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Intertidal Community

Intertidal Community



- The intertidal community is found within the area of the shoreline reached by the waters of the highest high tide and left uncovered at the lowest low tide.
- It is an almost entirely marine community.



Types of Tidal Habitats



Different tidal habitats require different adaptations

Sandy Beaches and Mud Flats



- Substrate offers lots of nutrients, but little structure for attachment
- Animals bury themselves in mud
- Can also attach to plants

Rocky Shores



- Little protection from strong waves: animals must anchor
- Complex tide pools possible
- Seaweeds offer protection from drying

Rocky Shores



- Rocky shores, coastal regions that are composed of hard materials, are more densely inhabited and have greater diversity of algae and animals than those composed of soft sediments such as sand or mud.
- About 75% of the world's shorelines are rocky coasts.



Adaptions to Life on Rocky Shores



- Avoiding Overheating and Desiccation



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Adaptions to Life on Rocky Shores

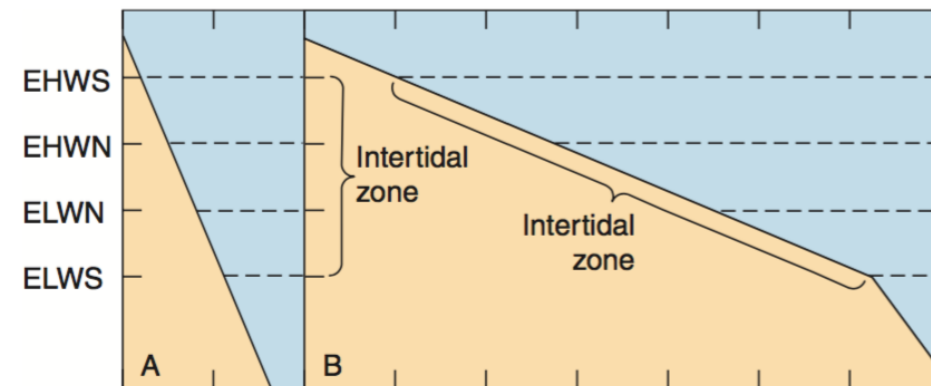
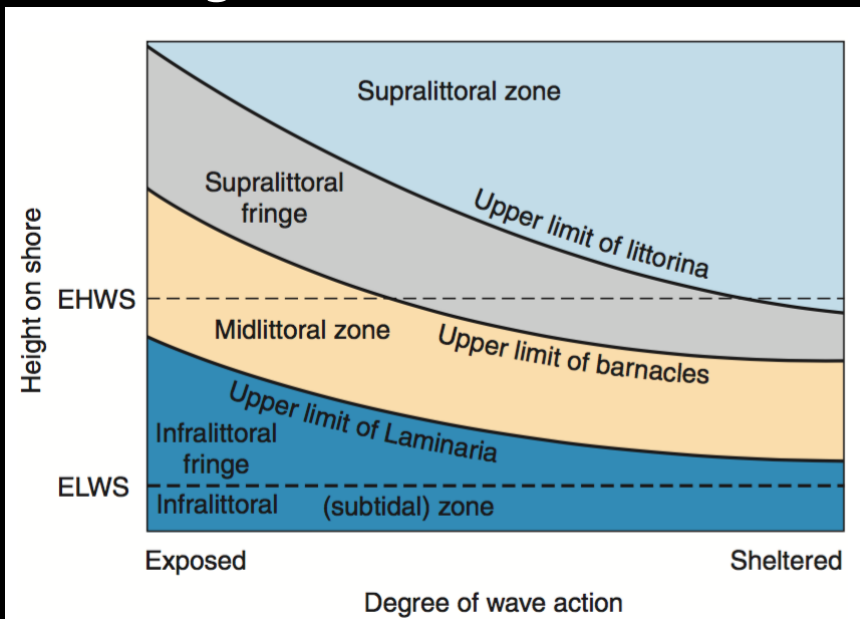


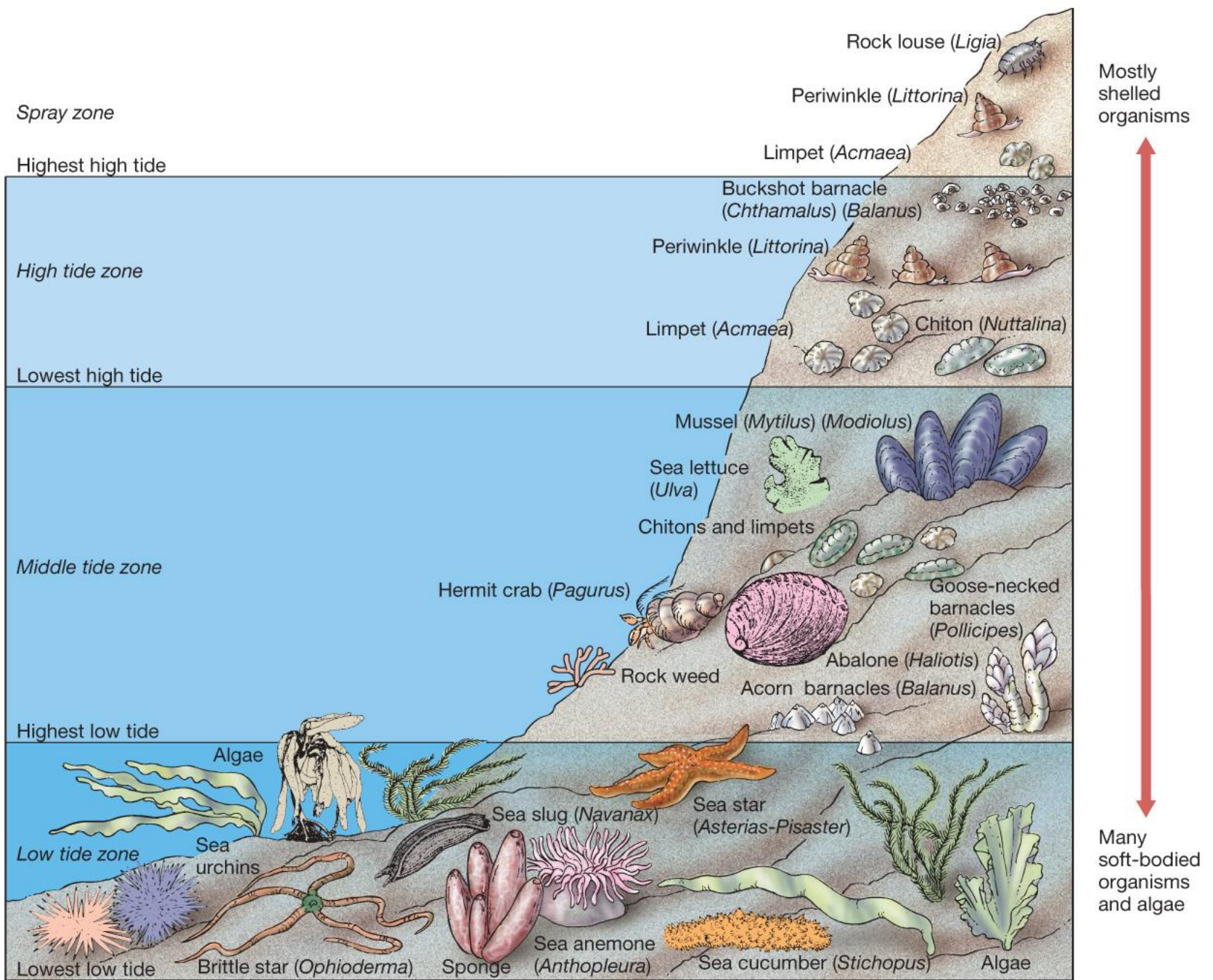
- Coping with Cold: Intertidal animals at high latitudes may be exposed to ice and freezing temperatures during the winter. Many of these organisms produce antifreeze compounds in their tissues or have other mechanism to prevent severe cell damage during freezing.
- Avoiding Wave Shock: Byssal threads.



Rocky Shore Zonation

- As the tide retreats and the shoreline covered at high tide emerges from water, prominent horizontal bands defined by color or the distribution of organisms appear. This separation of organisms into definite bands is called *vertical zonation*.





(a)

Spray Zone

- **Supratidal zone**
- Organisms
 - Avoid drying out
 - Many animals have shells
 - Few species of marine algae



(b)

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Intertidal Zone Organisms

- **High tide zone**
 - Animals have shells to avoid drying out
 - Marine algae—rock weeds with thick cell walls



(d)

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(e)

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Intertidal Zone Organisms



- Middle tide zone
 - More types of marine algae
 - Soft-bodied animals



(g)

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Intertidal Zone Organisms

- **Low tide zone**
 - Abundant algae
 - Many animals hidden by sea weed and sea grass
 - Crabs abundant in all intertidal zones



(i)

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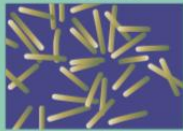
Rocky Shore



- Rocky shores are inhabited by organisms that tend to form bands on the rocks. This intertidal zonation is caused by a complex interaction of biological and physical factors. The supralittoral fringe receives little moisture. The dominant species in this zone are **periwinkles**. The midlittoral or true intertidal, is the area alternately exposed and submerged by tides. The characteristic species found here are **barnacles**. The infralittoral fringe extends from the lowest of low tides to the upper limits reached by the large kelps. **Large algae and kelps** are abundant here in temperate regions, but relatively barren in the tropics. The subtidal zone is covered by water even at low tide and is more stable, it supports a greater diversity of organisms in the temperate zone but may be barren in the tropics because of the abundance of grazers and predators.

Solar energy

Benthic diatoms



Gulls and other birds



Plankton



Detritus food chains

Isopods



Limpets



Littorina



Chitons



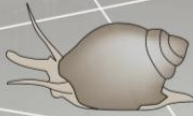
Barnacles



Crabs



Predatory snails



Sea stars



Sea urchin



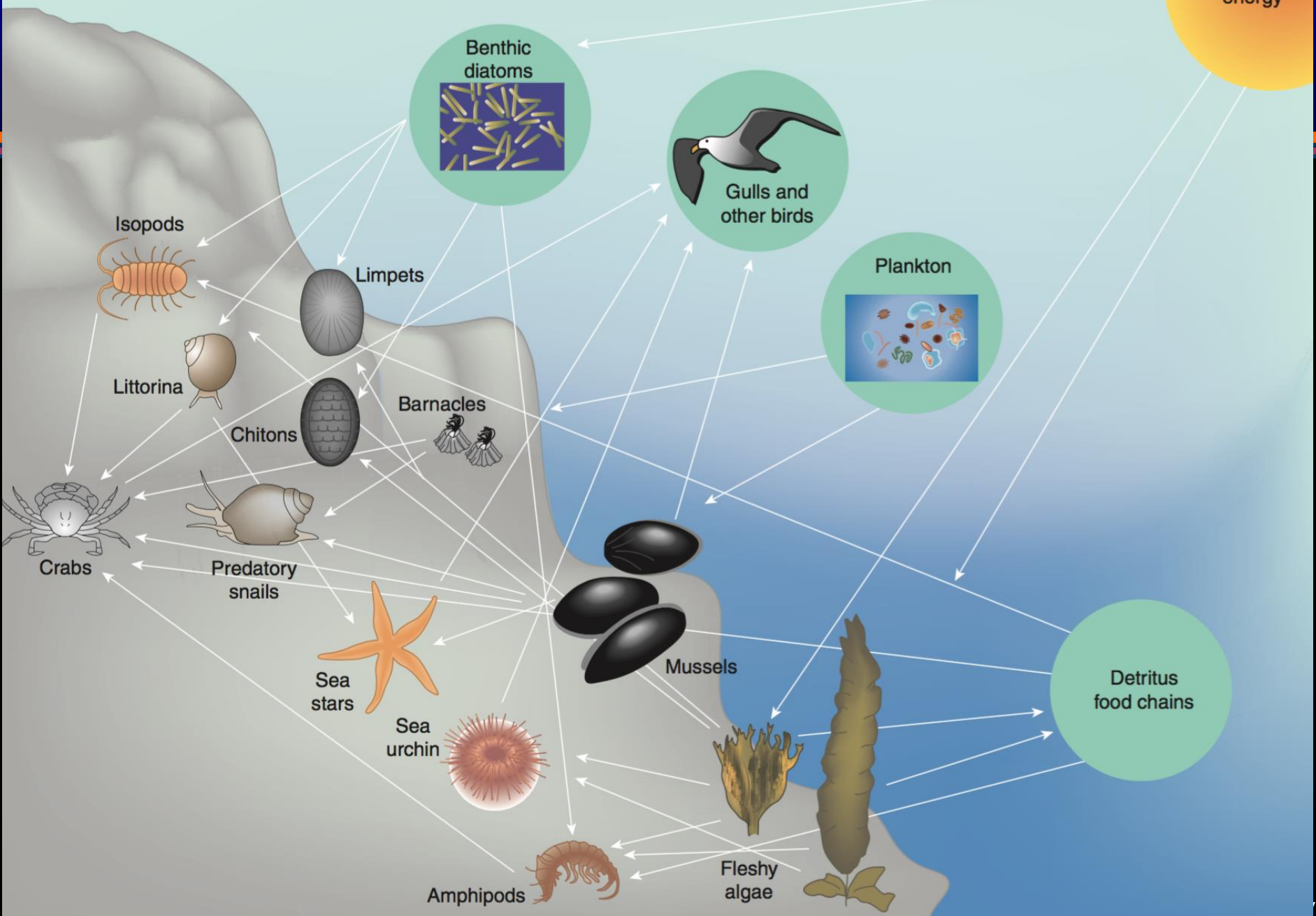
Mussels



Fleshy algae



Amphipods



Intertidal Foodweb



- The tides consistently supply nutrients for photosynthesis, plankton, and detritus to intertidal communities.
- The base of the intertidal food web usually consists of plankton and benthic algae. Benthic algae vary from microscopic diatoms to fleshy seaweeds. Grazers, filter feeders, detritivores, and predators are all abundant in rocky intertidal food webs.
- The competition for space among community inhabitants is often the dominant biological factor in the organization of intertidal communities.

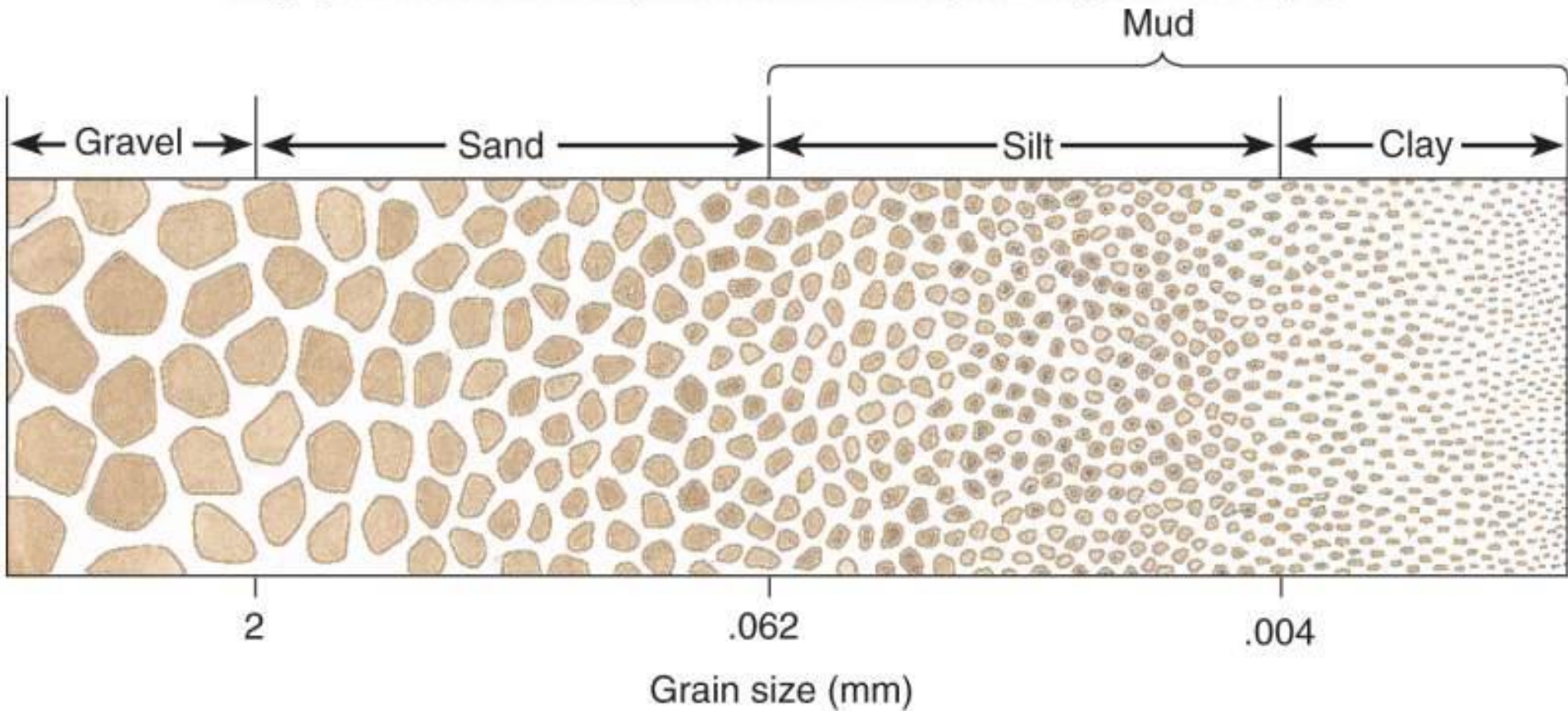
Soft Bottom



- Substrate is sediment- sand, clays, mud.
- Fine sediments are often found in calm areas.
- Coarse sediments on coasts that experience wave action.
- Many animals burrow into the sediments, they are called *infauna*.

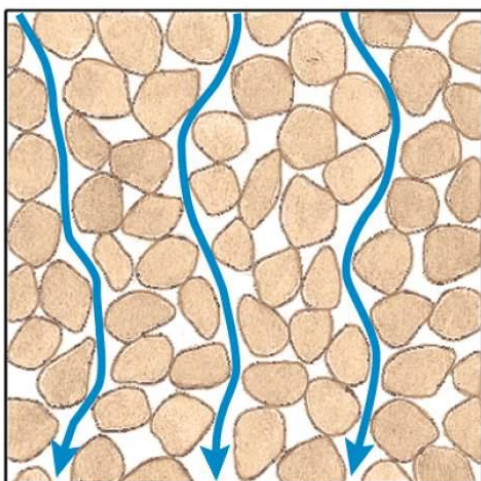
Sediment Size

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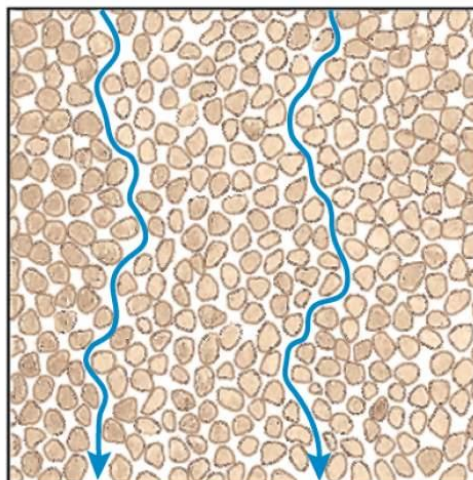
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Well-sorted (coarse)



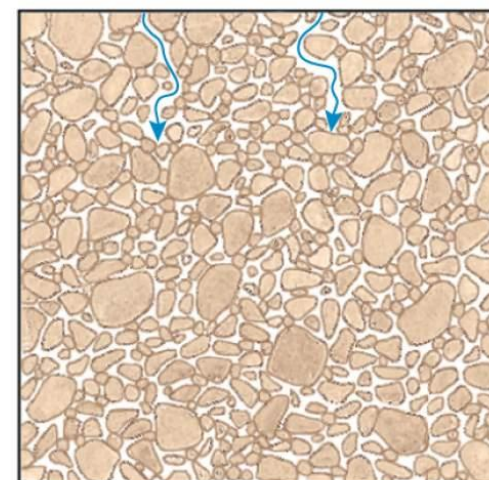
(a) Water drains quickly

Well-sorted (fine)



(b) Water drains slowly

Poorly sorted



(c) Water blocked

Life in the Sediment



- Less dessication- sediments hold water.
- Many deposit feeders- most feed on detritus. Fine sediments have more detritus, sand has less.
- Oxygen- decaying organic matter uses up oxygen- therefore interstitial water often is lacking in oxygen.
- Anaerobic bacteria thrive here- produce H_2S .
- Other infauna must pump O_2 - rich water from above the sediment, or have extra hemoglobin and slow metabolism.

Feeding Strategies



- Most soft bottom species feed on detritus.
- Some plankton is also in their diet.
- Deposit feeders- sea cucumbers and worms eat sediment, and digest the organic matter.
- Clams use long siphons to reach nutrient rich surface sediment.



Predation



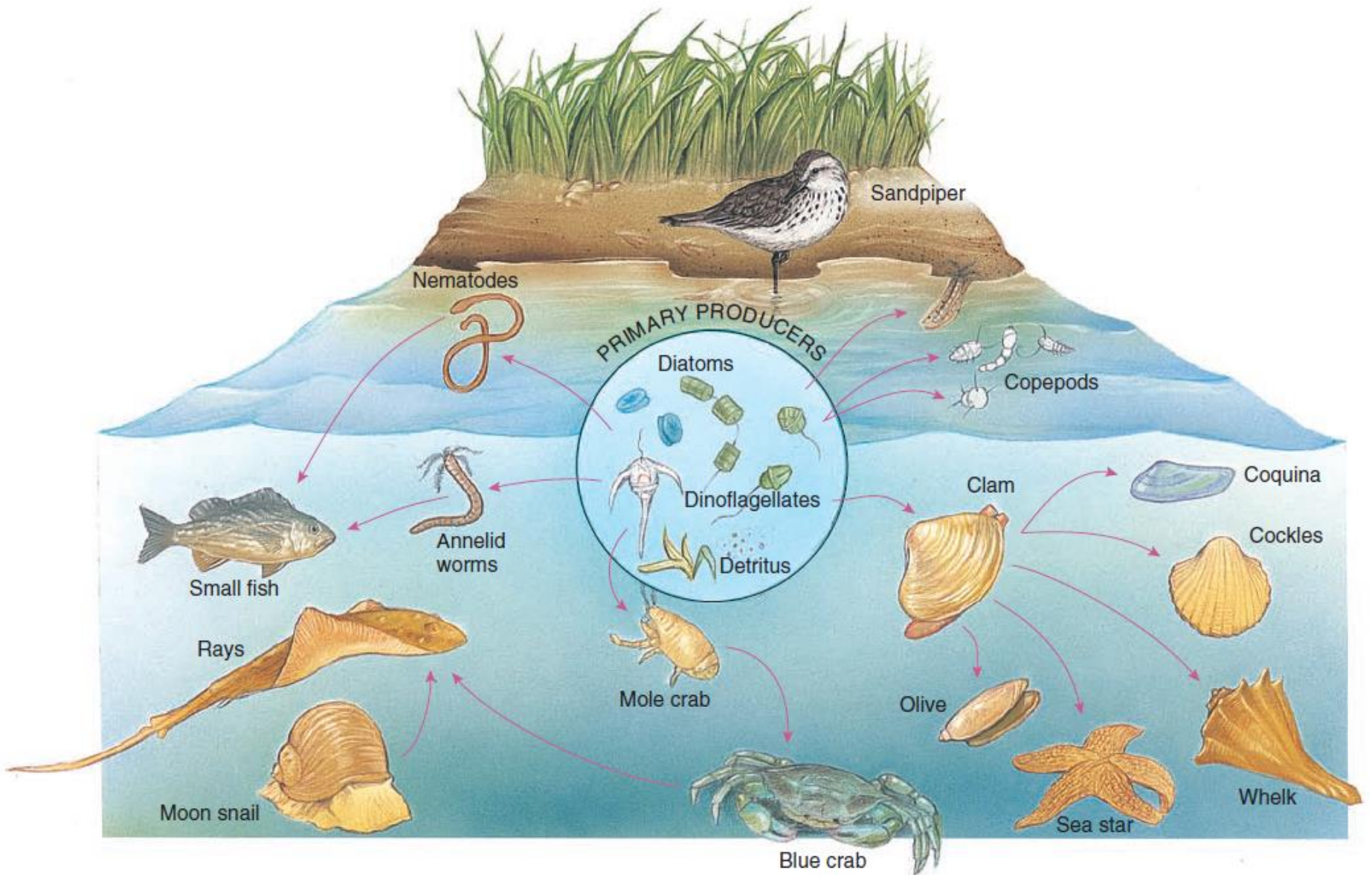
- Moon snails burrow in the sediments looking for clams.
- They use their radula to drill through the clam shell and eat it.
- During low tides, birds are important predators.



Moon Snails hunting Razor Clams Wellfleet Bay Wildlife Sanctuary

Massachusetts Audubon Series

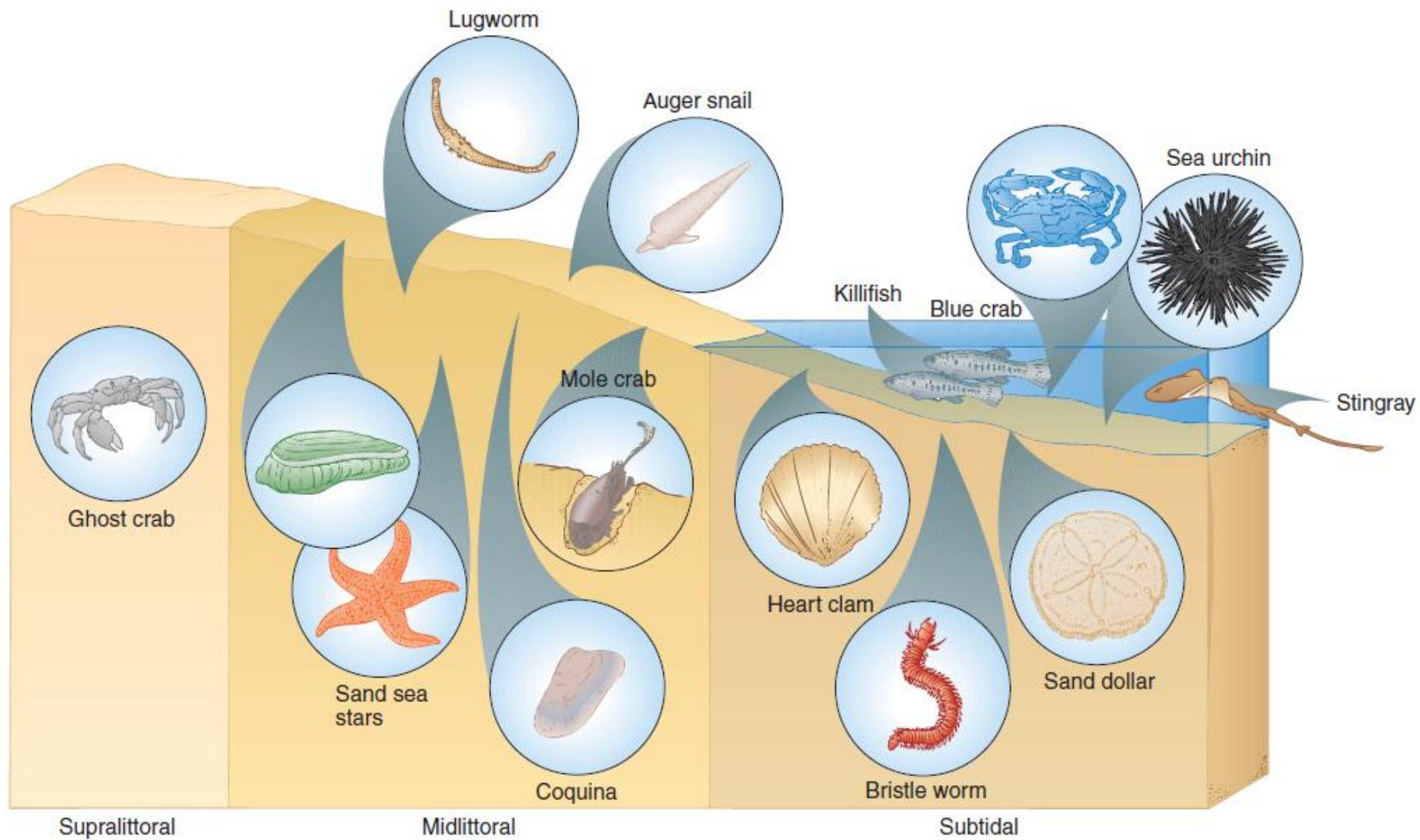




Zonation in Soft Bottom



- Less obvious than on rocky shores.
- Upper beach- Beach hoppers (sand fleas), ghost crabs and fiddler crabs.
- Lower beach- Polychaete worms, clams, moon snails.
- Just below tide line- sand dollars, blue crabs, sea cucumbers
- On muddy shores- very little zonation.



Key Concepts



- The intertidal zone is that part of the marine environment alternately exposed and submerged by tides.
- Organisms that inhabit the intertidal zone must be able to tolerate wave shock, desiccation, and radical changes in temperature and salinity.
- In contrast to sandy shores, rocky shores provide a relatively stable surface for attachment.
- Biotic factors are most important in determining the distribution of organisms on rocky shores, but physical factors are most important on sandy shores.

Further Reading



- Thompson, R. C., T. P. Crowe, and S. J. Hawkins. 2002. Rocky Intertidal Communities: Past Environmental Changes, Present Status and Predictions for the Next 25 Years, *Environmental Conservation* 29(2):168–191.
- Smith, J., P. Fong, and R. Ambrose. 2008. The Impacts of Human Visitation on Mussel Bed Communities along the California Coast: Are Regulatory Marine Reserves Effective in Protecting These Communities? *Environmental Management* 41(4):599–612