Aquatic Ecosystems

Section 4-4

- Nearly 75% of the Earth's surface is covered with water.
- Aquatic ecosystems are determined by:
  1. depth
  2. flow
  3. temperature
  4. chemistry of the overlying water

- Aquatic ecosystems are grouped according to the abiotic factors that affect them.
  - Depth of the water, or distance from shore determines amount of light that organisms receive
  - Water chemistry refers to the amount of dissolved chemicals-salts, nutrients, and oxygen.
  - Latitude determines temperature-polar, temperate and tropical regions.

Freshwater Ecosystems

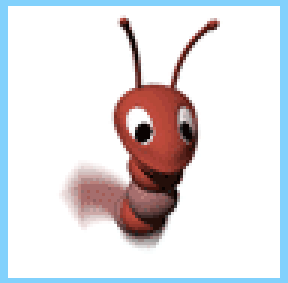
- Only 3% of the surface water is fresh water.
- Freshwater ecosystems are divided into two main types:
  1. flowing-water ecosystems
     - rivers, streams, creeks and brooks all flow over land
  2. standing-water ecosystems
     - lakes and ponds

Flowing-Water Ecosystems

- A river originates in the mountains or hills, often springing from an underground water source.
- Near the source, water has plenty of dissolved oxygen but little plant life.
- As water flows downhill, sediments build up and enable plants to establish themselves.
- Downstream, the water moves more slowly through flat areas, where turtles, beavers or river otters make their homes.

Standing-Water Ecosystem

- Water not only circulates in and out but also within them.
- Circulation helps to distribute heat, oxygen, and nutrients.
- Plankton is a general term for the tiny, free-floating or weakly swimming organisms that live in both fresh and salt-water environments.
- Phytoplankton or single celled algae are supported by nutrients in the water and form the base of many aquatic food webs.
- Zooplankton are planktonic animals that feed on the phytoplankton.



Freshwater Wetlands

- A wetland is an ecosystem in which water either covers the soil or is present at or near the surface of the soil for at least part of the year.
- Water may be flowing or standing and fresh, salty, or brackish (mixture of fresh and salt water).
- Three main types:
  - Bogs, form in depressions where water collects.
    - Dominated by sphagnum moss and very acidic

- Marshes are shallow wetlands along rivers and may be underwater part of the year.
  - dominated by cattails, rushes, and other grasslike plants
- Swamps are wet all year round and resemble flooded forests
  - presence of trees and shrubs is what distinguishes a swamp from a marsh!

Marsh

Swamp

Estuaries

- Estuaries are wetlands formed where rivers meet the sea.
- Contain a mixture of fresh and salt water, and are affected by the rise and fall of ocean tides.
- Estuary food webs differ from other aquatic ecosystems because primary production is not consumed by herbivores.
- Detritus is tiny pieces of organic material that provide food for organisms at the base of the food web, clams, worms, and sponges.

- Estuaries support a large amount of biomass but contain fewer species than freshwater or marine ecosystems.
- Commercially important fish and shellfish such as shrimp and crabs spawn and develop here.

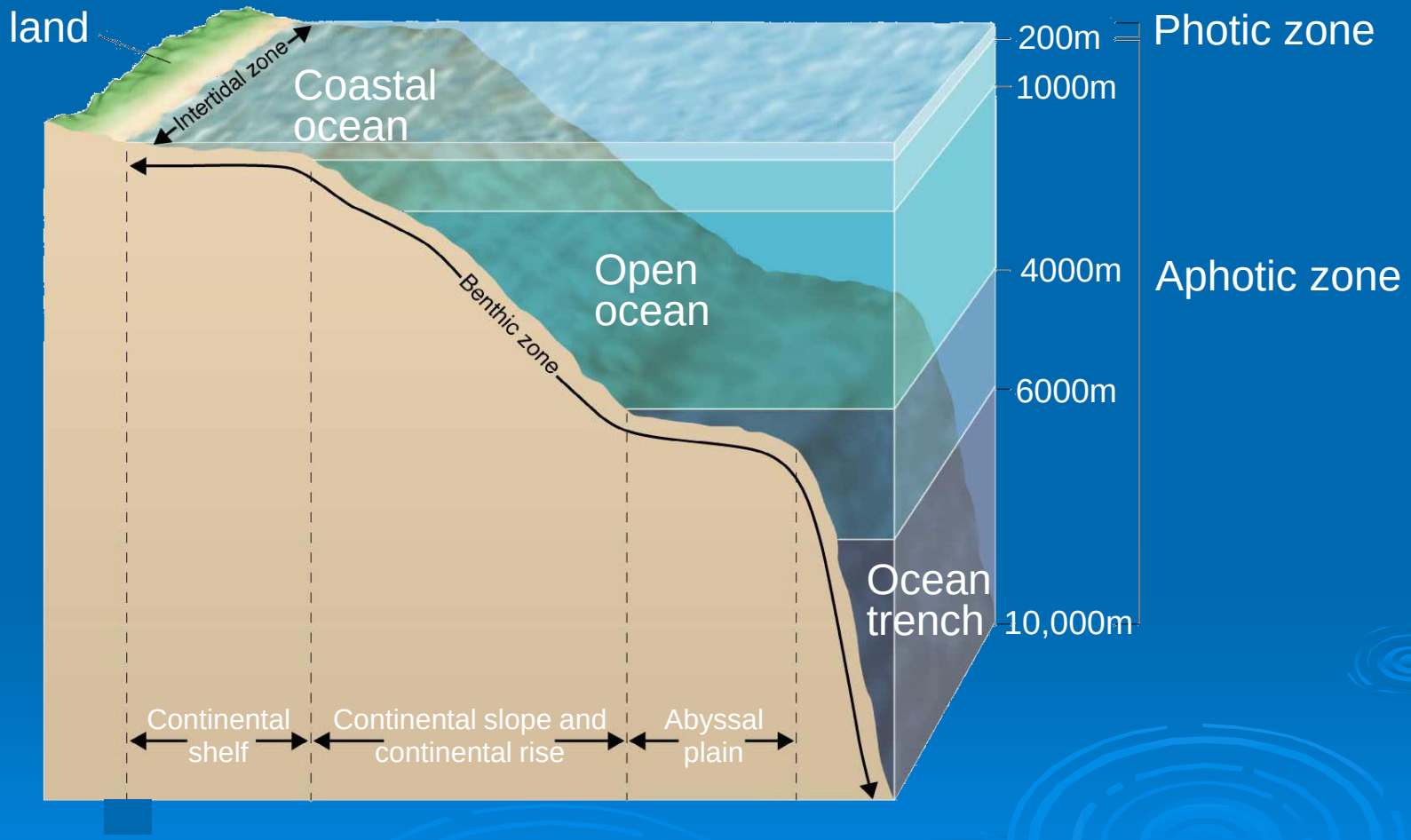
- Salt marshes are temperate-zone estuaries dominated by salt tolerant grasses above the low-tide line and by seagrasses under the water.
- Salt marshes are found along the eastern seaboard of North America from Maine to Georgia.
- One of the largest surrounds the Chesapeake Bay estuary in Maryland.

- Mangrove swamps are coastal wetlands that spread across tropical regions including southern Florida and Hawaii.
- The dominant plants are salt-tolerant trees called mangroves which provide a valuable nursery for fish and shellfish.
- The largest mangrove area in the continental U.S. is within Florida's Everglades National Park.

Marine Ecosystems

- Sunlight penetrates only a relatively short distance through the surface of the water.
- The photic zone is a relatively thin surface layer - about 200 meters.
  - Photosynthesis is limited to this layer.
- The aphotic zone, which is below the photic zone, is permanently dark.
  - Chemoautotrophs are the only producers that survive.

Zones of a Marine Ecosystem

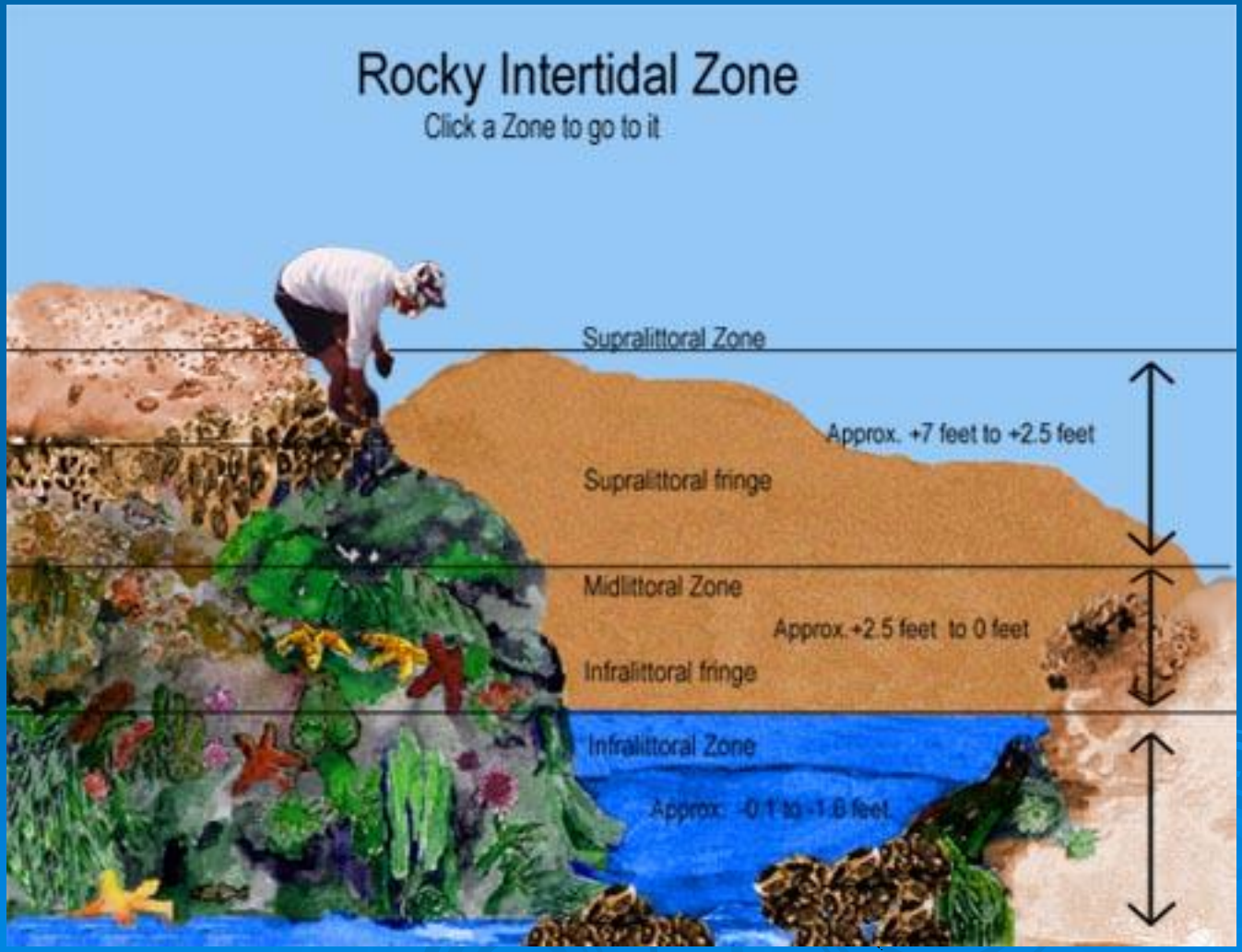


- The ocean is divided into zones based on depth and distance from shore:
  - intertidal zone
  - coastal zone
  - open ocean
- The benthic zone covers the ocean floor and is, therefore, not exclusive to any of the other marine zones.

Intertidal Zone

- Once or twice a day, organisms are submerged by sea water.
- Remainder of the time, they are exposed to air, sunlight, and temperature changes.
- Organisms are battered by waves and strong currents.

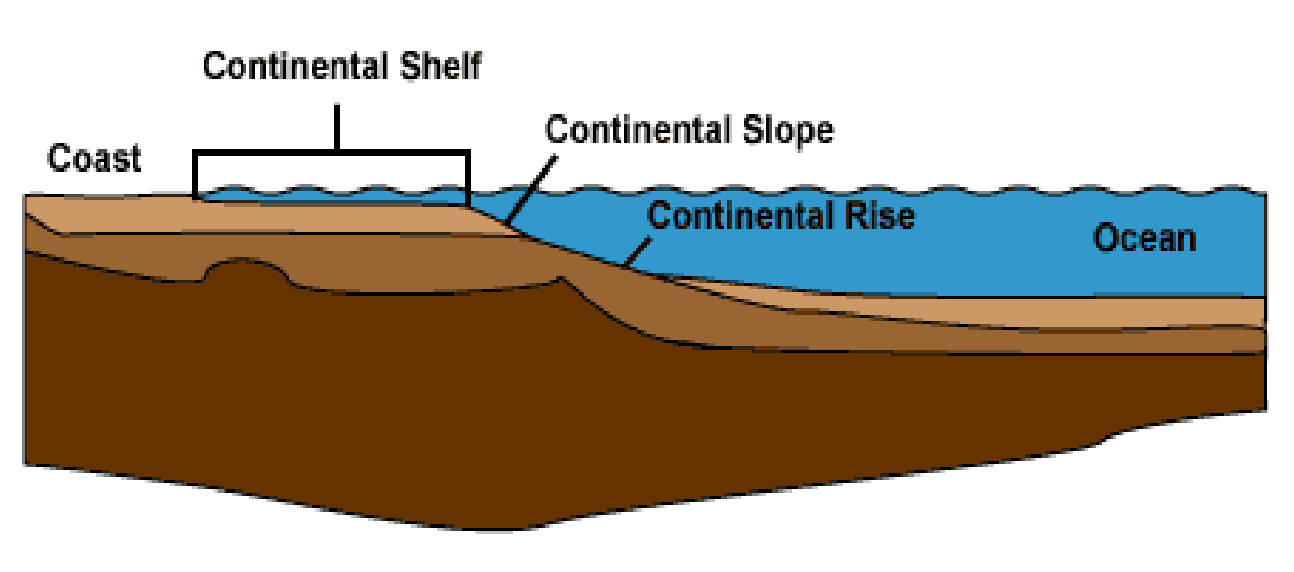
Zonation is the prominent horizontal banding of organisms that live in a particular habitat.



- Each band can be distinguished by difference in color or shape of the major organisms.
  - A band of black algae might grow at the highest hightide line----followed by encrusting barnacles---clusters of blue mussels might stick out amid clumps of green algae.
- This zonation is similar to the pattern that you might observe as you climb up a mountain.

Coastal Ocean

- The coastal ocean extends from the low-tide mark to the outer edge of the continental shelf.

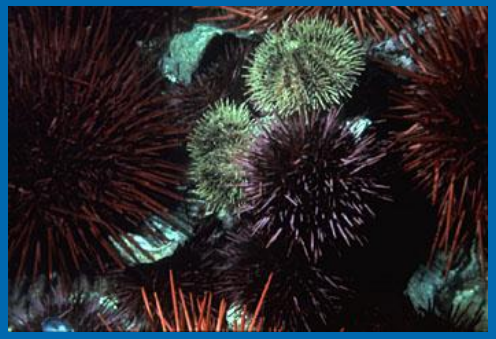


- Coastal ocean is rich in plankton because it is entirely within the photic zone.
- One of the most productive coastal communties is the kelp forest.

Kelp forests are named for their dominant organism: a giant brown alga that can grow as much as 50 cm/day.

- Found in cold-temperate seas along the coast of California and the Pacific Northwest.

- Support a complex food web that includes:



Sea Urchins

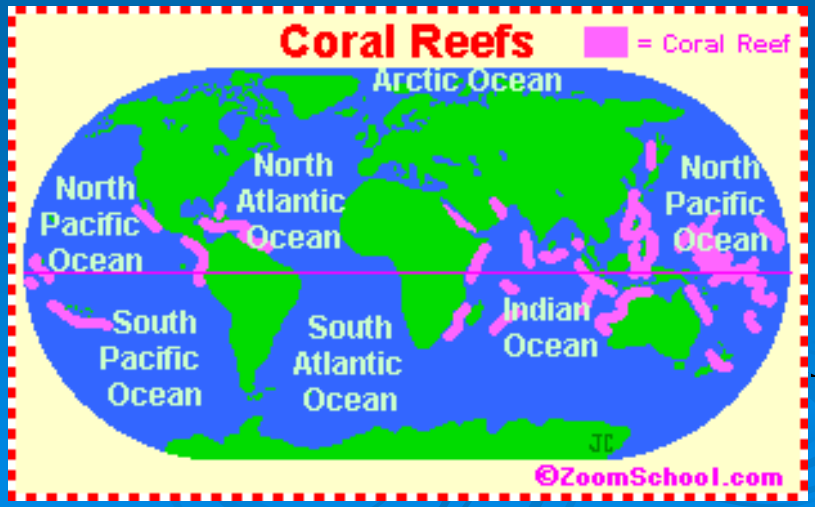
Sea Otters

Invertebrates

- Also, fishes, seals and whales.

Coral Reefs

- Coral reefs are found in the warm, shallow water of tropical coastal oceans.
- Coral reefs are named for the coral animals whose hard, calcium carbonate skeletons make up their primary structure.



- Coral animals are the size of your fingernail, or even smaller.

These animals use their tentacles to capture and eat microscopic creatures that float by.

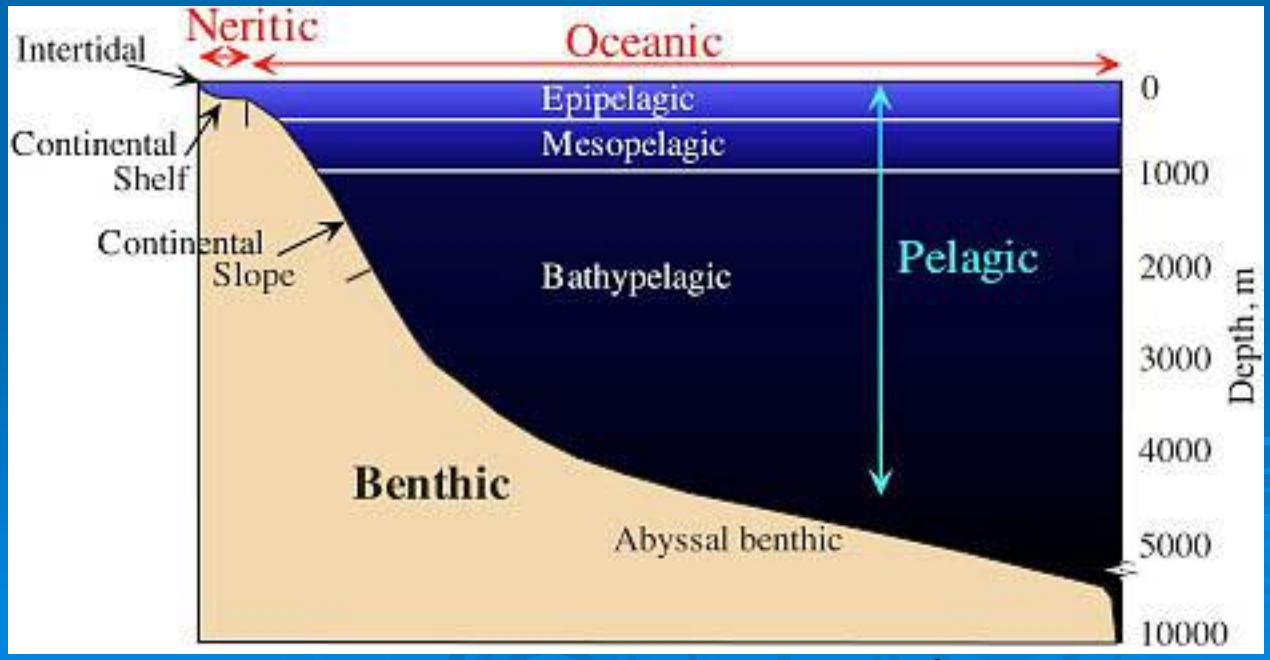
- Coral animals cannot grow in cold water or water that is low in salt.
- Corals grow with the help of algae that live symbiotically within their tissues.

Open Oceans

- The open ocean begins at the edge of the continental shelf and extends outward.
- It is the largest marine zone, covering more than 90% of the surface area o fthe world's oceans.
- Depth ranges from 500 meters to more than 11,000 meters at the deepest ocean trench.
- Organisms are exposed to high pressure, frigid temperatures, and total darkness.

Bentic Zone

- The benthic zone extends horizontally along the ocean floor from the coastal ocean through the open ocean.



- Benthos are organisms that live attached to or near the bottom such as sea stars, anemones, and marine worms.



- Benthic ecosystems often depend on food from organisms that grow in the photic zone and drift down from the surface.