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 ⇒ 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, SO₄ to generate methane from CO₂
        (than build sugar molecules = Energy)
   ➢ Some scientist think – 30 % biomass
   ➢ Slimes – Subsurface Lithoautotrophic Microbial Ecosystems

9. Hydro thermal Vent and Cold Seep Communities
   ➢ Near MOR
   ➢ Chemosynthetic, using H₂S, CO₂, O₂ 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. Commensalism – one benefits
3. Parasitism – one benefits, but harms the other