

The concentric rings are lines of growth. As the fish grows, the scales grow larger. Because the coldblooded fish grows slowly at low temperatures, the growth lines are formed close together during winter. Each winter's growth lines appear as a ring on the scale. So, you can approximate the age of the fish by counting the rings.

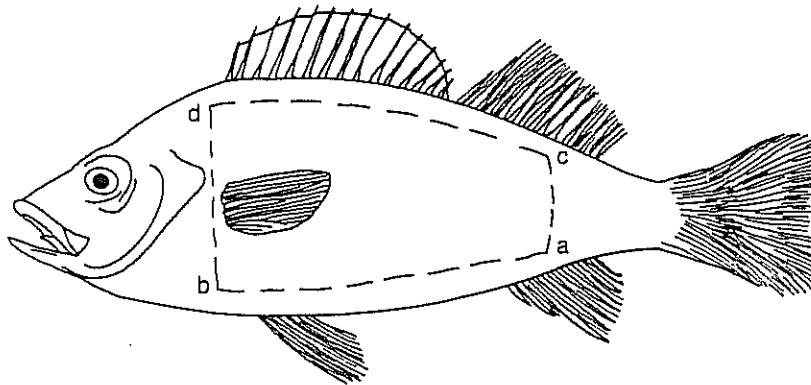
Estimated age \_\_\_\_\_

### Internal Anatomy

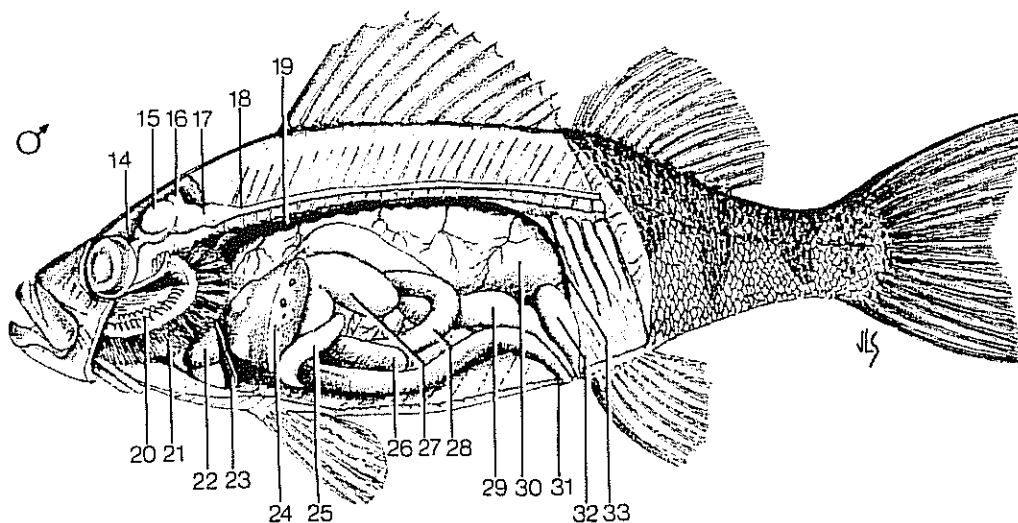
Position the fish in the dissecting pan so that the ventral surface faces you and the head points away from you. Insert the tip of the scissors into the body of the perch, at a point above and anterior to the anus as shown in the figure below. Cut through the skin and muscle from the anus forward to the pelvic fin, as shown in line ab in the figure. Then place the fish with its head pointing to your left.

Make a second cut with the scissors from the anus to the lateral line, as shown by line ac. Make a third cut from the pelvic fin to the lateral line, as shown by line bd.

To expose the body cavity, carefully lift the flap of skin and muscle tissues from the internal organs in the body cavity. Remove the flap from the specimen completely by cutting along the line cd.



Completed \_\_\_\_\_

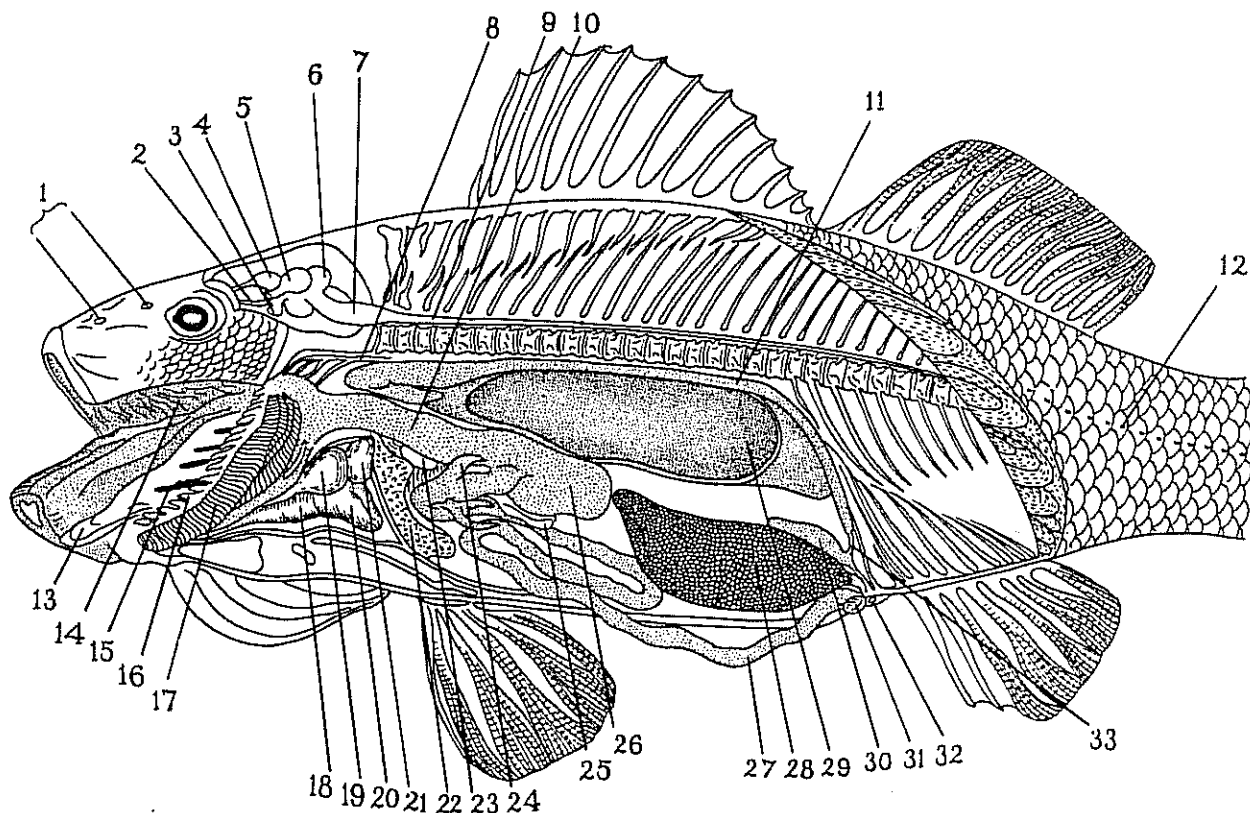


14. Cranial cavity

15. Optic lobe  
16. Cerebellum  
17. Medulla oblongata  
18. Spinal cord  
19. Kidney  
20. Gill arch  
21. Gills

22. Heart  
23. Pericardial cavity  
24. Liver  
25. Pyloric caeca  
26. Spleen  
27. Stomach  
28. Intestine

29. Gonad  
30. Air bladder  
31. Anus  
32. Bladder  
33. Ureter



- |                      |                          |
|----------------------|--------------------------|
| 1. External nares    | 18. Bulbus arteriosus    |
| 2. Optic nerve       | 19. Atrium               |
| 3. Hypophysis        | 20. Ventricle            |
| 4. Olfactory lobe    | 21. Sinus venosus        |
| 5. Optic lobe        | 22. Liver                |
| 6. Cerebellum        | 23. Gall bladder         |
| 7. Medulla oblongata | 24. Pyloric caecum       |
| 8. Dorsal aorta      | 25. Spleen               |
| 9. Spinal cord       | 26. Stomach              |
| 10. Esophagus        | 27. Intestine            |
| 11. Kidney           | 28. Ovary                |
| 12. Lateral line     | 29. Air bladder          |
| 13. Tongue           | 30. Urinary bladder      |
| 14. Pharynx          | 31. Anus                 |
| 15. Gill cleft       | 32. Urinogenital opening |
| 16. Gill rakers      | 33. Ureter               |
| 17. Gills            |                          |



## Digestive System

Food enters the digestive tract through the fish's mouth. It passes through the throatlike pharynx into the esophagus, the tube that leads to the stomach. The stomach's capacity is increased by several pouchlike structures called pyloric caeca. After being partially digested in the stomach, the food enters the winding intestine. Digestion is completed there, with the aid of the bean-shaped liver. Undigested food is removed through the anus.

Locate the liver in the anterior of the body cavity. The normally reddish-brown liver becomes cream-colored in preserved specimens. Also try to find the gall bladder between the lobes of the liver.

Carefully remove the liver and gall bladder and set them aside. Locate the short esophagus attached to the stomach.

Find the pylorus, which is located at the point where the stomach and intestine meet. After finding the pylorus, observe the small, pouch-like pyloric caeca that are attached to the pylorus.

Trace the intestine to the anus. Find the mesentery, a thin membrane that attaches the intestines to the body wall.

Find the small, red spleen attached to the mesentery near the stomach. Note: The spleen is not part of the digestive system, but it is easy to find at this point.

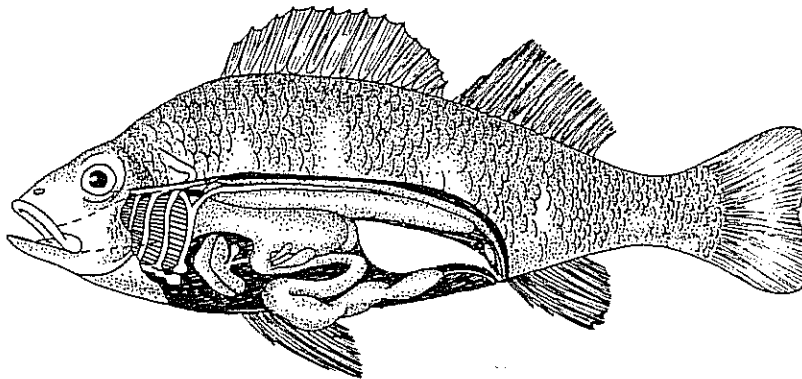
Locate the pancreas, an elongated, irregularly shaped gland found between the stomach and the loop of the intestine.

Examine the loops of the intestine and find where it leads to the anal opening. Long masses of fat lie along the intestinal loops.

How do you think the pyloric caeca aid the stomach in digestion? \_\_\_\_\_

What is the function of the mesentery? \_\_\_\_\_

Label the liver, gall bladder, esophagus, stomach, pyloric caeca, intestine, anus, and spleen in the diagram below.



Tag each of the following: liver, ~~esophagus~~, intestines, anus

Completed \_\_\_\_\_

Tag each of the following: stomach, mesentery, fat bodies

Completed \_\_\_\_\_

Tag each of the following: pylorus, spleen, pancreas

Completed \_\_\_\_\_

Remove the stomach from your specimen. Slice it longitudinally (long-ways), turn it inside out, and examine its contents.

Completed \_\_\_\_\_

Remove and discard the digestive system by using scissors to make a cut above the anal opening. Since you have removed the stomach, the anterior end of the digestive system should already be free.

### Air Bladder (Swim Bladder)

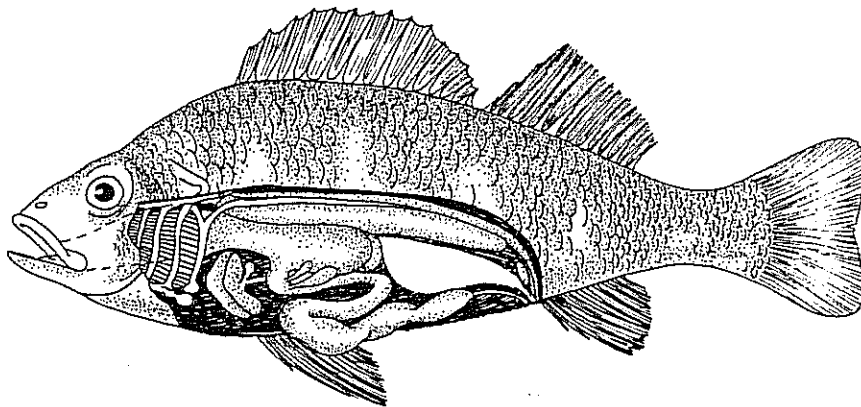
Locate the air bladder along the top of the body cavity. The bladder is filled with gases ( $O_2$ ,  $N_2$ ,  $CO_2$ ) and acts as a hydrostatic organ to adjust the specific gravity of the fish to the water at different depths. By secretion or absorption of gases through blood vessels in the bladder wall, a fish makes the adjustment slowly as it moves from one depth to another.

The fish uses the air bladder to regulate its position in the water. So, it plays an important part in the fish's ability to live and swim in the water.

If the amount of gas in the bladder increases, what do you think happens to the fish's position? \_\_\_\_\_

What function does the air bladder perform? \_\_\_\_\_

On the fish diagram below, label the air bladder.

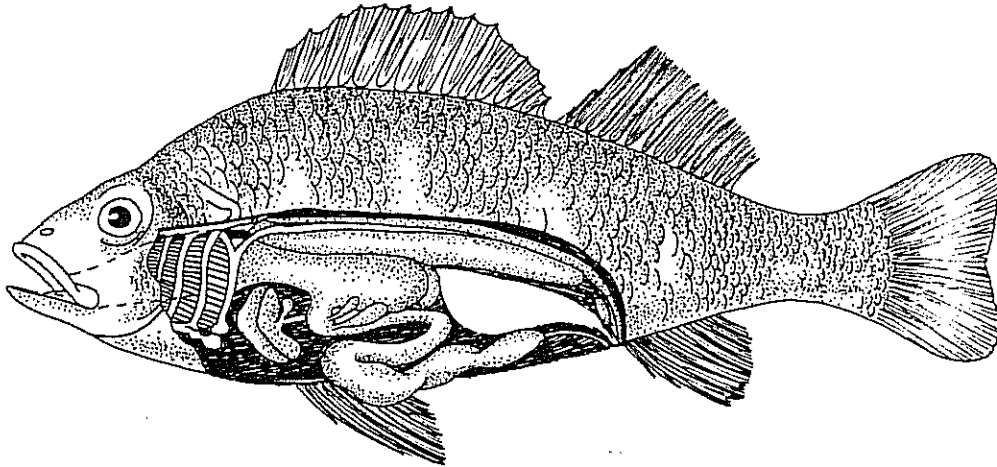


Some fish, such as sharks and rays, do not have air bladders. How must they maintain their vertical position in the water? \_\_\_\_\_

## Excretory System

Examine the kidneys, two dark, elongated structures that lie together against the dorsal body wall. To expose them, first find the air bladder on the dorsal body wall. Find the expanded urinary bladder, which connects the ureters to the urogenital pore in the male or to the urinary pore in the female.

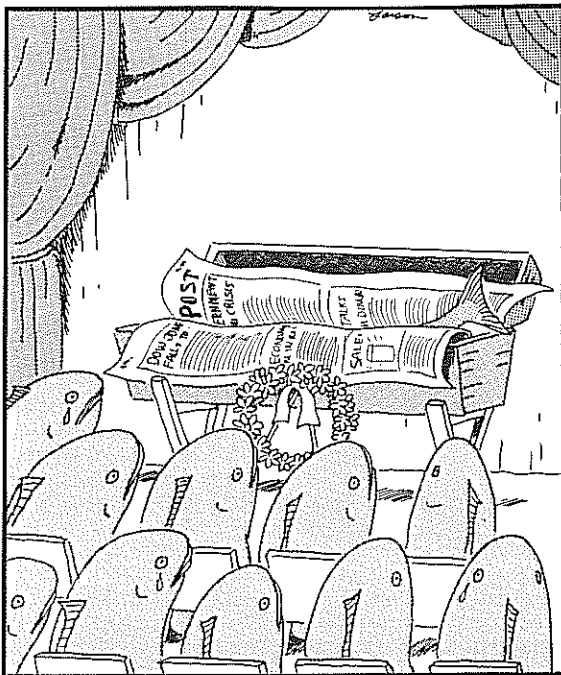
Label the swim bladder, kidney, ureter, urinary or urogenital pore, and urinary bladder in the picture below.



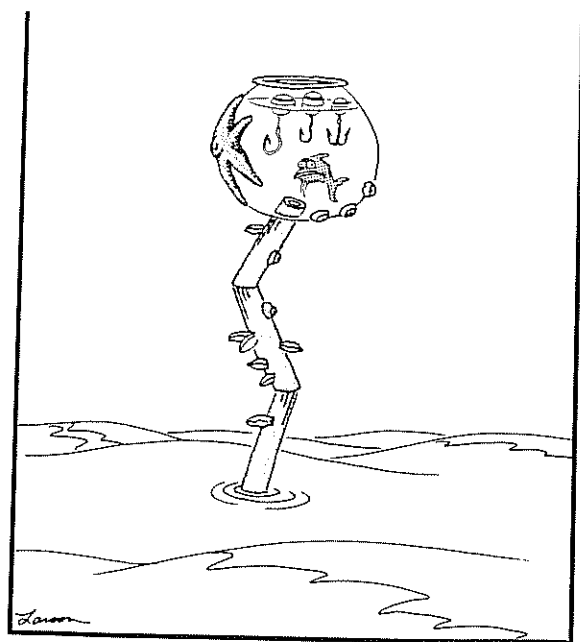
Tag the air bladder.

Tag the kidneys, located against the dorsal wall of the air bladder.

Completed \_\_\_\_\_



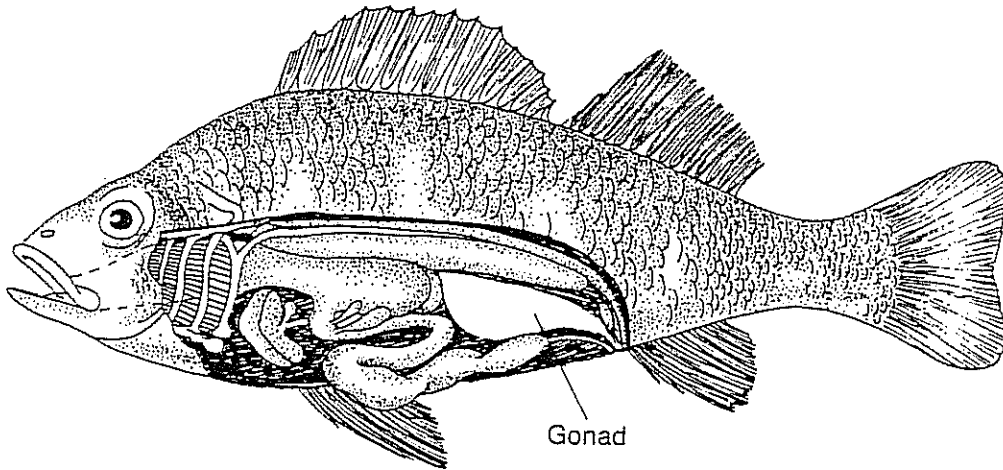
Fish funerals



Fish dungeons

## Reproductive System

If your fish is male, locate the testes in the body cavity just under the swim bladder. If your fish is female, locate the ovaries between the intestine and the swim bladder. Note: The size of the testes or ovaries varies with the seasons. Sketch the testes or the ovaries in the space labeled gonad in the figure below.



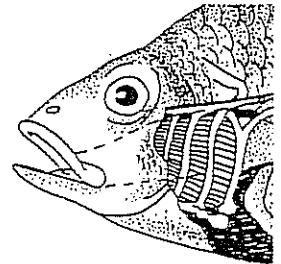
What type of fertilization is associated with fish (external or internal)? \_\_\_\_\_

Based on your new knowledge, is your fish a male or a female? \_\_\_\_\_

## Circulatory System

Locate the pericardial cavity that is located in front of where you removed the liver. Use the scissors to make a cut through the anterior wall of this cavity (toward the mouth). Note the dashed lines on the drawing to the right. The pericardial cavity, containing the heart, is almost "in the fish's mouth."

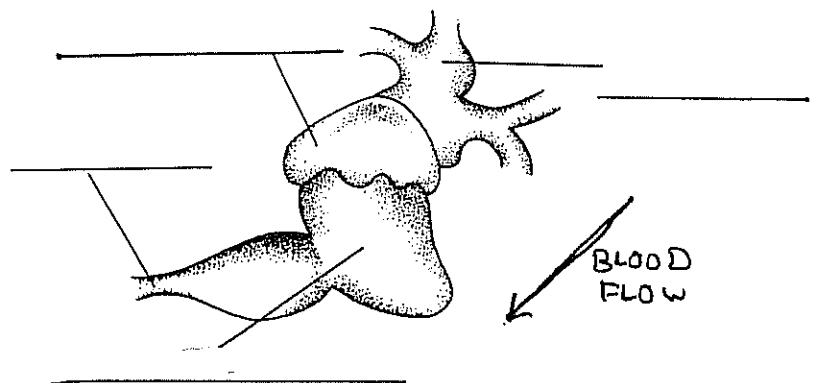
Locate the large cardinal vein carrying blood from the body into the heart. The blood enters the heart through the **sinus venosus**, a sac on top of the heart. From here it goes into the upper chamber, the **atrium**, then into the lower, the **ventricle**. The **ventral aorta** leaves the heart (it has a large muscular bulb at its base), carrying blood forward to the gills.



List the heart structures in the order that the blood flows through them:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

Label each part of the heart on the diagram:



Completed \_\_\_\_\_