

# BENTHOS

# INTRODUCTION

- All the organisms living or inhabiting in the bottom regions of the aquatic environment are termed benthos.
- These benthos/benthic organisms live in a variety of bottom environments of the aquatic ecosystems and are as diverse as the plankton.
- These bottom living organisms have direct contact with the substrate, which limits the distribution of these organisms.
- The factors such as the composition, size of the particles, its firmness or resistance to penetration, its mobility and the food they contain, are all known to have major influence on the distribution of organisms.

# CLASSIFICATION OF BENTHOS

## BASED ON SIZE

- Macro benthos are organisms that are larger than one millimeter  
E.g. oysters, starfish, lobsters, sea urchins, shrimps, crabs and corals.
- Meio benthos are between one tenth and one millimeter in size.  
E.g. ciliates, annelids , kinorhynchs, copepods
- Micro benthos are very tiny organisms. They are smaller than one tenth of a millimeter.  
E.g. bacteria and ciliates

# TYPES OF MEIOBENTHOS

- Endobenthic organisms are the meiofaunal sized organisms which move within the sediment by displacing particles
- Mesobenthic organisms are the meiofaunal organisms living and moving within the interstitial spaces of the grains.
- Epibenthic organisms are those that living at the sediment-water interface

# BASED ON MOBILITY

**1. SESSILE ORGANISMS:** are those that do not have any mobility, attached or fixed with the substratum or bottom of the aquatic environments and rely on currents or other mechanisms to bring food to them.

E.g. benthic algae (seaweeds) ,sea grasses ,corals , barnacles, oysters etc

**2. VAGRANT BENTHOS :**are those that have locomotory powers and either they can move rapidly or slowly. E.g. Only animals are included under this category.

# BASED ON THE MODE OF LIFE

- **EPIFAUNAL ORGANISMS** : animals which live on the substratum.
- **INFAUNAL ORGANISMS** : are those that animals live into the substratum.
- **BURROWERS** : Organisms that penetrate or burrow into the unconsolidated bottom sediments are called burrowers.
- **BORERS** : organisms those that penetrate or bore the hard rock or substrate materials are called borers.

# BENTHIC PLANTS

**GREEN ALGAE :** include several calcareous species that are important contributors to the sediment substrate, especially in the shallow waters of the low latitudes.

**BROWN ALGAE :** include the largest varieties of seaweeds i.e. the kelps, which are very abundant in shallow cold waters. Most of them are of commercial value as they contain algin, a gelatinous material that is used as an emulsifier in ice-creams, paints, drugs, and cosmetics.



**red algae** : represented by more species of seaweeds than all other classes of algae. They may inhabit relatively in the deep waters of the sub tidal regions of the sea

**Grasses** : Some of these occupy the intertidal marsh environment.

# BENTHIC ANIMALS (ZOO BENTHOS)

**SEDENTARY OR VAGRANT EPIFAUNA:** They may live on rigid substrate, firm sand or soft mud. While some move very slowly, others move very quickly.

**FORAMINIFERA:** These tiny animals are typically less than a millimetre in diameter with different shaped tests or shells and most of which are multichambered

**SHELLED INVERTEBRATES** : arthropods (crabs and lobsters), molluscs (clams, gastropods, chitons, and octopuses) and echinoderms (sea urchins, sand dollars, star fishes and sea cucumbers).

**ARTHROPODS** : The crabs and lobsters are the largest and fastest of the vagrant benthos. In addition, they have some swimming ability, using either their tails and/or specially adapted legs.

- Many species in this group live in the shelter of rocks, ledges or other cover.
- They are scavengers and will eat almost anything that is available.

**ECHINODERMS** : They have numerous appendages in the form of sucker feet or spines that are used for locomotion.

- The sea urchins live on hard substrates where they feed on debris.
- Sand dollars have the poorest mobility but they can move slowly by the whisker-like feet that surround their body.

- Nearly all vagrant benthic molluscs have external shells and move slowly, on the order of millimetres or centimetres per minute.
- Some, such as the chitons, are completely protected by their shell and will move across a hard substrate rasping and scraping food from the surface.
- A few gastropods move slowly through the sediment, ingesting whatever material they encounter, with little or no selection. They digest the nutrient material and excrete the mineral sediment.

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- Generally, these animals have thick, heavy shells to protect them from predators and from the enemies.
  - Most have somewhat bulbous shapes, those that live on soft sediment may have special adaptations in shell morphology to prevent sinking into the mud. e.g. *Murex* sp with spines.

# SESSILE EPIFAUNA

Many organisms are attached to the substrate throughout their maturity and have no mobility at all. These include,

**BRACHIOPODS:** attach with a stem like foot that extends from near the hinge line that holds the shells together.

Mussels are about the same size and they attach themselves to a hard surface with strong thread like structures, called byssus threads which develop at the hinge line

# INFAUNAL ORGANISMS

- This group includes various meiofaunal and macro fauna such as snails, clams, worms, sea urchins, and crustaceans.
- Some groups are entirely infaunal, such as the tusk shells (scaphopods). Infaunal organisms occupy two different models of life.
- Some graze or plow through the sediment (sediment destabilizers) and others construct extensive burrow complexes that they occupy and in which they move about (sediment stabilizers)

- There are also those that burrow or bore near the surface and simply occupy that place; they do not move from place to place unless uprooted by waves, currents, or other organisms.
- Numerous varieties of worms also occupy this mode of life. These types of infaunal organisms typically move only when they are exhumed from their burrow.
- These meiofaunal organisms have a size range similar to that of some of the smaller mesoplankton and the micro plankton.

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- These include the members of the phyla Ciliophora, turbellarians of the Platyhelminthes, Gastrotricha, Kinorhyncha, Tardigrada, Annelida, and Arthropoda.
  - These organisms are very abundant only in the intertidal beaches and their biomass decreases with increasing depth in the oceans.
  - The abundant groups are nematodes and harpacticoid copepods.

- These meiofaunal forms a very good food source to most of the macro faunal deposit feeders like larger polychaetes, holothurids, fishes such as young ones flat fishes, gobies and mullets.
- The role of these as food of the macro faunal organisms mainly depends on the nature of sediments.
- That is the muddy sediment is known to harbour more meiofaunal biomass in the top layer, which is more accessible to the predators than the sandy sediment

- These infaunal meiobenthos are also known to exhibit a variety of feeding habits viz. herbivores- feeds on the attached diatoms; detritus feeders, suspension feeders and predators.
- Suspension feeders are quite rare, due to lack of plankton availability.
- Large bodied animals and sessile benthos are poorly represented in the marine meiobenthos, for example, members of the phyla Echinodermata and Cnidarian.

- The members of the phyla such as Phoronida, Pogonophora, Porifera, Ctenophore, Hemichordates and Chaetognatha are totally absent in the meiobenthos communities.
- There are some organisms, such as certain clams and sponges that can bore into solid rock or shells.
- This is done through a combination of physical rasping and chemical reaction between substances secreted by the organisms and the substrate