

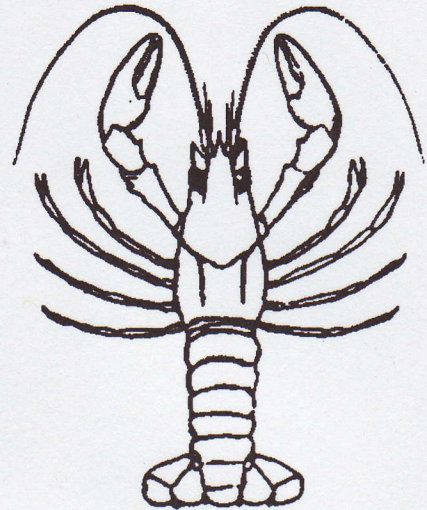
DISSECTION OF THE CRAYFISH

Phylum Arthropoda

Class Crustacea

INTRODUCTION:

Crayfish (or "crawdads" or crawfish as they are sometimes called) are freshwater crustaceans that are very similar to lobsters. You can readily find these in freshwater ponds and streams in much of the United States. Watch for their chimney like mud mounds in the shallow waters. If you try to catch them, you will soon discover their amazing ability to make a hasty retreat-backwards!



Give two alternate "local" names for the crayfish:

_____ or _____

The crayfish is an extraordinary example of the arthropod characteristic of jointed legs. The crayfish has twenty pairs of appendages that have been modified for specific functions. In this investigation you will locate and examine the main external structures and respiratory system of the crayfish.

Name the phylum to which the crayfish belongs: _____

State the major characteristic of members of this phylum: _____

How many pairs of appendages does the crayfish have? _____

The group of organisms to which the crayfish belongs is the largest of the plant and animal phyla. Indeed, of the millions of known species of animals, three-fourths are arthropods. In addition to crayfish, this group contains millipedes, centipedes, spiders, scorpions, horseshoe crabs, insects, and a little known animal called *Peripatus* which is considered to be the "missing link" between the annelids (segmented worms) and the arthropods.

The crayfish is a cannibalistic scavenger that lives on the muddy bottoms of streams and ponds. It emerges at night to feed on dead and decaying matter, insect larvae, and worms.

Tell what portion of all known species of animals are arthropods: _____

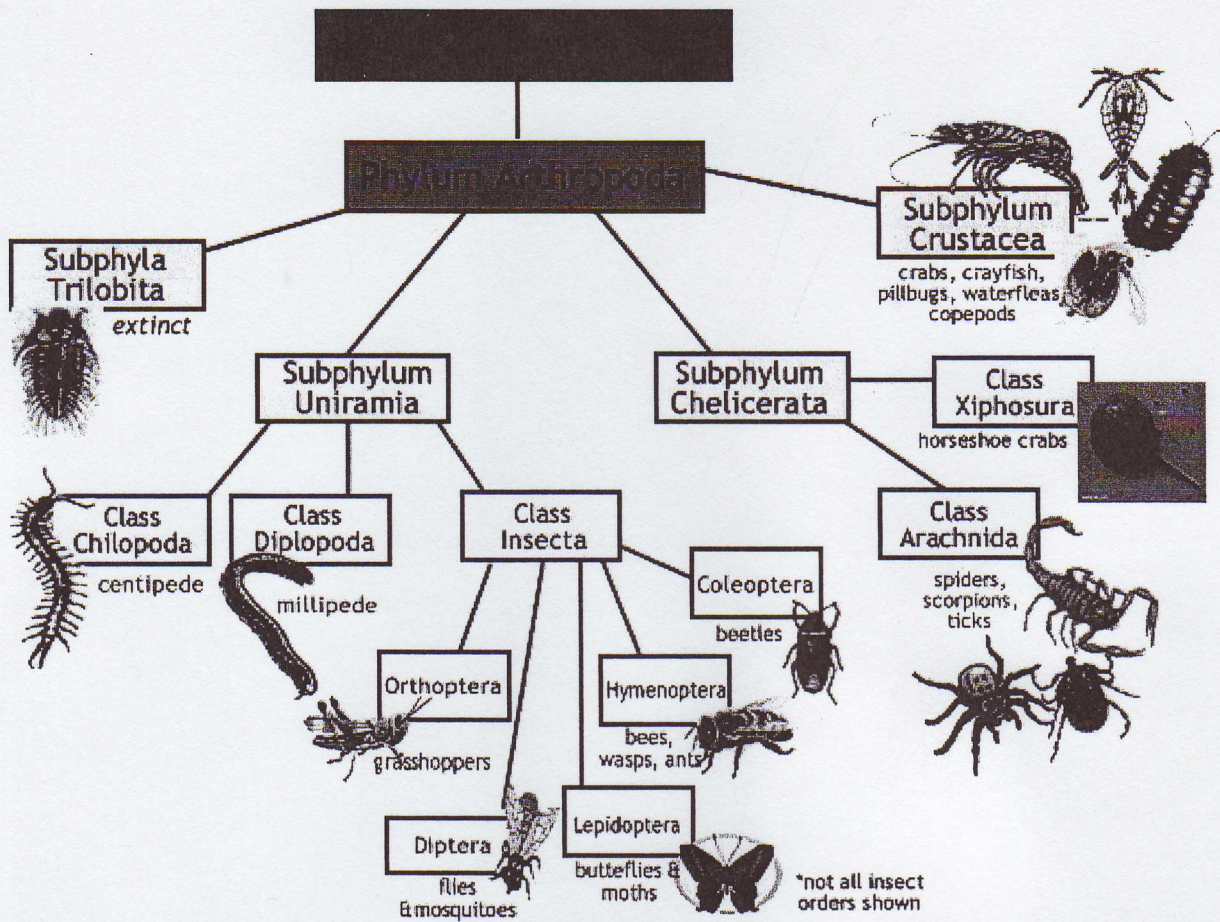
To what class does the crayfish belong? _____ Name six other "common classes" that

belong to the phylum Arthropoda: _____, _____, _____,

_____, _____, _____

What does the phrase "cannibalistic scavenger" mean? _____

Here is a summary of the phylum Arthropoda. Use your pencil to circle the subphylum (most biologists call it a class) to which the crayfish belongs.....



As an arthropod, the crayfish has a body protected by a hard exoskeleton made of chitin. Periodically, the crayfish sheds, or molts, its outer skeleton and grows a new one. After molting, the crayfish takes in large amounts of water to increase its body size before the new skeleton hardens. The crayfish body has five pairs of jointed legs and two segments, a fused cephalothorax, and a jointed abdomen. The carapace, a part of the exoskeleton, covers the cephalothorax. Crayfish breathe by means of gills. Tubular structures, called green glands, remove excess water and wastes from the blood. The "brain" of the crayfish consists of a pair of ganglia connected to a ventral nerve cord.

What is an exoskeleton? _____ What is the exoskeleton made of in the crustacean? _____

When a crayfish sheds his exoskeleton, the process is called _____

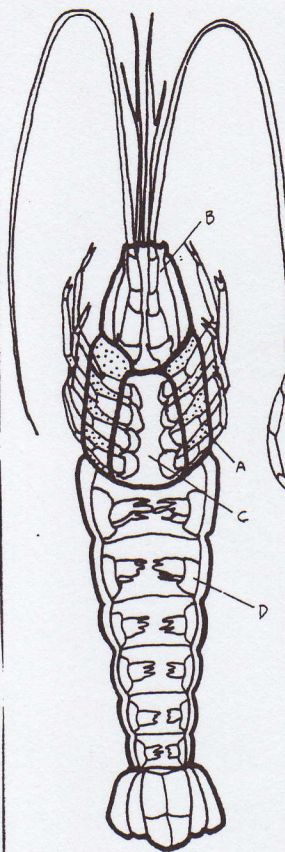
Describe how the crayfish increases in size after a molt: _____

Name the organs crayfish use for breathing: _____

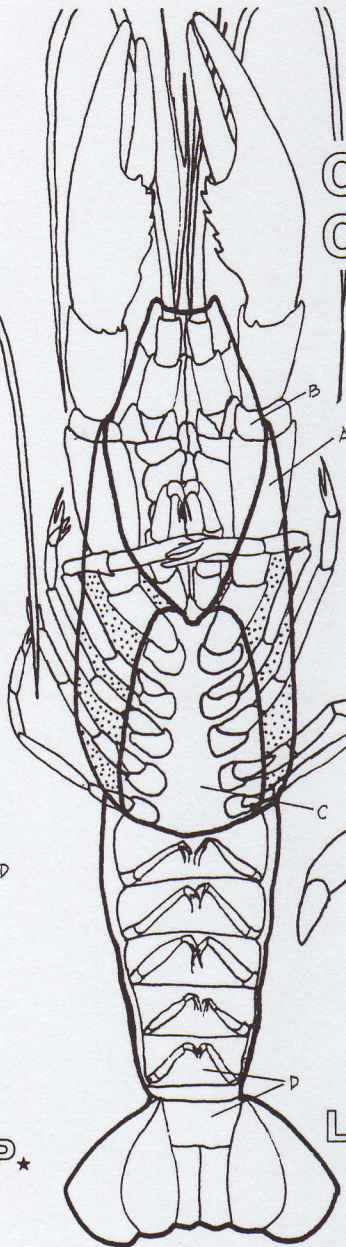
Tell what green glands do: _____

Color Diagram : Complete all parts.

COMPARISON OF SOME CRUSTACEAN BODY FORMS.

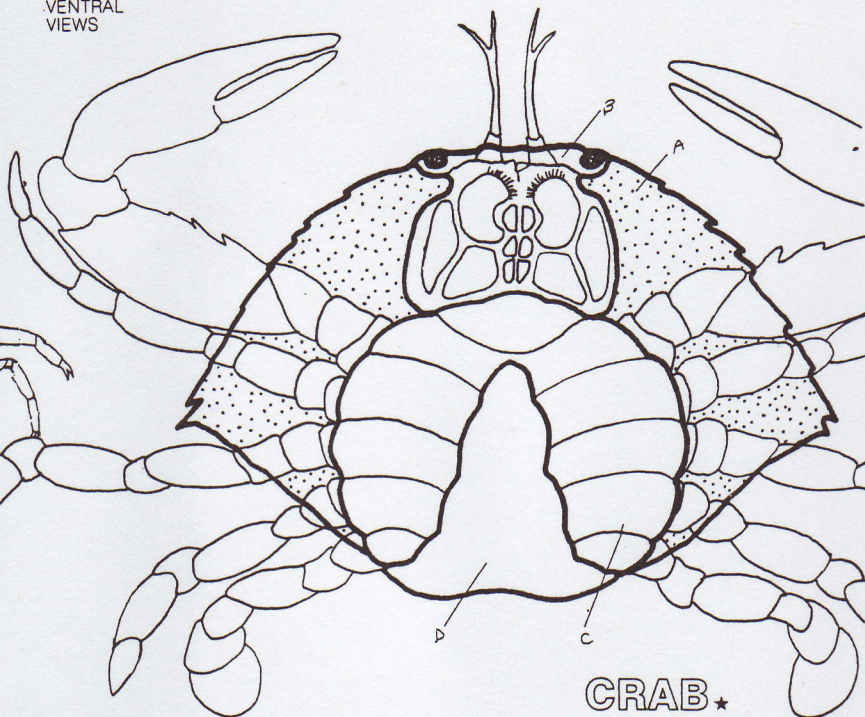


SHRIMP*
(PENAEUS)



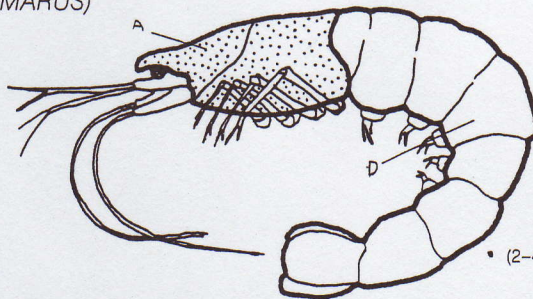
LOBSTER*
(HOMARUS)

VENTRAL VIEWS

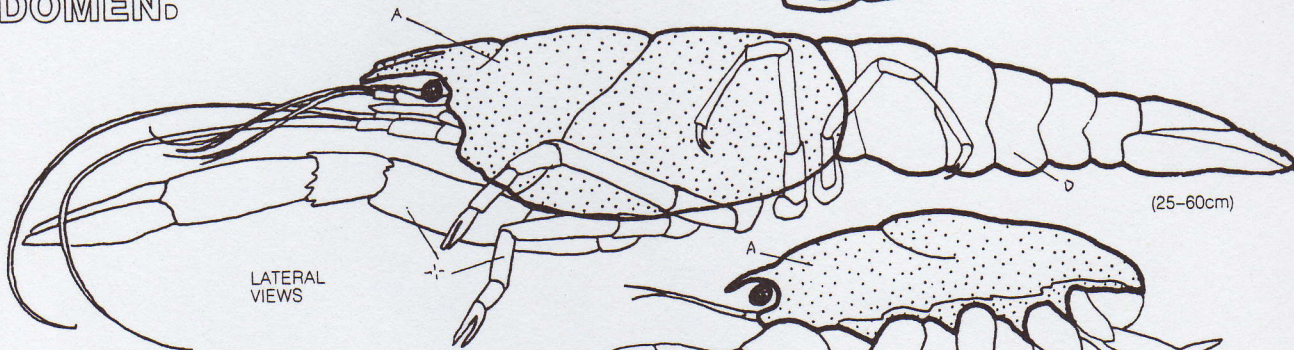


CRAB*
(PORTUNUS)

CARAPACE_A
HEAD_B
THORAX_C
ABDOMEN_D

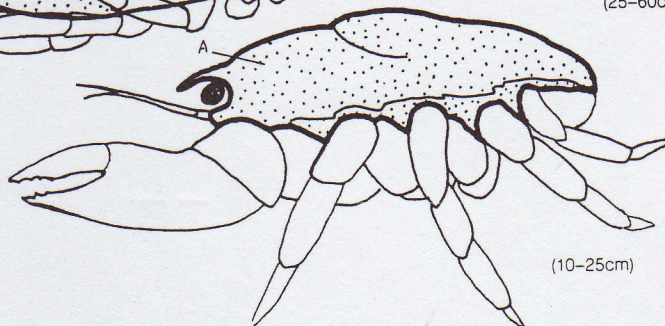


(2-4cm)



(25-60cm)

LATERAL VIEWS



(10-25cm)

Crayfish are grouped in the phylum Arthropoda, which also includes such animals as insects and spiders. Arthropods are characterized by having jointed appendages and segmented bodies. In crayfish and other higher arthropods each appendage has a specific function. Crayfish, which are aquatic, use their appendages for swimming, walking, food-getting, reproduction, biting, touching, and tasting.

What does aquatic mean? _____ terrestrial? _____

Line a dissecting pan with newsprint and place a crayfish in the pan with its dorsal (back) side up. Feel the hard exoskeleton. It is made of a substance called chitin.

Body Segments: The crayfish's body is divided into two major regions: the abdomen and the cephalothorax, which includes the head and thorax (chest). The cephalothorax is covered by a piece of exoskeleton called the carapace. Note the curved cervical groove that marks the division between the head and thorax. The pointed anterior end of the carapace is the rostrum. Beneath it are the stalked compound eyes.

The segmented abdomen ends in a segment called the telson. Unlike the cephalothorax, the abdomen can be flexed.

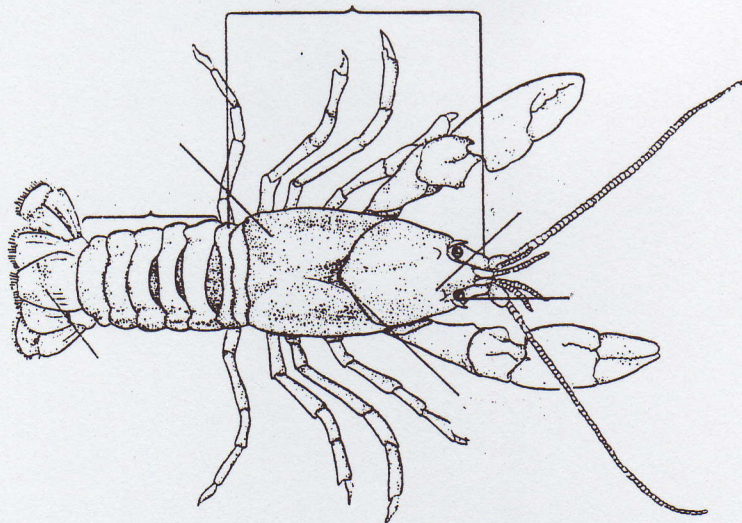
Name the two parts of the cephalothorax: _____, _____

What do humans have in place of the cervical groove? _____

What can the crayfish do with the abdomen that it cannot do with the cephalothorax?

How many segments does the abdomen have? _____

On the diagram of the dorsal surface below, label the cephalothorax, abdomen, carapace, cervical groove, rostrum, eyes, and telson.



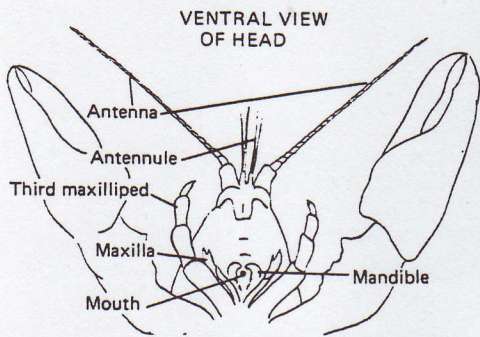
Tag each of the following on your specimen: dorsal surface, cephalothorax, abdomen, carapace, cervical groove, telson

Verified _____

Appendages: Turn the crayfish over to expose its ventral side. Note the many paired appendages. Crayfish have the ability to regenerate lost body parts, so you may find an appendage that has only partially regrown.

Protruding from the head are two long antennae. Two shorter branched antennules are located between the antennae. The crayfish uses these structures for taste, touch, and smell.

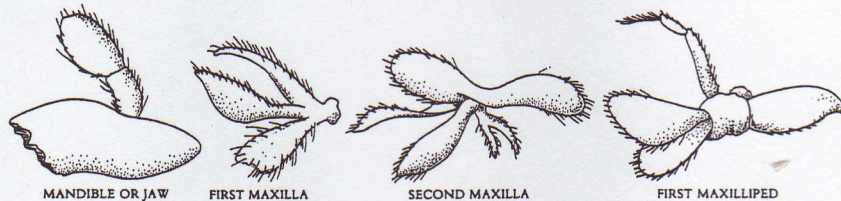
Locate the mouth opening. Surrounding the mouth are jagged jaws called mandibles, used for biting and chewing. Posterior to the mandibles are two pairs of maxillae and three pairs of leg-like maxillipeds; these structures are used to hold food. Use a hand lens to examine these mouth parts. If you have trouble identifying them, refer to the diagrams below.



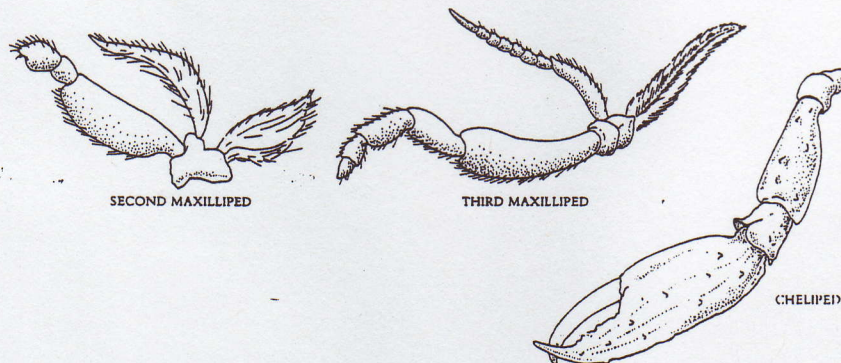
Tag each of the following: ventral surface, antennae, antennules, mouth

Verified _____

Use the diagrams below and the description above to locate the various appendages that surround the mouth. Working from the mouth "out" locate the mandibles, maxilla, and maxillipeds.

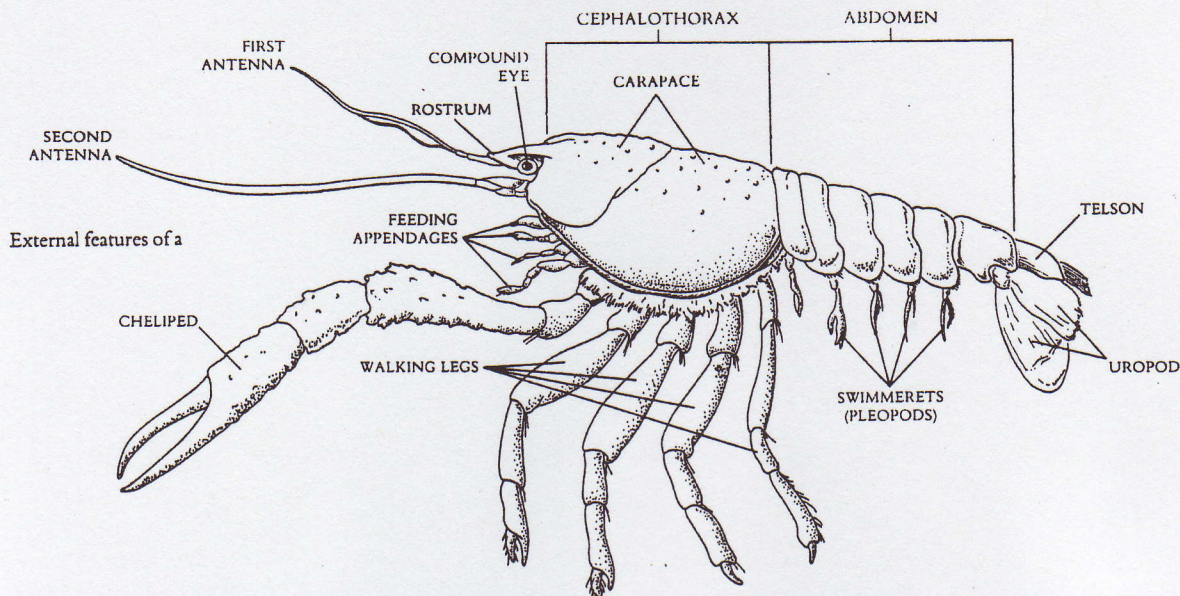


Feeding appendages of a

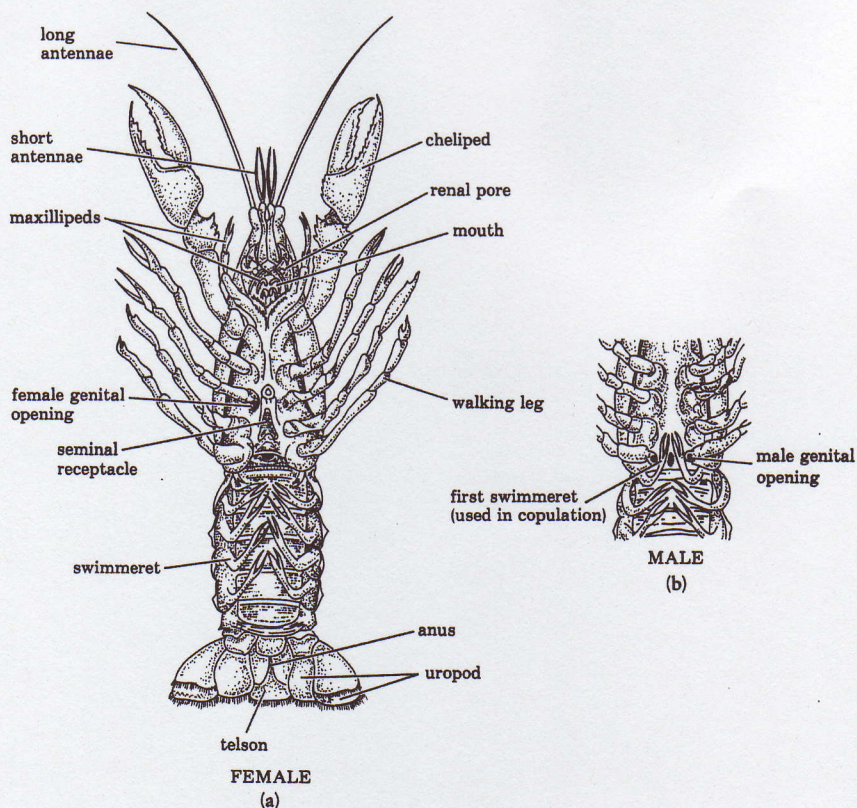


Tag each of the following: Maxilliped, maxilla, mandible Verified _____

The four pairs of appendages on the thorax are the walking legs. The large, pincer-like appendages are the chelipeds ("pinching legs"), which the crayfish uses for defense and capturing prey.



On the abdomen, note the small appendages called swimmerets. These are used in swimming and reproduction. In a female crayfish the first pair of swimmerets are small. In a male the first two pairs, which transfer sperm to the female, are larger and folded forward.

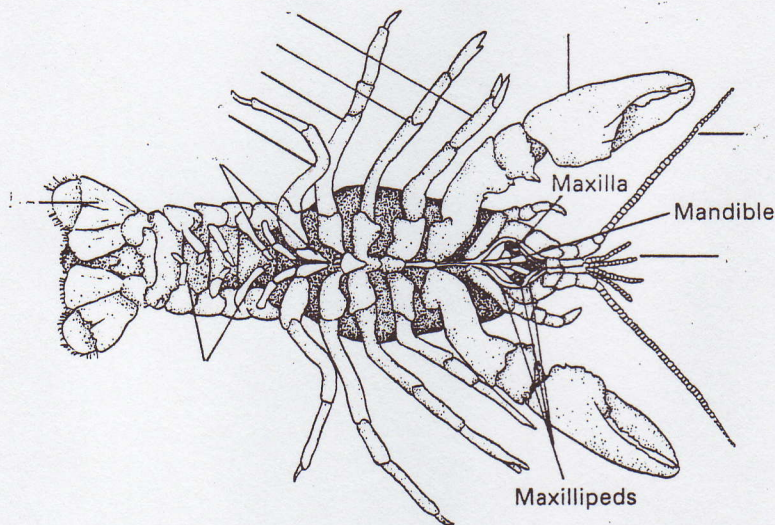


What is the sex of your crayfish? _____

Observe the abdominal region and its division into six segments. The jointed appendages, called swimmerets, on the first five segments also aid in respiration by moving water over the gills. Grab the edge of the carapace on one side or the other of the crayfish and lift it gently....the gills are located under the carapace. The carapace is actually not "glued-down" to most of the cephalothorax

At the posterior end, on each side of the telson, are modified swimmerets called uropods. The uropods and telson form a tail fin that is used to propel the crayfish backward through the water.

On the diagram of the ventral surface below, label the antennae, antennules, chelipeds, walking legs, swimmerets, and uropods.



Tag each of the following: walking legs, cheliped, swimmerets, uropod, gills.

Verified _____

Based upon your observations and reading to this point, complete the "function" column in the table below. Then, carefully remove one sample of each appendage (use scissors and cut close to the body) and place it in the sample column. DO NOT TAPE THEM DOWN. Only ONE partner will need to have the sample appendages in place....

Appendage Chart

Body Section	Appendage	Function	
Cephalothorax	Antennules (1 pair)		
	Antennae (1 pair)		
	Eyes (compound, 1 pair)		
	Mandibles (1 pair)		
	Maxillae (2 pairs)		
	Maxillipeds (3 pairs)		
	Chelipeds (1 pair)		
	Walking Legs (4 pairs)		
Abdomen	Swimmerets (5 pairs)		
	Uropods		
	Telson		

Completed _____

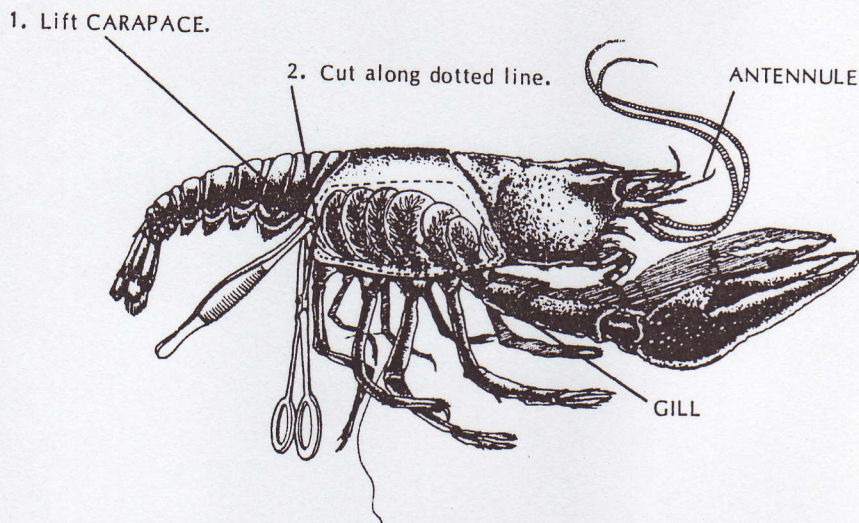
Internal Anatomy Dissection

Place your crayfish dorsal side up in a dissecting pan. Note: When cutting with the scissors, be sure to raise the exoskeleton first and to use only the point of the scissors. Do not penetrate into the body of your crayfish, because the very delicate internal organs are easily damaged.

Using a pair of forceps, raise the posterior dorsal edge of the carapace.

Using the scissors, carefully cut the carapace forward on each side of the dorsal midline, from the posterior edge of the carapace to the eyes.

Remove the entire carapace from the dorsal and lateral surfaces. The interior of the crayfish body should now be exposed.



Cut through muscles at the base of a leg and gill. Carefully remove a leg with its attached gill intact. Place the leg/gill in a watch glass.

Completed _____

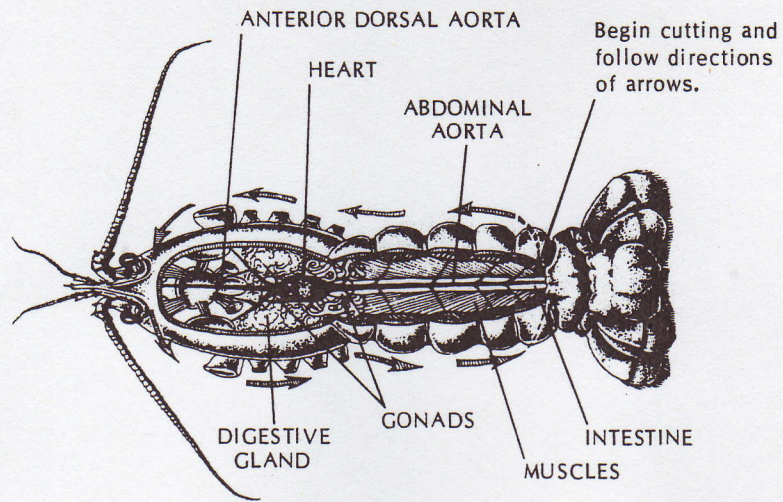
The large, feathery structures you see are the gills. These remove oxygen from the water as it flows up and under the carapace.

Describe the structure of the gills. _____

The walking leg plays an important role in the respiratory system. Move one or more legs back and forth.

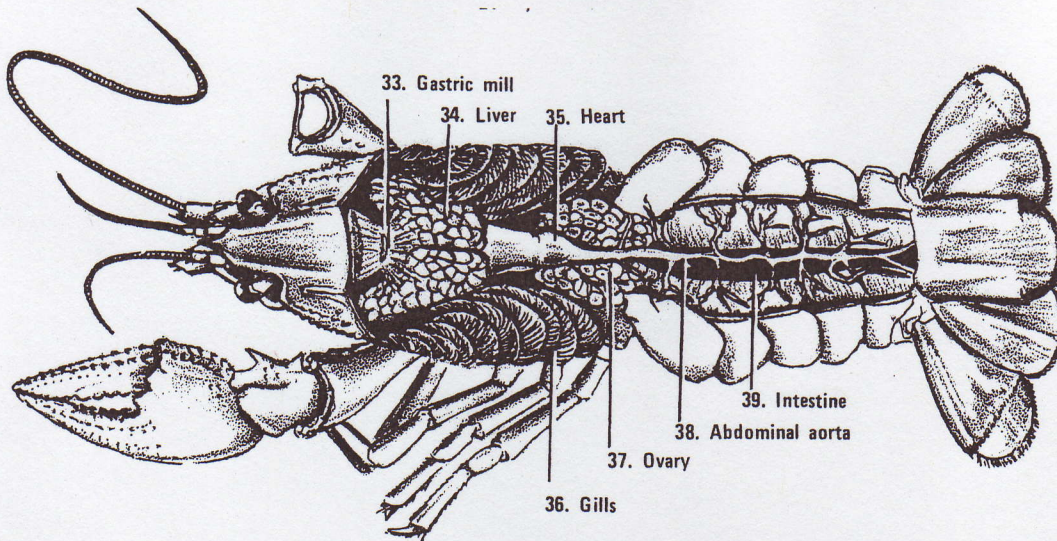
What do the walking legs do for the respiratory system? _____

To expose several important organs and blood vessels, remove a long, narrow section of the dorsal abdominal exoskeleton as shown in the figure below.



Completed _____

Attempt to locate the heart and the two blood vessels leaving the heart, the abdominal aorta and the anterior dorsal aorta. Since there are no veins in crayfish, the blood flows from the dorsal blood vessels to capillaries and then into tissue spaces called sinuses which function as veins.



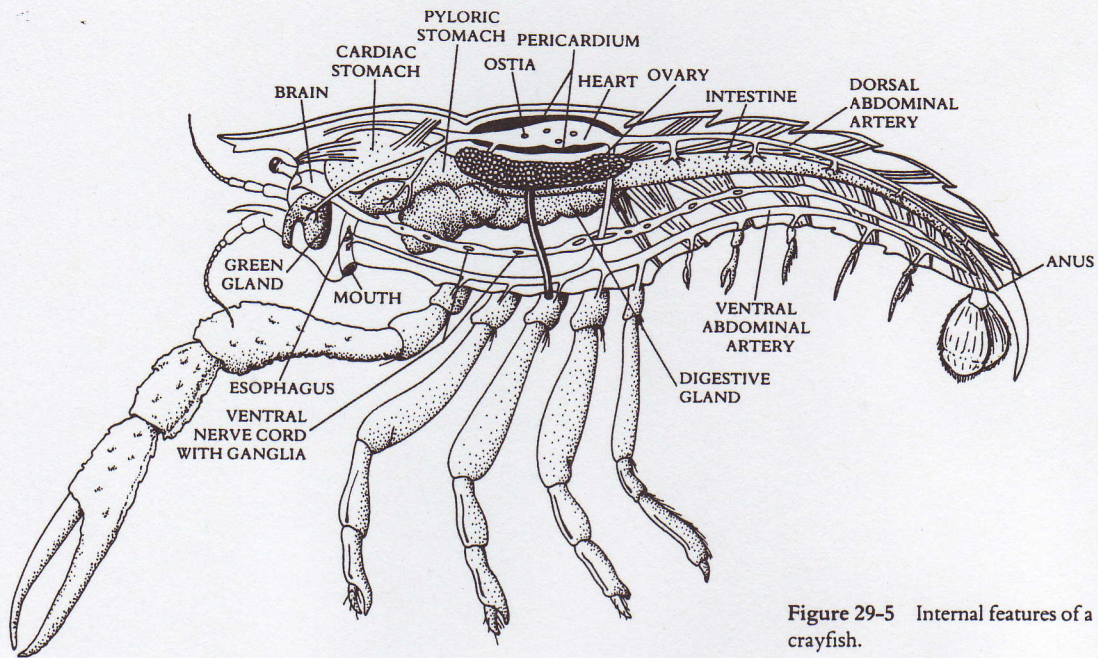
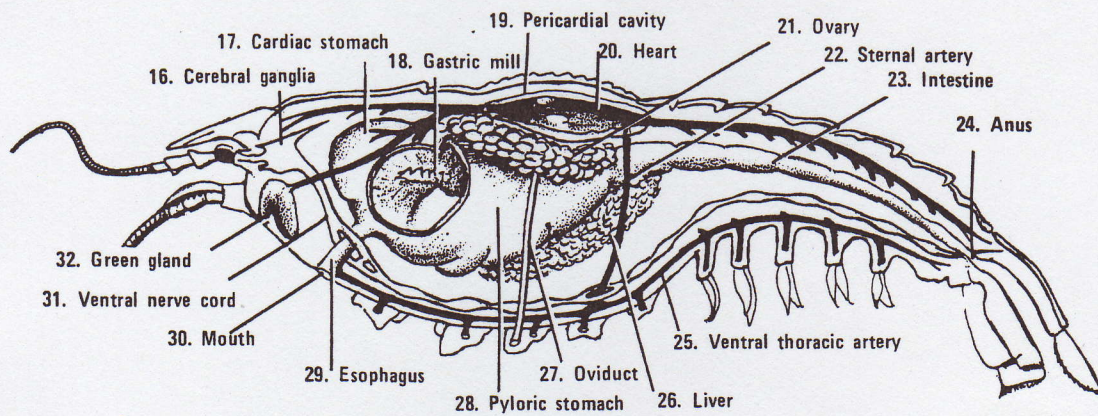
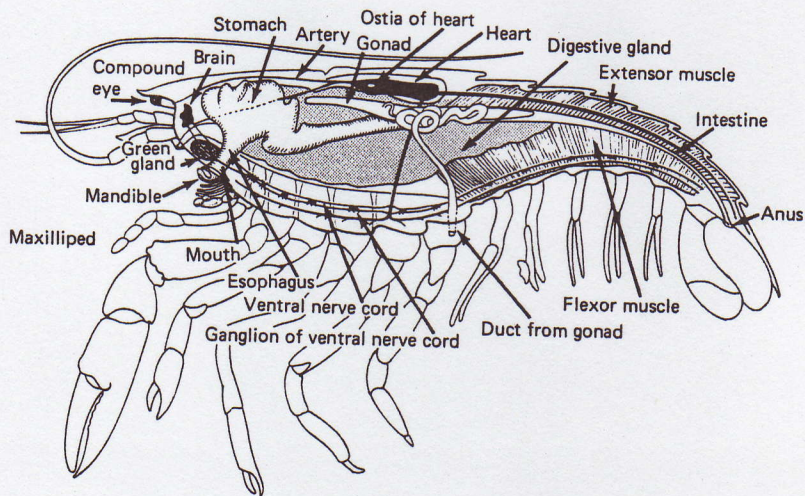


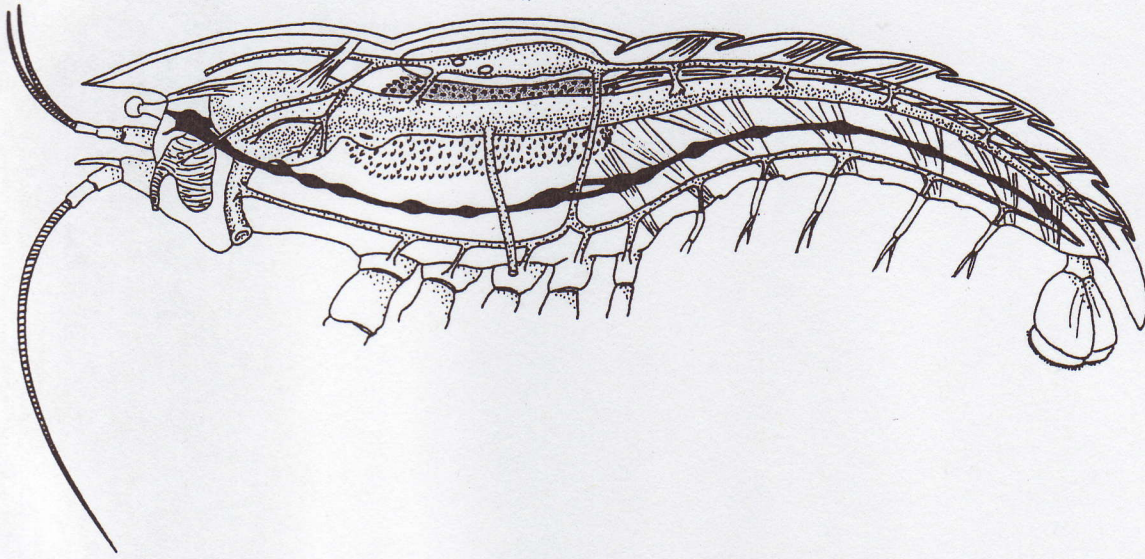
Figure 29-5 Internal features of a crayfish.



Circulatory System

Locate the heart within the pericardial sinus, or cavity, at the posterior edge of the cephalothorax. With the hand lens, observe the three pairs of ostia, or small openings, through which blood enters the heart. Note: Observe as many arteries as you can without damaging the internal organs.

On the diagram below, label the heart, pericardial sinus, ostia, dorsal artery, sternal artery, and ventral artery.

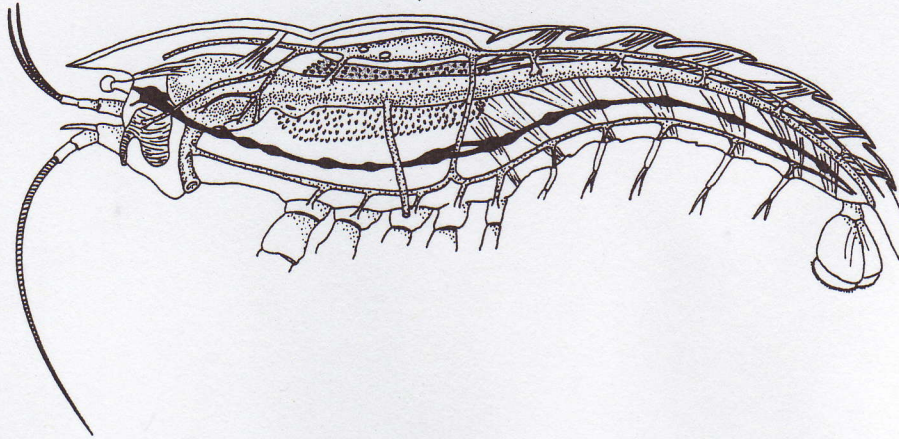


Reproductive System

Locate the gonad, either testis or ovary, beneath and slightly anterior to the heart. In the female, the ovary with eggs appears as a large pink or orange mass. On each side of the ovary, try to find the straight oviduct extending downward to the base of the second walking leg. Then locate the oviduct openings at the base of these legs. The white testis of the male occupies the same position as the ovary does in the female. On each side of the testis, try to find the coiled sperm ducts extending downward to the base of the last walking leg. Then locate the sperm duct openings at the base of these legs. Note: The pair of oviducts and sperm ducts may be difficult to observe in some preserved crayfish.

Mating takes place in autumn. Sperm pass from a male's testes through the ducts to the outside. Using the modified swimmerets, the male transfers his sperm to the female's seminal receptacle, where the sperm are stored over the winter. The eggs are not fertilized until the female lays them in April.

Trace over (draw in) and label the testis/ovary and the oviduct/sperm duct in the diagram below. (From the paragraph above, you learned these organs and ducts are in the same location(s) in the male and female. One drawing with the dual labels will take care of the labeling.)



Digestive and Excretory Systems

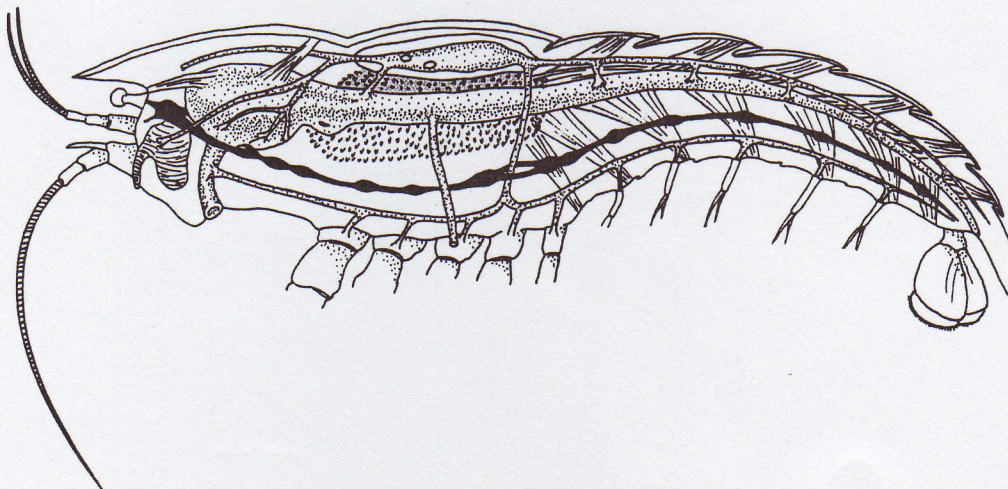
Carefully remove some of the muscle tissue in the anterior part of the cephalothorax. Locate the stomach, a large, thin-walled, two-chambered sac that is just above the Mouth and esophagus.

Identify the large, yellowish-green digestive glands on either side of the stomach and part of the intestine. Ducts connect these glands to the stomach.

Using a probe, separate the digestive glands from the stomach to observe where the stomach joins the intestine. Follow the intestine along the length of the abdomen to the anus. The anus is located on the ventral surface of the telson.

Locate the paired excretory organs, or green glands. Each pair is anterior to the stomach at the base of the antenna beneath each eye. Find the excretory pore, or opening, at the base of the antennae on the ventral surface.

Label the stomach, mouth, esophagus, digestive gland, intestine, anus, green gland, and excretory pore on the diagram below.



Nervous System

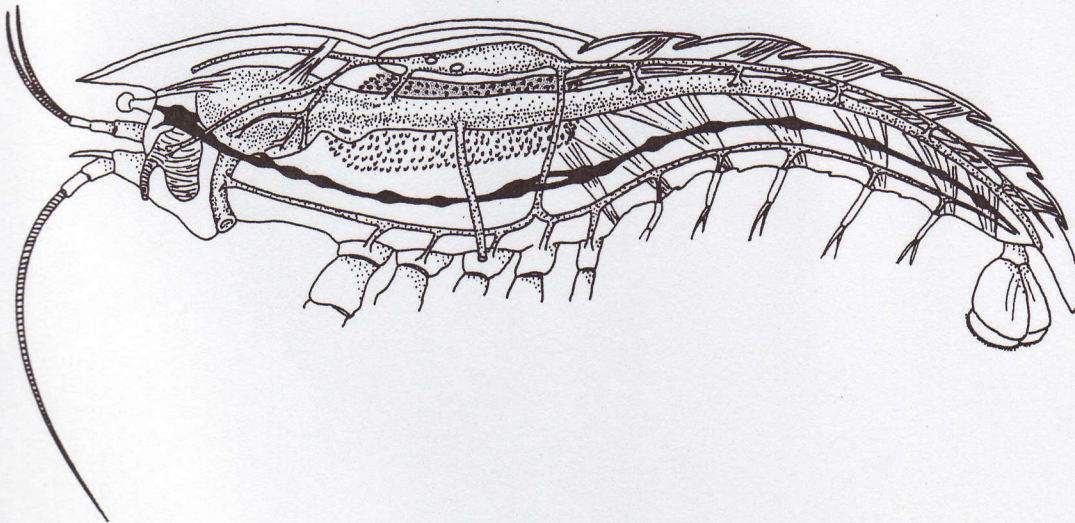
Place the crayfish with the ventral side up. Using scissors, carefully remove the soft tissue from the ventral area of the abdomen.

Completed _____

Locate the slender, white ventral nerve cord that lies along the central midline of the crayfish. Note: Begin tracing the nerve cord in the abdomen. The thin plates of shell that partly cover the nerve cord in the cephalothorax make the cord difficult to find in this area. Locate one or more segmental ganglia on the nerve cord.

Find the brain just above the esophagus. Carefully cut away the rostrum and any remaining carapace. Between the eyestalks is the brain, a small white mass. Note the nerves traveling from the brain to the eyes and antennae.

Label the ventral nerve cord, ganglia, and brain on the diagram below.



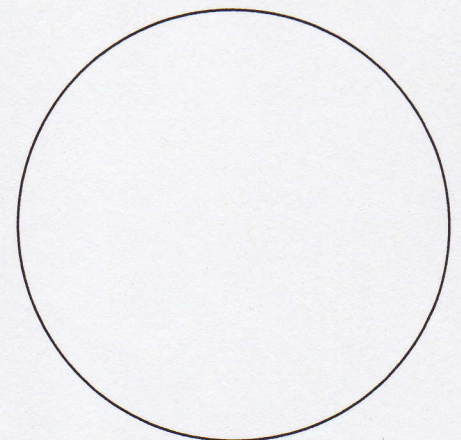
Each of the crayfish's compound eyes is made up of long visual rods. The outer surface of each rod is called a facet. Light is focused through each facet onto the retina, producing a fuzzy but wide-ranging image.

Remove an eye by clipping it at its base and examine it with the dissecting microscope. Note the numerous facets in the eye. Because the eyes are on movable stalks, the crayfish has a very wide field of view. How might this be an advantage?

Draw a view of what you see under the stereoscope in the field of view circle to the right. Leave the eye in place on the stage so you instructor can verify it.

Verified _____

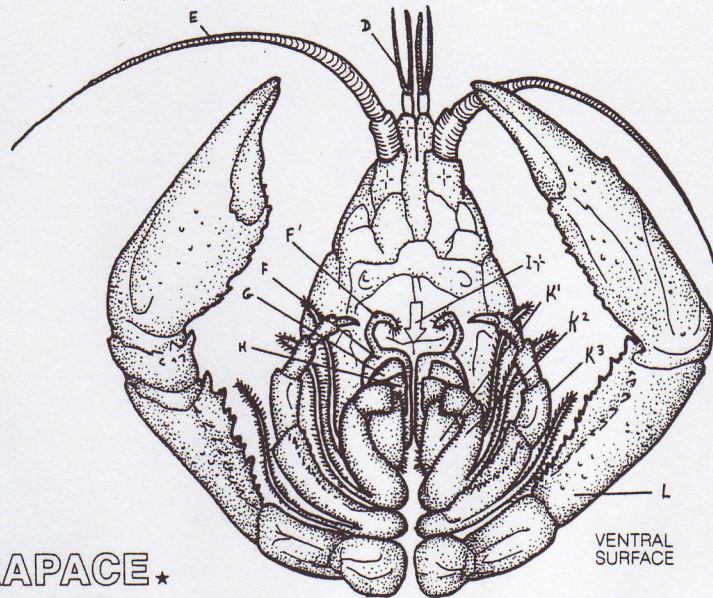
The sense of touch is probably more important in the crayfish than vision. Touch receptors are located in specialized hairs on the body as well as in some appendages.



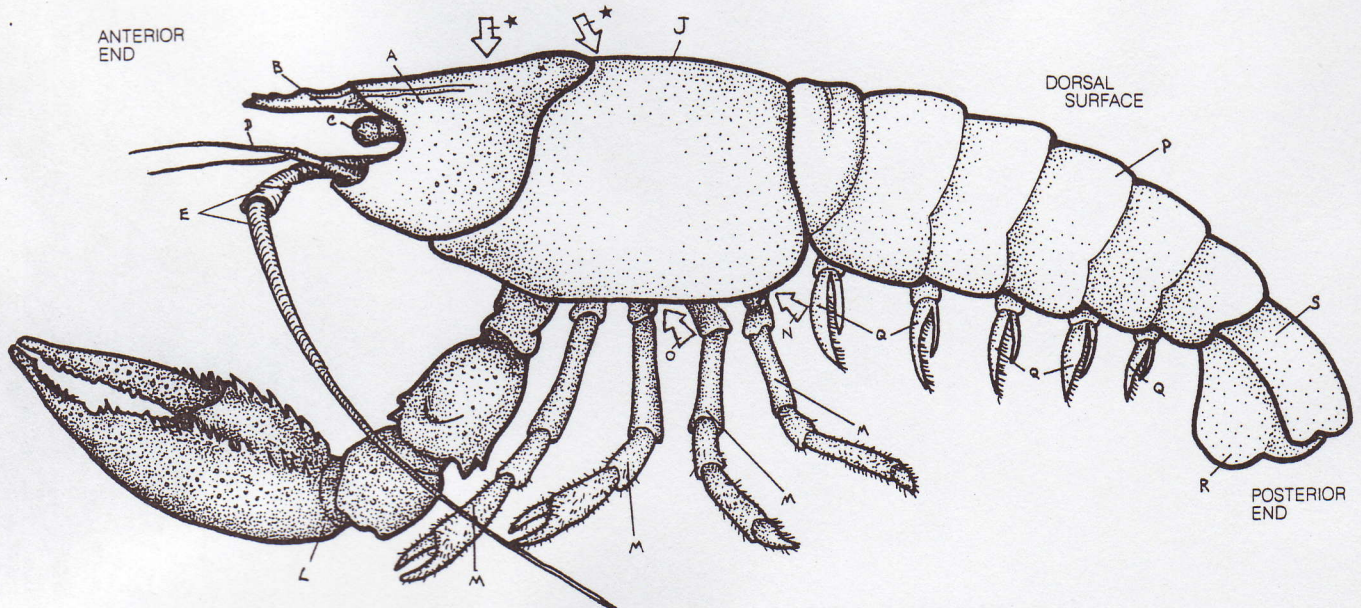
Magnification _____

CRAYFISH: EXTERNAL STRUCTURE.

HEAD_A
 ROSTRUM_B
 EYES_C
 ANTENNULE_D
 ANTENNA_E



CARAPACE ★



THORAX.
 1st, 2nd, 3rd MAXILLIPED_K
 CHELIPED_L
 4 WALKING LEGS_M
 MALE GONOPORE_N
 FEMALE GONOPORE_O

ABDOMEN.
 5 SWIMMERETS_Q
 UROPOD_R
 TELSON_S

CRAYFISH: INTERNAL STRUCTURE.

DIGESTIVE SYSTEM ★

MOUTH.
 ESOPHAGUS.
 STOMACH.
 INTESTINE.
 DIGESTIVE GLAND.
 ANUS.

EXCRETORY SYSTEM ★

GREEN GLAND/PORE.

CIRCULATORY SYSTEM ★

HEART.
 PERICARDIAL SINUS.
 ARTERY.
 SINUS.
 AFFERENT CANAL.
 EFFERENT CANAL.
 BRANCHIOCARDIAC VESSEL.

RESPIRATORY SYSTEM ★

JOINT GILL.

FOOT GILL.

REPRODUCTIVE SYSTEM ★

OVARY.

OVIDUCT.

PORE.

