Mollusks
(Mollusca)

Crustaceans

Chapter 6
Bivalves (Class: Bivalvia)

- Mollusks with two shells.
- Also called pelecypods.
- Have soft, bilateral symmetry bodies composed of head, foot, and coiled visceral mass (internal organs).
- Most have either an external or internal shell.
- Have a coelom and a brain.
- Shells are hinged together by the adductor muscles.
  - Clams, oysters, and mussels have two muscles.
  - Scallops have one.
- The rings on its shell represents its age. It grows a new ring every year.
• Shells are hard due to the presence of calcium carbonate secreted by the mantle.
• **Mantle**: a thin membrane lining the insides of both shells protecting its internal organs.
Life Activities of Bivalves

• Normally the shells are shut tight with only a small gap between them.

• **Siphon tube**: tube which protrudes through a gap between its shells for feeding and breathing.

• Siphon has two openings:
  1. *incurrent siphon* – entrance for water containing food and oxygen.
  2. *excurrent siphon* – exit for waste products of digestion and respiration.

• Bivalves are examples of filter feeders – filter their food from water.

• Responsible for filtering and cleansing seawater.
• Have gill membranes which act like our lungs. They take in oxygen and give off carbon dioxide. Water brought in through the incumbent siphon flows to the gills.
• Ciliated cells on the gill membranes beat back and forth creating a current that enters and exits the clam.
• During feeding, food particles in the water get stuck in mucus that coats the surface of the gills and mantle.
• Ciliated cells move food particles towards the mouth.
• Have an open circulatory system. Nutrients and oxygen are transported through the body by a colorless blood.
• Mussels live in turbulent intertidal zones.
• **Byssal threads:** threads made of fibrous proteins that attach mussels firmly to rocks and other hard substances.
• Byssal threads are secreted from a gland in the mussel’s foot.
Oysters

- Live attached to a substrate.
- Shells are rough and uneven
- Flat upper shell fits like a lid on top of a more curved lower shell.
- Lower shell secretes a cement that adheres to rocks and other hard substances.
- Dentists are interested in the chemical properties of the cement. Development of filling for teeth.
- Can produce natural pearls. Develops when a sand grain gets into the oyster and lodges between the mantle and the shell.
- Seen as a foreign body, the body secretes layers of shell around the grain.
Movement in Bivalves

- Scallop is the fastest of the bivalves.
- Caused by the contraction and relaxation of its adductor muscle.
- Shell opens and closes, forcing water out from between them.
- Clams move through the sand by using their muscular foot as a digging tool.

http://www.youtube.com/watch?v=2iXHBuSIJY
Reproduction in Bivalves

- Have separate sexes.
- Fertilization and development are external.
- Females release egg and males release sperm into the water.
- When they for their shells, the sink to the seafloor and develop into adults.
Gastropods

- Comprise about two-thirds of the mollusk species.
- Also called univalves.
- Structure:
  - Have a single coiled shell.
  - Glide along surfaces using its large muscular foot.
  - One-way digestive tract. Food enters through the mouth.
  - Open circulatory system. One chambered heart and blood vessels.
  - Kidneys excrete metabolic waste.
  - **Operculum**: thick pad of tissue that closes like a trapdoor over its foot.
Life Activities of Snails:
• Takes in oxygenated water through its siphon tube.
• Gills take up the oxygen and give off carbon dioxide.
• Anterior tentacles in the head region are receptors used for touch.
• Two posterior tentacles, or eyestalks, are used for vision.
• Adapted to crawl and climb in search of food.
• Some are predators. Secretes chemicals from a gland in its foot to soften the shell of other organisms. Other snails are scavengers.
• Radula: toothed structure used to scrape and ingest algae.
Cone Snail – uses toxins to kill prey; has a harpoonlike radula; toxins studies for use as pain reliever

Periwinkle – grazes on algae

Moon Snail – feed on live clams

Mud Snail - scavengers
Reproduction in Snails

- Some have separate sexes; some are hermaphroditic
- Internal fertilization; external development
- The whelk snail produces an egg case composed of several capsules strung together.
• Moon snail eggs develop into larvae in a thin, leathery membrane called a sand collar.
• Sand collar consists of grains of sand cemented together by mucus.
• Mud snails deposit flattened, transparent jelly capsules on substrates in the intertidal zones.
• Each capsule contains 50 to 250 fertilized eggs.
• After 6 to 7 days, they hatch into ciliated larvae called veliger.
Sea hare

Nudibranch
Cephalopods

- Name means “head-foot.”
- Tentacles are the “foot.”
- Streamlined body and lack an external shell.
- Water is drawn into the mantle cavity and expelled through the siphon.
- Highly developed nervous system.
- Predators that use a parrot-like beak to kill prey.
- One-way digestive tract.
- Closed circulatory system.
- Suction disks used for grasping and holding on to prey.
Life Activities of Cephalopods

- The squid is the fastest of all cephalopods; swim in schools for added protection.
- Octopus, cuttlefish, and nautilus are so literally animals.
- Use camouflage to avoid being detected; contain chromatophores—special pigmented cells, which expand and contract, causing changes in skin pattern and coloration.
- Able to discharge a cloud of ink into the water.
- Brain and eye are highly developed.
Chambered nautilus:
- Inhabits deep waters of the South Pacific.
- Has a spiral-shaped shell divided into compartments; innermost compartments are gas-filled to regulate buoyancy.
- Nautilus lives in outermost compartment.
Cuttlefish

- Bottom-dwelling cephalopod feeding on invertebrates in the sand.
- Has an internal shell known as cuttlebone; adds support to its body.
- Also has ten tentacles, like the squid.
Giant squid

- Largest of swimming mollusks; largest invertebrate.
- Adult giant squid has never been captured alive.
- Can grow in length of about 20 meters.
- Inhabits the deep ocean; 300 to 600 meters below
- Favorite food of the sperm whale.
Reproduction in Cephalopods

• All but the nautilus breed in shallow waters.
• Fertilization is internal; development is external.
• Males deposit a package of sperm to the female, using its tentacles to place it within her mantle cavity.
• Most squids die after mating.
• Octopus protects and cleans her eggs, staying with them until they hatch. After they hatch, she dies of starvation.
Other Mollusks

**Chitons:**
- Have no eyes nor tentacles on their heads.
- Have overlapping shells.
- Belongs to class Polyplacophora (“many plates”); has eight overlapping shells.
- Inhabit the rocky intertidal zones.
- Shell covers muscular foot.
- Feeds by scraping algae off the rocks with its radula.
Scaphopods:

- Consists of the tusk shells, named for their tapering shell shape.
- Some burrow in the sand of deep water; some live in the sediments of shallow tropical waters.
- Their foot helps anchor them in the sand.
- Have numerous, long tentacles with sticky ends used for capturing worms and plankton.
- Native Americans used the shells to make necklaces and as wampum.
Crustaceans

- Phylum Arthropoda (jointed feet)

**Characteristics:**
- Movable limbs
- Tough body covering, outer skeleton (exoskeleton)
- The most important in marine habitats
• Have bilateral symmetry and divided into two segments:
  • Cephalothorax: comprises the head and chest regions
  • Abdomen: includes the tail, if present

• Carapace: part of the exoskeleton that covers the head and chest regions.

• Have 5prs. of legs --- known as “decapods”
  The claws are the first pair of legs, the other four are called walking legs.
• Head contains 2 eyes, 2 pairs of antennae, and special mouthparts for feeding.

• Swimmerets: small paddlelike appendages used for gliding along the sea bottom. Found in lobsters.

• Molting: process of shedding outer covering for the purpose of growing.
Lobsters

Characteristics:
- Act as predators and scavengers.
- Food is digested in a one way digestive tract consisting of a mouth, esophagus, stomach, and intestines.
- Waste is eliminated through the anus.
- Use gills for breathing, featherlike structures located in a water-filled chamber under the carapace.
• Oxygen and nutrients are transported around the lobster’s body in its blood. Blood is blue in color due to pigment called hemocyanin.
• Hemocyanin contains copper.
• Has a one-chambered heart.
• Open circulatory system – blood passes through tissue spaces.
• Have a ventral nerve cord (controls muscles in legs and abdomen), two pairs of antennae (actively feel out the environment), brain (cerebral ganglia).
• Reproduce sexually, fertilization is internal, development is external.
• Two common species are the northern lobster (Homarus americanus) and the spiny lobster (Panulirus argus).
• Northern lobster called Maine lobster has two large claws; absent in spiny lobster.
Lobster

Dorsal View
The Crab

• Body is divided into segments: the cephalothorax and the abdomen.
• Abdomen is small and flat and folded between the crab’s walking legs on its ventral side.
• Sex is determined by the shape of its abdomen:
• Eat mainly dead plants and animal matter; some graze on algae and others are predatory.
• Use their two sharp claws to tear and shred food. Food is then passed to the mouth, where it is cut into smaller pieces.
• Have a one-way digestive tract. (mouth, esophagus, stomach, intestines, and anus)
• Breathe by means of gills and transport nutrients and oxygen through an open circulatory system.
• Have two eyes on stalks; antennae for perceiving touch and temperature stimuli.
• Internal fertilization; external development.
• Produce large numbers of offspring.
Copepods

- The most abundant crustacean in the ocean.
- Class Copepoda
- Important primary and secondary consumers of phytoplankton and zooplankton.
- They link the tiny primary producers and consumers to the large animals higher up on the web.
- Sexual reproduction
- Eats Diatoms.
Krill

- Shrimp-like in appearance.
- More than ten legs, so not classified with decapods.
- Grow to about 5cm. in length.
- Most live in Antarctic waters.
- Principle food source for baleen whales.
Barnacles

• Attach to almost any substrate.
• Known as a type of encrusting organism.
• Lives in the upper intertidal zone.
• Body is folded up within its shell, so that its legs can protrude from the opening.
• Cirri: six pairs of feathery appendages used for catching phytoplankton and other food particles, which are then brought into its mouth.
• Filter feeders.
• One-way digestive tract