

## Fish: One-of-a-kind Animals

(30 minute activity)

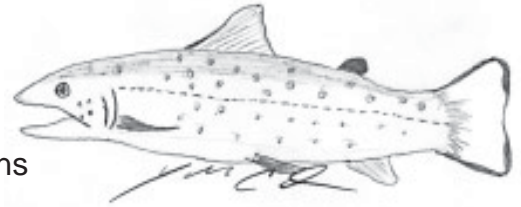
### Objectives

Students will be able to:

- 1) List what makes a fish a fish
- 2) Compare the internal and external anatomy of fish and humans

### Materials

- Paper
- Pencil
- Marking pens or crayons
- Transparencies
- Overhead projector
- Optional: picture of a fish, fish skeleton, fish model, picture containing a body of water (all contained in the *Fin Bin*\*)



### Background

Fish come in all shapes and sizes, just like people, but have been around much longer. They date back to the Paleozoic Era over 400 million ago, vs. humans appearing 3 million years ago during the Cenozoic Era (see *Figure 6*). Fish are a very diverse group. There are four classes of fish compared to one class each of mammals, birds, and amphibians. There are exceptions to most standards relating to internal and external anatomy, but generally in order to be a fish, an animal must:

- |                   |                        |
|-------------------|------------------------|
| ✓ Have scales     | ✓ Have fins            |
| ✓ Live in water   | ✓ Have back vertebrae  |
| ✓ Be cold-blooded | ✓ Use gills to breathe |

For location of anatomical features, please see *Internal and External Anatomy* diagrams (*Figures 4 & 5*) diagrams

### External Anatomy

- Scales are a fish's armor and protective covering. Some species have heavy thick scales while others have thin and flexible scales. A scale may be read like a cross-section of a tree trunk, counting the rings that indicate age. Slime on the outside of the fish's body provides protection and allows it to easily glide through the water. It also protects skin from bacteria and parasites.

*"I have known you  
in your streams  
and rivers where your  
fish flashed and  
danced in the sun,  
where the waters said  
come, come and eat  
of my abundance."*

Chief Dan George

\*Items available in the USFWS Fin Bin Education Trunk; call (509)548-7641 for information.

- Gills oxygenate the blood. They are a fish's lung system.
- Operculum is a plated gill cover, and acts as a valve that allows only the exit of water from the gill chambers.
- Fins are the fish's arms and legs. They give balance and steering abilities. They are identified as pelvic, dorsal, adipose, pectoral, anal and caudal. See their locations on the external fish anatomy drawing (Figure 4) at the end of this section. Fin rays support the structures of each fin.
- Lateral line is visible from a fish's head to its tail. It is a grouping of pores leading to sensory organs that assist in detecting external stimuli. Some species have many lateral lines.

### **Internal Anatomy**

The internal organ systems of a fish are similar to those of other vertebrates. Important organs to know are:

- Heart: Generally has two chambers and is located beneath the pharynx. The heart pumps blood through blood vessels transporting essential products to the cells and carrying waste products from the cells.
- Stomach: Most fish have a stomach that varies in size according to the food ingested.
- Intestine: An organ that assists with digestion and absorption of nutrients. Fish that are herbivores have comparatively long intestines, carnivores, short, and omnivores of medium length. Herbivores have longer intestines because more area is needed to digest the fiber found in plant materials. Organs associated with the intestine are the pyloric caeca, liver, pancreas, and air bladder.
- Pyloric caeca: these fingerlike projections are located near the upper end of the intestines, close to the stomach. Their size varies. The function is to serve as a temporary storage space for food and to aid in absorption.
- Liver: A large gland in fish that usually lies over or partially surrounds the stomach; manufactures bile, a greenish substance that emulsifies fat. It secretes digestive enzymes.

- Pancreas: Secretes enzymes used in digestion.
- Swim Bladder (air bladder): Responsible for a fish's buoyancy; the fish secretes a gas (mostly oxygen) into the bladder to rise and absorbs gas from it to sink.
- Spleen: A dark red gland located on or behind the stomach; a storage site for blood and some blood formation occurs there. It helps remove waste products from the blood.
- Kidney: A dark red band located above the stomach, just beneath and along the backbone. It removes excess water and minerals out of the body.
- Gonads: The reproductive organs; in females called ovaries, and testes in males.

Like the macroinvertebrates they eat, different fish species have varying levels of tolerance to environmental changes. Sensitivity to environmental differences is dependent on the species of the fish. For example, the salmonid species like spring Chinook salmon are sensitive, unlike carp, which are more tolerant of poor water quality.

### *Procedure*

1. Discuss with students what every fish must have to be a fish by using a poster that shows a body of water, thermometer, fish skeletal model or picture, and a fish anatomical model or picture.\* Study the anatomy of fish by making overhead transparencies (Figures 4 & 5). Associate body parts with those of a human for comparison. Ask a hatchery near you if there are any extra fish for dissection purposes to check out the real thing. If you prefer not to do the dissection, ask a resource specialist to visit your class.
2. Study the *Fish Family Tree* (Figure 6) and then ask students to select and classify a fish, from kingdom to species (Figure 7). What are the attributes of a given species of fish? What distinguishes the families? How do ancient species differ from more contemporary types? Additional resource materials may be needed.

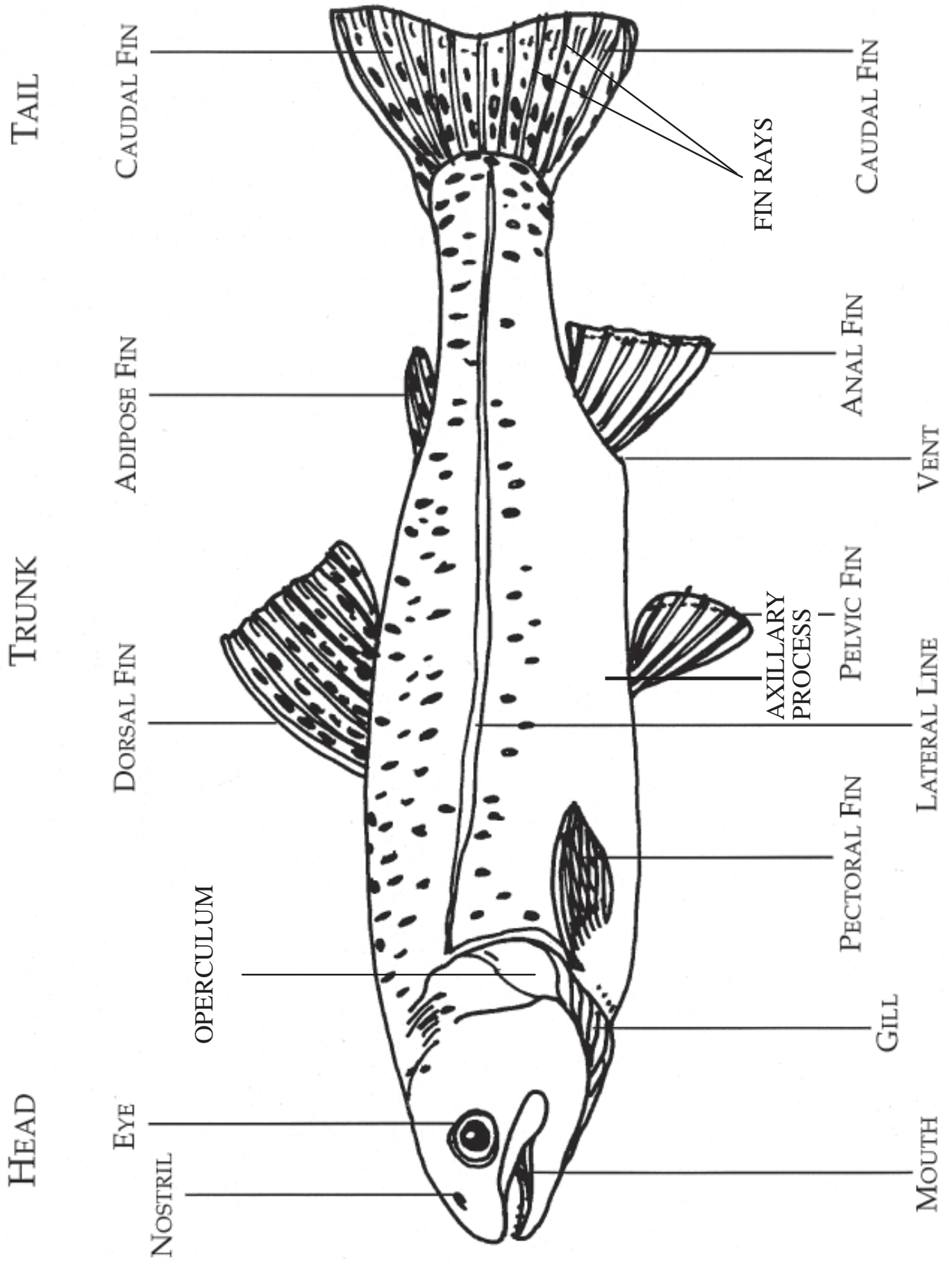


Figure 4. External Trout Anatomy

Name \_\_\_\_\_

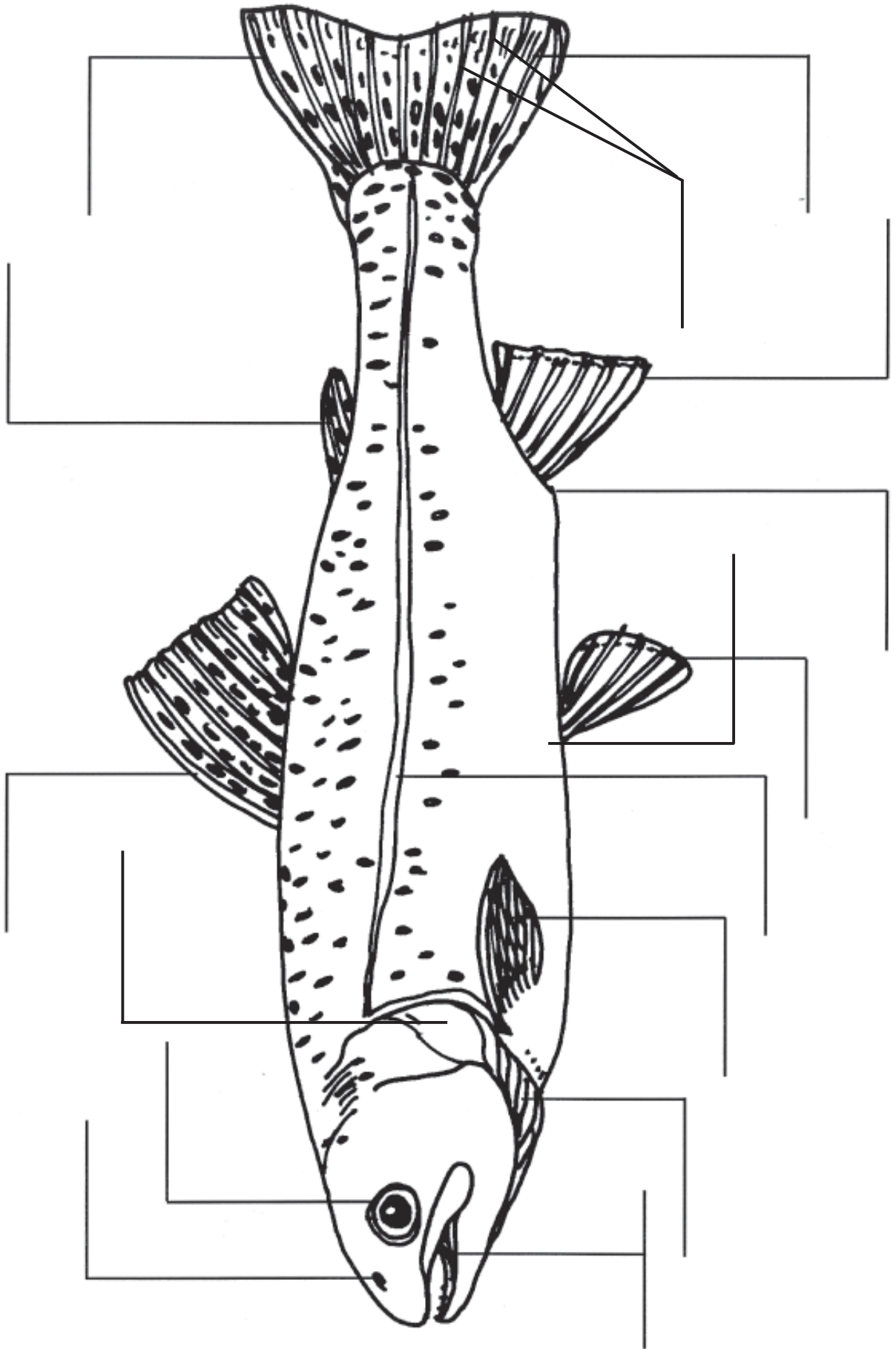


Figure 4A. External Trout Anatomy



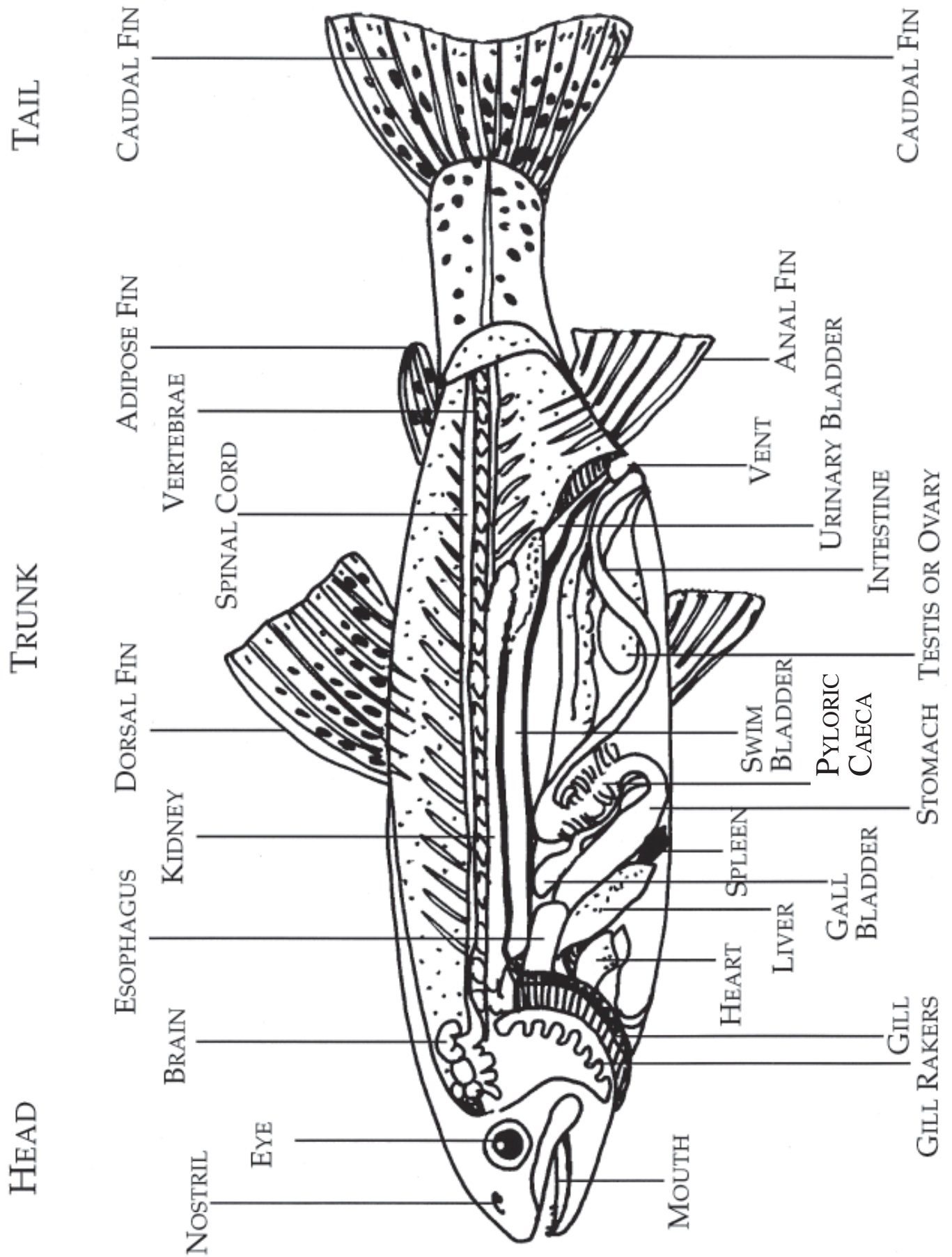


Figure 5. Internal Trout Anatomy

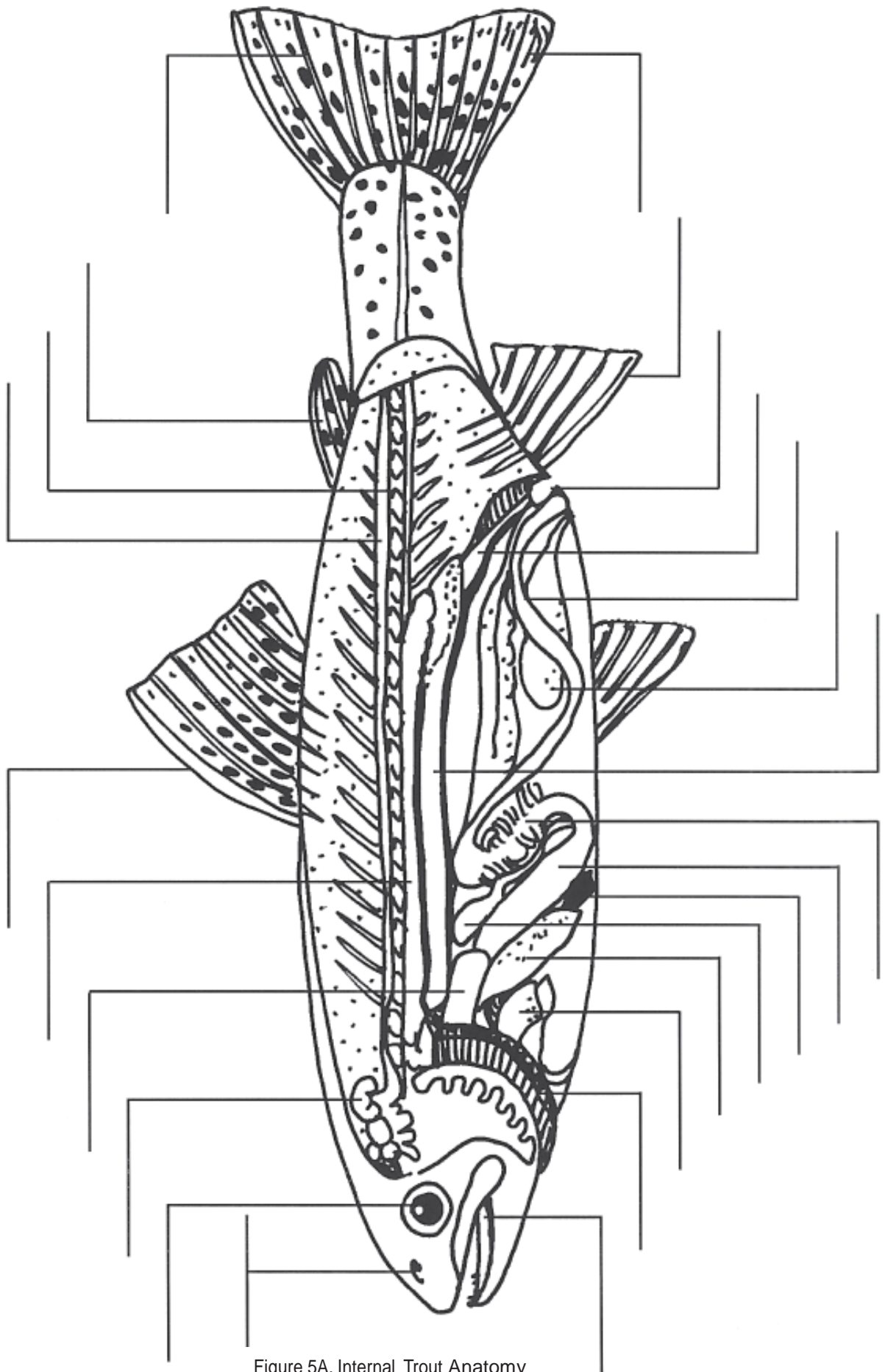


Figure 5A. Internal Trout Anatomy

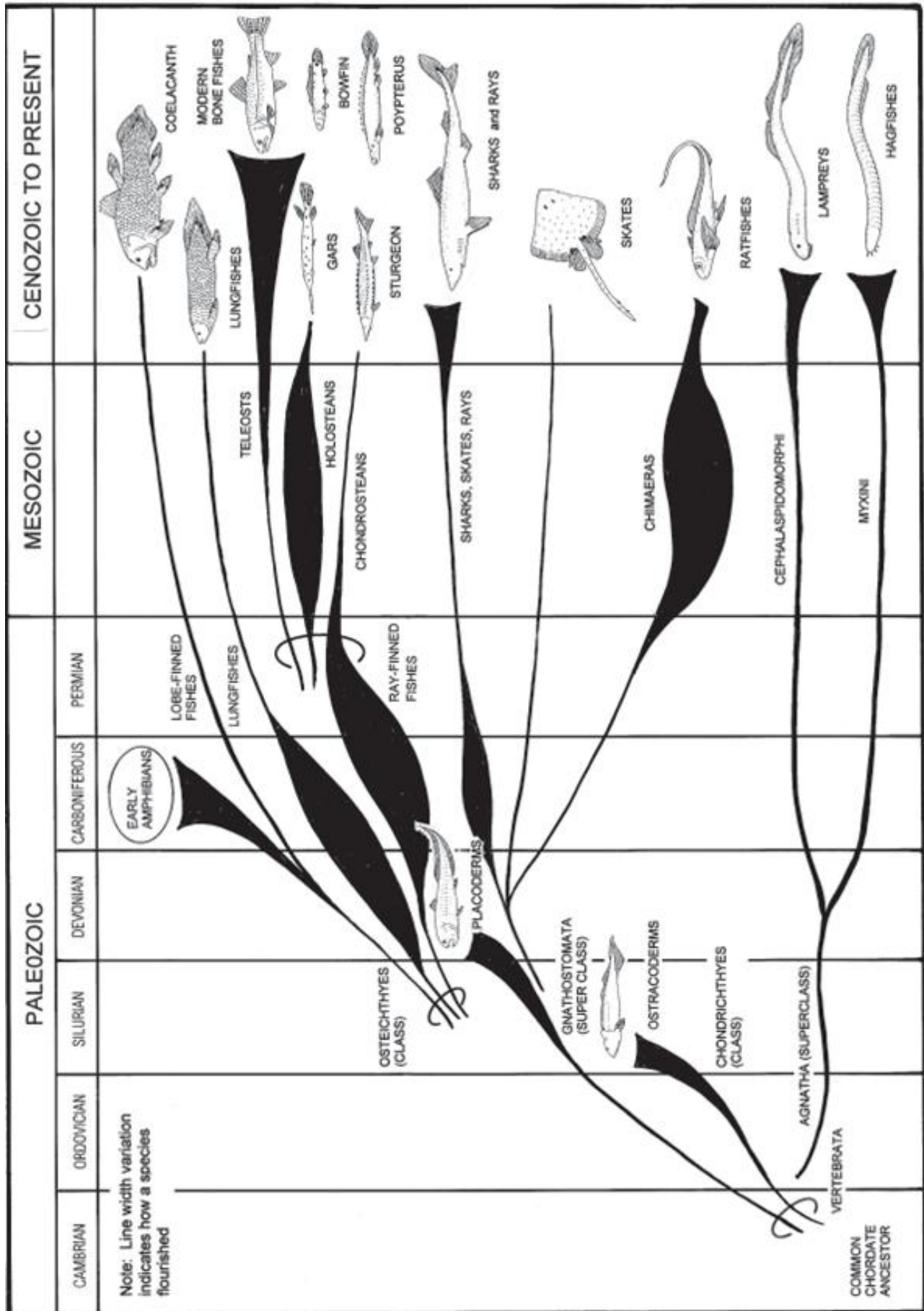


Figure 6. Fish Family Tree



## SPECIES CLASSIFICATION SYSTEM

Kingdom

Phylum

Class

Order

Family

Genus

Species

There are super and sub classifications for many of the classifications. Genus names are always capitalized and the species names are in lower case letters. Both are italicized. See the example of the classification system below for steelhead.

Example:

- Kingdom: Animalia
- Phylum: Chordata
- Subphylum: Vertebrata
- Class: Osteichthyes (bony fishes)
- Subclass: Actinopterygii (higher bony fishes)
- Order: Salmoniformes
- Family: Salmonidae
- Genus: *Oncorhynchus* (hooked nose)
- Species: *mykiss*

Figure 7. Species Classification System (Carolus Linnaeus, 1700's)