

General Organization of Tortoises

II Semester Zoology

Animal Diversity - Chordates
ZOO-CC-201

Dr. C. Latch

(Study materials are collected from books and internet for classroom teaching purpose only)

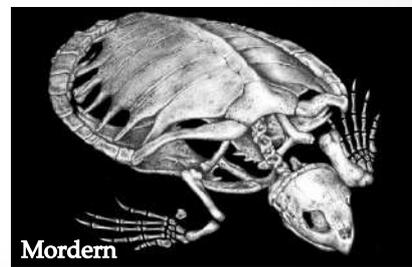
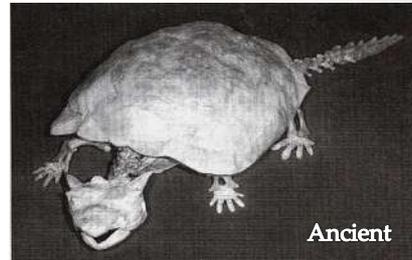
General Organization of Tortoises

- Interchangeably – Tortoise
- Turtle – Aquatic or Semi-aquatic
- Tortoise – land
- Terrapin – edible fresh water species

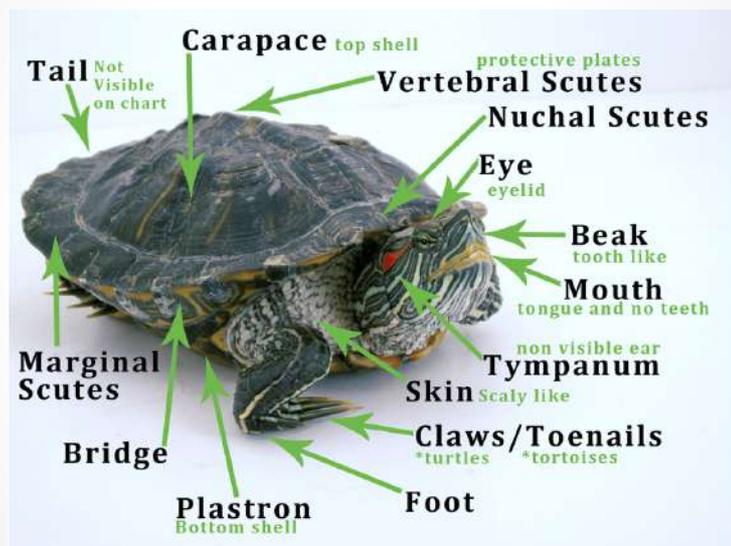


Origin – Ancient & Modern Turtles

- Ancient reptiles, evolved a successful approach to life in the Triassic period and have scarcely changed since.
- The shell, which is the key to their success, has also limited the group's diversity.
- The most distinctive turtles are an extinct group of very large terrestrial turtles with horns and frills on the head and clublike expansion on the end of the tail, the **Meiolaniidae**.
- Meiolaniids lived in South America in the Cretaceous period and Eocene epoch, and in Australia and New Caledonia from the Miocene through the Pleistocene epochs.



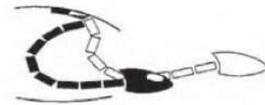
Tortoise - Morphology



Salient Features of Turtles

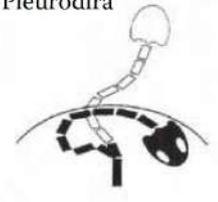
- All turtles show morphological specialization associated with terrestrial, freshwater and marine habitats.
- They are easily identified with armored shell –
Carapace
Plastron
- The limbs are heavy – required for carrying about the unusually heavy body.
- When the animal is threatened with danger – the head, neck limbs and tail are withdrawn into the shell.
- Teeth are absent in all turtle and being replaced by a horny-beak like structure.

Cryptodira



head is retracted in the vertical plane

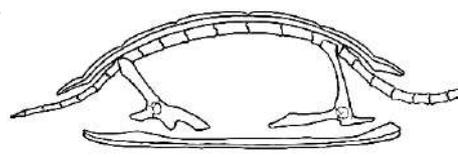
Pleurodira



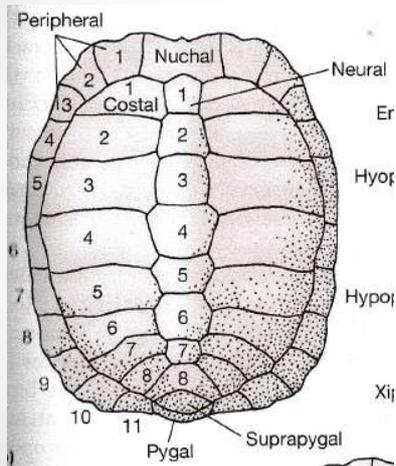
head is retracted in the horizontal plane

Turtle's Shell

- A Tortoise's protective shell is formed from the fusion of bones from the ribs and vertebrae.
- The spine and ribs are attached to the shell, so turtles can't really crawl out of their shells.
- The bones of the shell are divided into sections called SCUTES, and are covered with skin containing a protein called KERATIN.
- The carapace is composed of dermal bones that typically grows from 59 separate centers of ossification.

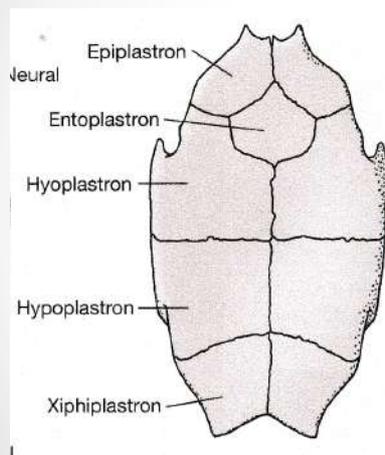


Tortoises Carapace – Dermal Bones



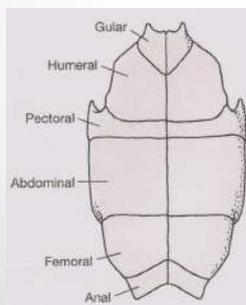
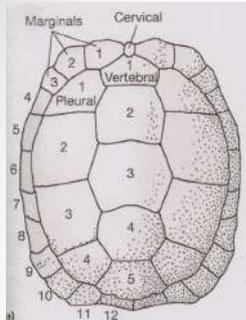
- Median row of about 8 neural plates (fused to the neural arches of the vertebrae).
- Two rows of costal plates (fused to the broadened ribs).
- The ribs of turtles are unique among tetrapods in being external to the girdle.
- A series of marginal plates (11 pairs of peripheral bones).
- In front of the first neural plate, There is a large nuchal plate.
- Behind the last neural plate, there are 1-3 pygal plate.

Plastron – Dermal Ossification



- The plastron is formed largely from dermal Ossification.
- The plastron consist of 9 bones.
- The median entoplastron – lying in front is derived from the interclavicle, the paired epiplastra anterior to it derived from the clavicles.
- Processes from the hypoplastron and hypoplastron fuse with the first and fifth pleurals, forming a rigid connection between the plastron and carapace.

Scutes



- The bones of the carapace are covered by horny scutes of epidermal origin that do not coincide in number or position with the underlying bones.
- The carapace has a row of five central scutes, bordered on each side by four lateral scutes.
- Ten to 12 marginal scutes on each side turn under the edge of the carapace.
- The plastron is covered by a series of six paired scutes.

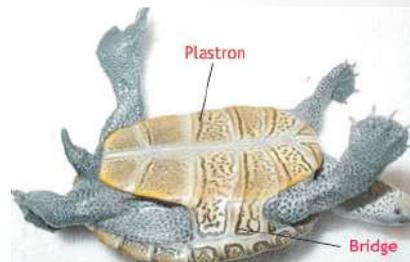
Carapace, Plastron and Bridge

Scutes have nerve endings, so turtle feel something touching its shell.

The scutes and the bone underneath can grow allowing the turtle to expand and get larger.

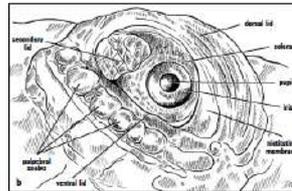
The turtles can regenerate damaged scutes, and some scutes have rings similar to growth rings on trees that can be used to estimate age.

The bridge along the sides connects the carapace to the plastron.



Other Salient Features of Turtles

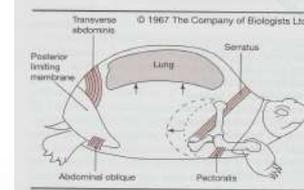
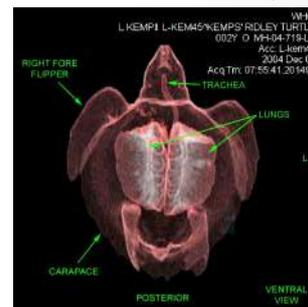
- Cloaca is present (a multipurpose cavity shared by the digestive, reproductive and excretory systems exit through a vent).
- Nictitating membrane (acts as a third eyelid to cover and protect the eyeball under water).
- The tympanic membrane is directly behind the eyes, turtles have very poor hearing.



Respiration in Turtle

- First, they employ buccal pumping, pulling air into their mouth, then pushing it into the lungs via oscillations of the floor of the throat.
- Secondly, by contracting the abdominal muscles that cover the posterior opening of the shell, the internal volume of the shell increases, drawing air into the lungs, allowing these muscles to function in much the same way as the mammalian diaphragm.

Some other species of turtles perform accessory underwater respiration through gas exchange in the cloaca and oral cavity.

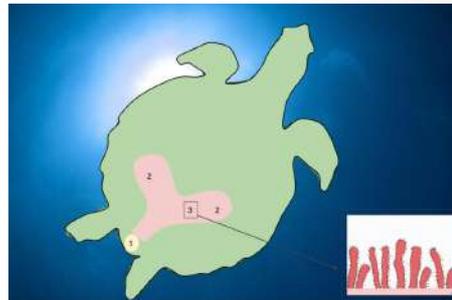


Cloacal Respiration in Turtle

The turtles pump water in and out of their pouches, which are called cloacal bursae

The cloacal bursae are the muscles in the inguinal pocket, which expand and contract.

The inner lining of the cloacal bursae, which is made of long fimbriae and is highly vascular.

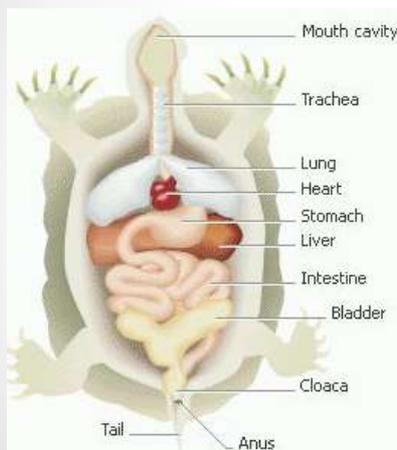


- (1) Cloacal orifice
- (2) Cloacal bursae
- (3) Location of fimbriae

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Digestive System in Turtle



- Most vertebrates have similar digestive systems and the turtle is no exception.
- Turtles are not strictly herbivores. All species are found to eat at least some meat which causes them to have powerful digestive enzymes.
- In addition turtles swallow their food with very little chewing.
- Food particles are often whole or in fairly large chunks.
- The salivary glands of the turtle help to soften and break down the food to make swallowing possible.

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Digestive System in Turtle

- **Mouth and Tongue:**

The mouth of a turtle is a cavity found inside its skull.

The tongue is flat and wide and fastened securely to the bottom of its mouth to prevent it from moving.

Air, water, food and other essential nutrients enter the turtle's body most often by way of the mouth.

- **Esophagus**

The esophagus is tubular, digestive structure that is connected to the stomach.

- **Stomach**

Powerful digestive enzymes and acids that decompose the food.

- **Liver, Gall Bladder and Pancreas**

The liver is the largest organ and has numerous functions. The gall bladder, on the other hand, is a small organ hidden behind the liver. It transfers the bile produced in the liver to the small intestine

The pancreas is a sliver like gland located next to the small intestine. It aids in the digestive process by introducing digestive enzymes into the small intestine as well.

Digestive System in Turtle

- **Small and Large Intestine**

The small intestine is connected from the stomach to the large intestine.

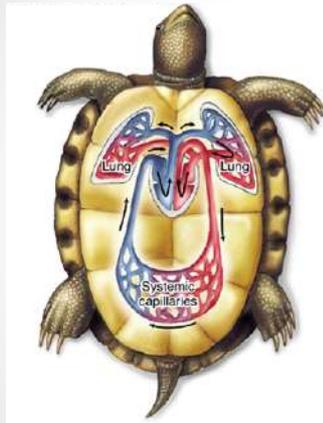
Villi (or villus singular) located on the small intestine wall absorb food into the body.

The large intestine, which is also known as the colon, reabsorbs excess waste and water produced by the digestive system.

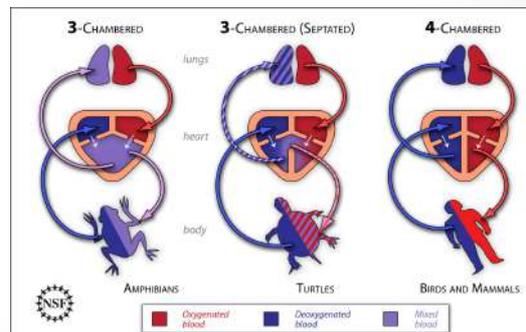
- **Anus**

The last part of the digestive system, the anus is where the feces (or wastes) exit the turtle's body.

Circulatory System in Turtle

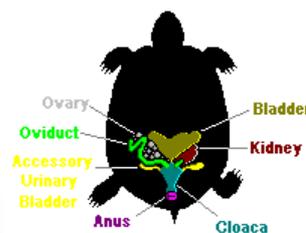
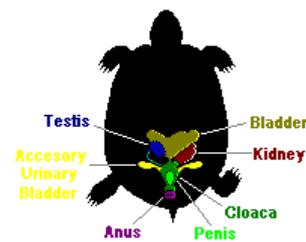


- The systemic circuit carries oxygenated blood from the heart to the head, trunk, and appendages, whereas the pulmonary circuit carries deoxygenated blood from the heart to the lungs.



Reproduction in Turtle

- During mating season, or courtship, the males of many species of turtles and tortoises try to attract females by methods that can range from head bobbing and gentle rubbing against the female to biting her legs or ramming his shell into hers.
- The male has testes, and penis.
- The female has ovaries that produce eggs, and an oviduct, a tube connecting the ovaries with the cloaca.



Reproduction in Turtle

- Most female turtles and tortoises nest by finding a spot on dry land, digging a hole, dropping the eggs inside, and burying them.
- All turtles lay eggs, and none exhibits parental care of the hatchlings.



Temperature Dependent Sex Determination in Turtle

- For most turtles and tortoises, the temperature of the nest controls whether the eggs hatch into males or females.
- A very warm nest usually produces females, and a cooler nest produces males.
- In some species, an extremely cold nest temperature produces females.
- In a few species, the nests have about equal numbers of males and females, no matter what the temperature of the nest.

Endangered Species

- Nearly all species of sea turtle are classified as Endangered.
- Slaughtered for their eggs, meat, skin and shells, sea turtles suffer from poaching and over-exploitation.
- They also face habitat destruction and accidental capture in fishing gear.
- Climate change has an impact on turtle nesting sites. It alters sand temperatures, which then affects the sex of hatchlings.

