Bio 20 Marine Biology – Exam 4 Outline

Between the Tides (Chapter 11)

The Intertidal Zone (Littoral Zone)

2 main types of intertidal zones
I. Rocky Shore Communities

A. Problems that rocky intertidal organisms face in this habitat and how they are adapted to deal with them:
   1. Exposure at low tide (ex. water loss, temperature extremes)

2. Wave Action/Shock

3. The Battle for Space:

B. Vertical Zonation – (fig. 11.18)

1. Why does this zonation exist?
   a. What is the upper limit of a species set by?

   b. What is the lower limit of a species set by?
C. 3 Main Rocky Intertidal Zones

1. Upper intertidal

   - Small-sized organisms that are well adapted to exposure
   - Ex. cyanobacteria, periwinkle snails, limpets

2. Middle intertidal

   - Medium-sized organisms
   - Ex. acorn barnacles, rockweeds, mussels

3. Lower intertidal

   - Larger organisms
   - Ex. red, green and brown seaweeds, seagrass, purple urchins, sea slugs, seastars

II. Soft-Bottom Intertidal Communities (Fig. 11.34)

A. Problems that soft-bottom intertidal organisms face in this habitat and how they are adapted to deal with them:

1. Low oxygen availability

2. Getting around

3. Feeding
I. Estuaries

A. Characteristics of Estuaries

B. Functions of Estuaries

C. Problems that estuarine organisms face and how they are adapted to deal with them:

1. Salinity fluctuations (Fig. 12.4)
   Read pp. 273-275 “Coping with Salinity Fluctuations” and describe how each of the following deals with salinity changes.
   a. Osmoconformers (Fig. 12.6)

   b. Osmoregulators (Fig. 12.6)

2. Living in the mud
D. Estuarine Communities

1. Salt Marshes (tidal marshes, wetlands) (fig. 12.14, 12.15)
   a. Location:

   b. Salt Marsh Plants:
      Read pp. 273-275 “Coping with Salinity Fluctuations” and state the adaptations that cordgrass and pickleweed have evolved to handle salinity changes.
      Cordgrass (Fig. 12.7):

      Pickleweed (Fig. 12.8):

2. Mangrove Forests (fig. 12.17 - 12.21)
   a. Location:

   b. Mangrove Forest Plants (Fig. 12.18 – 12.20)
I. Continental Shelf (Subtidal Zone)

A. Characteristics of the Continental Shelf

B. Continental Shelf Communities:
   1. Soft-Bottom Subtidal Communities

2. Hard-Bottom Subtidal Communities (reefs)

   a. Kelp Communities

      Physical Characteristics that Influence Kelp Communities

Importance of Kelp Communities

Kelp Grazers & Urchin Barrens
Coral Reefs (Chapter 14)

I. Coral Reefs
   A. Corals
      1. Hard Corals

B. Physical Characteristics That Influence Coral Reefs (Fig. 14.11)

READ “Coral Reproduction” p. 319 and answer the following:
1. Do corals reproduce asexually, sexually, or both?

2. Do corals use internal or external fertilization?

READ “Kinds of Coral Reefs” pp. 320 - 326 and define the following types of reefs. Also briefly describe how atolls are formed by using Figure 14.24
1. Fringing Reefs – (fig. 14.15)
2. Barrier Reefs – (fig. 14.18) Ex. Great Barrier Reef

3. Atolls – (fig. 14.23)

4. Atoll Formation – (fig. 14.24)

READ “Coral Reef Communities” pp. 328 -334 and answer the following:
C. Common Coral Reef Organisms
   1. Butterflyfish – What do they eat and what role do they play in a coral reef?

   2. Crown of Thorns Sea Star - What do they eat and do they experience population explosions?

   3. Parrotfish – What do they eat and what role do they play in a coral reef?
4. Damselfishes - What do they eat and what role do they play in a coral reef?

5. Anemonefishes (Clown Fish) – What is their unique relationship with sea anemones?

Read “Deep-Water Coral Communities” p. 325 and answer the following:
1. Describe how deep-water corals feed? Do they have zooxanthellae?
I. Pelagic Environment (fig. 10.12)

A. Physical Characteristics of the Pelagic Environment

B. Epipelagic

Divided into 2 components
1. Coastal (neritic)
2. Open Ocean (Oceanic)

C. Organisms of the Epipelagic
1. Plankton
   a. Phytoplankton:
   b. Zooplankton:

2. Nekton:
D. Problems that epipelagic organisms face in this habitat and how they are adapted to deal with them:
   1. Staying Afloat

2. Need to eat and avoid being eaten
   a. What sense organs do they have?
   
   b. What type of coloration is common? (fig. 15.18)
   
   c. Are fish good swimmers here? (fig. 15.20)
   
   d. What is vertical migration and how does it work? (fig. 15.23)

Read “Swimming Machines” p. 351 and answer the following:
1. What types of fish swim continuously?

2. What is the fastest fish?

3. Describe 5 specific adaptations that these fish have that allow them to be extremely hydrodynamic.

4. Would these fish be considered more ectothermic or endothermic?
E. El Niño-Southern Oscillation (ENSO) Phenomenon (fig. 15.34, 15.35)

1. What is El Niño?

2. Conditions normally

   a. Effects

3. Conditions during El Niño

   a. Effects
I. Waters Below the Epipelagic
   A. Physical Characteristics of the Waters Below the Epipelagic (fig. 16.1)

B. Mesopelagic (Midwater) – below epipelagic to 1000m

1. Adaptations that Mesopelagic Organisms Have: Ex. krill, copepods, shrimps & small fishes (bristlemouths & lanternfishes)
   a. Are they small or large bodied and why?
   b. Do they have small or large mouths and why?
   c. Do they have small or large eyes and why?
   d. What colors do these organisms tend to be and why?
   e. What are photophores and counterillumination and how are they used?
C. The Deep Sea - below mesopelagic (bathypelagic, abyssopelagic, hadopelagic)

1. Adaptations that Deep Sea Organisms Have: Ex. bristlemouths & anglerfishes
   a. Are they small or large bodied, fit or flabby and why?

   b. Do they have small or large mouths and why?

   c. Do they have small or large eyes and why?

   d. What colors do these organisms tend to be and why?

   e. How are photophores used in the deep sea?

   f. How do these organisms find mates to reproduce with?

Read “Biodiversity In The Deep Sea” p. 382 and answer the following:
1. Is the abundance of organisms in the deep sea low or high?

2. Is the number of species in the deep sea low or high?

3. How is this area being affected by humans?
<table>
<thead>
<tr>
<th></th>
<th>Epipelagic (vertical migrants)</th>
<th>Mesopelagic (non-migrants)</th>
<th>Deep pelagic</th>
<th>Deep-sea bottom</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Appearance</strong></td>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
<td><img src="image3.png" alt="Image" /></td>
<td><img src="image4.png" alt="Image" /></td>
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<tr>
<td><strong>Size</strong></td>
<td>Wide size range, from tiny to huge</td>
<td>Small</td>
<td>Relatively small, larger than mesopelagic</td>
<td>Relatively large</td>
</tr>
<tr>
<td><strong>Shape</strong></td>
<td>Streamlined</td>
<td>Relatively elongated and/or laterally compressed</td>
<td>No streamlining, often globular in shape</td>
<td>Very elongated</td>
</tr>
<tr>
<td><strong>Musculature</strong></td>
<td>Strong muscles, fast swimming</td>
<td>Moderately strong muscles</td>
<td>Weak, flabby muscles</td>
<td>Strong muscles</td>
</tr>
<tr>
<td><strong>Eye characteristics</strong></td>
<td>Large eyes</td>
<td>Very large, sensitive eyes</td>
<td>Very large, sensitive eyes, sometimes tubular eyes</td>
<td>Eyes small, sometimes absent</td>
</tr>
<tr>
<td><strong>Coloration</strong></td>
<td>Typical counter-shading: dark back and white or silver belly</td>
<td>Black or black with silver sides and belly; counterillumination</td>
<td>Black or black with silver sides and belly; counterillumination</td>
<td>Black, occasionally red, often lack coloration at greatest depths</td>
</tr>
<tr>
<td><strong>Bioluminescence</strong></td>
<td>Bioluminescence relatively uncommon</td>
<td>Bioluminescence common, often used for counterillumination</td>
<td>Bioluminescence common, often used for counterillumination</td>
<td>Bioluminescence common, often used to attract prey</td>
</tr>
</tbody>
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