

Crayfish Dissection Guide

Observe • Identify • Explain



A crayfish is an arthropod whose jointed appendages and hardened exoskeleton support feeding, movement, protection, and sensing. Begin with the cephalothorax and abdomen, then open the carapace carefully to examine the gills and internal organ systems.



Use with the Mr. E Science crayfish dissection video, pre-lab, and write-up.

1 Meet the crayfish

Classification

Kingdom Animalia (also called Metazoa) • Phylum Arthropoda • Subphylum Crustacea • Class Malacostraca • Order Decapoda

Arthropoda comes from Greek roots meaning “jointed foot.” Arthropods have jointed appendages, a segmented body, and an external skeleton. Decapoda means “ten-footed” and refers to five pairs of thoracic walking appendages; in crayfish, the first pair forms the **chelipeds**.

Exoskeleton and molting

The exoskeleton is a tough, noncellular cuticle secreted by the living epidermis beneath it. Muscles attach to its inner surface. Because the hardened cuticle cannot expand continuously, a growing crayfish must molt: it sheds the old cuticle, expands while the new cuticle is soft, and then allows the new covering to harden.

Natural history

Crayfish are freshwater crustaceans found in streams, ponds, lakes, wetlands, and burrows. Many are most active from evening through early morning. They are omnivores and scavengers that may feed on plant material, algae, small animals, and decaying matter. The exact species and native range of a preserved specimen should not be assigned without its supplier label.

Look for evidence

As you examine the specimen, connect each structure with a job: a protective carapace, sensory antennae, grasping chelipeds, walking legs, swimmerets, and a tail fan for rapid backward escape.

2 Prepare for the dissection

Materials

Preserved crayfish; dissecting tray; dissecting scissors; blunt probe; forceps; gloves; eye protection; colored pencils; paper towels. Use only the tools and specimen provided.

Orient the specimen

Dorsal — toward the back or upper surface	Ventral — toward the underside
Anterior — toward the head and rostrum	Posterior — toward the abdomen and tail fan

Work safely

- Wear gloves and eye protection. Keep hands away from your face and work area.
- Use shallow cuts. Lift the carapace away from organs before advancing the scissors.
- Use the blunt probe for teasing and separating tissue; do not rip the carapace away.
- Keep fingers out of the cutting path. Report splashes, cuts, or damaged equipment.

Protect the evidence

Identify structures before removing or cutting them. Preserved tissues can be collapsed, discolored, or damaged. Record what you actually observe instead of drawing an ideal specimen from memory.

3 External examination

Video sequence: cephalothorax and abdomen; dorsal surface

Find the external landmark

The external landmark is the **cephalothorax**, the large anterior region formed by the fused head and thorax. A hard **carapace** covers it. The flexible, segmented **abdomen** lies posterior to the cephalothorax.

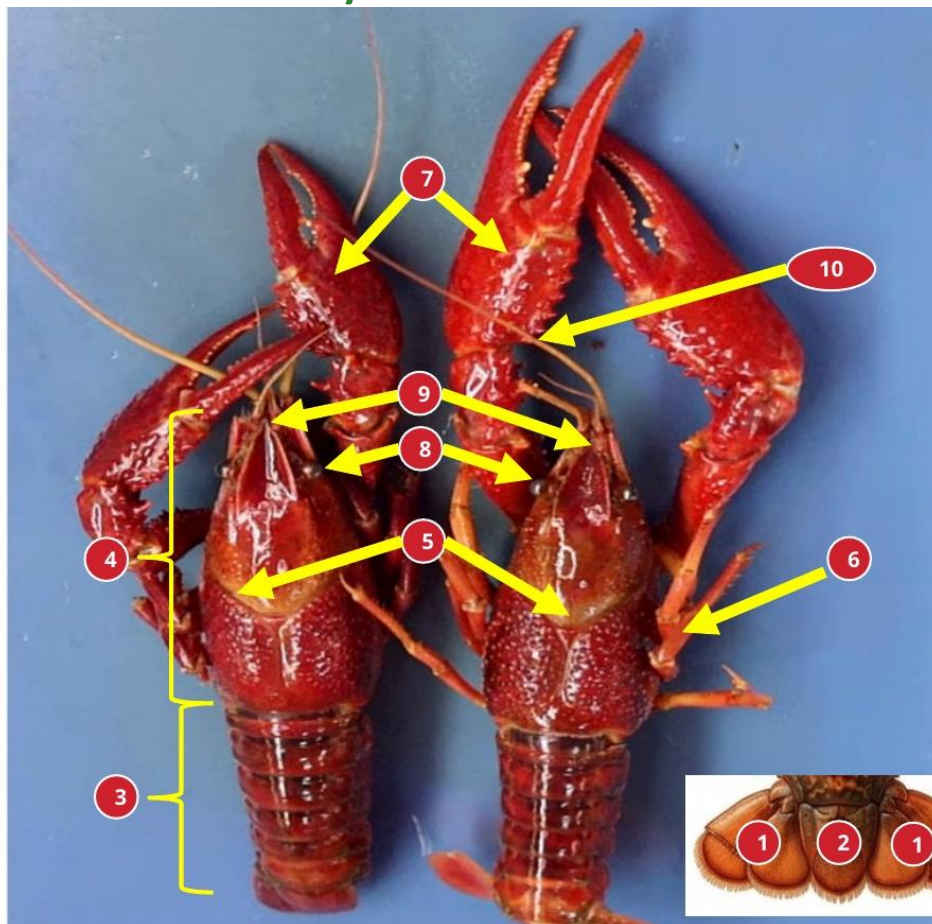
Examine the dorsal surface

1. Place the crayfish dorsal side up with the **rostrum** pointing anteriorly.
2. Locate the **cervical groove**, the transverse groove marking the boundary between the head and thoracic portions of the cephalothorax.
3. Identify the pointed **rostrum**, two **compound eyes**, one pair of long **antennae**, and one pair of shorter, branched **antennules**.
4. Locate one pair of **chelipeds** and four additional pairs of **walking legs**. Together these are five pairs of thoracic walking appendages.
5. Follow the segmented abdomen to the tail fan. The fan consists of one pair of **uropods** and the central **telson**.

Functions to connect

Antennae and antennules detect environmental information. Compound eyes receive visual information. Chelipeds grasp food and assist in defense. Walking legs move the animal along the bottom. Rapid flexion of the abdomen drives the tail fan and propels the crayfish backward.

External anatomy

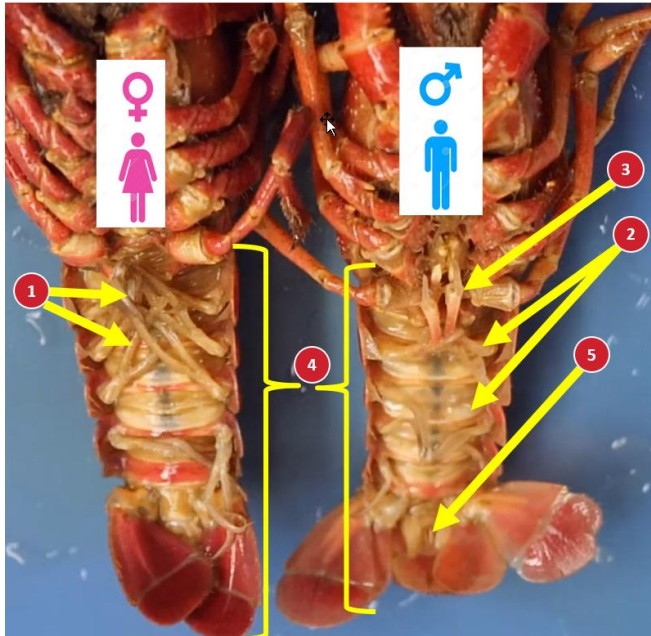


1 Uropod (one on each side)
2 Telson
3 Abdomen
4 Cephalothorax
5 Cervical groove
6 Walking legs
7 Cheliped
8 Compound eye
9 Rostrum
10 Antenna

Observe the photograph as a location guide. Your specimen may differ in size, color, condition, or the position of its appendages.

Dorsal view — anterior is to the right; posterior is to the left.

4 Ventral surface and sex determination



1 Long overlapping swimmerets (female)
2 Short non-overlapping swimmerets (male)
3 Gonopods - modified male swimmerets
4 Abdomen
5 Anus

Observe the photograph as a location guide. Your specimen may differ in size, color, condition, or the position of its appendages.

Examine the abdomen

Swimmerets are paired appendages attached to the ventral abdominal segments. In females they help carry and ventilate eggs. In the specimens shown, the **female** has long, overlapping swimmerets. The mature **male** has shorter, non-overlapping swimmerets and modified anterior swimmerets called **gonopods** for sperm transfer. Use several traits when determining sex; preserved or immature specimens may be difficult to classify.

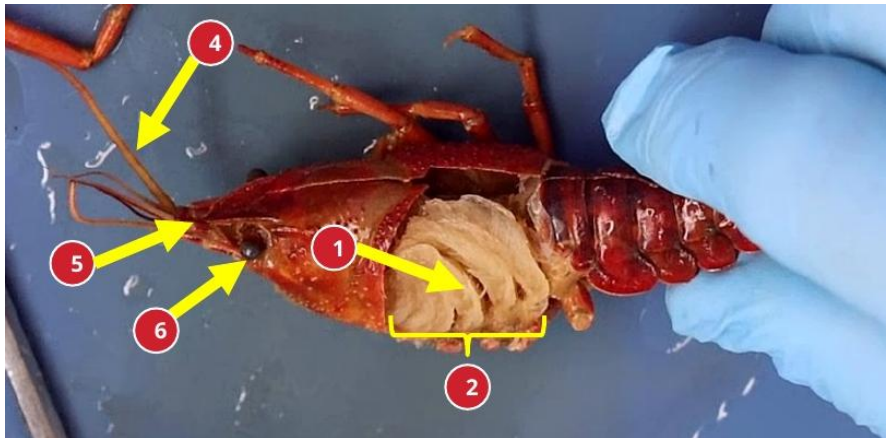
Examine the mouthparts

Move the chelipeds aside. Three pairs of **maxillipeds** help handle food near the mouth. Beneath them, the hard **mandibles** crush food before it enters the digestive tract. Do not confuse maxillipeds with the walking legs.

5 Open the branchial chamber

Make the first incision

6. Place the crayfish dorsal side up. Insert the pointed scissor tip beneath the posterior edge of the carapace at the midline.
7. Lift the carapace away from the organs and make a shallow cut anteriorly toward the rostrum. Stop before the eyes and mouthparts.
8. Make a lateral cut along the cervical groove. Cut only through the carapace.
9. Use the blunt probe to tease muscle attachments away from the inner carapace. Reflect the carapace gradually rather than pulling it off.



1 Gills
2 Branchial chamber
3 Cervical groove
4 Antenna
5 Rostrum
6 Compound eye

The branchial chamber has been opened to expose the featherlike gills.

Find the internal landmark

The internal landmark is the group of featherlike gills inside the branchial chamber. Locate the gills before exposing deeper structures.

6 Respiratory system

How the gills work

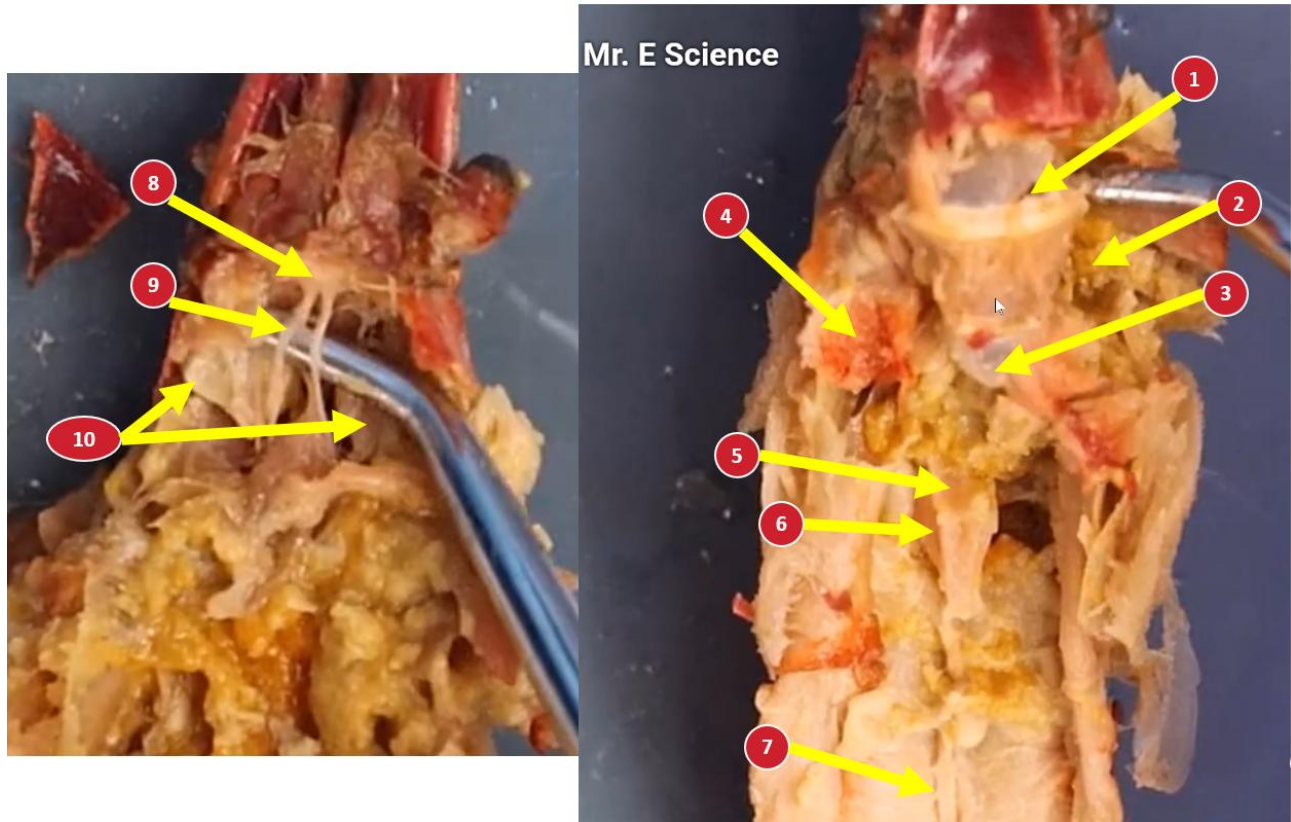
The **branchial chamber** is the protected space between the body wall and carapace. Movements of appendages and specialized mouthparts help move water across the thin, moist **gill** surfaces. Oxygen diffuses into the hemolymph and carbon dioxide diffuses out. A large surface area and short diffusion distance make the feathery gills effective exchange surfaces.

A crayfish may survive briefly out of water when its gills remain moist, but drying damages gas exchange. This does not make the animal terrestrial.

7 Expose the internal organs

Video sequence: remove remaining carapace; inspect dorsal organs

10. Continue teasing the remaining carapace away from the tissue beneath it.
11. Identify organs before lifting or cutting any tissue. Compare position and connections rather than relying on color alone.
12. In the abdomen, locate the large **flexor muscles** and the **intestine** running along the midline.



Exposed cephalothorax — video frames showing major internal structures.

1 Cardiac stomach	2 Digestive gland (hepatopancreas)
3 Pyloric stomach	4 Mandibular adductor muscle
5 Heart	6 Ostia (on lateral sides)
7 Intestine	8 Brain / cerebral ganglia
9 Ventral nerve cords	10 Green glands

The internal arrangement varies with specimen size, sex, preservation, and the amount of tissue moved during dissection.

8 Digestive and circulatory systems

Digestive system

Food is crushed by the mandibles and passes through the **mouth** and **esophagus**. The **cardiac stomach** contains a gastric mill that mechanically grinds food. The **pyloric stomach** sorts particles and directs them onward. The **digestive gland**, also called the hepatopancreas, produces digestive substances, absorbs nutrients, and stores materials. The intestine continues through the abdomen to the **anus** on the ventral surface of the telson.

Circulatory system

The heart lies dorsally in the posterior cephalothorax. Crayfish have an open circulatory system. The **heart** pumps hemolymph through arteries; the fluid then enters open tissue spaces called sinuses and bathes the organs in the hemocoel. Hemolymph is moved toward the gills, where it is re-oxygenated, then returns toward the heart. Small openings called **ostia** allow hemolymph to reenter the heart. Ostia are intake openings.

9 Excretory, nervous, muscular, and reproductive systems

Excretory system

A pair of green glands, also called antennal glands, lies in the anterior cephalothorax near the bases of the antennae. They remove nitrogen-containing wastes and help regulate water and dissolved salts. Their ducts open near the antennae.

Nervous system

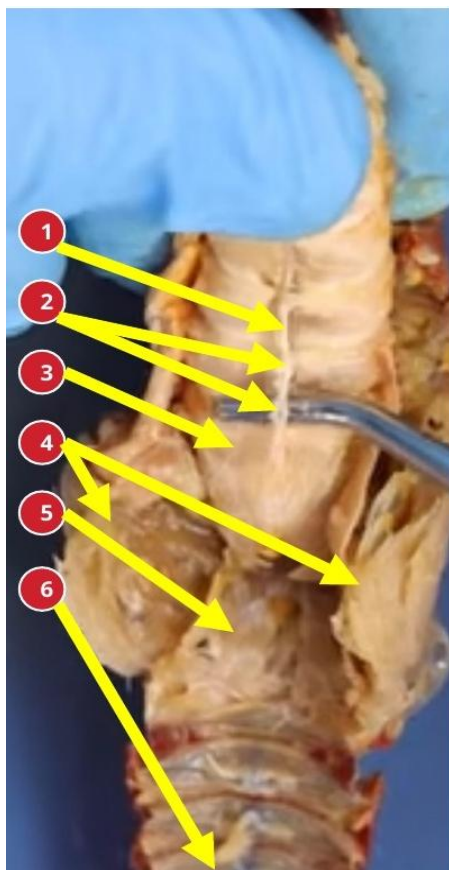
The brain lies anteriorly near the eyes and antennae. A paired ventral nerve cord extends posteriorly. Segmental swellings called ganglia contain clusters of nerve-cell bodies and connect with nerves serving the appendages and muscles.

Muscular system

Large abdominal flexor muscles bend the abdomen sharply. This motion pushes the tail fan against the water and produces rapid backward movement.

Reproductive system

Crayfish have separate sexes. Ovaries or testes lie dorsally near the intestine, although these organs may be difficult to distinguish in immature or poorly preserved specimens. Eggs are carried beneath the female abdomen on the swimmerets. Mature males possess modified anterior swimmerets called, **gonopods**, used in sperm transfer.



Exposed abdomen — ventral nerve cord, ganglia, flexor muscles, and posterior branchial region.

1	Ventral nerve cord
2	Ganglia (the bumps)
3	Abdominal flexor muscles (ventral view)
4	Gills
5	Posterior branchial region
6	Inner Ventral surface of the tail exoskeleton

10 Finish, clean up, and check your understanding

Complete the write-up

Make the required drawings from your specimen using colored pencils. Use accurate proportions, clear leader lines, and labels placed outside each drawing. Note missing or damaged structures rather than adding structures you did not observe.

Clean up

13. Place the specimen and removed tissues in the designated disposal container.
14. Return all tools. Rinse the tray, scissors, probe, and forceps as directed; dry them completely.
15. Clean the work surface, remove gloves properly, and wash hands with soap and water.

Self-check answers

1 Cephalothorax and abdomen. 2 Cephalothorax. 3 One pair of uropods and one telson. 4 Three pairs. 5 Gills. 6 Branchial chamber. 7 Cardiac stomach. 8 Pyloric stomach. 9 Ostia allow hemolymph to enter the heart. 10 Green or antennal glands. 11 Paired ventral nerve cord with ganglia. 12 Abdominal flexor muscles.

Sources and image note

Procedure sequence: Mr. E Science crayfish dissection video transcript supplied September 2026. Anatomical organization checked against David H. Hall, An Illustrated Miniguide to the Dissection of the Crayfish. Photographs are frames from the Mr. E Science crayfish dissection video and may be used with the Mr. E Science lab materials.