

CHAPTER 09

Adaptations in Different Ecosystem

Adaptations in Aquatic Ecosystems:

Aquatic ecosystems are mainly classified into two.

- Fresh water ecosystem comprising of Ponds, Lakes, Rivers etc.
- Marine ecosystems comprising of Seas, Oceans.

Different factors like light, salt content, food, oxygen affect the organisms and their populations in different ways. Animals that live in water have suitable characters adopted to live in water. They can be streamlined body scales for protection.

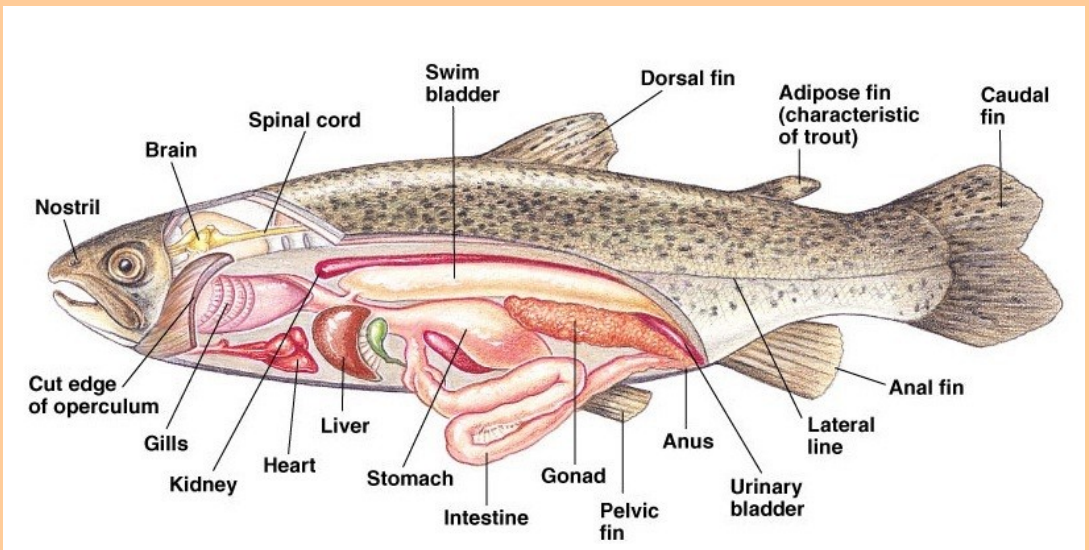
Gills for respiration

Fins for locomotion

The living conditions in marine and fresh water ecosystem are different .hence we come across various adaptations in several organisms living in these ecosystems.

Structural adaptation:

Aquatic species have the presence of special air spaces inside bodies or presence of such structures that help organisms to swim and float in water to inhabit different levels in the water body.



Some animals bear specialized structures on its body that helps to swim.

E.g., Flippers seen in Turtles and fins found in fishes.



Fishes and Dolphins have floaters, which is a (special structures of their digestive canals).

It enables them to inhabit particular levels in the water body.

Microscopic photosynthetic organisms like phytoplanktons have droplets of oil in their cells that keeps them float.



Larger plants have long broader leaves and flexible stems to keep the floating. The stem is not

damaged by strong water current because of its flexible nature.



Marine Ecosystem:

Over the last 2,000 million years, plant and animal life on earth has continuously evolved from its simple beginnings in the oceans to the complex existence on land today.



The protoplasm of cell strongly resembles seawater.

Although some animals emerged from the sea millions of years ago to fill all available places on land, some remained in the ocean, evolved, and adapted to

life beneath the surface.

Ocean, the largest part of the earth, remains a little understood place as scientists have limited scope for the study of habitats that lack physical boundaries and a span of thousands of miles.



Each form of marine life has become adapted to a specific area with a relatively narrow variation in salinity, temperature, and light.

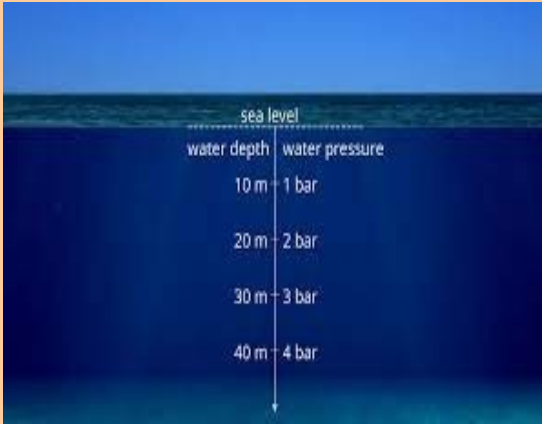


The high salt content found in the ocean can support the large bodies of Giant Squids and Whales, which has allowed them to evolve without the use of strong limbs for support.

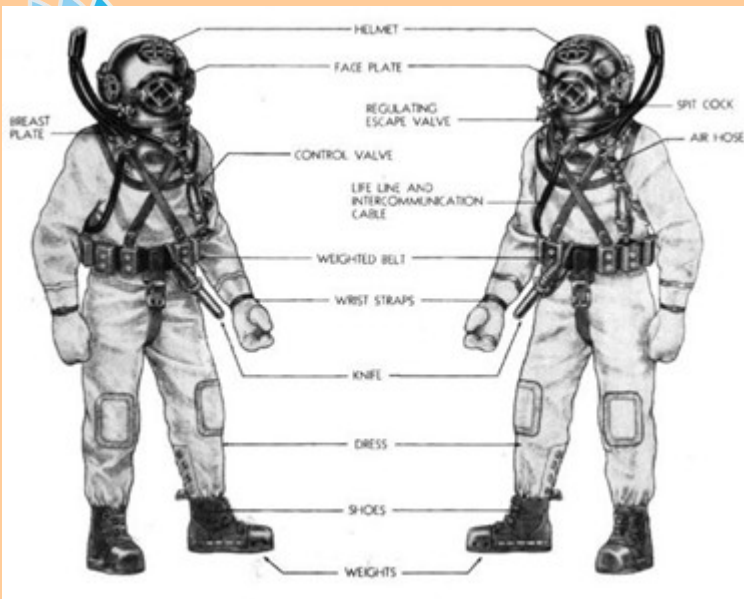
Nevertheless, salt water exerts enormous pressure on the air spaces of marine animals at depth; fluids like blood are practically incompressible.

For every 10 meters, pressure increases by one atmosphere.

Meaning pressure increases with depth. Similarly, temperature is directly proportional with depth.



This limits our study of ocean depths significantly unless we use diving craft specifically designed to maintain one atmosphere.



Secret of swimming:

Swimming is the fundamental characteristic feature of most aquatic animals.

Their bodies have certain adaptation to fight with enormous pressure of underwater current.

Yet, all sorts of other organisms thrive at high pressure.

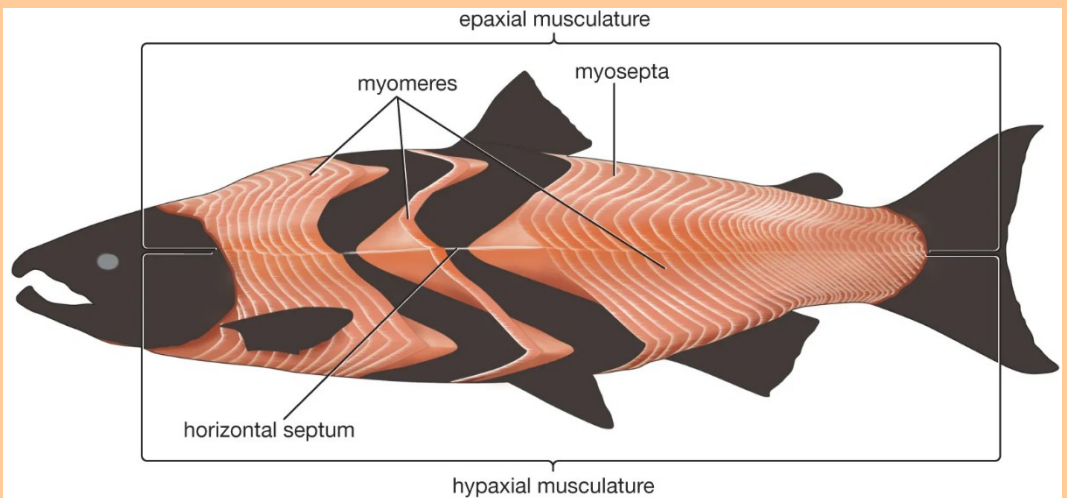
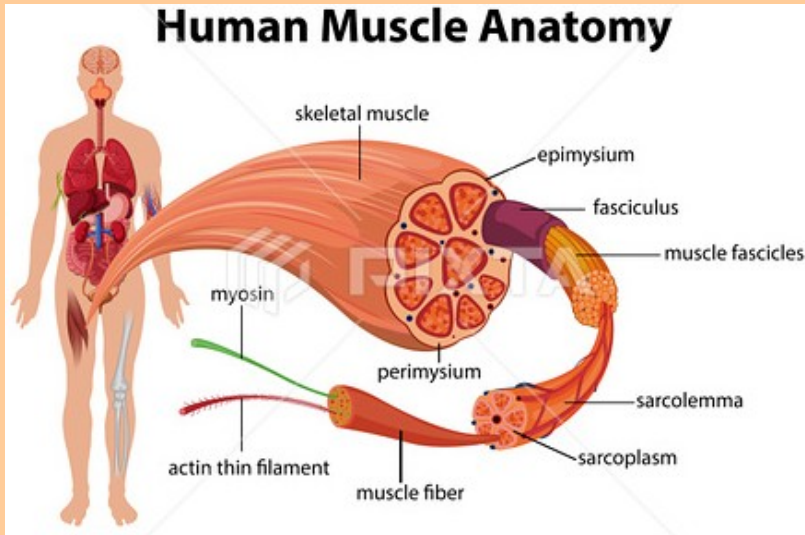
Some of the aquatic animals are air-breathing surface dwellers like us.

Mammals like, Seals can dive up to a mile and some whales can go much deeper than that. All these animals seem to share the same secret: instead of fighting the pressure, they let it shrinks their lungs completely.

Some oxygen remains in their lungs, but they mostly store oxygen in their muscles, where it is needed.

- What is the difference between their muscle and our muscle?

Their muscle tissue contains much higher concentrations of oxygen-binding chemical than our muscles.

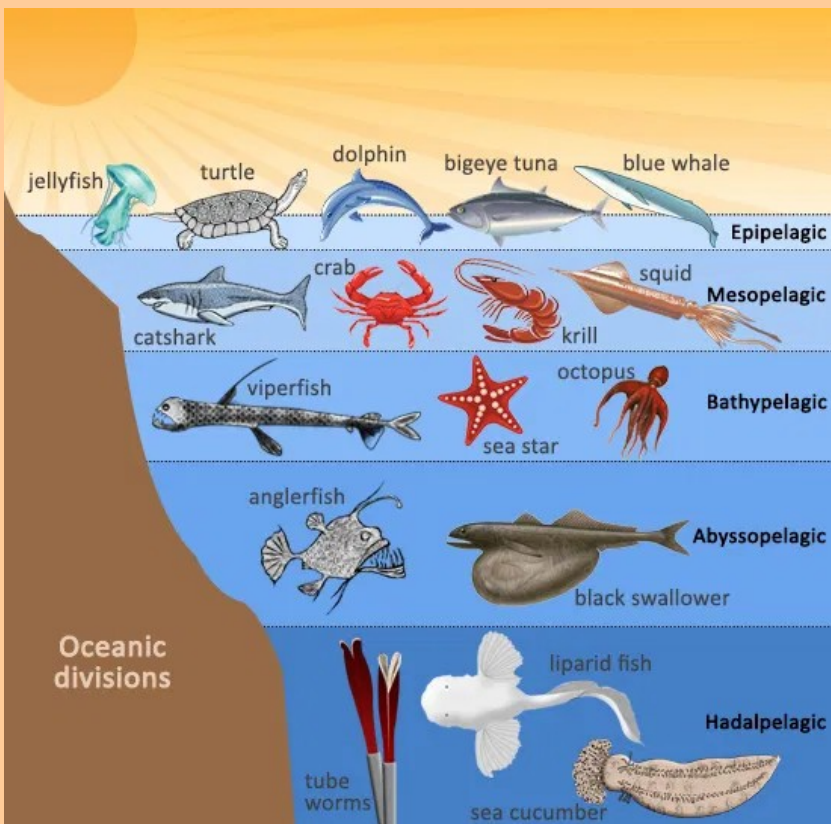


These aquatic animals sometimes need to dive down and come back up and this can be an energy-depleting process if they flap their flippers all the way round. Let us see how these animals tackle this problem.

Once a seal's lungs have shrunk, it becomes heavier than water, and so it sinks. Thus, it doesn't have to flap flippers all the way down; it reaches great

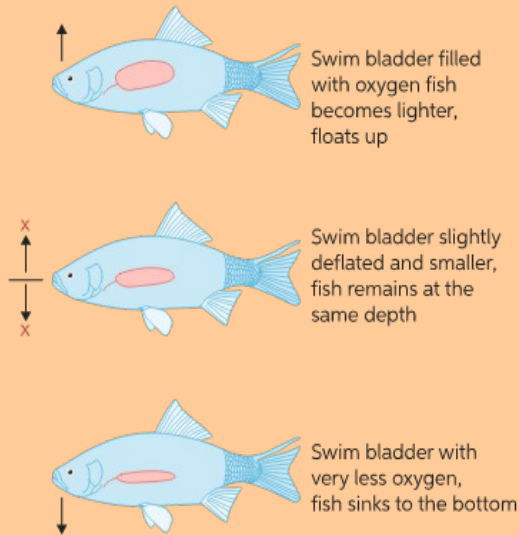
depths mostly by gliding effortlessly, saving its oxygen stores, for the strenuous climb back to the surface.

The deep seafloor itself, well beyond the range of diving mammals, is inhabited by an incredible diversity of animals.



Some of the like whale and seal have lung-like swim bladders to control their buoyancy.

With the help of swim bladder, they move up in the water column by releasing gas into the bladder and inflating it and down by reabsorbing gas into their blood.



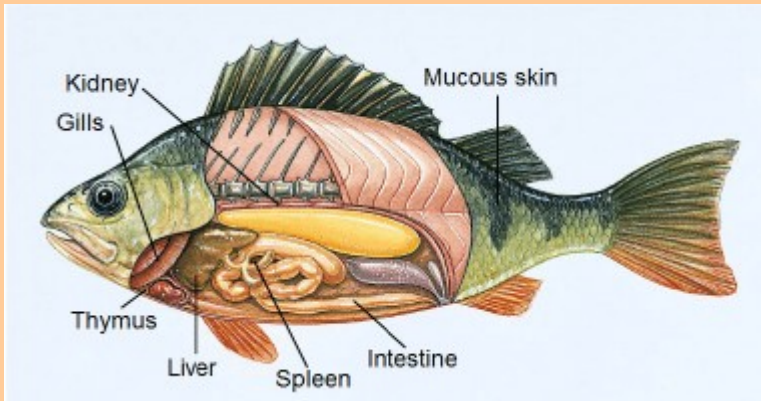
Researchers have observed that such fishes hang motionless a few feet above the seafloor.

A swim bladder does not shrink at depth because the gas inside is at the same pressure as the water outside, which means that if external pressure suddenly decreases, the bladder will swell greatly. When such a fish is brought up from depth, its swim bladder sticks out of its mouth.



Marine animals must regulate the interaction of freshwater and saltwater in their bodies.

For this, they have specially developed kidneys, gills, and body functions help to maintain salt concentrations across membranes through osmosis.



Marine animals must be able to take dissolved gases like oxygen from the water needed to release the energy from food.

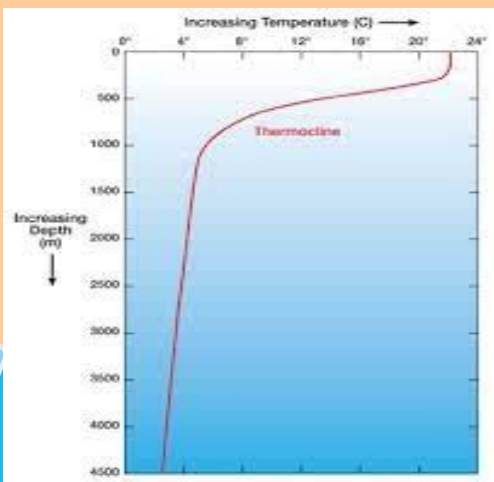
Animals, such as Anemones or worms, take the gases through their skin.

Mobile animals use gills, or even lungs to take oxygen from the water and air.

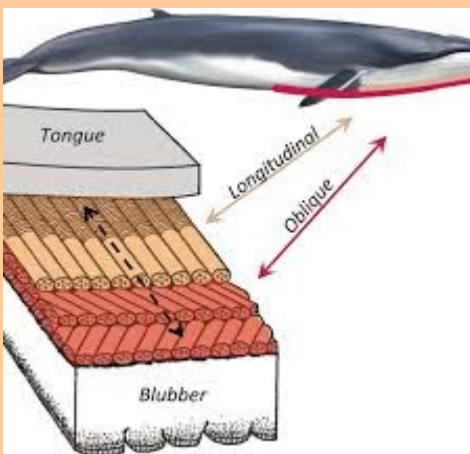


All animals in the ocean release carbon dioxide into the water as waste, which is then used by plants to produce energy.

The temperature at the surface and seafloor is not the same. Let us look at the ways how they adapt to these variations in temperature.



- **Presence of blubber**, it provides insulation from the cold.



- **Presence of antifreeze**, like substance in their

blood .it helps to keep blood flowing.

It is interesting to study the dramatically different adaptations in marine life on a vertical scale in the water. Animals and plants living in surface waters have access to

- High nutrient levels, increased temperatures
- Reduced pressure and
- More light and therefore lack the adaptations of deep-sea creatures that survives in high pressure, cold, dark waters with scarce nutrients.

Marine life has adapted to an incredible variety of conditions and habitats.

Barnacles and Mussels have developed mechanisms that allow them to cling to rocks so that they are not washed out by strong waves.





Brightly coloured Clownfish have adapted symbiotic relationships with Anemones to protect both the Clownfish and the Anemone from predators.

Some whales and herring gulls have adapted the ability to travel long distances and the ability to survive in a variety of environments.

Marine adaptations also include,

- Symbiosis
- Camouflage
- Defensive behavior
- Reproductive strategies
- Contact

- Communication like most other ecosystems on earth and adaptations to environmental conditions like pressure, temperature, light and salinity.

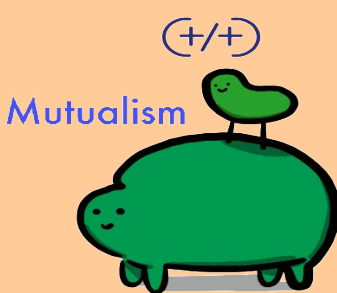
Symbiosis:

Symbiosis is the close relationship between two organisms, usually two different species. There are five types of symbiotic relationship.

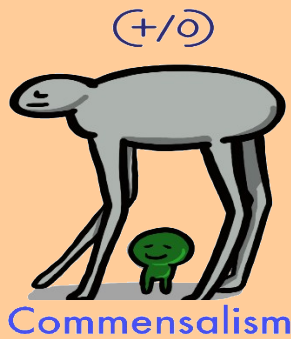
- Mutualism
- Commensalism
- Predation
- Parasitism
- Competition

Brainbox
learn easy

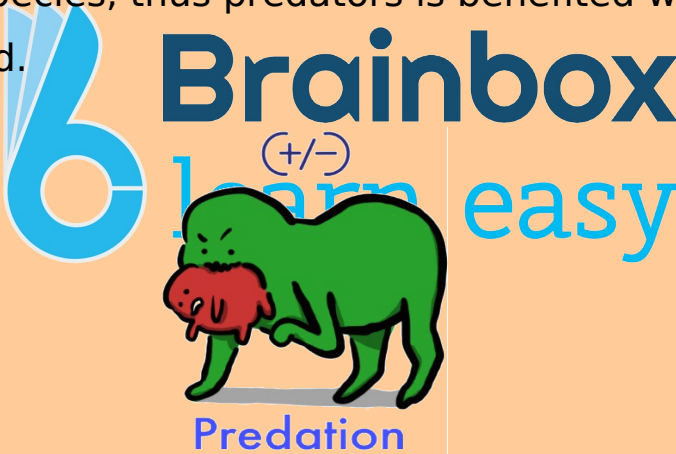
Mutualism, in a mutualistic relationship, both species benefit. In the case of sea anemone and clown fish, the anemone provides the clownfish with protection and shelter, while the clownfish provides the anemone nutrients in the form of waste.



Commensalism, happens when one species lives with, on or in another species, known as the host. The host species neither benefits nor is harmed by the relationship



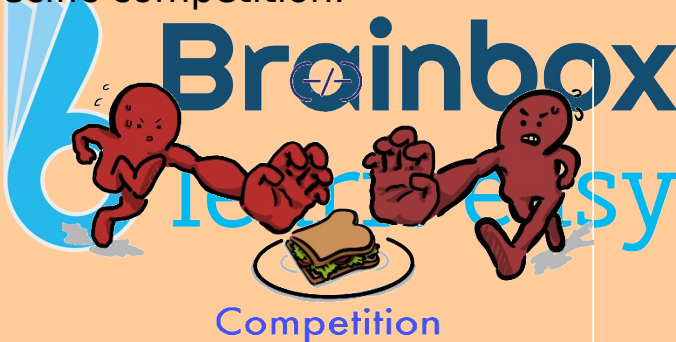
Predation, the predator species, hunts and kills the prey species, thus predators is benefited while prey is harmed.



Parasitism, in parasitism also one species is benefited while other species is harmed. This happens when the parasite species, lives with, on or in a host species, at the expense of the host species without killing it.



Competition, here the species compete for the same resource, thus both species are harmed. It is of two types when competition happens between members of the same species, its called intraspecific competition, and the one between different species, known as interspecific competition.



Camouflage:

This is also called cryptic coloration. You might have seen in movies that military soldiers often wear clothes that blends with the environment so that enemies cannot easily spot them. This is camouflaging.



It is a defense mechanism that organisms use to disguise their appearance, usually to blend in with their surroundings and protect them from predators.

Examples are satanic leaf tailed gecko. In first look, you might ignore it by thinking it as dried leaves. But it's actually an animal. Chameleon, which we often see around us.

