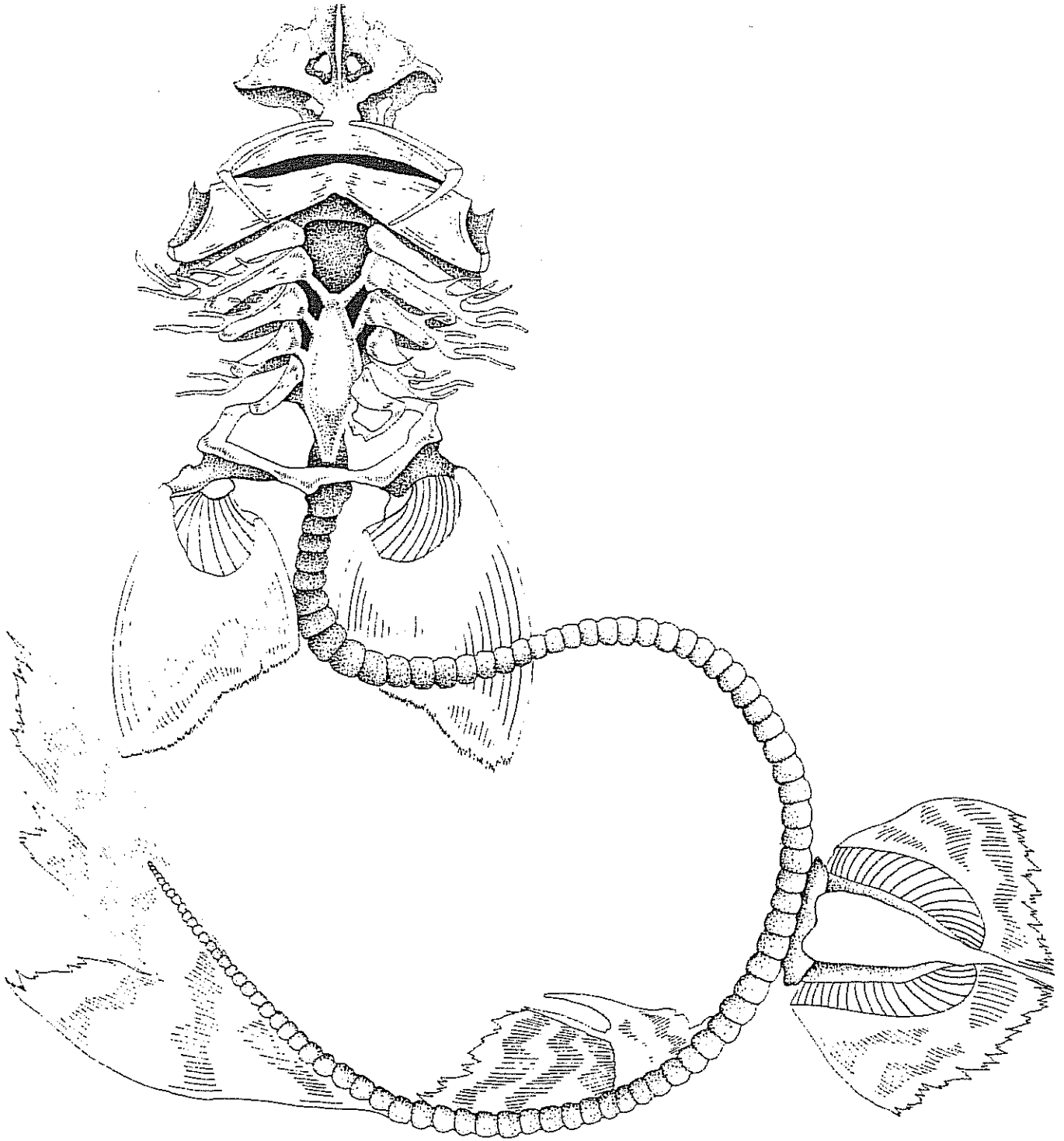


some areas of ossification due to deposits of calcium salts, they do not form the “bones” characteristic of the higher vertebrates.

The diagram below should be labeled as you read about each part of the skeleton. For convenience, each of the labels (you’re responsible for) has been underlined in the discussion.



## THE AXIAL SKELETON

In vertebrates, this portion of the skeleton consists of the skull, the vertebral column, and the rib cage.

### The Skull-Chondrocranium

Two regions of the skull or chondrocranium are identified, the neurocranium and the splanchnocranium. Learn to locate and identify the parts listed below.

Rostrum - The most anterior portion is known as the rostrum. It is medially located, tapered anteriorly almost to a point, resembling a bird's beak. It is the support for the shark's snout. Dorsally it is hollowed-out and trough-shaped which in life is filled with a gelatinous substance. Ventrally it is keel-shaped, with the keel extending from about one-half its length posteriorly.

Nasal Capsules – Two large spheres project laterally at the rear of the rostrum. They are the nasal capsules. Their walls are very thin and therefore often destroyed in the preparation of the skeleton. In the diagrams they are complete and you may see their external openings, the nares, ventrally.

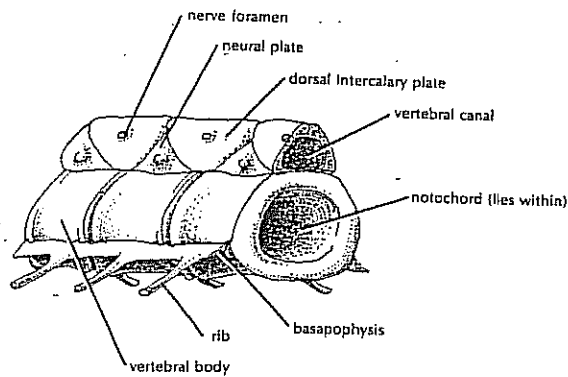
Visceral Arches – There are seven visceral arches that support the mouth and parts of the gills.

Mandibular Arch -The first visceral arch, the mandibular arch, is modified to form the Upper and lower jaws. The upper jaw and lower jaw are lined with several rows of sharp, pointed, triangular teeth, modified dermal denticles, that are located at the edges of the jaw. The back rows serve as replacement teeth when the anterior ones are lost or worn out.

The Gill Arches - The last five visceral arches, numbers 3 to 7, are known as the gill arches because they support the gill elements. They are "U"-shaped, with multi-jointed elements.

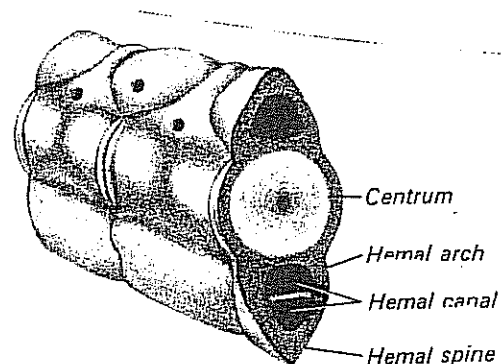
The Vertebral Column and Ribs - You are to do your own dissection of the vertebral bones. The tail should be cut in cross-section by the company that did the preserving. Make a second cross-sectional cut of the tail between the second dorsal fin and the caudal fin so that you remove approximately 5 cm of the tail section of the fish (including the vertebral column).

Also remove a 5 cm section of vertebral column just posterior to the first dorsal fin. Remove the skin and muscles to expose the vertebral bones of BOTH sections.



Spinal column segment of the trunk region

Completed \_\_\_\_\_



Caudal vertebrae.

## THE APPENDICULAR SKELETON

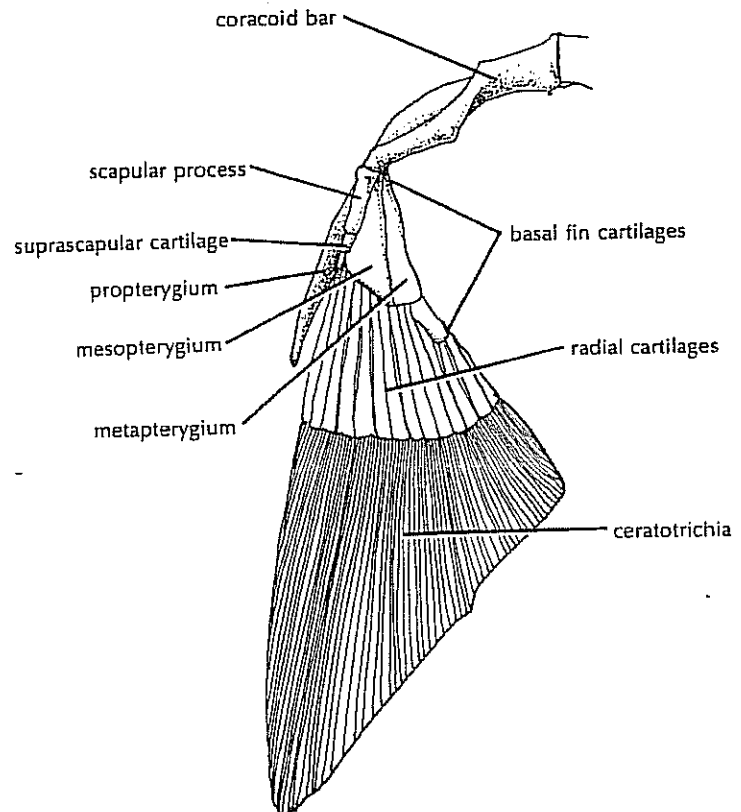
The appendicular skeleton refers to the cartilages of the pectoral and pelvic girdles and to their respective fins.

PECTORAL GIRDLE - A "U"-shaped structure which encircles the ventral side of the trunk.

PECTORAL FINS – They consist of three basal fin cartilages. These articulate distally with many slender radial cartilages. The most distal portions of the pectoral fins are broad, yet thin and flexible to allow for free movement.

Remove the remaining skin and muscle from one of the pectoral fins (ventral and dorsal sides). Your fin should look like the diagram on the right.

Completed \_\_\_\_\_



### Pelvic Girdle and Pelvic Fins

PELVIC GIRDLE - The pelvic girdle of the dogfish shark is composed of a single transverse rod of cartilage located in the ventral abdominal wall just anterior to the cloaca.

PELVIC FINS - The basal cartilages of the pelvic fins consist of two elements. As in the pectoral fins, there are a series of radial cartilages which articulate with the basal cartilages. The most distal portions of the fins are known as ceratotrichia. In male sharks a highly modified radial cartilage forms the clasper, by which sperm are transferred to the cloaca of the female.

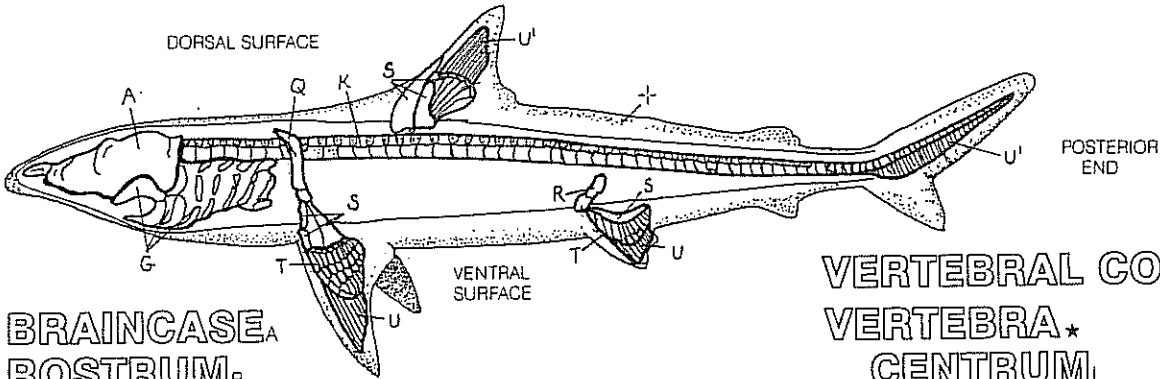
### Dorsal and Caudal Fins

DORSAL FINS - The dorsal fins, one anterior and the other more posterior, although not a part of the appendicular skeleton, are here described because they are similar in structure to the pectoral and pelvic fins. The larger basal cartilages are next to the vertebral column, the smaller radial cartilages are more distal. Finally, the thin parallel most distal rays are the ceratotrichia. A sharp pointed spine projects dorsally from the anterior end of each dorsal fin.

CAUDAL FIN - One may also find ceratotrichia on the caudal fin. The end of the vertebral column turns upward into the dorsal part of the caudal fin.

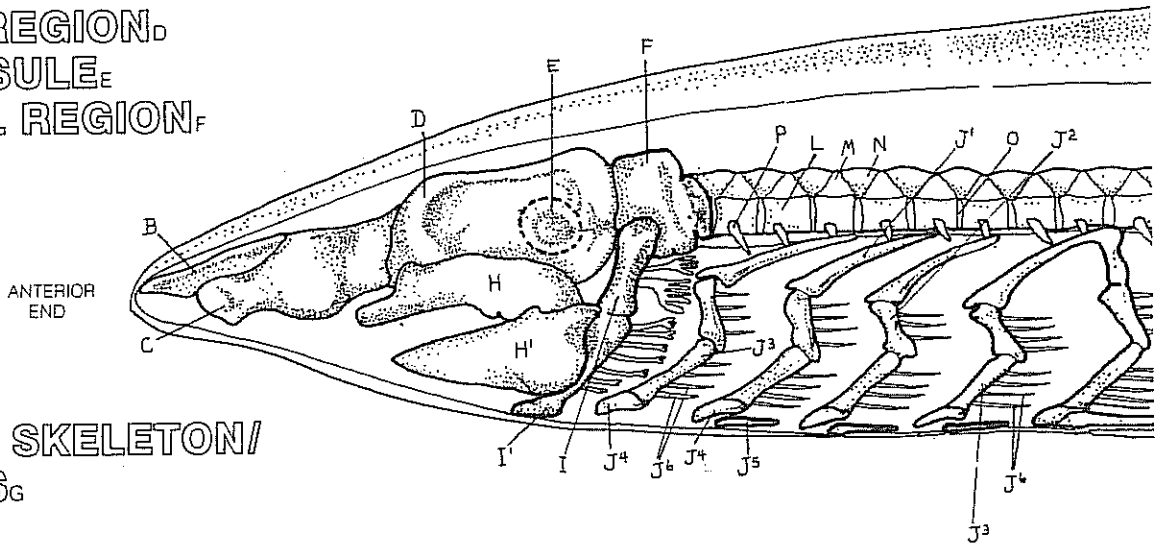
Your final color diagrams follow on the next two pages. Complete each. When done, it is recommended that you GO BACK and check your work (page by page) for the entire lab. Go through the packet with your partner, then go through it with someone outside your group. Follow the instructions on submitting your work and disposing of your specimen. Great job! You made it through the shark!

# SKELETON.



BRAIN CASE<sub>A</sub>  
 ROSTRUM<sub>B</sub>  
 NASAL CAPSULE<sub>C</sub>  
 ORBITAL REGION<sub>D</sub>  
 OTIC CAPSULE<sub>E</sub>  
 OCCIPITAL REGION<sub>F</sub>

VERTEBRAL COLUMN<sub>K</sub>  
 VERTEBRA\*  
 CENTRUM<sub>L</sub>  
 NEURAL ARCH<sub>M</sub>



VISCERAL SKELETON/  
 ARCHES<sub>C</sub>  
 JAWS\*  
 UPPER (PALATOQUADRATE)<sub>H</sub>  
 LOWER (MECKEL'S CARTILAGE)<sub>H'</sub>  
 HYOID ARCH\*  
 HYOMANDIBULAR  
 CERATOHYAL<sub>I'</sub>  
 BRANCHIAL ARCHES\*  
 PHARYNGOBRANCHIAL<sub>J<sup>1</sup></sub>  
 EPIBRANCHIAL<sub>J<sup>2</sup></sub>  
 CERATBRANCHIAL<sub>J<sup>3</sup></sub>  
 HYPOBRANCHIAL<sub>J<sup>4</sup></sub>  
 BASIBRANCHIAL<sub>J<sup>5</sup></sub>

INTERCALARY PLATES<sub>N</sub>  
 NOTOCHORD.  
 RIBS<sub>P</sub>

PECTORAL GIRDLE.  
 PELVIC GIRDLE.  
 BASAL CARTILAGE<sub>S</sub>  
 RADIAL CARTILAGE<sub>T</sub>  
 FIN RAYS<sub>U</sub>  
 MEDIAN FIN\*  
 BASAL CARTILAGE<sub>S</sub>  
 FIN RAY<sub>U</sub>

GILL RAYS<sub>S</sub>

# COMPARISON OF STRUCTURE:

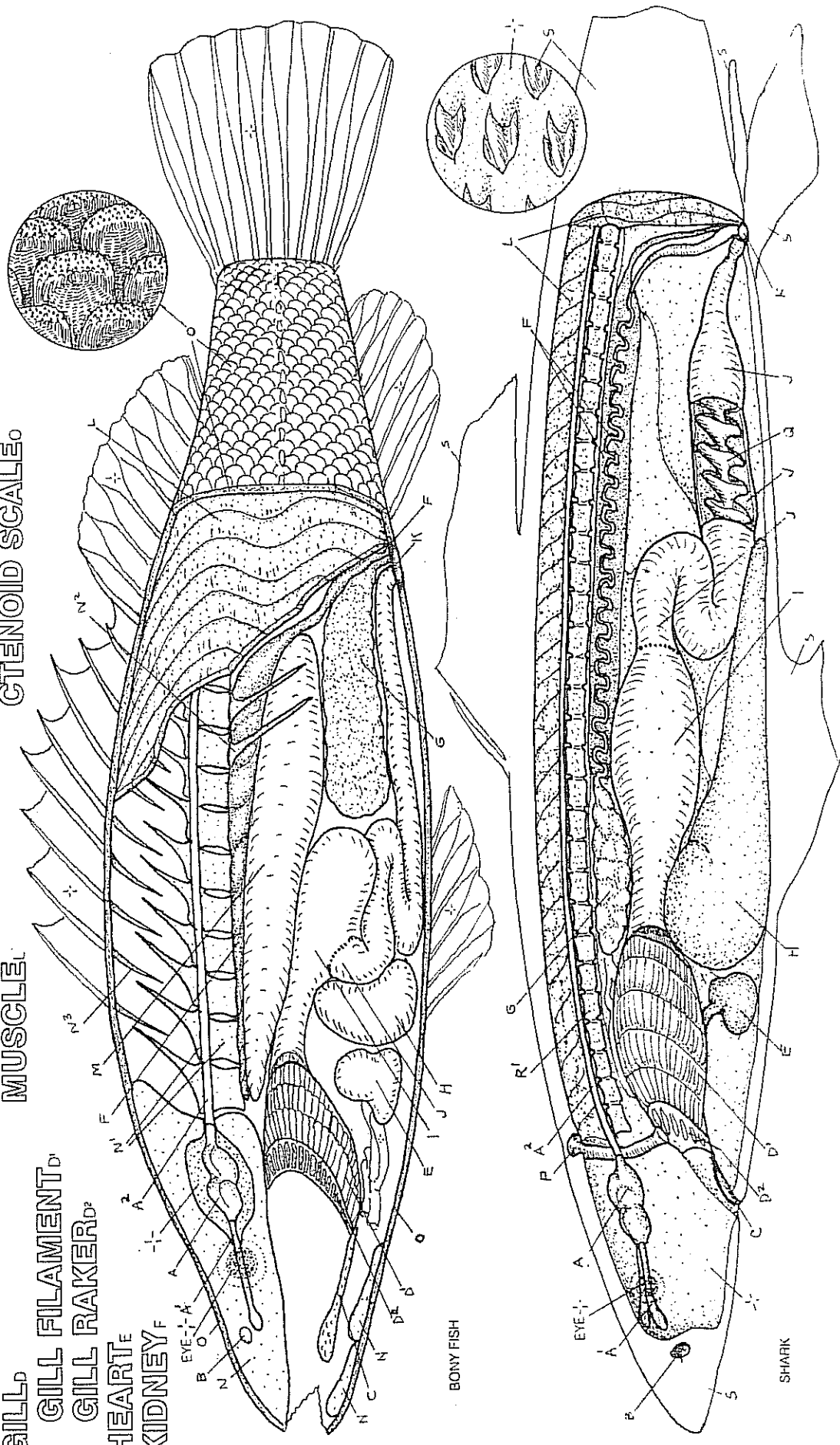
BRAIN<sub>A</sub>  
 OLFACTORY LOBE<sub>A1</sub>  
 SPINAL CORD<sub>A2</sub>  
 NOSTRIL<sub>B</sub>  
 TONGUE<sub>C</sub>  
 GILL<sub>L</sub>

GONADS<sub>G</sub>  
 LIVER<sub>H</sub>  
 STOMACH<sub>I</sub>  
 INTESTINE<sub>J</sub>  
 ANUS<sub>K</sub>  
 MUSCLE<sub>L</sub>

GILL FILAMENT<sub>D</sub>  
 GILL RAKER<sub>D2</sub>  
 HEART<sub>E</sub>  
 KIDNEY<sub>F</sub>

BONY FISH.  
 SWIM BLADDER<sub>M</sub>  
 BONE<sub>N</sub>  
 VERTEBRA<sub>N1</sub>  
 RIB<sub>N2</sub>  
 FIN SUPPORT<sub>N3</sub>  
 CTENOID SCALE<sub>O</sub>

SHARK.  
 SPIRACLE<sub>P</sub>  
 SPIRAL VALVE<sub>Q</sub>  
 CARTILAGE<sub>R1</sub>  
 VERTEBRA<sub>R2</sub>  
 PLAGOID SCALE<sub>S</sub>



BONY FISH

SHARK