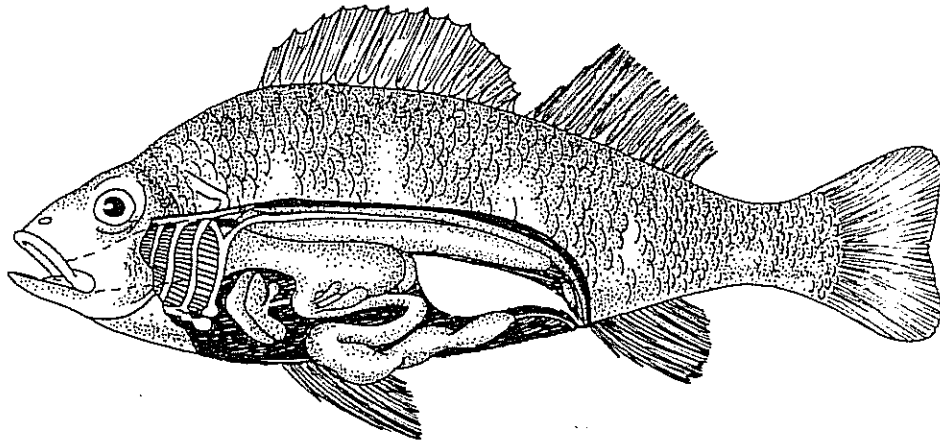


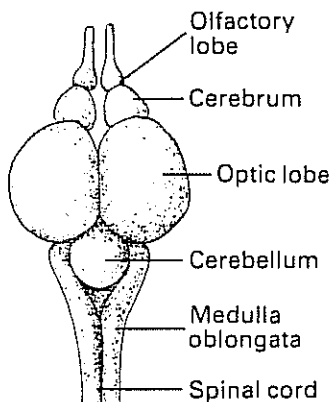
Label the heart and pericardial cavity in the figure below:



**Circulatory System** The fish's two-chambered heart lies ventral to, just behind, the gills. Veins carry blood to the upper chamber, the atrium. The blood then flows into the larger chamber, the ventricle. Ventricle muscles pump the blood through arteries to the gills, where it exchanges carbon dioxide for oxygen. The arteries then channel blood, carrying food absorbed from the intestine and oxygen, throughout the body.

**Nervous System**

Hold your fish in the normal swimming position, with the head pointed away from you. Cut the skin away from the skull, and gradually scrape away the skull bone with your scalpel. When it gets very thin, you may pick the bone away with your forceps, revealing the brain. In the far front are the olfactory lobes. A short distance behind these are the lobes of the cerebrum, followed by the very large optic lobes, and finally by the cerebellum. The cerebellum extends posteriorly to the medulla (no distinct separation) and the spinal cord.



Completed \_\_\_\_\_

Extract a lens from the eye. Cut through the cornea (the covering on the front of the eye) and gently press the periorbital area-the lens should pop out.

Completed \_\_\_\_\_

Write the system (or systems) to which each structure listed below belongs. (Systems: respiratory, circulatory, digestive, excretory, reproductive.):

anus _____	mouth _____	arteries _____
ovary _____	esophagus _____	pharynx _____
gills _____	pyloric caeca _____	heart _____
stomach _____	intestine _____	testis _____
kidneys _____	liver _____	veins _____

Why is the air bladder an outstanding development in fish evolution? \_\_\_\_\_

List the general vertebrate characteristics the fish exhibits. \_\_\_\_\_

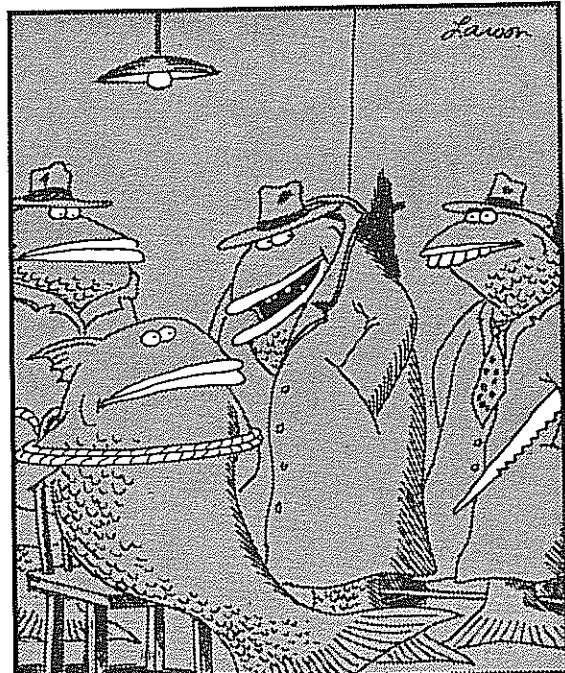
How does the body plan of a fish differ from that of an invertebrate? \_\_\_\_\_

What are some disadvantages associated with being cold-blooded? \_\_\_\_\_

After blood is pumped through gill capillaries, it moves very slowly to the body. Would this system work for an animal with a higher metabolic rate? \_\_\_\_\_ Explain. \_\_\_\_\_

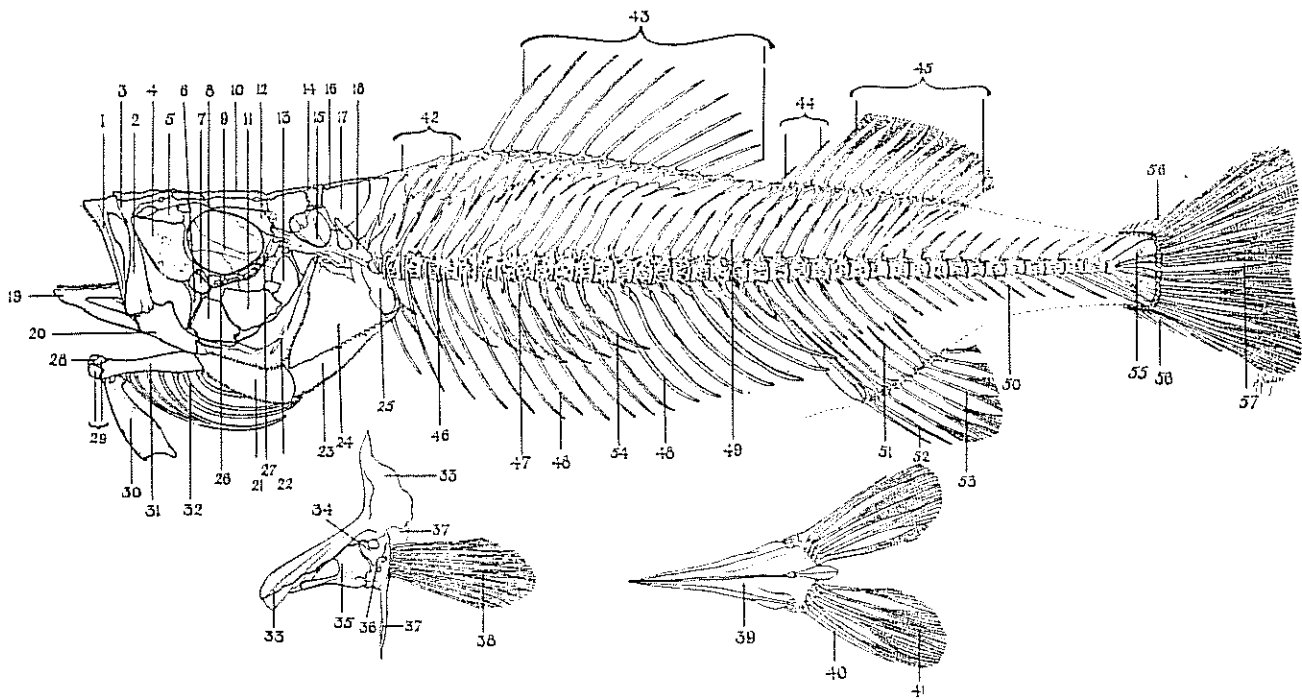


"Good heavens, John! Call someone! ... The entire basement looks dry!"



"Won't talk, huh? ... Frankie! Hand me that scaler."

# Perch Skeleton



- |                    |                                 |  |
|--------------------|---------------------------------|--|
| 1. Premaxilla      | 20. Articular                   | 39. Pelvis                             |
| 2. Maxilla         | 21. Interoperculum              | 40. Hard } Dermal rays of              |
| 3. Nasal           | 22. Preoperculum                | 41. Soft } pelvic fin                  |
| 4. Lacrimal        | 23. Suboperculum                | 42. Ptergiophores or proximal radiacia |
| 5. Prefrontal      | 24. Operculum                   | 43. Anterior dorsal fin rays           |
| 6. Ectopterygoid   | 25. Supracleithrum              | 44. Hard } Dermal rays of posterior    |
| 7. Entopterygoid   | 26. Suborbital                  | 45. Soft } dorsal fin                  |
| 8. Quadrate        | 27. Postorbital                 | 46. Vertebrae                          |
| 9. Parasphenoid    | 28. Basihyoid                   | 47. Parapophysis or Transverse process |
| 10. Frontal        | 29. Hypohyals                   | 48. Ribs                               |
| 11. Metapterygoid  | 30. Urohyal                     | 49. Neural spines                      |
| 12. Post frontal   | 31. Ceratohyoid                 | 50. Haemal spine                       |
| 13. Hyomandibular  | 32. Branchiostegal rays (7)     | 51. Radials of ventral fin             |
| 14. Parietal       | 33. Clavicular                  | 52. Hard } Dermal rays of              |
| 15. Paroccipital   | 34. Scapula                     | 53. Soft } ventral fin                 |
| 16. Supratemporal  | 35. Coracoid                    | 54. Subperitoneals or false ribs       |
| 17. Supraoccipital | 36. Pterygials                  | 55. Hypural bones                      |
| 18. Post-temporal  | 37. Postclavicle                | 56. Hard } Dermal rays of              |
| 19. Dentary        | 38. Dermal rays of pectoral fin | 57. Soft } Caudal fin                  |

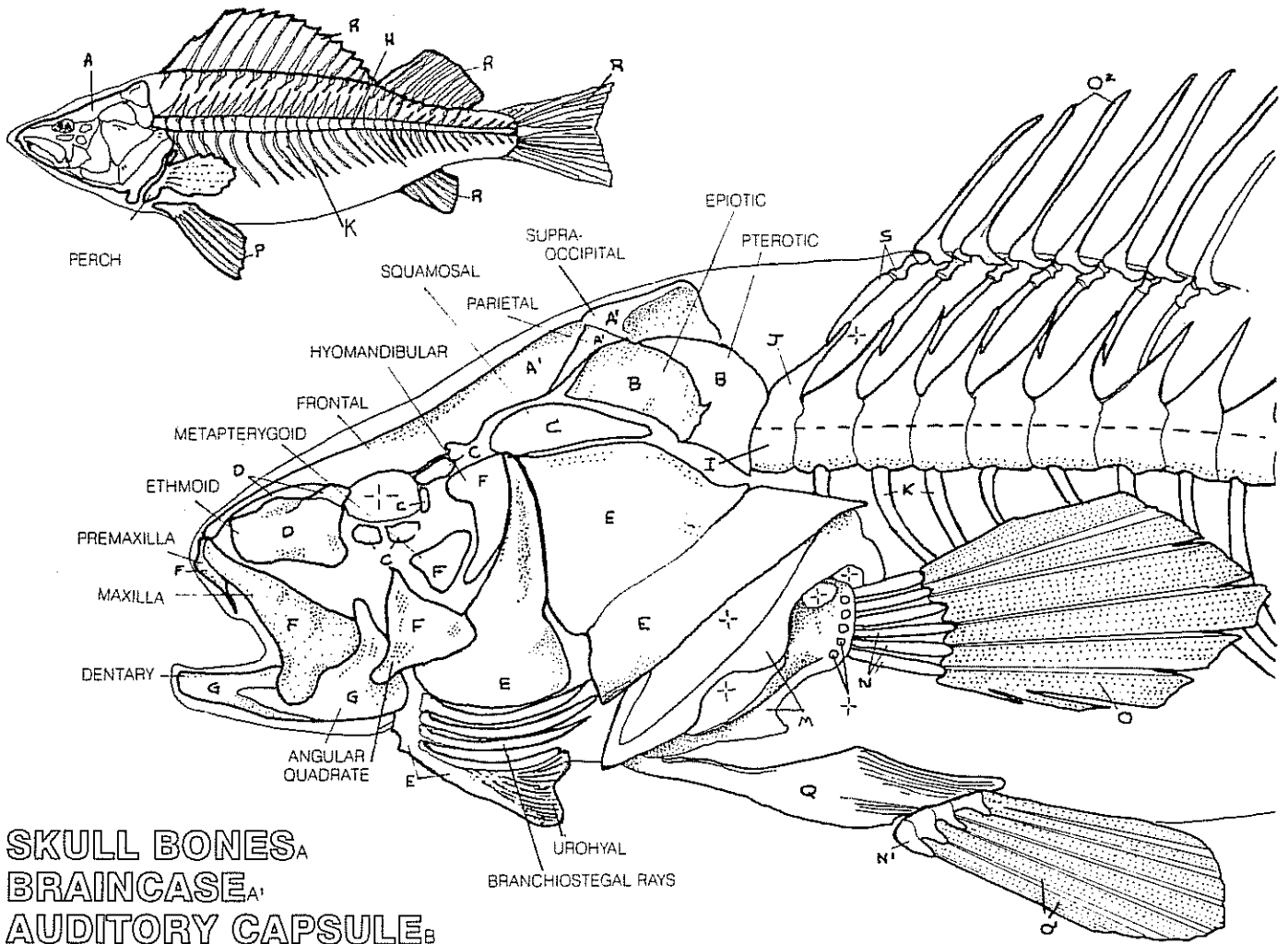
Expose the spinal column by removing all the meat in the area between the dorsal/anal fins and the caudal fin.

Completed \_\_\_\_\_

cut the spine in cross-section and tag the spinal cord.

Completed \_\_\_\_\_

# BONY FISH: SKELETON



SKULL BONES<sub>A</sub>  
 BRAINCASE<sub>A'</sub>  
 AUDITORY CAPSULE<sub>B</sub>  
 ORBITAL BONES<sub>C</sub>  
 NASAL BONES<sub>D</sub>  
 OPERCULAR BONES<sub>E</sub>

UPPER JAW<sub>F</sub>  
 LOWER JAW<sub>G</sub>

VERTEBRAL COLUMN<sub>H</sub>  
 VERTEBRA<sub>\*</sub>  
 CENTRUM<sub>I</sub>  
 NEURAL ARCH/  
 SPINE<sub>J</sub>

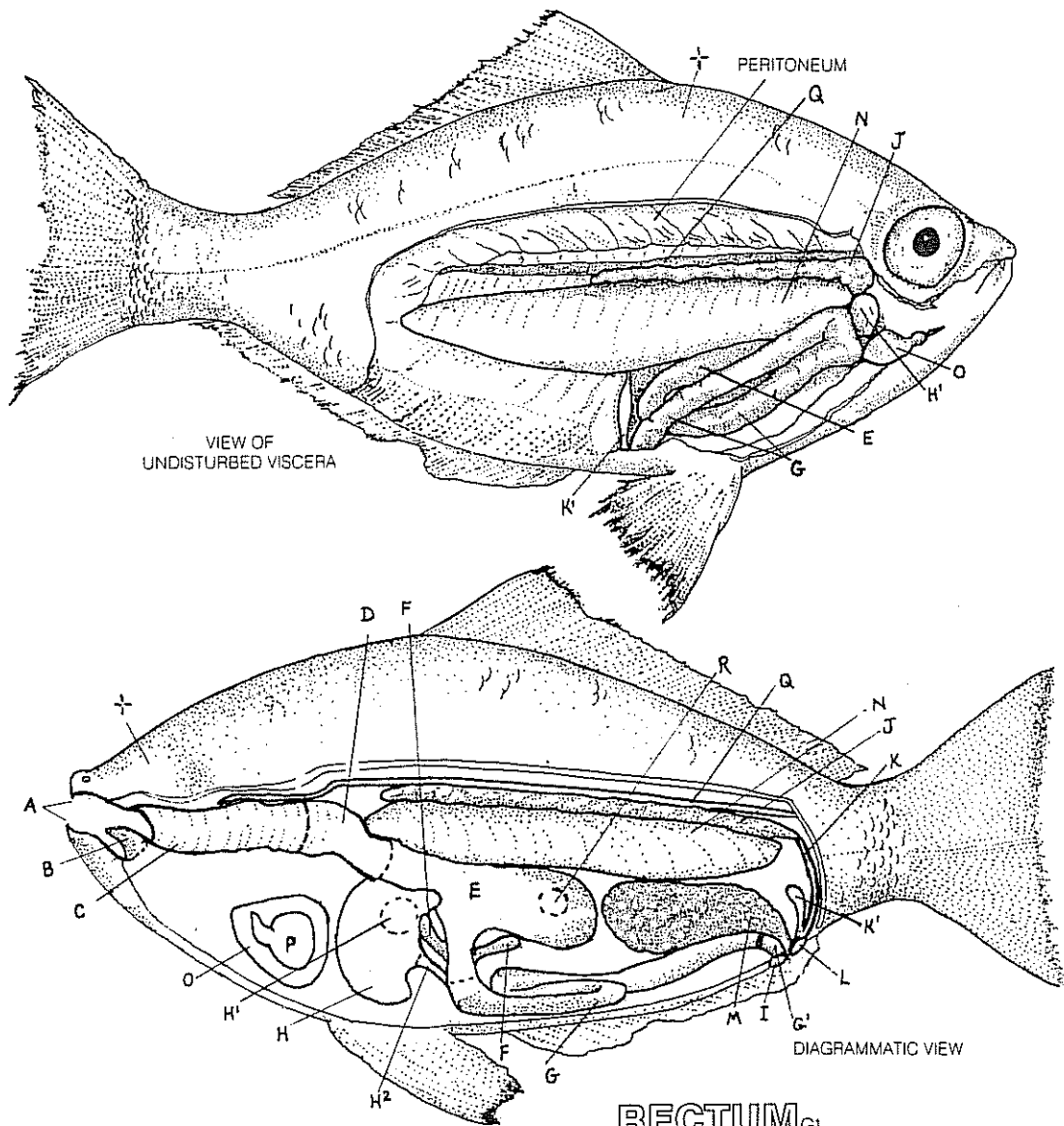
VENTRAL RIB<sub>K</sub>

PECTORAL GIRDLE  
 AND FIN.  
 GIRDLE BONES<sub>M</sub>  
 RADIAL BONES<sub>N</sub>  
 DERMAL FIN RAYS<sub>O</sub>

PELVIC GIRDLE AND  
 FIN.  
 GIRDLE BONE<sub>P</sub>  
 RADIAL BONES<sub>N'</sub>  
 DERMAL FIN RAYS<sub>O'</sub>

MEDIAN/TAIL FIN<sub>R</sub>  
 RADIAL ELEMENT<sub>S</sub>  
 DERMAL FIN RAY<sub>O'</sub>

# BONY FISH: II INTERNAL STRUCTURE.



**DIGESTIVE TRACT\***  
 ORAL CAVITY<sub>A</sub>  
 TONGUE<sub>B</sub>  
 PHARYNX<sub>C</sub>  
 ESOPHAGUS<sub>D</sub>  
 STOMACH<sub>E</sub>  
 PYLORIC CECUM<sub>F</sub>  
 INTESTINE<sub>G</sub>  
 LIVER<sub>H</sub>  
 GALL BLADDER<sub>H¹</sub>  
 BILE DUCT<sub>H²</sub>

RECTUM<sub>G'</sub>  
 ANUS

**EXCRETORY SYSTEM\***  
 KIDNEY<sub>R</sub>  
 URINARY DUCT<sub>K</sub>  
 BLADDER<sub>K'</sub>  
 UROGENITAL SINUS<sub>L</sub>  
 GONAD<sub>M</sub>  
 SWIM BLADDER<sub>N</sub>  
 PERICARDIAL CAVITY<sub>O</sub>  
 HEART<sub>P</sub>  
 DORSAL AORTA<sub>Q</sub>  
 SPLEEN<sub>R</sub>