

Lesson 2

Crustaceans

Objectives

Students will

- identify physical characteristics common to crustaceans
- make comparison sketches of crustaceans

Vocabulary

crustaceans—arthropods with hard shells

mandibles—the grinding mouth parts of crustaceans

maxillipeds—appendages that help a crustacean eat

Structuring the Curriculum

You may want to preserve crustacean specimens for classroom observation. Also set up an aquarium with crayfish and small rocks ahead of time for **Let's Find Out: What Is a Crayfish Like?** (page 243) in the student text.

Preparation/Materials

- ✓ wide variety of crustacean shells and specimens
- ✓ pictures of crustaceans
- ✓ crab specimens
- ✓ shrimp specimens
- ✓ blackline 51

Let's Find Out: What Is a Crayfish Like?

- ✓ small aquarium, set up ahead of time
- ✓ live crayfish
- ✓ hand lenses
- ✓ small pieces of fish
- ✓ pointer

Optional: Crustacean Searches

- ✓ Arrange to visit a location such as a stream, forest, or ocean.
- ✓ nets and buckets
- ✓ ice cube trays
- ✓ field guides
- ✓ microscopes
- ✓ jars with netting
- ✓ seine nets

Background

The number of paired appendages a crustacean has varies from species to species, but no crustacean has more than one pair of appendages per body segment. The arrangement of crustacean appendages also varies. Lobsters, for example, have two pairs of sensory antennae, three pairs of jaws or mouth parts, three pairs of appendages called maxillipeds to aid in feeding, and five pairs of thoracic appendages for walking. The first, second, and third pairs of these appendages may have pincers or claws for capturing prey. Other appendages are used to maintain equilibrium, touch, taste, chew food, handle food, mate, carry eggs, swim, and circulate water over the gills.

Most crustaceans are marine. Crayfish and water fleas are two common freshwater crustaceans; others include scuds, seed shrimp, fairy shrimp, copepods, isopods, and tadpole shrimp. Some crustaceans, primarily certain crab species, inhabit only brackish water. A few crustaceans are terrestrial. Wood lice feed on humus and fungi; 100 species of these crustaceans live in North America, including various types of rock slaters, sow bugs, and pill bugs. Various species of hermit crabs and land crabs that live in the Caribbean and Florida are also primarily land dwellers.

Crustaceans are an important food source. Since the late 1970s, shrimp aquaculture has provided protein for a growing world population. Today Thailand, Indonesia, China, India, and other Asian nations have three million acres of shrimp farms; the Western Hemisphere has about 600,000 acres of shrimp farms. In the late 1970s shrimp aquaculture was hailed as the “blue revolution.” It reduced overfishing of ocean shrimp and limited the damage caused by drag nets; however, aquaculturists and environmentalists have clashed over the discharge of pollution from shrimp farms into fresh water and the destruction of mangrove forests to build shrimp farms.

2 Crustaceans

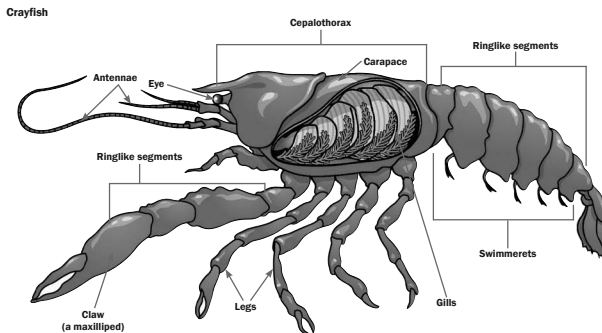


Sow bugs breathe through gills but live on land.

The Latin word *crusta* means “hard shell.” **Crustaceans** are arthropods with hard shells. Crabs, lobsters, crayfish, shrimp, barnacles, prawns, water fleas, pill bugs, and sow bugs are among the 26,000 crustacean species.

The head and thorax of a crustacean are combined into a cephalothorax, which is often covered by a carapace—a shieldlike covering. Crustaceans’ ringlike segments in their abdomen, along with their jointed appendages, help them move quickly. Crustaceans have grinding mouth parts called **mandibles**.

Crustaceans have various appendages. For example, crustaceans have two pairs of antennae. They use the longer pair for touch, taste, and smell; they use the shorter pair for touch, taste, and balance. Some crustaceans, such as the crayfish and lobster, have compound eyes at the end of a flexible stalk. Appendages that help a crustacean eat are called **maxillipeds**. Claws are one type of maxilliped. Swimmerets are small leglike appendages attached to the abdomen. They are designed for swimming and for carrying eggs.



242



What Is a Crayfish Like?

You will need

- ✓ live crayfish
- ✓ hand lens
- ✓ small aquarium
- ✓ small piece of fish
- ✓ pointer

Do this

1. Using a hand lens, observe the live crayfish. Sketch the following features:
 - cephalothorax
 - carapace
 - legs
 - abdomen
 - antennae
 - maxillipeds
2. Place a small piece of fish into the aquarium. Observe how the crayfish takes the food and eats. Record your observations.
3. With a pointer, gently touch the crayfish on its carapace or antennae. Be careful not to injure it. Record your observations.

Questions

1. How does the crayfish take food and eat?
2. How does the crayfish move about when it is not threatened?
3. How does the crayfish move about when it is threatened?

Crustaceans live in watery or damp environments and obtain oxygen from the water through respiratory organs called gills. As water passes over the gills, oxygen diffuses from the water into the gills. Then the oxygen moves into the blood. Carbon dioxide moves out of the blood through the gills and into the water.

Crustaceans reproduce sexually. Most crustacean species include males and females, but individual barnacles have both male and female body parts. A few shrimp begin their lives as males before turning into females.

Most crustaceans live in the ocean. Tiny ocean crustaceans are a food source for fish and whales. Some crustaceans, such as crayfish, live in fresh water. Others live on land. If you’ve ever walked in a woods, you’ve probably seen

243

Discover

1. Ask students if they enjoy eating crustaceans. Make a list of which crustaceans are most popular with the class. (They may include lobsters, crabs, shrimp, or crayfish.)
2. Have students examine and describe a wide variety of crustacean shells and specimens. Have them record similarities and differences, or use **blackline 51**.

Develop

1. Have students complete **Let’s Find Out: What Is a Crayfish Like?** (page 243) in the student text. Set up an aquarium with crayfish and small rocks ahead of time.
 1. *How does the crayfish take food and eat? (It will retrieve the food with its claws, carry it with its other two pairs of maxillipeds, and use its maxillipeds to shove pieces of food into its mouth.)*
 2. *How does the crayfish move about when it is not threatened? (It walks on its legs.)*
 3. *How does the crayfish move about when it is threatened? (It propels its body backwards with surprising speed to escape predators.)*

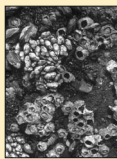
2. Optional Crustacean Searches

Option A: Freshwater Stream Crustacean Search. Search a freshwater stream for crustaceans. Use nets, buckets, and ice cube trays to house the crustaceans that you find. Use a field guide to ponds to identify them. Most crustaceans will be found under rocks; aside

Barnacles

If you take a walk along the seashore, you might see barnacles clinging to solid surfaces that get covered by water. Barnacles are crustaceans that cling to docks, boats, rocks, and even whales.

After the barnacle larva selects a home, it attaches itself to the surface with a strong glue. (This glue is so strong that scientists are researching how it could be useful to dentists.) They then secrete limestone plates and grow into an adult. They live in hard, cone-like houses, and they peek out when water covers them so that they can filter food from the water.



some of these: pill bugs, sow bugs, and rock slaters. All of these crustaceans live in moist leaf litter and in damp soil under rocks and logs. Several species of hermit crabs and other crabs that live in the Caribbean and Florida also live mainly on land.

Review

1. What do all crustaceans have in common?
2. Why can crustaceans move rapidly?
3. What is a maxilliped? Give an example.

244

Crustacean Comparison

Examine and describe a wide variety of crustacean shells and specimens. Record similarities and differences.

Crustacean	Similarities to Other Crustaceans	Differences from Other Crustaceans	Sketch
	A hard shell that serves as an exoskeleton; specialized appendages for capturing prey, and two major body segments.	The number of appendages, claw size, leg size, body shape, the number of segments per body segment, antennae, length, and the presence of a tail.	

Blackline 51
Unit 4, Chapter 2
Lesson 2

from crayfish, most freshwater crustaceans will be small. Types of freshwater crustaceans include crayfish (there are more than 200 North American species), scuds, water fleas, seed shrimp, fairy shrimp, copepods, isopods, and tadpole shrimp. If you want to preserve several samples for the classroom, fill large vials with 70% rubbing alcohol, drop the crustacean into the liquid, and stop the vials with caps. Label the vials with the species name, date collected, and location of collection. Take some samples of pond water back to the classroom, and use microscopes to search for microscopic crustaceans.

Option B: Forest Crustacean Search. Search the woods for land crustaceans such as sow bugs, pill bugs, trichoniscids, and rock slaters—all commonly called wood lice. Looking under rotten logs or in moist soil and leaf litter will improve your chances of finding these creatures. Use a field guide for identification, and use nets or small jars to capture the crustaceans. Large jars covered with netting or cheesecloth can be used to house specimens. If you want to preserve several samples for the classroom, fill large vials with 70% rubbing alcohol, drop the crustacean into the liquid, and stopper the vials. Label each vial with the species name, date collected, and location of collection.

Option C: Ocean Crustacean Search. Take students to the seashore to search for crustaceans. Search areas along bays and tidal waters. Crabs and other crustaceans can be netted in shallow water with hand nets or seine nets. Depending on your region, you can find several species of crabs including hermit crabs, fiddler crabs, and rock crabs, among

Crustacean				
Similarities to Other Crustaceans				
Differences from Other Crustaceans				
Sketch				

others. Crayfish can be caught in fresh water, as can certain shrimp. Most shrimp are nocturnal, but they can be caught with a seine net near the bottom of the bay, or they may be found buried beneath mud and sand.

3. Read **Crustaceans** (page 242) in the student text.
4. Assign the section review questions (page 244) in the student text as homework.
 1. *What do all crustaceans have in common? (A hard shell.)*
 2. *Why can crustaceans move rapidly? (They have jointed appendages and ringlike segments in their abdomen.)*
 3. *What is a maxilliped? Give an example. (An appendage that helps a crustacean eat, such as a claw.)*

Reinforce/Assess

1. Distribute crab and shrimp specimens, and have students sketch them. Have them label all the physical features these crustaceans have in common with each other and with the crayfish that they drew earlier for **Let's Find Out: What Is a Crayfish Like?** Also have them list the differences.
2. Questions to ask:
 - Name several types of crustaceans. (Lobster, crab, shrimp, barnacle, crayfish, sow bug, pill bug.)

- What is a cephalothorax? (One body segment that combines the head and thorax.)
- What is a carapace, and what is its purpose? (A shield-like covering to protect the cephalothorax.)
- Name two ways crustaceans use their appendages. (Maxillipeds for feeding, legs for walking.)

Extend

- ▶ Have students set up an aquarium to house crayfish caught in a stream. Place the aquarium in partial sunlight to encourage the growth of algae for the crayfish to eat. Every two or three days, place a small piece of fish or meat into the tank for the crayfish to scavenge. To prevent ammonia buildup, avoid putting too much food in the tank.
- ▶ Set up a saltwater aquarium to house shrimp.
- ▶ House a hermit crab in the classroom.
- ▶ In recent years the fishing industry has overharvested many species of commercial fish, which has resulted in a crash in fish populations. Many biologists fear a similar scenario for the lobster industry. As a class, research the facts surrounding current fish and lobster harvests, and decide if these harvests are sustainable for the future. You may choose to focus on the Caribbean lobster, which has become rare in many parts of the Caribbean because of overharvesting.
- ▶ Have a crustacean feast. Do this only if no one in the class is allergic to seafood. Have students bring in dishes with crustaceans as their primary ingredient. You may also wish to prepare lobster, crab, and shrimp for the class to eat. Before the feast, have students research whether or not the harvesting of these crustaceans shows good stewardship—for example, whether many other species are caught and wasted along with these crustaceans. If so, eliminate those crustaceans from the menu.
- ▶ If you vacation near the ocean, search for, note, and photograph the different species of crustaceans you find. Share your findings with the class. If you vacation in southern Florida or the Caribbean, try to snorkel off a coral reef in search of Caribbean lobsters, slipper lobsters, and various species of crabs and shrimp. Walking along the Pacific or Atlantic coastlines will provide opportunities for finding crab shells or for searching for other small crustaceans. Use a guidebook for these areas to identify the crustaceans that you encounter.

2 Crustaceans



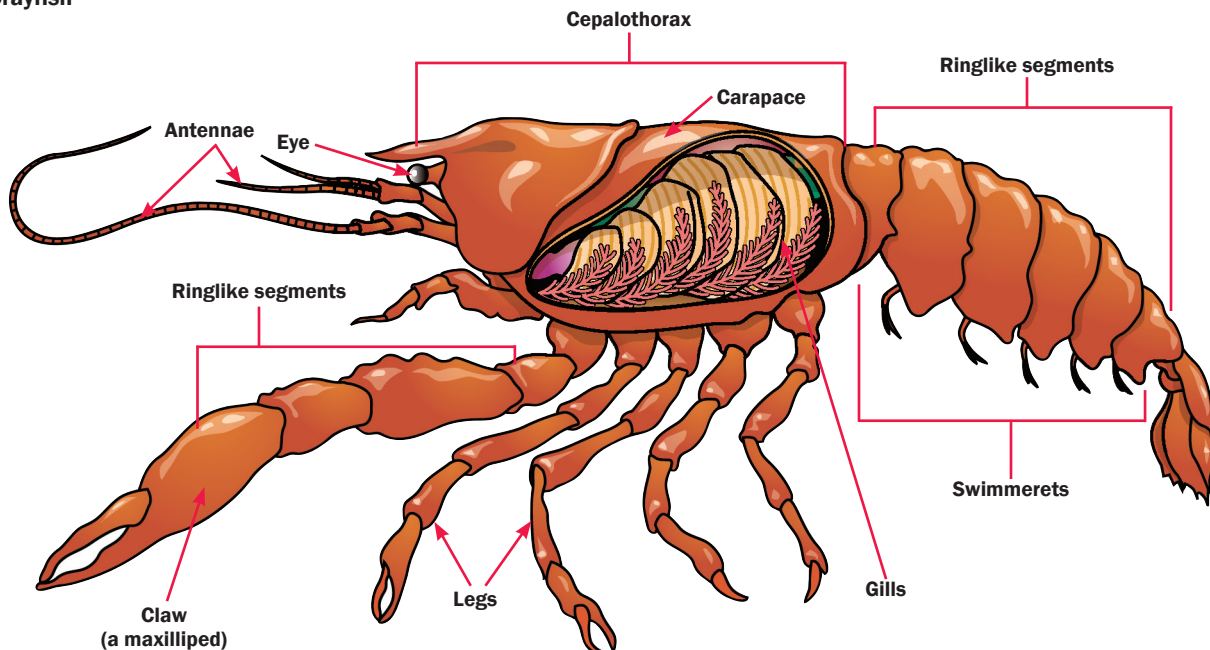
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Crayfish



Let's Find Out



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