Benthic Communities

Variety of Environments

- Knowledge largely limited to coastal regions because of access
  - Intertidal
  - Estuaries
  - Coral reefs
  - Subtidal - coastal
- Abyssal environment only recently investigated - limitations and cost
- Each environment has its own set of physical and chemical characteristics and therefore biological

General Environmental Characters

- Variety in coastal environments, little in abyssal (ex. for vents)
- Substrate - rock (solid or rubble), sand, sediments
  - Coastal substrates dependent on land, abyssal substrates dependent on falling debris
  - Characteristics include firmness, texture and stability
- Temperature
- Osmotic nature (salinity, exposure to dehydration)
- Water currents and waves
  - Mouth of river
  - Shoreline exposure
    - Headlands vs. bay
    - Barrier reef or shoal

Size of Substrate Material (graphic)

Faunal Types

- Feeding habits
  - Carnivores, scavengers, suspension feeders (including filter feeders), deposit feeders, grazers
- Size
  - Epifauna - found on hard or firm substrates
  - Infauna - found in softer substrates
    - Macrofauna - typically feed on substrate (deposit feeders) or passing debris (filter feeders)
    - Microfauna
    - Interstitial (meiofauna)

Dispersal

- 75% have of coastal benthic animals have mobile larval forms (meroplankton) for 2-4 wks- important for lifetime of substrate existence
- Biology of larval forms very different than adults
- Settling is very important activity
Reproductive Strategies
• Fecundity (# of eggs or offspring produced) vs. mortality
• Timing - seasonal or lunar vs opportunistic
• Rearing - none vs. brooding

Intertidal Environment
• Or littoral
• Periods of emersion and immersion (including spring and neap tides)
• Variation plays important role of distribution (zonation) due to exposure to changing elements
  – Dehydration (desiccation)
  – Rainfall or high salinity
  – Temperature - high or low (freezing)
  – Predation (including by terrestrial animals)
  – Access to nutrient supply and oxygen
  – Wave action
  – Shifting sediments
• Interactions between species also plays role in zonation (particularly at lower limite of range of distribution)
  – Predation
  – Competition for food and space
  – Caging and removal experiments

Prevention of Dessication
• Depression
• Grouping
• Operculum

Opahi (graphic)
Deflection of Wave Force (graphic)
Other Rocky Intertidal Residents (graphic)

Sand Beach Environment
• Unstable substrate moving with waves, tides and currents
• Grain size important
  – Water retention (drainage)
  – Size of interstitial space
  – Detritus accumulation
  – Oxygen levels (anoxic - hydrogen sulfide)
• Burrowing (digging, boring, consuming)
• Detritus or suspension (filter) feeders
• Zonation not as discrete as rocky shorelines

Effect of Substrate Size (graphic)
Ghost Crab (graphic)
Mole Crab (Sand Turtle) (graphic)