



# Aquatic Ecosystems

## Aquatic ecosystems

- Pond Ecosystem
- River Ecosystem
- Ocean Ecosystem



## Aquatic Ecosystems

- The types of organisms that live in an aquatic ecosystem is determined by the water's salinity
- Salinity is the amount of dissolved salts the water contains.
- Freshwater=  $< 0.5$  ppt
- Saltwater=  $> 10$  ppt
- Aquatic Ecosystems are divided into Freshwater and Saltwater or Marine



# Aquatic Ecosystems

- Freshwater Ecosystems
  - Lakes, Rivers and Streams
- Saltwater or Marine Ecosystems
  - Oceans & Lagoons
- Freshwater ecosystems are further of standing type (lentic) like ponds and lakes or free-flowing type (lotic), like rivers.



# Characteristics of Aquatic Ecosystems

Aquatic Ecosystems are characterized by

- Temperature
- Sunlight Depth
- Oxygen Concentration
- Available Nutrients
- Aquatic Organisms are grouped by their location at water depths and adaptations
- Plankton-Surface, provide most of food, producers
- Zooplankton-microscopic animals
- Phytoplankton-microscopic plants
- Nekton-Free swimming organisms



## Pond Ecosystem

Pond is a freshwater aquatic ecosystem where water is stagnant (lentic ecosystem) . It receives enough water during rainy season. It contains several types of algae, aquatic plants, insects, fish and birds.

- Stagnant freshwater body
- Ponds get polluted easily due to limited amount of water



## Pond Ecosystem

- Producers are of following type
  - Macrophytes: large rooted plants which may be partly or completely submerged e.g. : Hydrilla, Trapa, Typha.
  - Phytoplankton: minute floating or submerged lower plants e.g.: algae.
  - Consumers: They are aquatic animals which depend on the food manufactured by producers.



## Pond Ecosystem

- Primary Consumers:
  - Benthos: These are animals associated with living plants , detritivores and some other microorganisms
  - Zooplanktons: These are chiefly rotifers, protozoans, they feed on phytoplankton
- Secondary Consumers: They are the Carnivores which feed on herbivores, these are chiefly insect and fish, most insects & water beetles, they feed on zooplanktons.
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## Pond Ecosystem

- Tertiary Consumers: These are some large fish as game fish, turtles, which feed on small fish and thus become tertiary consumers.
- Decomposers: They are also known as micro-consumers. They decompose dead organic matter of both producers and animal to simple form. Thus they play an important role in the return of minerals again to the pond ecosystem, they are chiefly bacteria, & fungi.



## Functions of Pond Ecosystem

- Recycle nutrients
- Purify water
- Recharge ground water
- Provide habitats for wildlife
- Attenuate floods
- Used for human recreation



## How Nutrients Affect Pond Ecosystem

- A pond that has large amounts of plant growth due to nutrients is known as a eutrophic lake.
- Ponds naturally become eutrophic over a long period of time.
- Eutrophication can be accelerated by runoff, such as rain, that can carry sewage, fertilizers, or animal wastes from land into bodies of water.



# Pond Ecosystem





# Pond Ecosystem





# Pond Ecosystem





# Pond Ecosystem





## River Ecosystem

- Rivers are streams that flow downward from mountain highlands and flowing through the plains fall into the sea. So the river ecosystems show a series of different conditions.
- Streams, tributaries, brooks, creeks and springs are the different types of water courses classified based on their dimension and distribution.
- Rivers are freshwater aquatic ecosystems where water current is a major controlling factor, oxygen and nutrient in the water is more uniform and land-water exchange is more extensive.
- Although stream organisms have to face more extremes of temperature and action of currents as compared to pond or lake organisms, but they do not have to face oxygen deficiency under natural conditions.



## River Ecosystem

- This is because the streams are shallow, have a large surface exposed to air and constant motion which churns the water and provides abundant oxygen. Their dissolved oxygen level is higher than that of ponds even though the green plants are much less in number. The stream animals usually have a narrow range of tolerance to oxygen. That is the reason why they are very susceptible to any organic pollution which depletes dissolved oxygen in the water. Thus, streams are the worst victims of industrial development.



## River Ecosystem

- The mountain highland part has cold, clear waters rushing down as water falls with large amounts of dissolved oxygen. The plants are attached to rocks (periphytons) and fishes are cold-water, high oxygen requiring fish like trouts.
- In the second phase on the gentle slopes, the waters are warmer and support a luxuriant growth of plants and less oxygen requiring fishes.
- In the third phase, the river waters are very rich in biotic diversity. Moving down the hills, rivers shape the land. They bring with them lots of silt rich in nutrients which is deposited in the plains and in the delta before reaching the ocean.



## River Ecosystem

The major abiotic factors controlling the river ecosystems are

- Slope and geomorphic conditions including the nature of substratum
- Physico-chemical properties of water. Temperature, color, alkalinity, pH and dissolved oxygen
- Flow velocity and quantity
- Type and amount of suspended and bed-load sediments
- Turbidity
- Thickness of water column and the depth of light penetration
- The climatological factors like atmospheric temperature, humidity, sun shine hours, evapotranspiration and wind.



## Characteristics of River Ecosystem

- The establishment of a firm attachment with the substratum. Most of the sponges, diatoms and moss are examples of these. They live on the wooden logs, stones, rock exposures.
- The swimmers are expected to have hooks or suckers to maintain grip over the polished surfaces.
- Some of them build nets around them for food trapping.
- Some of them, like snails and worms, may have sticky bottoms to move long the base.
- The life living in rivers, have a stream-lined shape of the body. They may have a body rounded anteriorly and tapering posteriorly. This is for a free-swimming habit against the water currents.



## Characteristics of River Ecosystem

- Some have a flat body to stay within the cracks and crevices of rocks.
- Rheotaxis is a feature seen in rivers. This is the capacity, or mechanism by which fishes and other animals swim against the currents and rapidly flowing water. This is the resistance capacity of many lotic forms.
- Clinging habitat is another feature of Life in river ecosystems. Some organisms mostly stay closer and nearer to the hard bodies or materials.
- Some of the life forms in rivers have the characteristic feature of Osmo regulation. Especially, the Protozoans eliminate excess water through a contractile vacuole.



## Biotic components of River Ecosystem

### Producers

- Phytoplanktons like diatoms, blue-green algae and green algae such as ulothrix, cladophora, water moss, aquatic plants like water grasses etc.

### Consumers

- They are helodes, cephalopteryx, phalacroceras, flat worms, crabs, snails and small to medium fishes, crocodiles and many birds like dove and crane. etc. Fishes are also found.

### Decomposers

- Bacteria and fungi are the reducers in streams which feed upon the producers and consumers after their death.



## Abiotic components of River Ecosystem

### Abiotic components

- It includes inorganic substances like carbon dioxide, water, dissolved oxygen, nitrogen and inorganic salts as well as many micro and macro nutrients, organic substances like carbohydrates, lipids and proteins, physical factors like sunlight, rainfall, suspended solids, dissolved oxygen, temperature and pH.

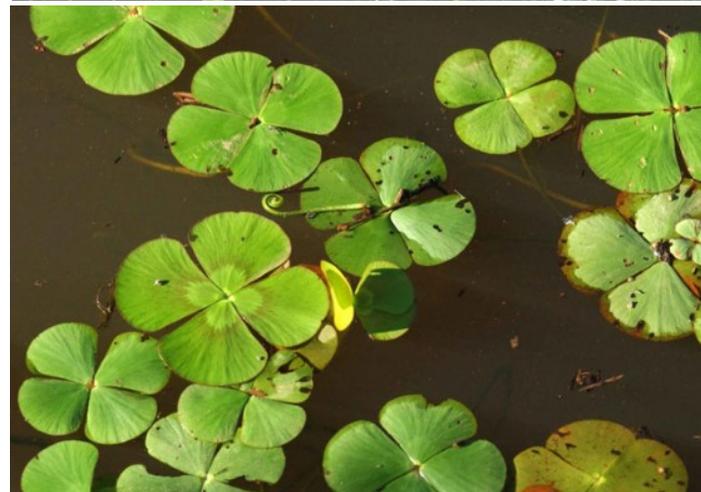


## Danger to River Ecosystem

- Industries use river water in manufacturing processes and as receptacles for wastes.
- People use rivers for disposal of sewage and garbage.
- These practices have polluted rivers with toxins, which have killed river organisms and made river fish inedible.
- Today, runoff from the land puts pesticides and other poisons into rivers and coats riverbeds with toxic sediments.

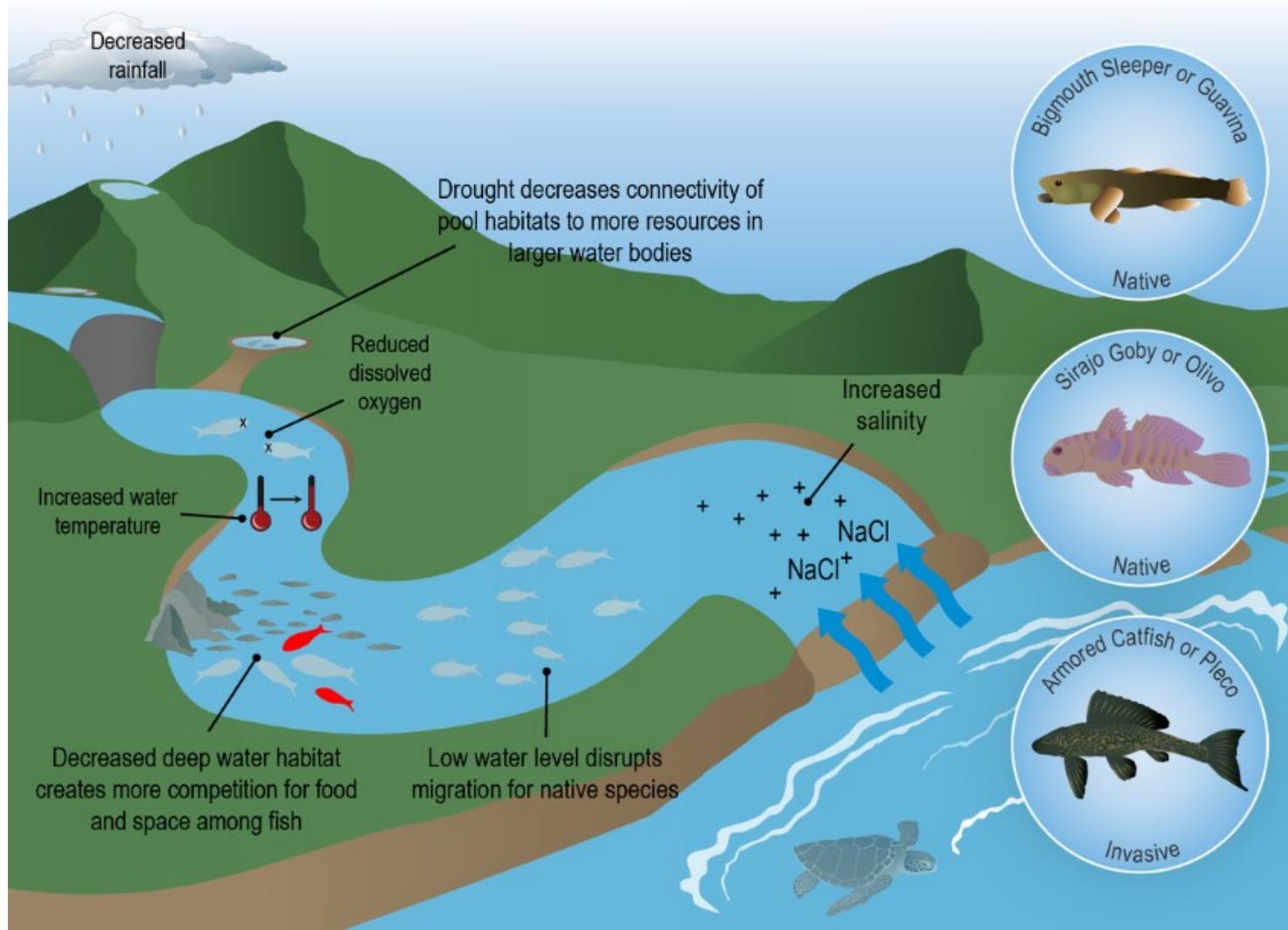


# River Ecosystem





# Impact of Drought on River Ecosystem





## Ocean Ecosystem

- Oceans cover more than two third of the earth's surface.
- Ocean environment is characterized by a high concentration of salts and minerals. It supplies a large variety of sea products and drugs. Among others, it is a reservoir of magnesium, iron, phosphorus and natural gas



## Ocean Ecosystem

- Oceans have two major life zones.
- Coastal zone which is relatively warm, nutrient rich and shallow water. It is the zone of high primary productivity because of high sunlight.
- Open sea is the deep part of the sea that is vertically divided into three regions.
  - Euphotic zone that receives abundant light and shows high photosynthetic activity (up to 200 m)
  - Bathyal zone that receives low light and is usually geologically active (700 m – 100 m)
  - Abyssal zone which is dark and very deep (~2000 to 5000m)



## Ocean Ecosystem

### Littoral Zone

- It is the shoreline between the land and the open sea. Waves and tides have maximum effect in a littoral zone.

### Neritic Zone

- This zone lies just above the continental shelf. The nutrients washed from land are found in this zone. Thus this zone is rich in species. The productivity of this zone is high because sunlight can penetrate through this zone. Zooplankton and phytoplankton are abundant here and support fishing grounds. Pollution also affects the neritic zone first.



## Ocean Ecosystem

### Pelagic Zone

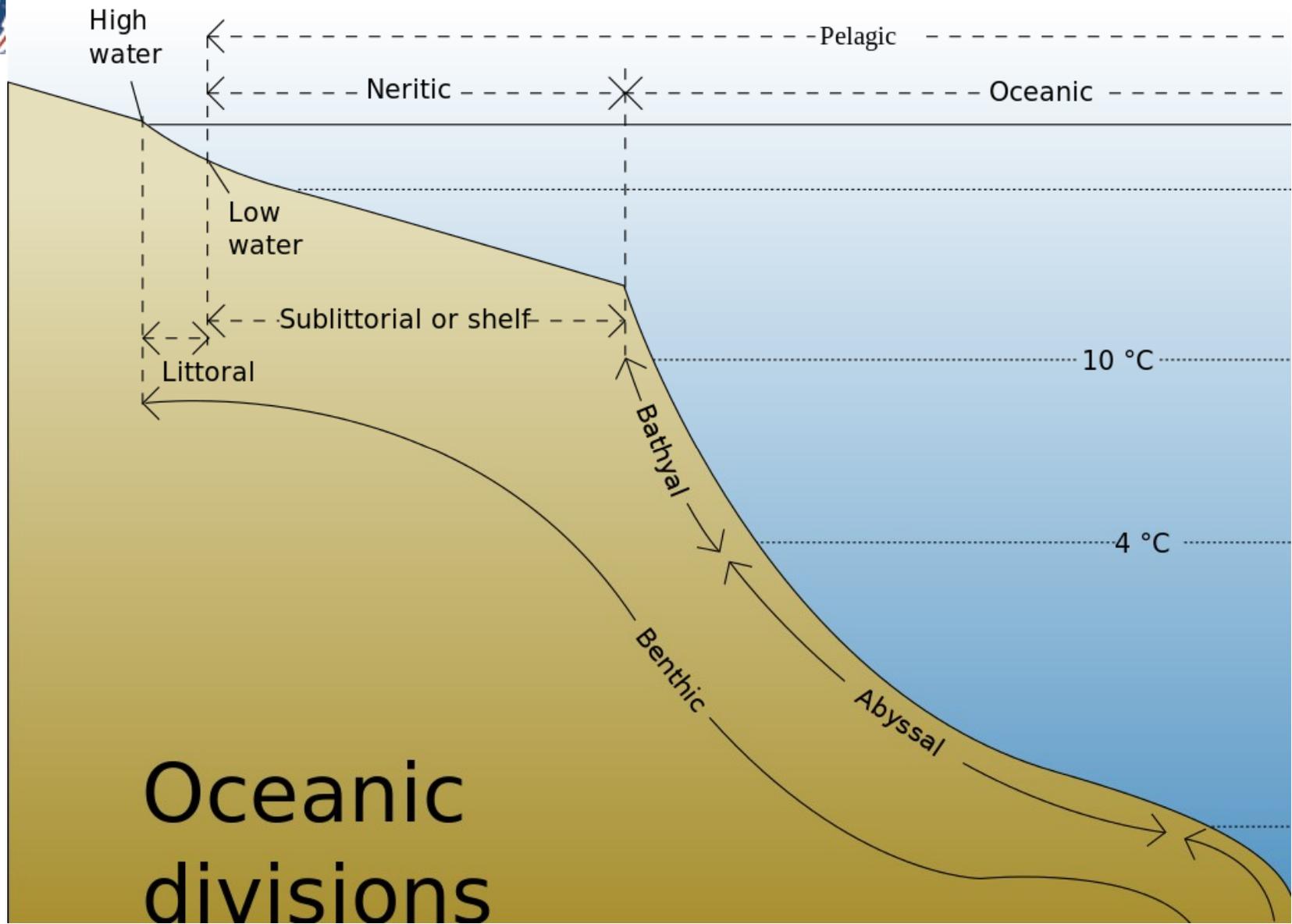
- The open sea constituting 90 per cent of the total ocean surface forms this zone. Phytoplanktons, zooplanktons, shrimps, jelly fish, deep-water fishes and blue whale are found here.
- Organisms of this zone are present below the light penetration zone and totally depend on the rain of detritus of upper regions for their nutrition.



## Ocean Ecosystem

### Benthic Zone

- The floor of the ocean constitutes this zone. It stretches from the edge of the continental shelf to the deepest ocean trenches.
- Sponges, sea lilies, sea fans, snails, clams, starfish, sea cucumbers and sea urchins are found in this zone.





# Abiotic Components of Ocean Ecosystem

## Abiotic Components

- It includes inorganic substances like carbon dioxide, water, dissolved oxygen, nitrogen and inorganic salts as well as required micro and macro nutrients, organic substances like carbohydrates, lipids and proteins, physical factors like intensity and speed of current, cyclones and storms, sun light, rainfall, soil, temperature and pH.



## Biotic Components of Ocean Ecosystem

### Biotic Components

- Producers: These are autotrophs and are also known Primary producers. They are mainly, some microscopic algae (phytoplanktons) besides them there are mainly, seaweeds, as brown and red algae also contribute to primary production. Producers in the marine ecosystem are mainly phytoplankton, large marine plants, mangroves and sea weeds.



## Ocean Ecosystem

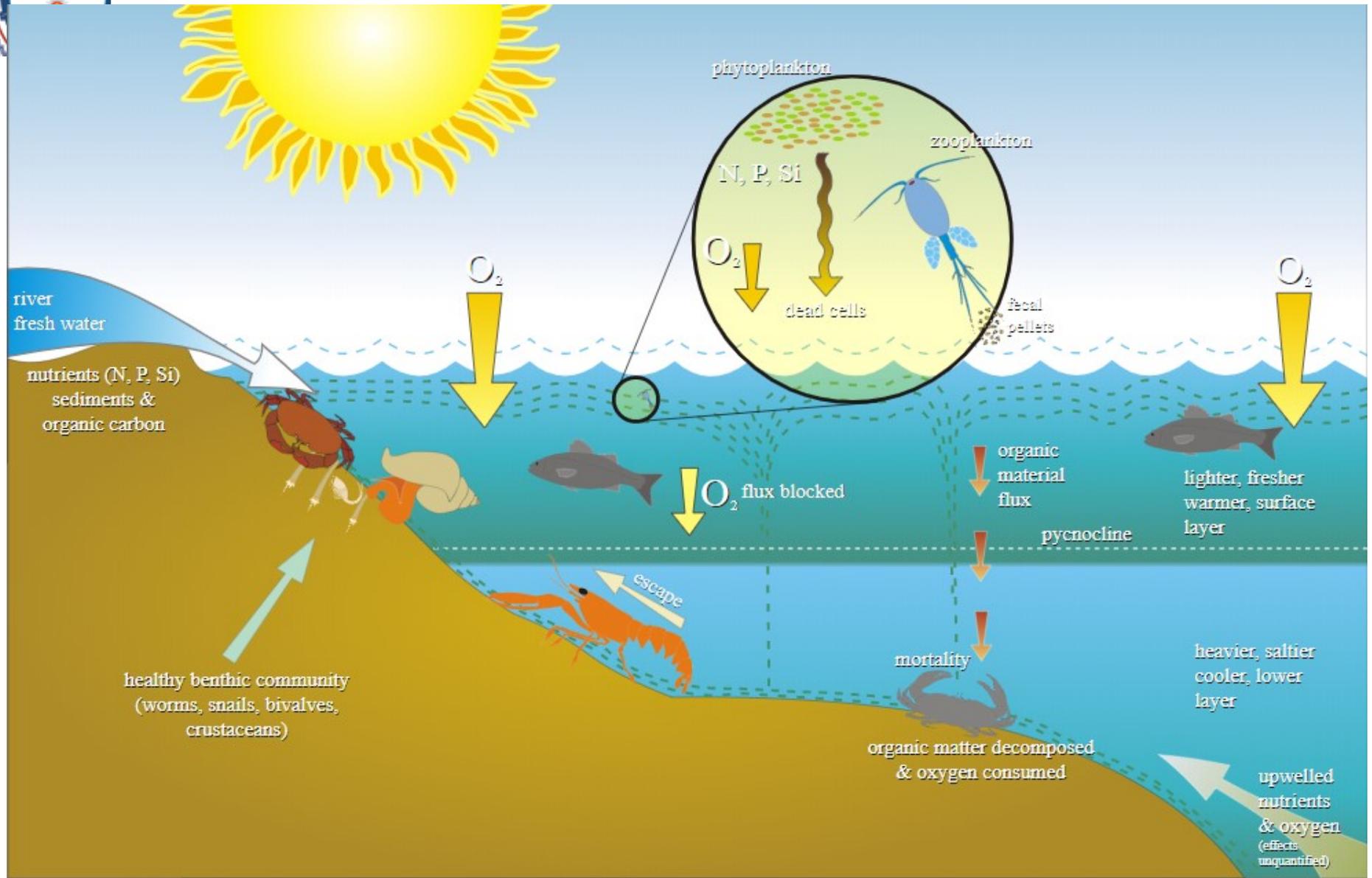
### Consumers

- Primary Consumer: The herbivores, that feed on producers are shrimps, Molluscs, fish, etc.
- Secondary Consumers: These are carnivores fish as Herring, Shad, Mackerel, feeding on herbivores.
- Tertiary Consumers: These includes, other carnivores fishes like, Cod, Halibut, Sea Turtle, Sharks, whale etc.
- Decomposers: The microbes active in the decay of dead organic matter of producers, and animals are chiefly, bacteria and some fungi.



## Characteristics of Ocean Ecosystem

- It occupies a large surface area with saline water
- Commercial activities like fishing and shipping are carried-out in oceans
- It is rich in biodiversity
- It helps moderate the temperature of earth.





# Ocean Ecosystem





# Ocean Ecosystem





# Ocean Ecosystem

