

Phylum Arthropoda

1. Crayfish anatomy (substituted for the lobster)

It is illegal to collect or possess juvenile lobsters whose carapace length is less than 3 ¼ inches from eye socket to end of carapace. If you are unable to obtain legal lobsters crayfish are an economical alternative. Although crayfish are freshwater organisms, they are anatomically and behaviorally similar to the lobster and serve well as a substitute. They can be collected locally or ordered from a biological supply house. (Be careful the pinching claws can hurt.)

<<Activity>>

The following instructions can be used interchangeably with crayfish or lobsters, but it is recommended to have anatomical diagrams that are specific to each organism. Place one crayfish in a large shallow dish and examine the external anatomy. A labeled crayfish or lobster diagram can be found at www.enchantedlearning.com It will be necessary to remove the animal from the water by grasping the dorsal surface of the cephalothorax with your forefinger and thumb. Examine the appendages on the ventral surface. Be careful of the pinching claws (chelipeds). Return the animal to the dish every 5 minutes or so to re-hydrate the gills. The head generally consists of six fused segments and is sensory in nature. Locate the following appendages using the live animal:

- Paired antennae (larger), antennules (smaller) and stalked eyes. Describe the function of each. Shine a beam of light at the eyes. Record the animal's reaction.
- Paired mandibles. What are they used for?
- Two pairs of maxillae. They are used for manipulating food. Part of the second pair of maxillae is used as a gill bailer, responsible for moving oxygenated water over the gills.
- Three pairs of maxillipeds. They are responsible for holding and tasting food.
- Next are the large chelipeds. What is their function?
- Following the chelipeds are four pairs of walking legs. Gills are attached to the base of the legs. Carefully describe how the legs are used as the animal moves forward or backward. Does one pair of legs move forward or backward at the same time? Do they move in opposite directions? How does the next pair of legs move in relationship with the first? The second? The third? The fourth? The fifth? Does the abdomen play a role in movement? Explain.
- The abdomen is segmented and ventrally bears 5 pairs of appendages called swimmerets. Based on your observations what is the function of these appendages? The abdomen ends in a terminal telson, flanked by a pair of uropods. How are they used in movement? In the male, the first two pairs of swimmerets are thickened and modified for sperm transfer. Examine an illustration of the ventral surface of the thorax of a male and locate the male opening and swimmerets 1 and 2. Can you locate these on a live specimen? Do the same for a female and locate the female genital opening.
- Feed the crayfish with small pieces of clam or hamburger. Describe the feeding process.

2. Green Crab (*Carcinus*) Feeding Behavior

The external anatomy of a crab is generally similar to that of the lobster described above. One of the major differences is that the abdomen of the crab is tucked up underneath the animal rather than extending posteriorly, as in the lobster. Because of this “crabs move sideways and lobsters straight ahead.” Green crabs (*Carcinus*) are abundant along the rocky shores of Maine. They can be found at most times of the year by turning over rocks near the low tide line. Be careful the claws can pinch. Green crabs tend to be more active than rock crabs (*Cancer spp.*)

<<Activity>>

Place one inch square pieces of filter paper (coffee filter works well) in a large glass dish treated as follows:

1. saturated with the juice from mashed clam tissue;
2. soaked in distilled water;
3. soaked with seawater;
4. other (Use your imagination, what else might a crab be attracted to?)

Place a small crab in the dish and observe and record its' behavior.

- Was the crab attracted to any of treated filter paper squares?

Devise an experiment that will test whether different regions of the crab's body are more sensitive than others to the presence of filter paper squares treated with mussel juice.

Observe and record crab feeding behavior using pieces of mussel tissue. If animals are uncooperative keep them in the refrigerator for a few days. House them in a covered dish with about a ½ inch of seawater on the bottom (about one inch deep for larger crabs).

3. Amphipods

Refer to the photograph of the two clasping amphipods in the MITZI Image Library (also seen below). Amphipods can be collected in tide pools or at the waters edge with a fine mesh, long handled dip net. Freshwater amphipods are similar to their marine relatives and can be used as a substitute.

<<Activity>>

General Anatomy:



Place an amphipod in a glass dish that is half filled with seawater and examine with a dissecting microscope. Amphipods are crustaceans that lack a carapace such as that found in lobsters or crayfish. They are compressed laterally (from side to side). Most species are nocturnal and are restricted to living on or in the substrate.

- Locate the two pairs of antennae and the eyespots on the head. Find the three pairs of longer walking legs (periopods) towards the anterior end. These appendages are used to crawl across the substratum.
- Next, locate the more posterior three pairs of abdominal appendages (pleopods). The pleopods are used primarily when the animal swims in concert with dorso-ventral undulations of the body.

Amphipods are omnivorous feeders for the most part feeding on aquatic vegetation or indirectly by scraping attached animals and plants from the surface of stems and leaves.

Behavior:

Place one animal in the center of a glass dish partially filled with seawater, and describe movement in detail.

- Based on your observations, which type of habitat, is the animal best suited for?

4. Barnacle Feeding

Small mussels with attached barnacles can often be found on the sides of marina or commercial fishing floats. Refer to labeled barnacle photographs in the MITZI Image Library (also seen below).

<<Activity>>



Transfer a blue mussel with its attached barnacle to a glass dish filled with seawater. Examine the external structure of the barnacle shell with a magnifying glass or dissecting microscope. Identify the various plates using the labeled photograph in the MITZI Image Library (*Image #6-Mid-intertidal Zone--Animals-Barnacles and Mussels*).

Barnacles filter the surrounding water by rhythmically extending and retracting long appendages called cirri from the top of the animal. The cirri have lateral extensions that help trap particles. When the cirri are retracted into the shell, food is passed to the mouth and consumed. Describe as much of the process as you can.

- How does this type of filter feeding differ from that of the blue mussel?