# Crayfish Dissection Guide

## Part 1 - Building Background

**Directions:** Read the background information below and discuss the building background questions with a partner or small group.

Amazing & Abundant Arthropods

The most prolific phylum of all the animals is Arthropoda. At least 75% of all described animal species belong in phylum Arthropoda ("joint foot") including lobster, barnacles, insects, and spiders. Arthropods are represented in nearly all habitats on Earth. Based on species diversity, distribution, and sheer numbers, arthropods are simply the most successful phylum of animals ever to live.

Although arthropods do not have a well-developed nervous system, they do have a few other advantages. Primarily, arthropods are completely covered by an **exoskeleton**. The exoskeleton protects the animal and provides points of attachments for lightweight striated muscles that move the **jointed appendages**. The arthropod exoskeleton is strong, which makes it possible for members of this phylum to successfully move onto land. To grow, an arthropod must occasionally shed its old exoskeleton and secrete a larger one. This process is called molting. Once the animal is out of its old skeleton, it remains vulnerable until the new skeleton hardens.

All arthropods exhibit cephalization, with most sensory organs, including **eyes**, olfactory receptors for smell, and **antennae** for touch and smell, located at their head. Arthropods have a variety of specialized organs for gas exchange. Most aquatic species have thin, feathery **gills** to maximize the surface area in contact with the water. The jointed appendages of arthropods give them greater articulation, which is the ability to move and bend their appendages at specific points.

Some other important unifying characteristics of arthropods include:

| | |
|---|---|
| Bilateral symmetry | 3 body segments: head, thorax, abdomen |
| Segmented bodies | |
| Jointed appendages | Antenna for touch and chemosense |
| Complete digestive system | |
| Open circulatory system | Most have separate sexes |
| Paired gills | Internal fertilization |

The phylum Arthropoda is divided into five subphyla, the most recognizable aquatic group being Crustacea (crayfish, crabs, and lobsters). There are approximately 40,000 species of crustaceans and most are found in the ocean. The appendages of crustaceans are highly specialized. Crustaceans are the only arthropods with two pairs of **antennae**. In many species, the antennae are used for both touch and smell. Crustaceans also have three or more pairs of appendages on their head which are modified as **mouthparts**. Many crustaceans have **walking legs** attached to the **thorax**, or middle section, and additional appendages on the **abdomen**.

The decapods are probably the most recognizable crustaceans and include crayfish, shrimps, and lobsters. The exoskeleton of the decapods is fused over the head and thorax region, resulting in a shield called a **carapace**. Decapods have five pairs of appendages on their thorax. In some species, the first pair has been modified into a pair of **claws**.

### Lab Safety

During a dissection, safety is the number one priority. You must wear your safety glasses and follow all directions to the best of your ability. If you are unsure, discuss with a classmate and/or ask the instructor. Be very careful with both scissors and scalpels. You should always cut **away** from yourself and never over-apply pressure to a blade. Before making any cut with either a scalpel or scissors, read the directions first and then wait for approval from an instructor.

Please keep in mind that the more closely you follow the directions, the more likely you will be able to view all of the structures. Even when directions are carefully followed, no two specimens look exactly alike and specimens rarely look like the diagrams. People usually have to complete more than one dissection of a specimen before they can reliably identify all structures. Do your best!

**Discussion Questions:**
Discuss the questions below with a partner or small group.

1. Explain one characteristic shared by all arthropods.
2. Name two structures you think you might be able to identify in the crayfish dissection and state each structure's function.
3. State one way to make sure your dissection goes safely.

## Part 2 – Crayfish Dissection

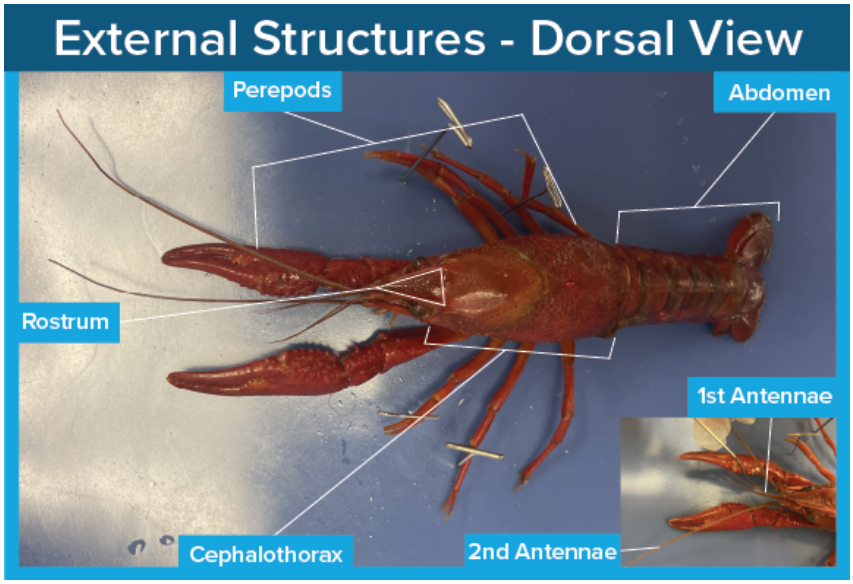
Follow the directions below. Record sketches in the spaces on the Student Crayfish Dissection Sheet. When prompted, check off structures you can identify on the Student Crayfish Dissection Sheet.

## External Crayfish Anatomy

1. To understand crayfish anatomy and help us with the dissection, we need to know a few terms and how they apply to the orientation of our specimen. Study the list of terms below.

| Important Anatomical Terms | |
|---|---|
| **Term** | **Meaning** |
| Doral | Top |
| Ventral | Bottom |
| Anterior | Front |
| Posterior | Behind |

2. Orient your specimen as shown in the image below. This is the dorsal view of the crayfish. Crayfish, like all arthropods, have three body segments: the head, thorax, and abdomen. The **head** is located at the anterior end. The sensory organs, **the eyes and antennae**, are attached to the head. The **abdomen,** commonly called the tail, is located at the posterior end and the **thorax** is between the head and the abdomen. Determine the anterior and posterior ends of the crayfish.

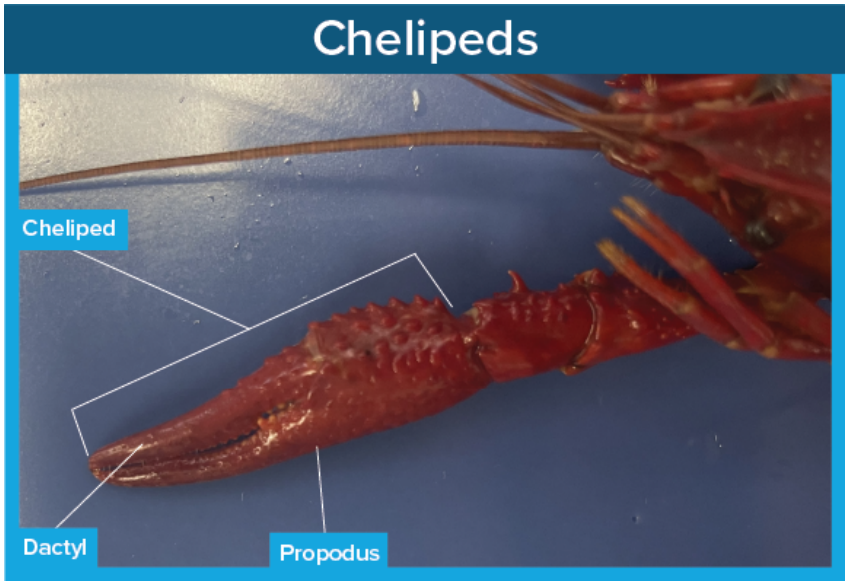



3. While observing the crayfish from a dorsal view, observe that the **exoskeleton** of the head and the thorax are fused together into a region called the **cephalothorax**. The exoskeleton over the cephalothorax is called the **carapace**. Run your finger over the carapace to feel the exoskeleton. The most anterior portion of the carapace is called the **rostrum**, which protects the **eyes**. Locate the rostrum and the eyes.

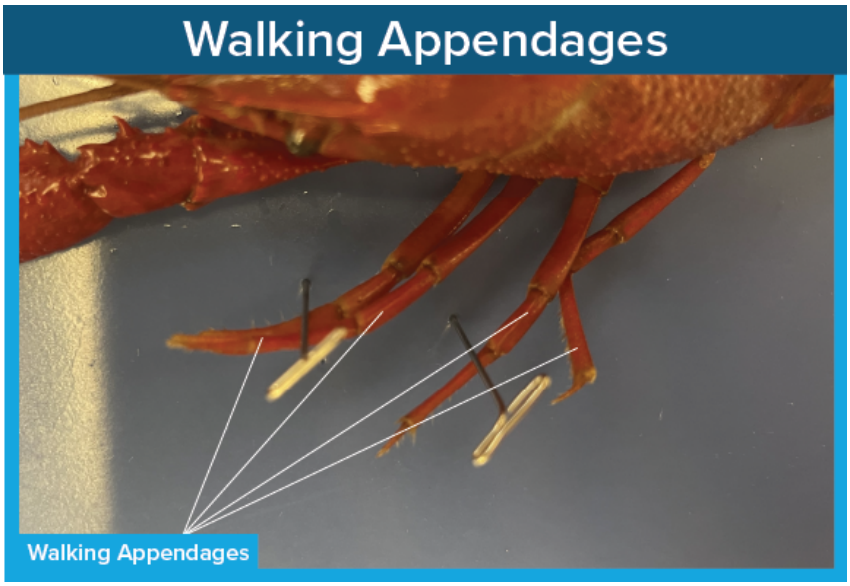
4. Locate the two pairs of antennae located at the anterior end of the crayfish. The **first antennae** are smaller and located more towards the midline. These antennae are each divided into two filaments. The **second antennae** are longer. The antennae are sensory organs that can sense chemical and vibrations.

5. Locate the five pairs of jointed appendages. These appendages are attached to the cephalothorax and are called **pereopods**. Crayfishes and other decapods can autotomize their appendages, meaning they can self-amputate an appendage segment to escape a predator or minimize an injury. Their appendages can be regrown!

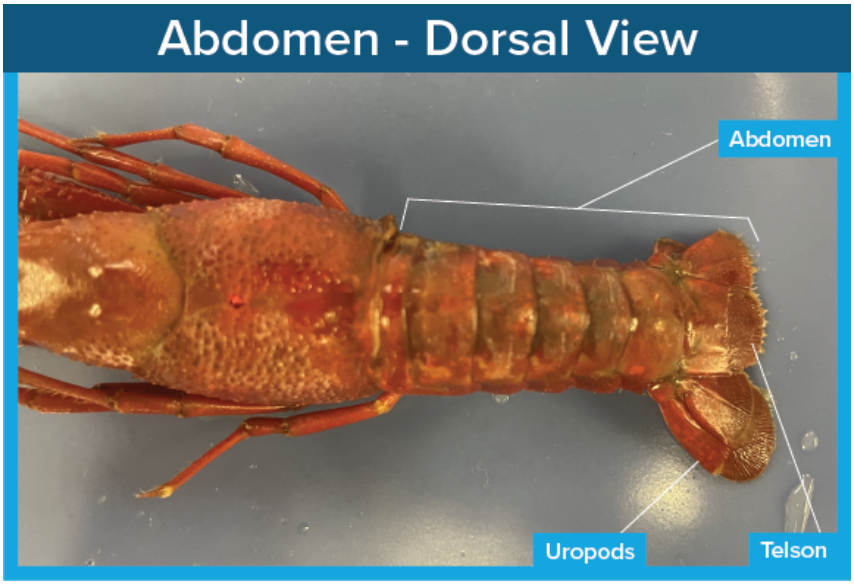
6. The first pereopod contains what is commonly called the claw. Scientifically, this structure is called the **cheliped**. The cheliped consists of two parts, the **propodus** (fixed finger) and the **dactyl** (moveable finger). The dactyl is used for grasping and is articulated. The propodus is used for either crushing or cutting and is not articulated. Notice the teeth of each propodus are shaped differently. One propodus has rounded teeth used for crashing and the other has more minted teeth used for cutting. Crayfish have one claw for crushing and one for cutting!




7. The second through fifth pairs of pereopods are called **walking appendages**. Notice their pointy ends used for traction as the crayfish moves.



8. Lastly, locate the segmented **abdomen**. At the posterior end of the abdomen are the **uropods**, flipper-like structures used for swimming. There is a pair of uropods on either side of the **telson**, the last abdominal segment. Crayfish usually move by using their walking appendages, but when threatened will use their abdomen to move backwards through the water.



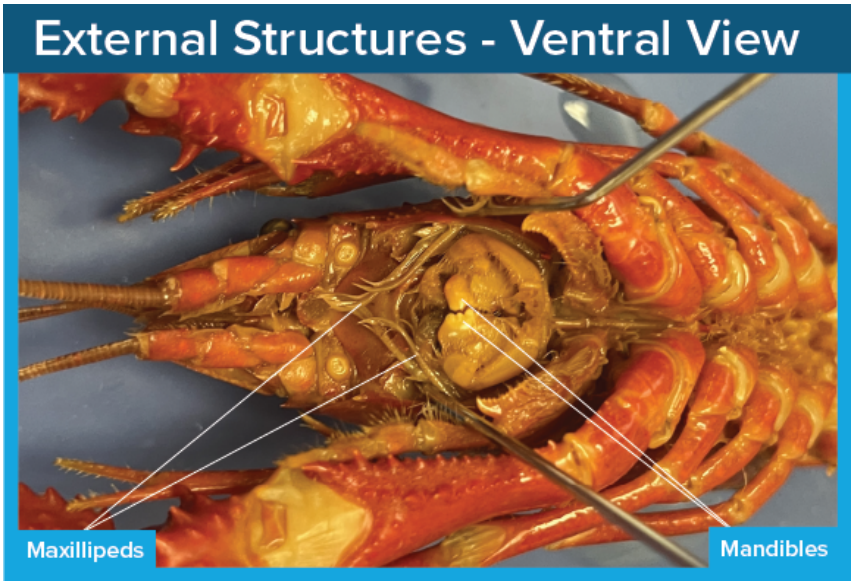

9. On your Student Sheet, sketch a **dorsal** view of your specimen. Label the following: **cephalothorax, carapace, rostrum, first antennae, second antennae, eyes**, **pereopods, chelipeds, propodus, dactyl, walking appendages, abdomen, uropods, telson.**

10. Pause to check off structures you can identify on the Structure Identification Check off List on your Student Sheet.

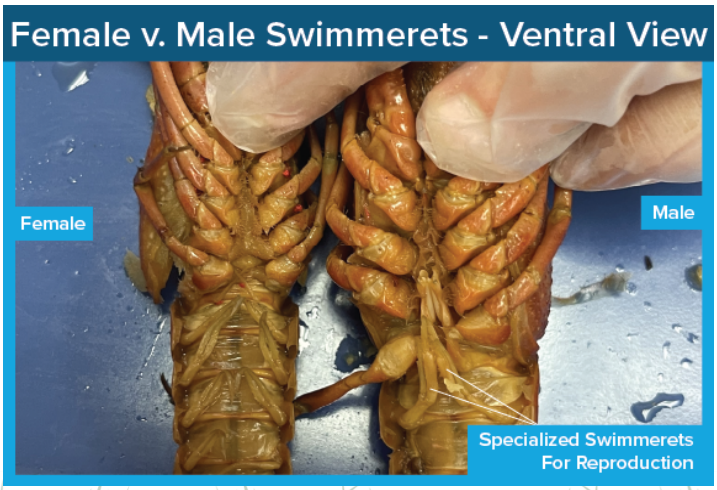
## External Crayfish Anatomy - Ventral View

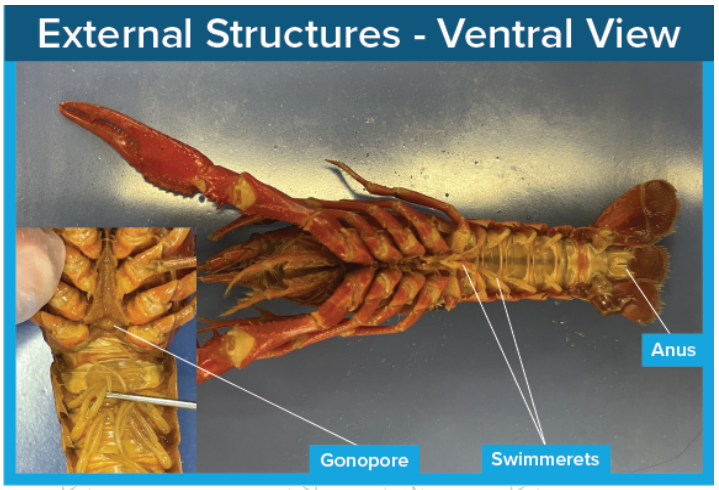
1. View the ventral side of your as shown in the image below. Determine the anterior and posterior ends. Locate the three pairs of **maxillipeds**. These structures cover the **mandible**, or jaws, of the crayfish and are used to facilitate feeding. Once the crayfish has cut/crushed its food using its chelipeds, the maxillipeds help to break the food into smaller pieces and move it towards the mandibles.

   Locate the three pairs of maxillipeds on both the right and left side. The first maxilliped is the largest and located most exterior. Use your probe to push the maxillipeds aside to reveal the right and left mandibles underneath. The mandibles are used to chew food and move side-to-side instead of up-and-down like our jaws!




2. Locate the abdominal appendages called **swimmerets**. Each of the first five abdominal appendages has a pair of swimmerets. These appendages are used to pass water over the crayfish aiding its respiration. In males, the first pair is long, stiffened, and used to transfer sperm to the female. Females use their swimmerets to carry eggs and hatchlings. Discuss with other groups to ensure you view both a male and female specimen.



3. Both males and females have **gonopores**, two small holes, located on the ventral side of the cephalothorax. The gonopores are where sperm and eggs are released. To view the male gonopores, you will have to fold back the first pair of swimmerets.

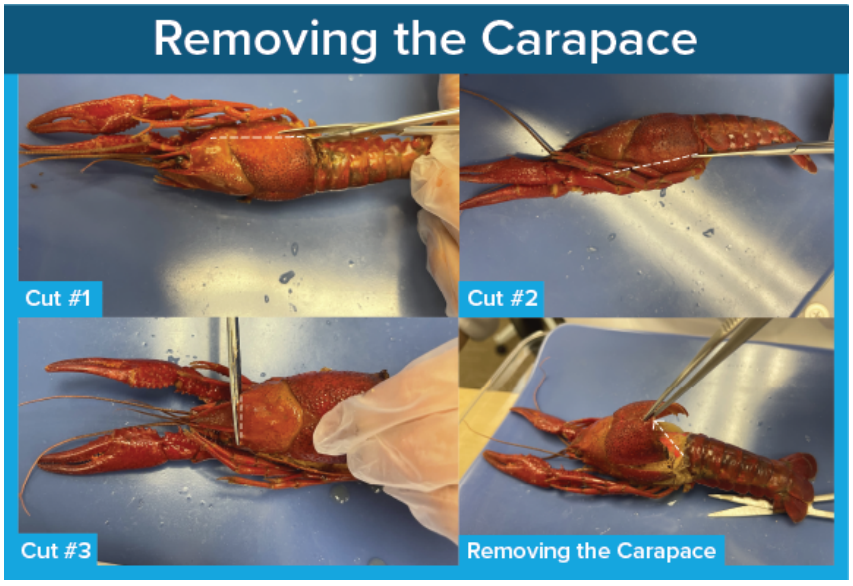
4. Locate the **anus**, the exit of the intestine, at the posterior end of the abdomen.

5. On your Student Sheet, sketch a **ventral** view of your specimen. Label the following: **cephalothorax, abdomen, swimmerettes, gonopore, anus.**

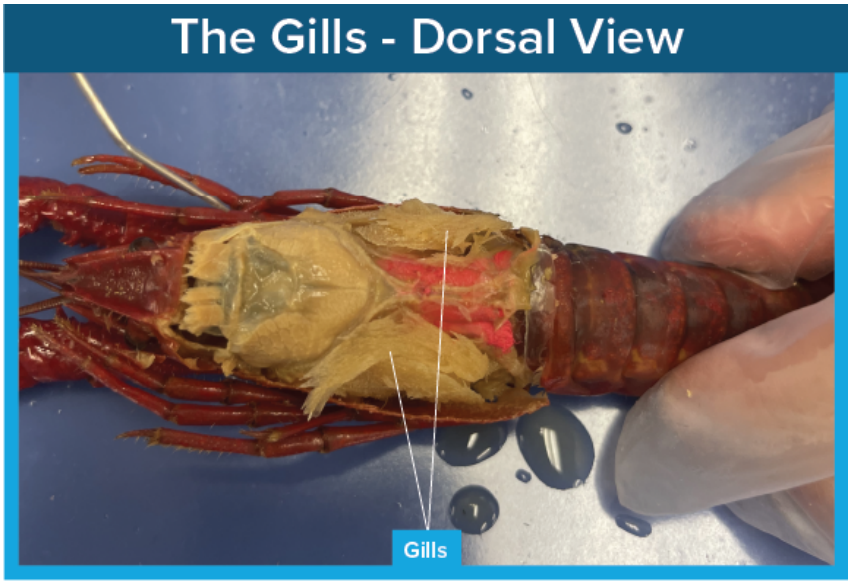
6. Pause to check off structures you can identify on the Structure Identification Check off List on your Student Sheet.

## Internal Crayfish Anatomy

1. **Instructor Approval Needed**: Return your specimen to a dorsal view. Use your scissors to make an incision into the posterior end of the carapace about ½ way up the side. Cut up along the side of the crayfish up to its eye. Repeat on the other side. Gently lift the carapace and use your scalpel to cut connective tissue holding the carapace to the internal organs. Finally, cut through the carapace at the rostrum to remove it entirely.



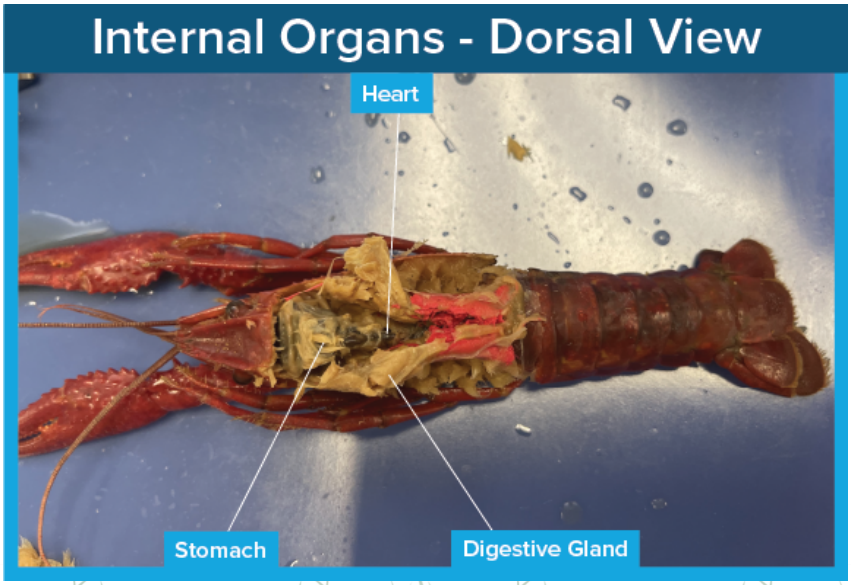
2. Locate the feathery **gills** used to remove oxygen from the water.




3. Locate the **stomach** at the anterior end of the internal cavity. It is a large, thin-walled sac. The crayfish's stomach is surprisingly complex, consisting of 2 chambers. Inside the stomach is the **gastric mill,** a group of teeth-like plates used for further grinding of food material. It is not possible to observe the gastric mill in a preserved specimen.

4. Locate the whitish-yellowish **digestive glands**. Substances produced by these glands help the crayfish digest food.

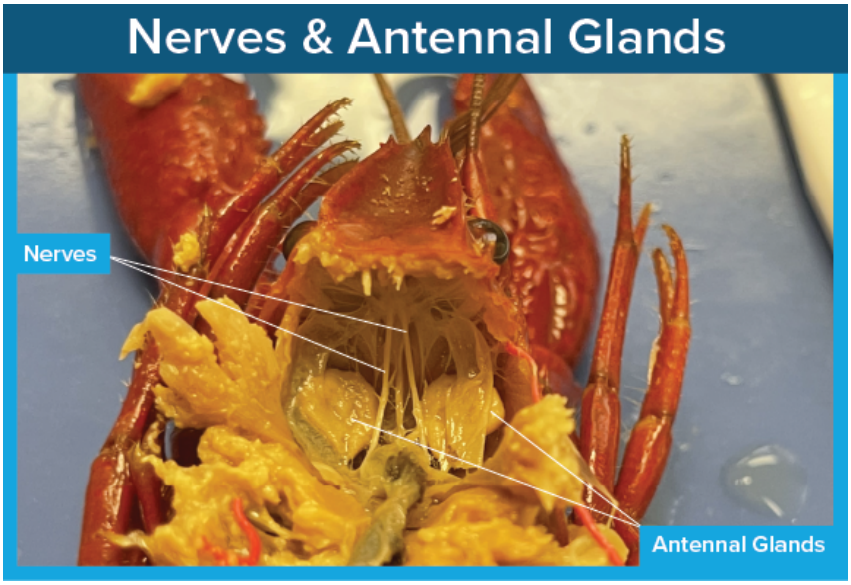
5. Locate the **heart**. Crayfish have an open circulatory system, meaning hemolymph, blood-like fluid, is not contained within vessels. In the specimen in the images, the circulatory structures have been injected with pink latex. The heart is anterior to the mass of pink in the image in between the gills.



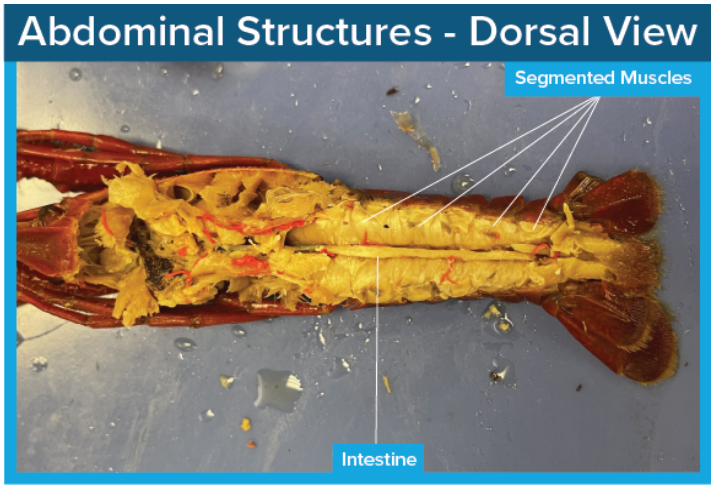
6. Pause to check off structures you can identify on the Structure Identification Check off List on your Student Sheet.

7. Use your gloved fingers to carefully remove the stomach from your specimen.

8. Once the stomach is removed, locate the **nerves** running from the eyes. You will also be able to locate the **antennal glands** at the base of the antennae. These glands help the crayfish break down, concentrate, and excrete wastes.




9. **Instructor Approval Needed**: Use your scissors to cut into the first segment of the abdomen along the side. Cut towards the uropods. Repeat on the other side. Pull the exoskeleton of the abdomen away exposing the **segmented muscles** of the abdomen. This is what people consume when they eat crayfish. Running through the middle of the abdomen is the **intestine**. This is usually dark in color because it's filled with fecal material.


10. Pause to check off structures you can identify on the Structure Identification Check off List on your Student Sheet.

## Part 4 - Cleanup

Check with your instructor prior to beginning the cleanup procedure.

1. Carefully, deposit all parts of the crayfish in the trash can. If there are any pieces on your table, pick those up and discard them as well.
2. Wipe down your table as directed.
3. Rinse dissection tray and tools as directed by your instructor.
4. Remove gloves and wash hands.
5. Return safety glasses.