

Aquatic mammals & their adaptation

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Aquatic Mammals

- Mammals are primarily terrestrial animals, but some of them have wonderfully adapted their secondary aquatic life.
- So based on the relation to water and the aquatic adaptations, mammals are classified in to two group:
 1. **Entirely/Completely aquatic mammals**
 2. **Semi-aquatic or amphibious mammals**
- They either live in fresh water or salt water.

1. Entirely/Completely aquatic mammals:

Aquatic mammals include species that live their entire life in the water and depend on it for survival, such as **whales, dolphins or manatees etc.** They never come to land and are completely reside in water.

2. Semi-aquatic or amphibious mammals:

- There are some mammals reside their life in both terrestrial and aquatic environments called **semi-aquatic animals/Amphibious mammals**, like **seals, otters, and hippopotamuses etc.**
- The **semi-aquatic mammals** spend the majority of their time in the water (for food and shelter), but need to return to the land for important activities such as mating, breeding and molting.

Adaptation and Modification in aquatic mammals

Completely aquatic mammals

Group	Example
Cetacea	Whales , dolphins , porpoises
Sirenia	Dugongs , manatees

Note# A great disadvantage of all aquatic mammals is retention of the lung breathing habit

Cetacea (Whale like mammals)

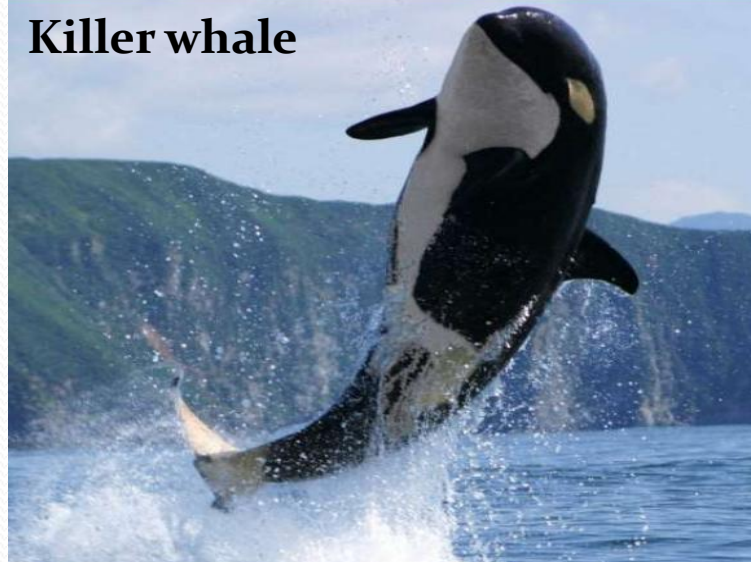
Baleen whale



Blue whale



Killer whale



Sperm whale



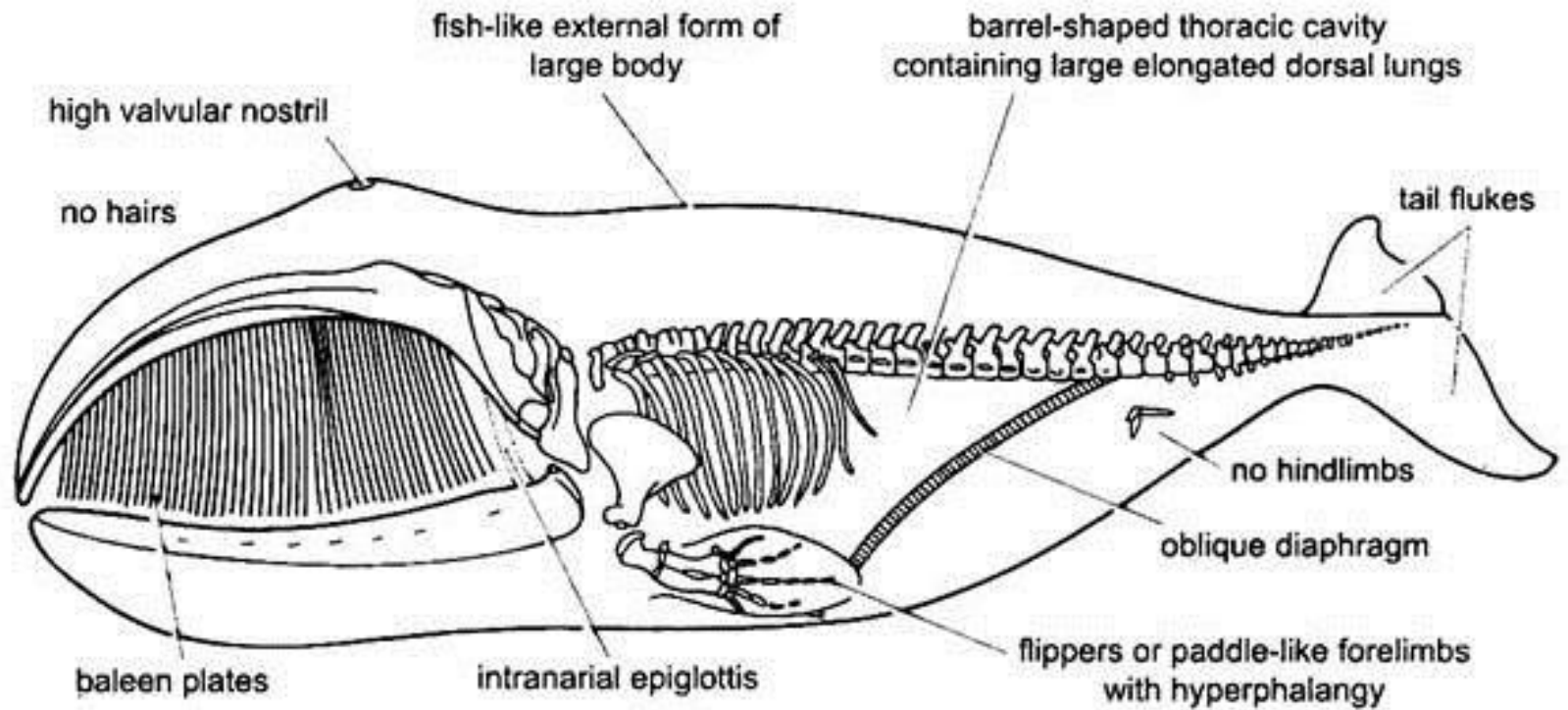


Fig. Body outline structure of the Whale.

Dolphins

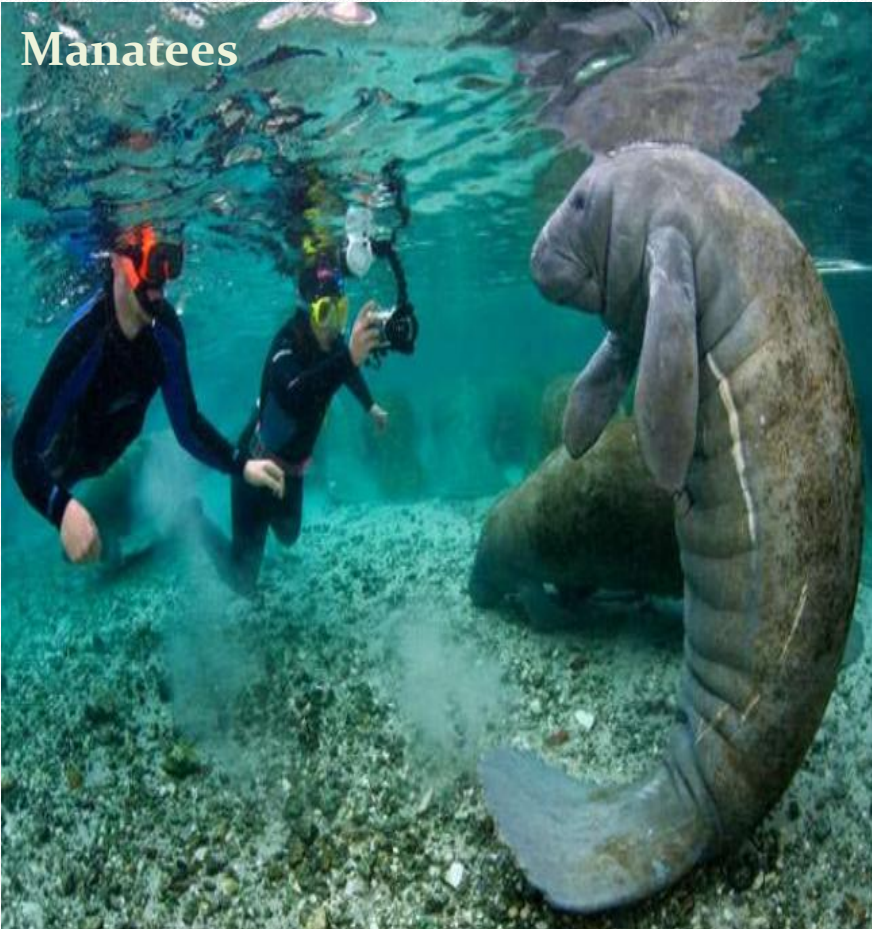


Porpoises

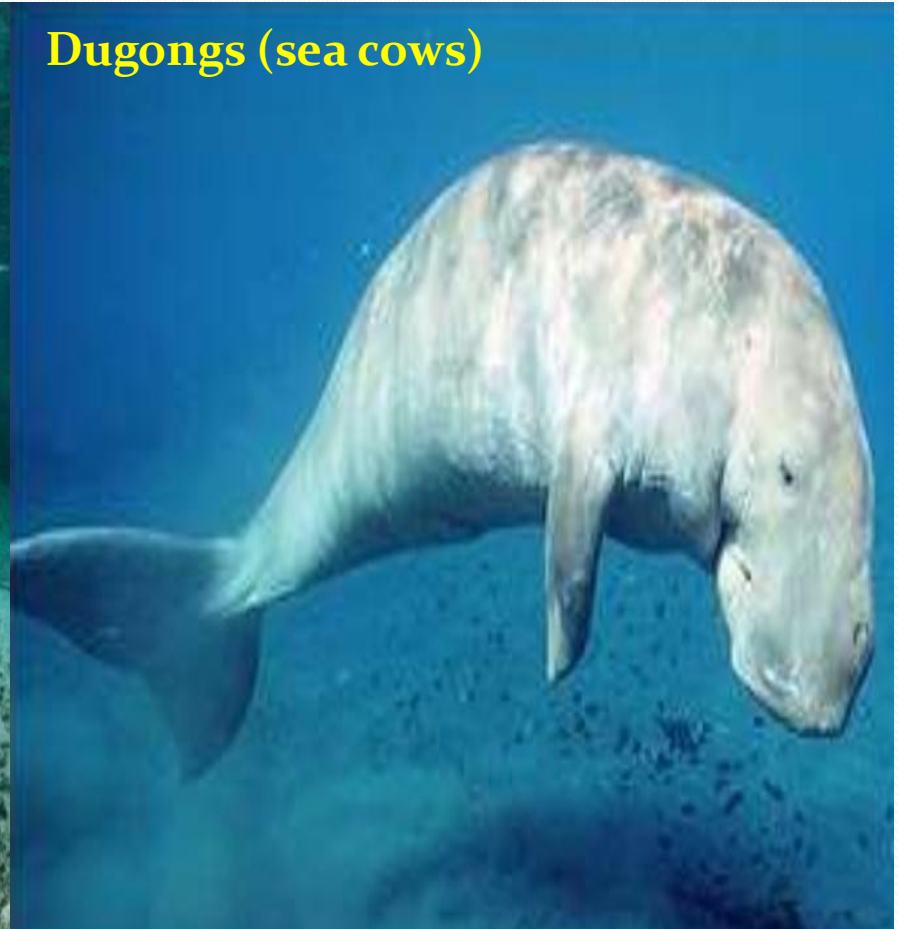


Sirenia(aquatic herbivorous mammals)

Manatees

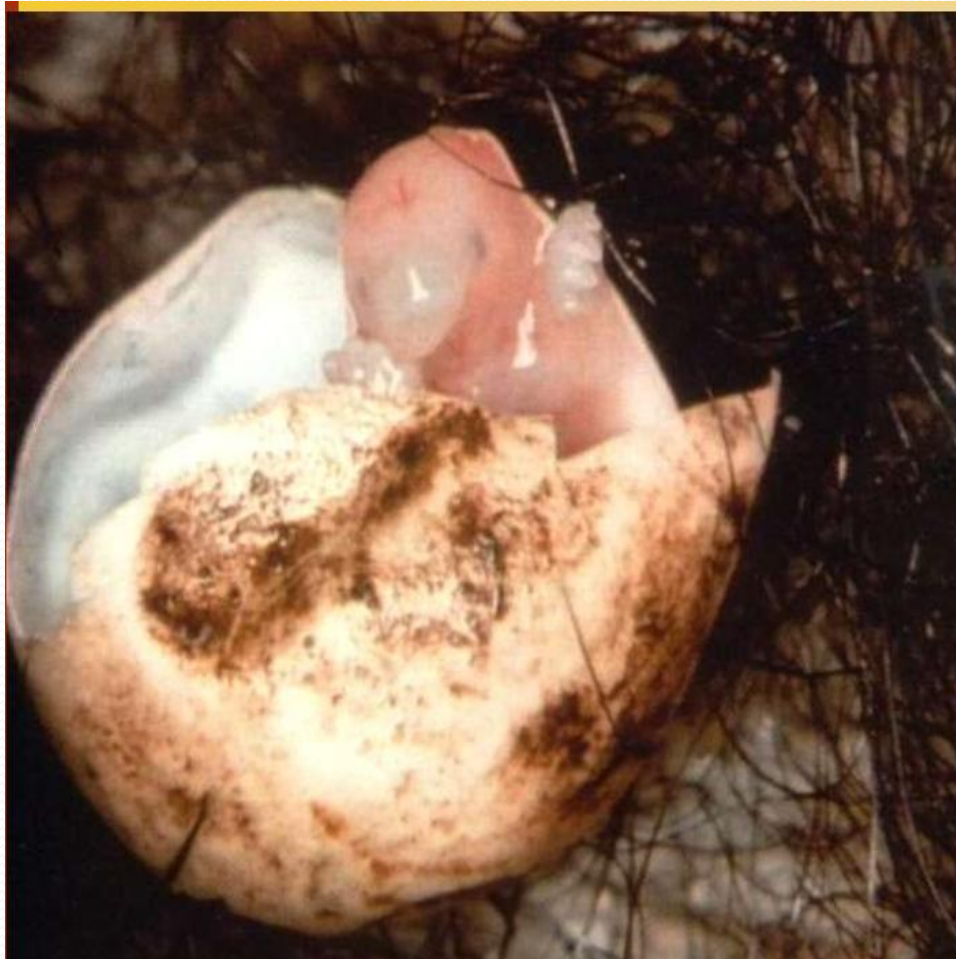


Dugongs (sea cows)



Semi-aquatic or amphibious mammals

Group	Example
Monotremata	Ornithorhynchus (Platypus)
Marsupialia	Chironectes
Artiodactyla	Hippopotamus
Pinnipidia	Walruses ,otters, seals , sea lions
Rodentia	Beavers , Musk rats



Monotremata (Egg laying mammals Ornithorhynchus): , They also referred as duck-billed platypus, important features are pectoral girdles made of five bones, splayed legs and rudimentary ribs on the neck vertebrae. Both male and female platypuses are born with ankle spurs, only the male's spurs deliver venom.



Chironectes (Marsupialia): It is the only living member of its genus.



Beavers (Rodentia): Long incisors that grow continuously.

Important Aquatic adaptations

Modification in Original structure	Characteristics
Body shape	Elongated skull, tapering and stream lined body help in swimming, reduced projecting structure like hind limb, pinnae, scrotum etc.
Integumentary modification	Mainly loss of hair, skin glands & the formation of blubber (fatty layer of adipose tissue, beneath the epidermis –thick coat), that maintained constant temperature and prevent heat loss. Hair around the mouth (except white whales)
Locomotor adaptation	Origin of flipper (swimming paddles), Forelimbs are modified into skin covered un jointed flipper , Formation of dorsal fin, tail flukes in cetaceans Hyperdactyly and hyperphalangy (development of extra fingers & extra phalanges)
Respiratory modifications	The nose opening is move to the dorsal side of the head that help animal to inhale atmospheric air ,without raising head, Nostrils are valvular (closed during under water stay), Epiglottis has become tubular, elongated .

Contⁿ..

Mammary gland	In lactation the mammary duct dilates and acts as storage of milk which is pumped directly into the mouth of the young.
Skeleton Modification	Endoskeleton is lighter by the presence of oil inside bones, Modification of skull bone, Cervical vertebrae are fused (neck region reduced).
Large lungs	Highly elastic & non lobular with high storage capacity, this allow the animal to stay under water for a longer period, High concentration of myoglobin in muscles that help to store oxygen.
Teeth	Teeth are simple, dentition is homodont and monophyodont, In baleen whales teeth are present only embryo.
Digestive System	Mastication is absent in aquatic animal oral cavity, Salivary glands are very much reduced, stomach having chambered & specialized for crushing and digesting the food.

Important points

- All kind of **skin gland** including (Lacrimal) are absent and skin is devoid of muscle and nerve
- They have **foam** like substance made up of fat mucus and gas in the middle ear which improve their hearing under water.
- **Melon:** It is a receptor organ present in front of nostril which detect pressure change in water.
- **Baleen:** In some whale the upper jaw develop rows of numerous triangular horny plate called baleen, serve as effective sieve to capture plankton.
- **Harderian gland** – This gland secrete a fatty substance which protect the eye under water.
- **Nictitating membrane** of eye is absent.



References:

- Jordan, E.L. and Verma , P.S., Chordate Zoology, S. Chand and Company Ltd, 1998.
- <http://www.notesonzoology.com/mammals/aquatic-mammals-and-adaptations-chordata-zoology/8523>.



Thank You