

Benthos & Meiofauna COVID VERSION

Benthos

- Organisms that live on or above the substrate are called epifauna.
- Organisms that live in the substrate are called infauna, and are divided into categories based on size: macrofauna are greater than 0.5 mm, meiofauna are 0.5 to 0.062 mm and microfauna are smaller than 0.062 mm

Major Benthos Phyla

- The phylum Echinodermata, containing over 6,000 species, includes sea stars, sea urchins and sea cucumbers. They all have radial symmetry and a water vascular system, although most Echinoderm larvae are planktonic with bilateral symmetry.
- The phylum Cnidaria includes corals, anemones, jellyfish and hydroids. With about 9,000 species, Cnidaria is a diverse phylum common in their possession of stinging tentacles. The stinging cells are called cnidocytes and contain a harpoon-like nematocyst that injects toxin into the victim.
- With over 50,000 species, Mollusks are second only to Arthropods in phylum size. Mollusks include Gastropods (snails & sea slugs), Bivalves (clams, scallops, oysters etc.) and Cephalopods (octopuses, squid, cuttlefish & nautilus). All mollusks have well-developed body organs but lack body segmentation.
- The largest phylum of life on Earth is Arthropoda. There are over 1 million species, with the vast majority being insects. Most marine Arthropods are Crustaceans, including crabs, lobsters, barnacles and copepods. Crustaceans have an exoskeleton and most have five pairs of appendages, often with claws.

Benthic Macroinvertebrates

- The health of freshwater and estuarine systems is often determined by analyzing the benthic macroinvertebrate population. A stream index can be calculated based on the relative abundance of different species

Kelp

- In colder temperate regions, the hard subtidal substrates are dominated by very large brown algae known collectively as kelps. These associations are known as kelp beds if the algae do not form a surface canopy and kelp forests where there is a floating canopy.
- Kelps are attached to the substrate by a structure called a holdfast rather than by true roots. From the holdfast arises a stem-like or trunk-like stipe, which ends in one or more broad, flat blade. At the base of the blade is a pneumatocyst or float, which keeps the blade at the surface.

Seagrass Communities

- Seagrasses are flowering plants adapted to live submerged in seawater. All types of substrates are inhabited by these grasses, from soupy mud to granite rock, but the most extensive beds occur on soft substrate.
- Seagrass beds are depositional environments, often with high organic content that can make the sediment under the bed anaerobic.

Meiofauna

- Meiofauna, or interstitial organisms, are organisms that occupy the microspaces between particles or live on the individual particles.
- The most important factor determining the presence, absence, and types of meiofauna is grain size. The coarser the grain size, the greater the volume of interstitial space, and therefore the greater the size and number of meiofauna.
- Other limiting factors include:
 - Temperature - the most extreme range occurs in intertidal beaches and minimally in subtidal sediments
 - Salinity - particularly in intertidal areas where freshwater runoff occurs
 - Wave Action - both intertidally and subtidally affecting the arrangement of sediment
- The major adaptation of most meiofauna is the statocyst, which is an organ that detects gravity and helps the organism differentiate up and down.

Marine Organisms of the Day

1. Sea Anemone (Order Actiniaria): Sea Anemones are in the same phylum (Cnidaria) as jellyfish and corals, sharing much of the same physiology. Sea Anemones are most known for their symbiotic relationship with anemonefish.

<https://www.youtube.com/watch?v=vNhORnwcQcU> (3:00)

2. Sea Cucumber (Class Holothuroidea): Sea Cucumbers are a type of echinoderm that may help reduce the effect of ocean acidification on coral growth by recycling calcium carbonate. They are currently being overfished in developing countries for sale and consumption in large countries like China.

<https://www.youtube.com/watch?v=MVNrbyU-Vck> (1:28)

3. Crown-of-Thorns Sea Star (*Acanthaster planci*): They have up to 21 arms. Despite all of the thorns, the actual surface of their body is soft and membranous. If you take them out of the water, that body surface will burst and the liquid will drain out, causing the spines to bend over and flatten. They regain their shape when placed back in water if they are still alive.

<https://www.youtube.com/watch?v=E8WXiEBf4Oc> (6:31)

4. Carnivorous Sponges (Family Cladorhizidae): Sponges (Phylum Porifera) are typically filter feeders. The deep sea Cladorhizidae family, however, trap small crustaceans with velcro-like hooks.

<https://www.youtube.com/watch?v=oJeyOU4eSKw> (4:06)

5. Bull Kelp aka Giant Kelp (*Nereocystis luetkeana*): Kelp forests are an important ecosystem that supports high biodiversity. Due to its very fast growth rate, kelp is often used in a variety of products including food, toothpaste, pharmaceuticals and biofuels.

<https://www.youtube.com/watch?v=GcbU4bfkDA4> (3:13)

6. Peacock Mantis Shrimp (*Odontodactylus scyllarus*): The Peacock Mantis Shrimp is one of over 400 species of mantis shrimp, known for their incredible color vision and powerful claws. They have 16 color-receptive cones in their eyes (as opposed to our three) and can accelerate their attacking claws at 23 m/s.

<https://www.youtube.com/watch?v=J4o7Fbt7OXU> (1:26)

7. Blue Crab (*Callinectes sapidus*): The blue crab's scientific name means 'beautiful savory swimmer.' Blue crabs not only comprise the most valuable fishery in the Chesapeake Bay, but are major predators of benthic communities and are prey for many other fish species. Blue crabs are sexually dimorphic, meaning sexes occur in distinct forms. Males have blue claws and a narrow abdominal apron (referred to as the Washington Monument). Females have red-tipped claws ("painted fingernails") and a broad abdominal apron (referred to as the Capitol dome).

<https://www.youtube.com/watch?v=VpNayQkwwkg> (1:20)

8. (Jacques) Pacific Cleaner Shrimp (*Lyasmata amboinensis*): There are 36 genera of cleaner shrimp representing over 150 species. They are known for actively engaging in mutualistic symbiotic relationships with fish, where they feed on small parasites and dead tissue living on the fish.

<https://www.youtube.com/watch?v=FAHtzP6hnE> (0:31)

Finding Nemo Clips for This Exam