Oceanography Chapter 16: Marine Communities

Community: comprised of the many populations of organisms that interact at a particular location.

Population: group of organisms of the same species that occupy a specific area.

Communities/Populations depend on the biological and physical characteristics of the living space.

Largest community (Deep Ocean) is the most sparsely populated.

Small community - a rock

Microscope communities also exist.

Organisms Within Communities
Habitat – its physical address or location
Niche – occupation within the habitat
Range of species – biodiversity

Influence of Physical and Biological Factors

›determine the location and composition of a community
›Physical Factors: T, P, and Salinity
›Biological Factors: crowding, predation, grazing, parasitism, shading from light, generation of waste substances, competition for limited oxygen

Stenothermal – narrow temperature range
Eurythermal – can function in a wide range

Stenohaline – require stable haline environment
Euryhaline – can withstand a wide range.

Combination of effects may prove lethal

Ecology: study of the balance between physical and biological factors and how they relate to community success and longevity.

Competition

- Can be between the same population or different ones
- Subtle changes in factors can swing favor to one organism over another (Barnacles, Limpets)
- Same species – larger, stronger, getting food, mating, avoiding enemies

Growth Rate and Carrying Capacity

- With no competition – growth rates are exponential
- Most have environmental resistance – some sort of limiting factor.
- Carrying Capacity- number of organisms in an environment

Distribution of Organisms
Population Density: number of individuals per unit area (or volume).

Random Distribution – the position of one organism in a community in no way influences the position of other organisms

- Also implies conditions are uniform.

Figure 16.5

Clumped Distribution – most common

- Where conditions are optimal for physical protection, nutrient concentration, initial dispersal, social interaction

Uniform Distribution – rarest

- Eels come close

Change in Marine Communities

Communities can alter their own environment
Coral Reefs $\Rightarrow$ currents, temp, dissolved gases

Natural catastrophes can alter communities.

Human activities can.

Climax Community: stable, long-established community

Succession: reestablishment of a climax community

Examples of Marine Communities

1. *Rocky Intertidal Communities (Figure 16.6)*
   - Band between the highest high tide and lowest low tide marks
   - Wave shock – the powerful force of crashing wave.
   - Can be extreme (with rise/fill of the tides)

(Critters are adapted) Exposure Figure 16.7

Motile vs. Sessile
Crabs Clams

Desiccation occurs – drying

2. *Seaweed Communities (Figure 16.8)*
   - Urchins like them
   - Others will eat urchins

3. *Sand Beach/Cobble Beach*
   - Actually high energy (Sand is tough)
   - Cobble – higher energy
   - Basalt – hot!
   - Sand beach critters Figure 16.9

4. Salt Marshes /Estuaries
    - Brackish to Saltwater
    - Estuary – broad, shallow river mouth
    - Critters are euryhaline
    - Lots of juveniles

5. Coral Reefs
    - Medium to High energy environment, but stable
    - Warm water
    - 50% biomass

    Figure 16.12

6. Open Ocean
    - 83% Biomass, uppermost 200m (660 feet)
    - Less than 1% us found below 3000m (10k ft)
      (Photosynthesis)
    - Deep Sea Scattering layer (DSL)
        1. Migrate up/down with light Figure 16.13
        2. Found with Echo sounding
        3. Found in all ocean areas but the Artic
    - Deeper water is "patchy"
      (And Bizarre - Gulper Eels (Figure 16.15)
      - Angler Fish (Figure 16.16)

7. Deep Sea Floor
    - slow metabolism: cold water
    - Live long lives
    - Very specialized for their environment
      Tripod Fish – 16.17
      Other Bizarres – 16.18

8. Deep Rock Communities
    - Extremophiles – stand very high temperatures.
    - Chemosynthethic (below Photic Zone)
        1. Use Fe, Ma, SO_4 to generate methane from CO_2
        (than build sugar molecules = Energy)
    - Some scientist think – 30 % biomass
    - Slimes – **S**ubsurface **Li**thoautotrophic **M**icrobial **E**cosystem**s**

9. Hydro thermal Vent and Cold Seep Communities
    - Near MOR
    - Chemosynthetic, using H_2S, CO_2, O_2 to make food
    - Huge ecosystem, from bacteria to higher level heterotrophs
        - Crabs, clams, sea anemones, shrimps
        - "Tube Worms" – Pogonophorans
        - Critters shelter bacteria
    - Cold Seeps – hypersaline cold water rich in nutrients
        - Base of chemo synthetic bacteria

10. Whale Fall Communities
    - May be the recruiters

Symbiosis: Co-occurrence - dependance

1. Mutualistic – both benefit
2. Commensialism – one benefits
3. Parasitism – one benefits, but harms the other