Marine Biology - Part 3

**Pelagic Communities**

- **Plankton** *(floaters)*
  - Phytoplankton (autotrophs)
  - Zooplankton (heterotrophs)
- **Nekton** *(swimmers)*
  - Squids and nautiluses
  - Shrimps and relatives
  - Fishes
  - Reptiles
  - Birds
  - Mammals

**Food Sources in the Deep Ocean**

Most food from surface waters above drifts down through the water column (dead organisms, fecal pellets, molts). Some is transported down the continental slope by currents.

**Plankton Net**

Fig. 13.2a, p. 300
Diatoms (SiO$_2$) = A Phytoplankton

Fatty acids, oils, chlorophyll

Frustules

Very efficient photosynthesizers! (~55%)

Other Phytoplankton

- Dinoflagellates (cellulose)
  - 2 flagella - drive, rotate
  - Red tides
  - Bioluminescence

- Coccolithophores (CaCO$_3$)
  - Covered with disks (coccoliths)
  - Translucent
  - Bright temperate coastal waters
  - Chalk

See Fig. 13.6, p. 304 & Fig. 13.7, p. 305
Copepods (crustaceans) = A Zooplankton

Other Zooplankton
• Radiolaria (SiO$_2$)
  • Siliceous oozes

• Foraminifera (CaCO$_3$)
  • Calcareous oozes
  • Protista (~amoebas)

Other Zooplankton
• Krill (arthropods)
  • Key role in Antarctic ecosystem
  • Eat diatoms
  • Greater biomass than humans!

• Cnidarians (the “c” is silent)
  • Hydrozoans and jellies

See Fig. 13.10, p. 307
See Fig. 13.12, p. 308
Nekton

Fish Fins

Fig. 13.19, p. 313

Turn, brake, balance
Stabilizers
Propulsion

Alternate contraction and relaxation of the myomeres sends a wave of body curvature back along the body to produce a forward thrust.

Modifications of Pectoral Fins

Flying fish--Pectoral fins modified for gliding
Pectoral fin
Skeletal
Skeletal--Pectoral fins modified for walking
Gurnard--Pectoral fins modified for swimming
Pelvic fin

Caudal fin
Soft dorsal fin
Spiny dorsal fin
Anal fin
Myomeres
Lateral line
Operculum (gill covering)
Pectoral fin

Modifications of Caudal Fins

Fish with homocercal caudal fins (dorsal, caudal, and anal fins attached) are able to swim in an undulating motion.

Fish with heterocercal caudal fins, with the ventral lobe taking the largest portion of the caudal fin, are better suited for jumping or quick turns.

Fish with thomsoni caudal fins are usually strong, but slow swimmers.

Fish with nelsoni caudal fins are usually strong, but slow swimmers.

http://www.marinebio.org/manual/WHAM/Fishbase/Fish_Swimming_and_Speed_Table.htm
http://www.paleo.co/Vertebrates/Lsts/Glossary/Images/Epicercal.gif

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Fish Mouths

- **Large**
  - For eating whole fish or chunks of fish

- **Small**
  - For nibbling on plants and small animals

- **Dorsal**
  - For eating near the surface

http://www.anaworld.org/aquademics/tetra/mouthsfins.htm

“The Problems of Fishes”

- **Movement, shape, propulsion**
  - Problem: Drag (friction)
    - Solutions:
      - Streamlined shape
      - Size (larger = faster)
      - Warm/cold blooded
      - Red/white muscle tissue
      - Additional arteries

  - Warm-blooded fish swim faster; Cold-blooded fish swim slower
  - Cruisers hunt prey - mainly red muscle tissue; Langers wait for prey - mainly white muscle tissue
  - Extra arteries for fast swimmers - Heat energy generated by contracting muscles

“The Problems of Fishes”

- **Maintenance of vertical level**
  - Problem: Sinking (mass)
    - Solutions:
      - Swim bladders (bony fishes)
      - Movement, tail-fin shape (cartilaginous fishes)
      - Increasing projections

“The Problems of Fishes”

- **Gas exchange**
  - Problem: Breathing underwater
    - Solutions:
      - Gills with huge surface area and efficient extraction

Fig. 13.20, p. 314
“The Problems of Fishes”

- Feeding, defense
  - Problem: Staying alive
  - Solutions:
    - Schooling
    - Large, sensitive eyes
    - Bioluminescence - Fig. 13-17
    - Big mouths
    - Camouflage
    - Poisons
    - Symbiosis
    - Expandable bodies

Reasons to “Stay in School”

- Reduces % of ocean volume in which cruising predator might find you.
- Predator less likely to consume entire unit.
- May appear as a single large, dangerous opponent to predator.
- Continually changing position and direction of movement is confusing to predator.
- Reduced drag, boost from vortex of fellow schoolers —> Swim farther, more efficient

School enhances survival! 😊

Adaptations of Deep-Sea Fishes

- Big eyes
- Big mouth!
- Bioluminescent “lure”

Adaptations of Deep-Sea Fishes

- Lure
- Large teeth
- Hinged jaw
- Curled-up prey in stomach is longer than the predator!

Viper fish
(Chaunolodus sloani)

(Chiasmodon niger)
See Fig. 13.29, p. 321
Fig. 13.25, p. 318
“5-Minute Write”

Summarize the main points of today’s lecture.
List 3 to 5 questions you have, based on today’s lecture.
What did you find most interesting about today’s lecture?
How was the lecture relevant to you?