

## Skills Practice Lab

# Crayfish Dissection

Like all crustaceans, a crayfish has a fairly hard exoskeleton that covers its body. As shown in **Figure 1**, the body is divided into two main parts, the *cephalothorax* and the *abdomen*. The cephalothorax consists of the cephalic (head) region and the thoracic region. The part of the exoskeleton that covers the cephalothorax is called the *carapace*. The cephalothorax consists of 13 segments that are not clearly divided. The abdomen is located behind the cephalothorax and consists of six clearly divided segments.

Each segment of the cephalothorax and the abdomen contains a pair of appendages. The head region has five pairs of appendages. The *antennules* are organs of balance, touch, and taste. The two long *antennae* are organs of touch, taste, and smell. The *mandibles*, or jaws, crush food by moving from side to side. Two pairs of *maxillae* hold solid food, tear it, and pass it to the mouth. The second pair of maxillae also helps to draw water over the gills.

Of the eight pairs of appendages of the thoracic region, the first three are *maxillipeds*, which hold food during eating. The fourth pair consists of *walking legs* with large claws called *chelipeds*, which the crayfish uses for defense and capturing prey. The four remaining pairs of appendages of the thoracic region also are *walking legs*.

The first five segments of the abdomen each have a pair of *swimmerets*, which create water currents and function in reproduction. The sixth segment has a modified pair of appendages called *uropods*. In the middle of the uropods is a structure called the *telson*, which contains the anus. The uropods and telson together make up the tail fan. The crayfish moves backward by forcing water forward with its tail fan.

In this lab, you will observe the external structures of a crayfish and dissect the crayfish to study its internal structures and systems.

## OBJECTIVES

**Locate** various external structures of a crayfish.

**Identify** organs that make up the different systems of a crayfish.

**Compare** the anatomy of a crayfish to that of other organisms.

## MATERIALS

- dissecting tray
- lab apron
- scissors
- felt-tip marker
- paper towels
- twist tie
- forceps
- plastic storage bag
- WARDSafe
- gloves
- preserved crayfish
- hand lens
- safety goggles



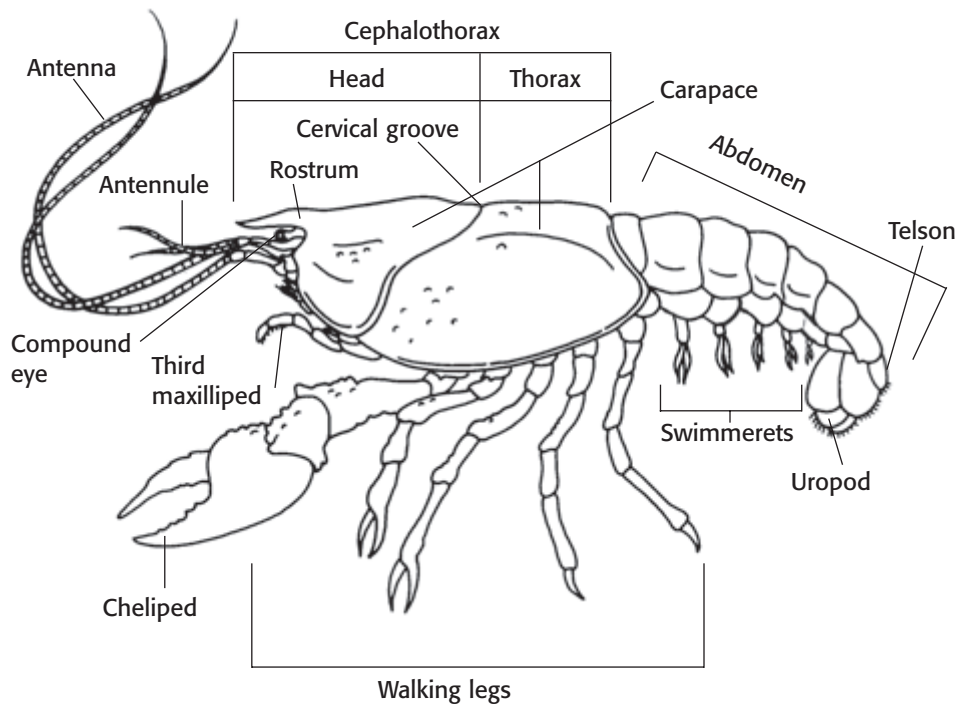
**Crayfish Dissection** *continued*

**Procedure**

**PART 1: EXTERNAL ANATOMY OF A CRAYFISH**

1. Put on safety goggles, gloves, and a lab apron.
2. Place a crayfish dorsal side up in a dissection tray.
3. Refer to **Figure 1** to locate the cephalothorax and the abdomen.
4. Locate the carapace, a stiff shield of chitin that covers the dorsal surface of the cephalothorax. On the carapace, observe the cervical groove, an indentation that extends across the mid-region and separates the head and thoracic regions.
5. On the thoracic region, locate the prominent suture or indentation on the cephalothorax that defines a central area separate from the sides. Note the individual segments of the abdomen. Try to bend the cephalothorax and abdomen.

**FIGURE 1 EXTERNAL ANATOMY OF A CRAYFISH**



- Which part of the crayfish—the cephalothorax or abdomen—is more flexible? Why?

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**Crayfish Dissection** *continued*

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- 6.** Turn the crayfish on its side. Locate the rostrum, which is the pointed extension of the carapace at the head of the animal shown in **Figure 1**. Beneath the rostrum, locate the two compound eyes. Notice that each eye is at the end of a stalk.
  - 7.** Locate the five pairs of appendages on the head region. First, locate the antennules in the most anterior segment. Behind the antennules, observe the much longer pair of antennae.
  - 8.** Locate the mouth. Observe the mandibles, or true jaws, behind the antennae. Locate the two pairs of maxillae, which are the last appendages on the head region.
  - 9.** Observe the three pairs of maxillipeds on the thoracic portion of the cephalothorax.
  - 10.** Observe the walking legs with the large chelipeds, or claws. Behind these walking legs, locate the other four pairs of walking legs, one pair on each segment.
  - 11.** Use the walking legs to determine the sex of your specimen. Locate the base segment of each pair of walking legs. The base segment is where the leg attaches to the body.  
Use a hand lens to study the inside surface of the base segment of the third pair of walking legs. If you observe a crescent-shaped slit, you have located a genital pore of a female.  
In a male, the sperm duct openings are on the base segment of the fifth pair of walking legs. Use a hand lens to observe the opening of a male genital pore.
    - Is your specimen male or female?
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- 12.** Exchange your specimen with a nearby classmate who has a crayfish of the opposite sex. Then study its genital pores.
  - 13.** Observe the six distinct segments on the abdomen. Observe a pair of swimmerets on each of the first five segments.
  - 14.** Observe a pair of paddlelike appendages, the uropods, on the last abdominal segment. Locate the triangular-shaped telson in the middle of the uropods.
  - 15.** Turn the crayfish ventral side up. Observe the location of each pair of appendages from the ventral side.
    - From which view—dorsal or ventral—can you see the location of the appendages on the segments more clearly?
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- 16.** Next, you will study the internal anatomy of a crayfish. If you must store your specimen until the next lab period, cover it with a paper towel dampened with WARDSafe. Then place the specimen on the tray in a plastic bag. Close the bag with a twist tie. Write your name on the bag with a felt-tip marker, and give your specimen to your teacher.

**Crayfish Dissection** *continued*

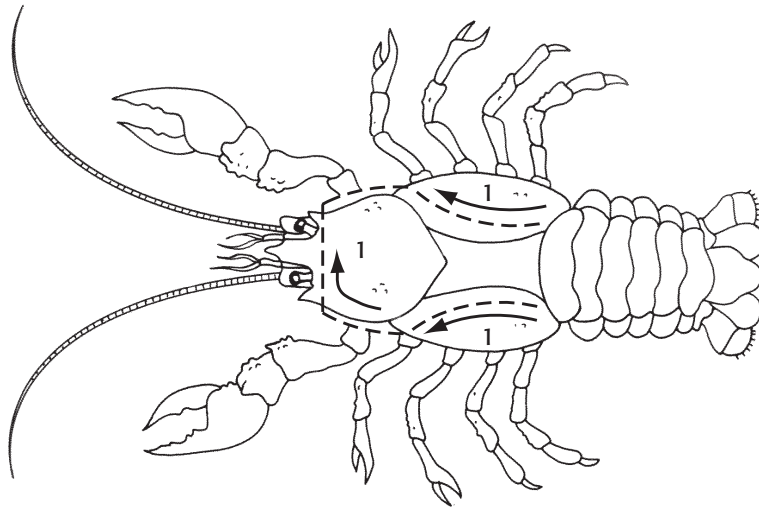
17. Clean up your work area, and wash your hands before leaving the lab.

**PART 2: INTERNAL ANATOMY OF A CRAYFISH**

18. Put on safety goggles, gloves, and a lab apron.

19. Use one hand to hold the crayfish dorsal side up in the dissecting tray.

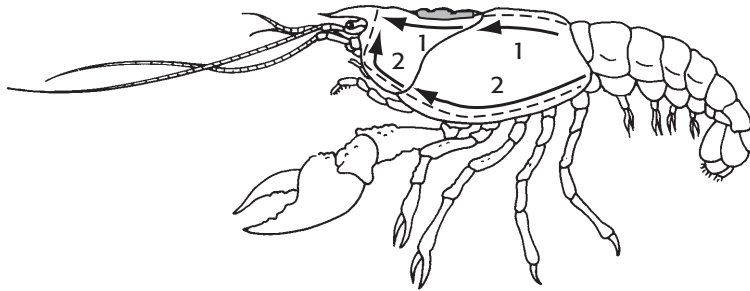
20. With your other hand, use scissors to carefully cut through the back of the carapace along dissection cut line 1 shown in **Figure 2**. Cut along the indentations that separate the thoracic portion of the carapace into three regions. Start the cut at the posterior edges of the carapace, and extend the cut along both sides in the head region. **CAUTION: Use sharp instruments with extreme care. Never cut objects while holding them in your hand. Place objects on a suitable work surface for cutting.**

**FIGURE 2 CUTTING THE CARAPACE DORSALLY**

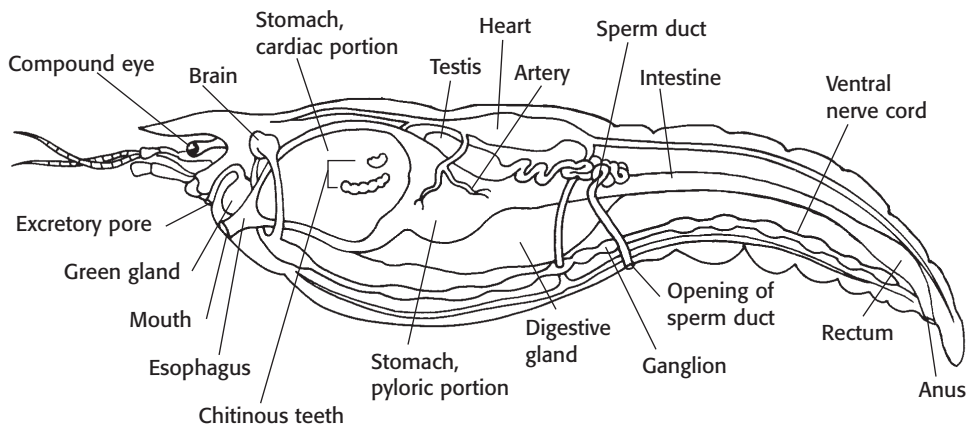
21. Use forceps to carefully loosen the carapace from the body. Be careful not to pull on the carapace too hard or too quickly. You could disturb or tear the underlying structures.

22. Place the specimen on its side, with the head facing left, as shown in **Figure 3**.

23. Using scissors, start cutting at the base of cut line 1. Cut along the side of the crayfish, as illustrated by cut line 2. Extend the cut line forward toward the rostrum (at the top of the head).

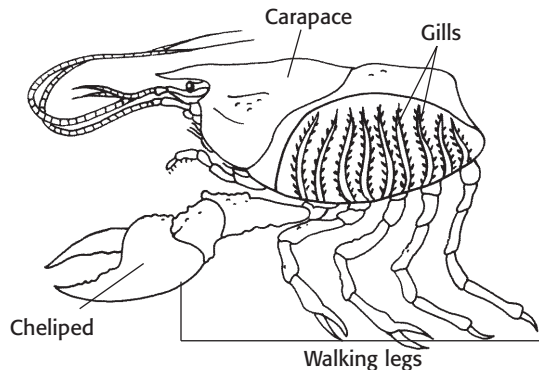
**Crayfish Dissection** *continued***FIGURE 3 CUTTING THE CARAPACE SIDWAYS**

- 24.** Use forceps to carefully lift away the remaining parts of the carapace, exposing the underlying gills and other organs.
- 25.** Refer to **Figure 4** to locate and identify the organs of the digestive system. Food travels from the mouth down the short esophagus into the stomach. Locate the digestive gland, which produces digestive substances and from which the absorption of nutrients occurs. Undigested material passes into the intestine. Observe that the intestine is attached to the lobed stomach. The undigested material is eliminated from the anus.

**FIGURE 4 INTERNAL ANATOMY OF A CRAYFISH**

**Crayfish Dissection** *continued*

- 26.** Refer to **Figure 5** to locate and identify the organs of the respiratory system. Locate the gills, which are featherlike structures found underneath the carapace and attached to the chelipeds and walking legs. A constant flow of blood to the gills releases carbon dioxide and picks up oxygen.

**FIGURE 5 RESPIRATORY SYSTEM OF A CRAYFISH**

- 27.** Refer to **Figure 4** and identify the organs of the circulatory system. Locate the dorsal tubular heart and several arteries. The crayfish has an open circulatory system in which the blood flows from the arteries into sinuses, or spaces, in tissues. The blood flows over the gills before returning to the heart.
- 28.** Refer to **Figure 4** to locate and identify the organs of the nervous system. Find the ventral nerve cord. Locate a ganglion, one of the enlargements of the ventral nerve cord.
- 29.** Locate the dorsal brain, which is located just behind the compound eyes. Note the two large nerves that lead from the brain, go around the esophagus, and join the ventral nerve cord.
- 30.** Refer to **Figure 4** to locate and identify the organs of the excretory system. The blood carries cellular wastes to the disklike green glands. Locate these organs just in front of the stomach. The green glands excrete waste through pores at the base of each antenna.
- 31.** Refer to **Figure 4** to locate and identify the organs of the reproductive system. The animal shown in the diagram is a male crayfish. If your specimen is a male, locate the testis. The testis is the long, white organ under the heart and a bit forward. The sperm ducts that carry sperm from the testis open at the fifth walking leg. If your specimen is a female, locate the bi-lobed ovary. It is in the same relative position as the testis, but the ovary appears as a large, reddish mass under the heart. Then locate the short oviducts that extend from near the center of each side of the ovary and open at the third walking leg.
- 32.** Exchange your specimen with a nearby classmate who has a crayfish of the opposite sex. Then study its reproductive system.
- 33.** Dispose of all materials according to your teacher's instructions.
- 34.** Clean up your work area, and wash your hands before leaving the lab.

**Crayfish Dissection** *continued*

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**Analysis**

**1. Classifying** What structures are used for capturing prey or securing and eating food?

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**2. Identifying Relationships** The feathery quality of the gills gives them a very large surface area. Why is this important?

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**3. Analyzing Data** What organs in your body carry out a similar function as the green glands? What is that function?

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**4. Analyzing Data** Of the crayfish systems you observed, which two are most unlike the related human system? Explain.

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**5. Analyzing Data** How are the segments of a crayfish different from those of an earthworm?

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**Crayfish Dissection** *continued*

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## Conclusions

**1. Making Predictions** Rows of chitinous teeth line the stomach. Predict their function.

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**2. Making Inferences** Many nerves leave from each ganglion. Where do you think these nerves go?

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**3. Drawing Conclusions** Is the crayfish most vulnerable to its enemies from the dorsal or ventral side? Why?

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**4. Drawing Conclusions** What is the major function of the exoskeleton of a crayfish? How is the exoskeleton an adaptive advantage to the crayfish?

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## Extensions

**1. Research and Communications** The crayfish, like some other animals, can regenerate lost appendages. It can also undergo autotomy. Investigate autotomy in crayfish, reporting what it is and how it is helpful to crayfish.

**2. Research and Communications** Investigate molting in crayfish. How does it occur? When? Why? Report your findings to the class.