Animals of the Benthic Environment

Intertidal Habitats:
Type of habitat is determined by ocean floor.

• Rocky Shores
  – Rocky Intertidal

• Sediment-Covered Shores
  – Sandy Beach, Tidal Marsh, Mud Flats

Rocky Intertidal Region
• Seashore between high and low tide
• Tide may go in and out or twice each day
  • Habitat is repeatedly:
    – Submerged underwater
    – Exposed to air

Rocky Intertidal Region
• Higher species diversity than soft-sediment regions
  • Why?
    • 1. Many Types of Habitats
      – flats, cracks, walls, tidepools
    • 2. More Stable Substrate
      – Habitat for sessile species
    • 3. More Food
      – Seaweeds and Plankton

Rocky Intertidal Region
• Dominated by Seaweeds (Algae) and Epifauna
  • Epifauna = animals that live on the surface of the ocean floor.

Rocky Intertidal Region
• Sessile Animals
  – Sponges
  – Barnacles
  – Mussels
  – Anemones
• Mobile Animals
  – Sea Stars
  – Urchins
  – Snails
  – Limpets
  – Crabs, Shrimp
  – Chitons
What are the Abiotic Conditions?

- **Favorable conditions:**
  - High Light, Nutrients, Oxygen from surf

- **Unfavorable conditions:**
  - Dessication
  - Strong Surf Action
  - Extremes in Temperature, Salinity, Oxygen concentration.

Intertidal Zones

- **Upper Zone**
  - Only under water at highest high tide (mostly exposed to air)

- **Middle Zone**
  - submerged and exposed each day

- **Lower Zone**
  - Only exposed at lowest tides (mostly submerged under water)

Upper Zone

- Harsh conditions
- High dessication
- Abiotic fluctuations
- Low Species Diversity
- Mostly shelled animals
  - barnacles & gastropods
  - few green and brown algae
- High Predation by Birds
- Low Predation by Invertebrates

Middle Zone

- Many favorable Habitats
  - flats, cracks, walls, tide pools
- High species diversity and abundance of invertebrates
- High algal diversity
- High competition for space
- Many sessile animals
  - mussels are dominant
- Many mobile animals
  - sea stars venture in
  - gastropods, sea urchins, crabs, worms are more common
Middle Zone
• Fewer Abiotic Stresses than Upper Zone
• Higher Competition and Predation

Lower Zone
• Least stressful abiotic conditions
• Dominated by producers
  – Kelps, Red Algae, Surf grass
• Large numbers of soft-bodied animals
  – Anemones, Sponges

Why do mussels inhabit the middle intertidal zone?
• Mussels are larger near the lower zone and smaller near the upper zone
• Mussels are filter feeders - Bivalves
• Mussels are excluded from upper zone because they do not have enough time to feed there

Predators can increase community diversity
• Keystone Predators:
  – A species with strong effects on others in the community
• Predators Present:
  – High species diversity in the community

• Predators Absent:
  – Low species diversity
  – Why? Predator feeds on a dominant species who reduces species diversity

Keystone Predators

• Sea Stars in intertidal community
  • Sea Stars present:
    – eat mussels
    – mussel population low
    – allows other species to fill in
  • Sea Stars absent:
    – mussels outcompete others
    – Low species diversity

Sea Otters are Keystone Predators in Kelp Forests (a subtidal habitat)

When Otters are Present:

• Otters eat lots of Sea Urchins
  – Sea Urchins mow down kelp beds
• Low number of sea urchins
• Large kelp populations
• Lots of food and habitat for others
• High species diversity in the community

When Sea Otters are Absent:

• High numbers of sea urchins
• Urchins eat a lot of kelp
• Small kelp populations
• Little food or habitat for others
• Low species diversity in the community