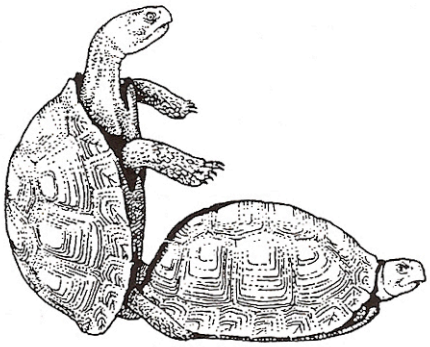
Courtshp in chelonians



A male gopher tortoise will bob his head and circle the female, then bites her on the shell and limbs.



Mating position in the eastern box turtle – male biting female's head.



Mating position in the eastern box turtle – male gripping the female's shell with his hind feet.

Courtship and breeding habits are listed on the individual fact sheets.