Limulus: a Living Fossil

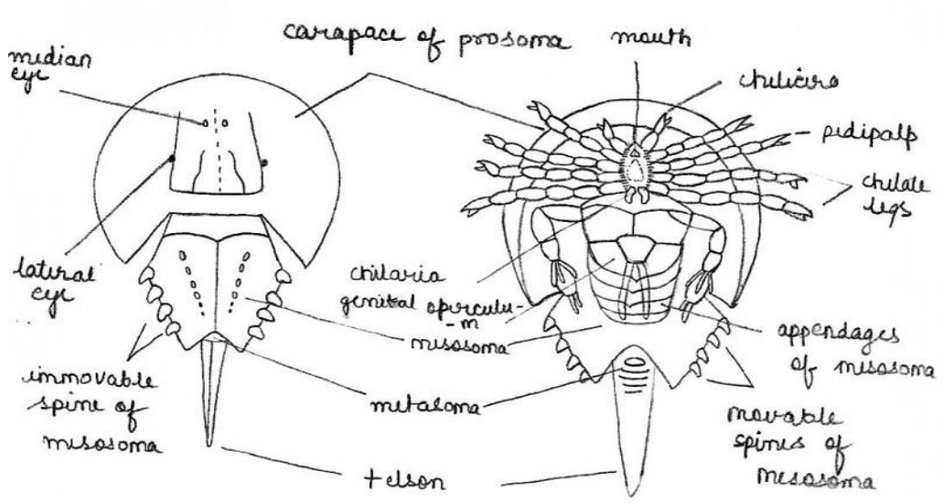
Structure & Significance

Common name- King crab.

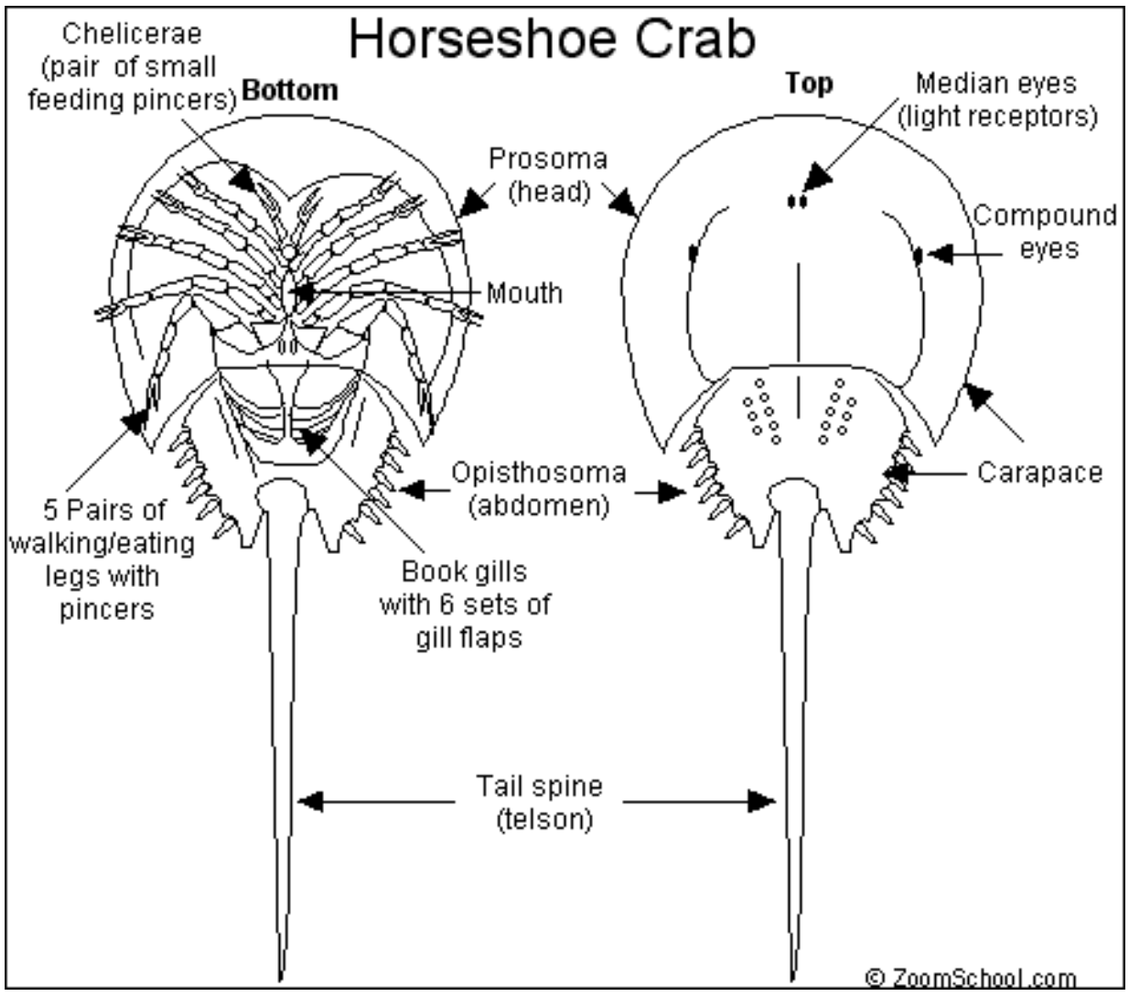
Habit and habitat- marine species, found burrowing in the sand.

IDENTIFYING CHARACTERS:-

- **Body division-** body is divided into prosoma and opisthosoma.
- **Prosoma-** anterior portion of the body, consisting of eyes and appendages.
- **Eyes-** There are two pairs of eyes in which one pair is of median eyes and other one is lateral.
- **Appendages-** There are six pairs of appendages in which first pair is of chelate chelicerae, four pairs of chelate legs and the last one of non-chelate legs.
- **Opisthosoma-** it is hexagonal in shape and is the posterior portion of the body. It is articulated with prosoma. It consists of six mesosomal segments and unsegmented metasoma (caudal spine), and six pair of appendages



Structure of Limulus



- The body of the horseshoe crab is divided into three regions: the prosoma, opisthosoma, and the telson.
- The entire body is protected by a hard shell known as a carapace.
- The horseshoe crab has two primary compound eyes and seven secondary simple eyes. Two of the secondary eyes are located on the bottom of the animal.
- The internal anatomy of the horseshoe crab is similar to that of spiders. Similar to the book lungs of spiders, horseshoe crabs possess book gills which function in gas exchange and are also used for swimming.
- The horseshoe crab has five pairs of legs for walking, swimming, and moving food into the mouth.
- The long tail, known as the telson, can be used to flip the horseshoe crab over if it is turned upside down.
- Horseshoe crabs usually swim upside down. However, they are most often on the ocean floor searching for food.

- Females are larger than males.

Affinities of Limulus:

- Limulus has certain features common with several groups of both extinct and living non-chordates but quite a number of differences have also been recorded.

Affinities with Extinct Forms with Trilobite:

Similarities:

- Cephalothorax with lateral eyes.
- Appendages biramous.
- Presence of lateral pleural spines.
- Presence of trilobite stage in the life history of Limulus.
- Certain fossils — Synxiphosura are very close to trilobites.
- In spite of above similarities, Limulus differs from trilobites in having a telson, in the structure of genital operculum, abdominal appendages, and in the absence of antennae. Cephalothorax of trilobites is distinctly flattened.

With Eurypterida (fossil Merostomata):

Similarities:

- Three similar body segments—prosoma, mesosoma and metasoma.
- Similar cephalothoracic appendages and telson.
- Structures of median and lateral eyes similar.
- Although Limulus bears above mentioned similarities with Eurypterida, the dissimilarities are no less striking and rule cut the possibility of any close relationship. In fact, the Eurypterida exhibit a much closer relation with the modern Chelicerata (scorpions).

With Hemiaspidae (fossil Crustacea):

- Construction of carapace and telson similar.
- Lateral compound eyes present in both.
- Trilobite larva of Limulus resembles some Hemiaspidae after first moult. Many workers believe that the affinities are merely superficial.

Affinities with living forms:

With crustacean:

Similarities:

- Aquatic habits and similarity in appearance.
- Appendages (especially abdominal) biramous.

- Simple median and less complicated lateral eyes.
- Presence of endosternite.

Dissimilarities:

- Book-gills have no parallel structure in Crustacea.
- Antennae absent in Limulus.
- Absence of Nauplius larval stage in Limulus.

With Arachnida:

Similarities

- Presence of a broad carapace.
- Number and arrangement of cephalothoracic appendages.
- Caudal spine of Limulus resembles the post-abdominal part of scorpion.
- Structure of genital operculum.
- Presence of median eyes.
- Presence of endostennite.
- Pharynx suctorial and symmetrical digestive glands.
- Presence of coxal glands.

Dissimilarities:

- Respiratory structures—book-gills and book-lungs are different.
- Malpighian tubules absent in Limulus.
- Attempts have been made to establish affinities of this archaic creature with other forms including chordates. Gaskell (1908) tried to establish its affinities with ammocoete larva of Petromyzon, largely based on the structure of dermal skeleton, median and lateral eyes, gills and endosternum.
- But these similarities are only superficial. Patten (1912) attempted to establish affinity with ostracoderms (fossil armoured agnathans), but this gained a little support.
- It appears that Limulus has much closer relationship with Arachnid and extinct Eurypterida than to any other arthropods. Formerly it was placed under the class Arachnida but Manton (1970) and others have assigned a separate class Merostomata for it along with eurypterids, and hold that Arthropoda is polyphyletic.