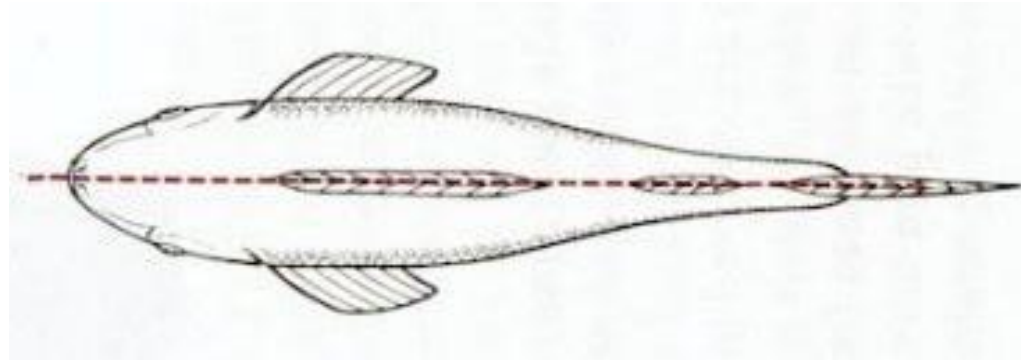


External Anatomy of Fishes

Course: Anatomy & Biology of Finfish
FRM-122 (2+1)



External Anatomy of Fishes

- **Body forms**

Commonly the fish body is Torpedo – shaped. In a perfectly “stream lined” body form (if head pointed trunk broadened and gradually tapering towards the tail)

The greatest cross section is about 36% of the length back from the anterior tip and gently sweep back to the tailed.



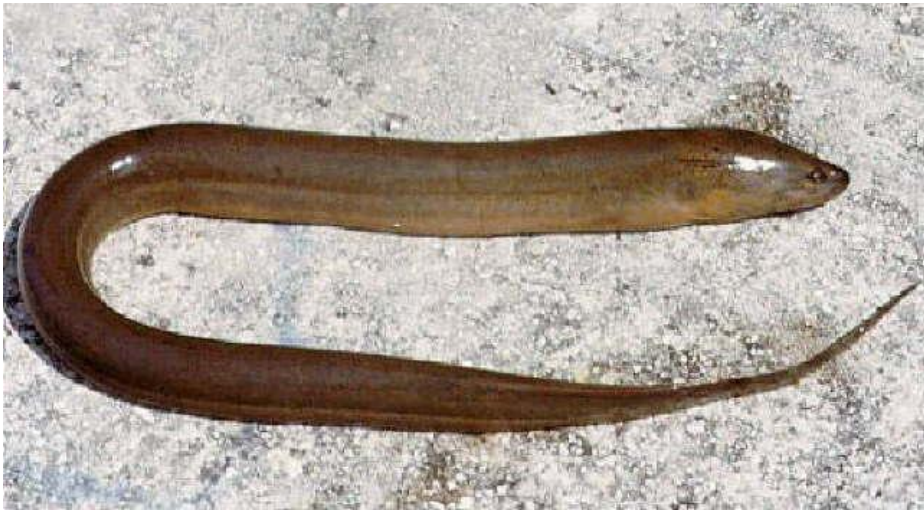
Different body shapes of fishes

The shape of the body is variously modified depending on their habitat and mode of living.

- **Globiform** – (Puffers of family Tetraodontidae)
- **Serpentine** (Snake like Anguilliform – eels of family Anguillidae)
- **Thread like** (spiney eel-Symbanchiformes)
- **Strongly flattened from side** (compressed butterfly fishes, chaetodontidae and flounders – pleuronectidae)
- **Flattened but greatly elongated** (trachipteriform – ribbon fishes, Trachipteridae)
- **Flattened from top to bottom/ depressed** (The skates and rays (Rajidae))



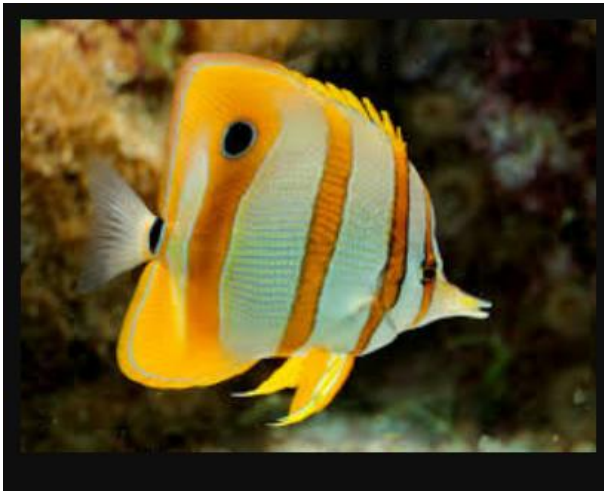
Globiform



Serpentine (Snake like) Anguilliformes



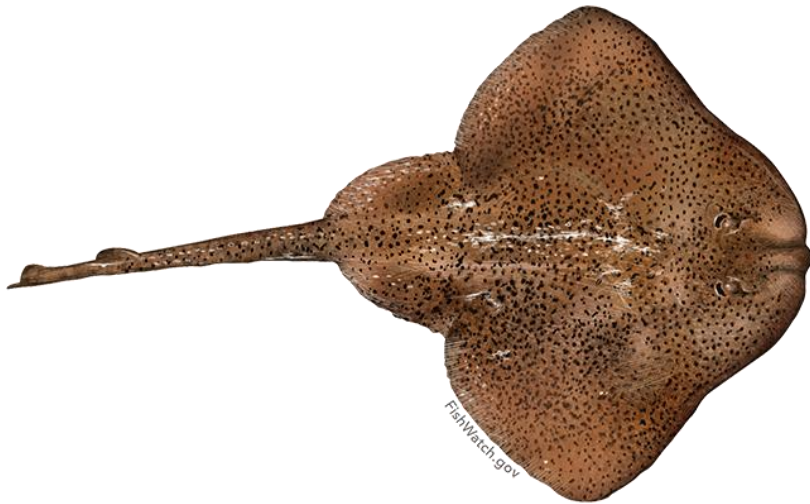
Fishes of order Symbranchiformes



Butterfly fish Family Chaetodontidae



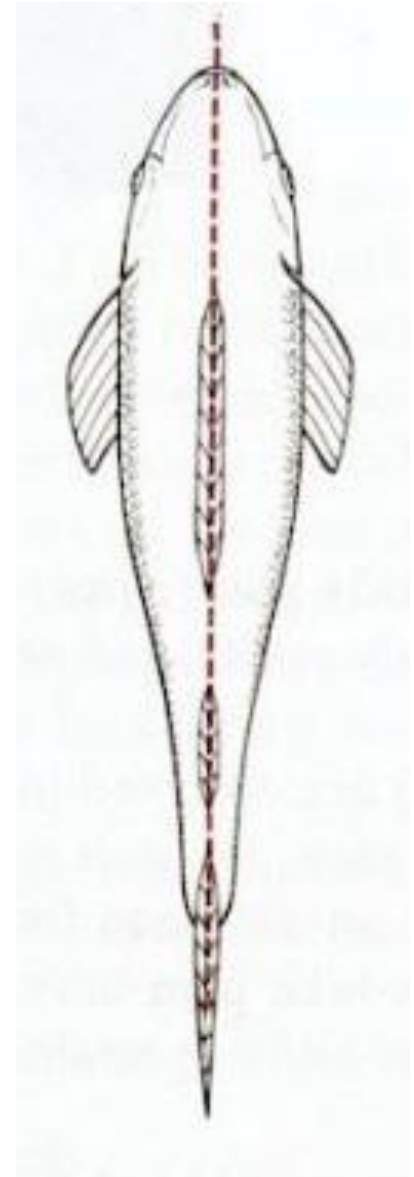
Flattened but greatly elongated (trachipteriform – ribbon fishes)



Flattened form top to bottom/ depressed (Skates)

Fishes are Bilaterally Symmetrical

- In spite of the many variations in the shape, plan of body organization in fishes is bilaterally symmetry.
- The left and right halves of the body are basically mirror images of one another.
- The tail is an integral part of the body rather than an appendage only.
- The fins are distinctly peripheral anatomical parts in most fishes.



Body Covering: Skin & Scales

- Fish is generally covered by a tough skin. It is continuous with the entire body parts
- Skin over surface of eye is transparent
- Much of the diverse coloration of fishes is due to its colour cells and the slimy coating is due to its mucus cells.
- As in other vertebrates, the skin of a fish is the envelope for the body and is the first lines of defence against disease.

Skin

- It also affords protection from, and adjustment to environmental factors that influence life.
- It contains sensory receptors tuned to the surroundings of a fish.
- The skin also has respiratory, excretory and osmo-regulatory functions

Skin

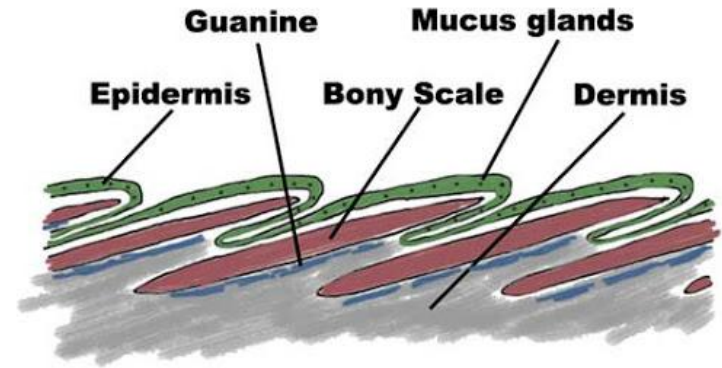
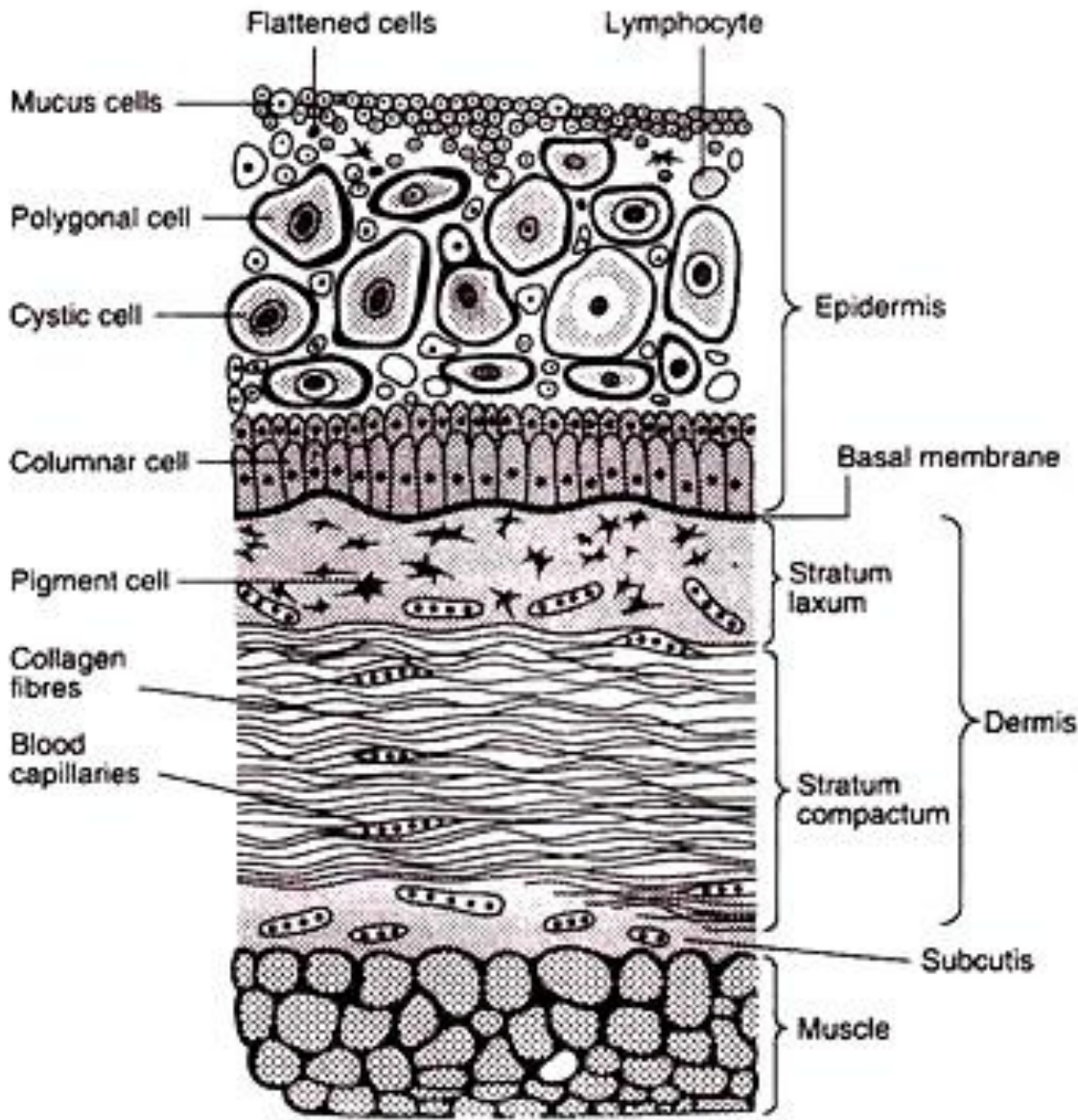
- The skin of a fish consists of two layers. The outer layer is epidermis and the inner, the dermis or corium.
- The epidermis is composed superficially of several layers of flattened, moist epithelial cells. The deepest layers are a zone of active cell growth and multiplication.
- These epithelial cells from the epidermis are the first to close a surface wound.

Skin

- The dermal layer of the skin contains **blood vessels, nerves and cutaneous sense organs and connective tissue**. The dermis plays the main role in the formation of scales and related integumentary structure.

Scattered among the flattened cells of the epidermis, there are numerous openings of the **tubular and flask shaped mucous gland cells** that extend into the dermis.

These mucus cells secrete the slippery mucus that cover most fishes. The mucus lessens the drag on a fish when it swims through water.



V. S. of Fish Skin

Scales

- Scales covers the body of many fishes (few fishes devoid of scales).
- Scales range in size from microscopic to large.
- From non-bony to bony fishes, they are loosely to very firmly attached.
- The types of scales may characterize the major fish groups. Scale morphology and the number of scales rows along or around the body frequently serve as specific and genetic characters.
- Living Agnatha are scale less, shark and their relatives have dentinal placoid scales and bony fishes have various types of bony scales (cycloid, ctenoid).

Scales

Structurally, there are two types of fish scales.

- **Placoid and Non-placoid.**
- **Non-placoid** scales are basically of the three kinds –
 1. **cosmoid,**
 2. **Ganoid**
 3. **Bony ridge scales (cycloid & ctenoid).**

Placoid Scale

- **Placoid** scales are also called as dermal denticles having an ectodermal cap or covering of enamel like substances (as an human teeth) termed as “Vitrodentine”.
- Beneath vitrodentine, there is a thicker layer of dentine with a pulp cavity and dentinal tubules.
- Each scale has a disc like basal plate in the dermis
- Placoid scales occur among the sharks and their relatives (chondrichthyes).

Non-Placoid Scales

- 1) Cosmoid scales:** The cosmoid scales have a thinner, harder outer layer (vitrodentine) than the placoid ones. Below vitrodentine, there is a hard and non-cellular layer called cosmine. The layer cosmine is made up of vascularised and perforated bony substances called "Isopedine". The cosmoid scales found in latimeria.
- 2) Ganoid Scale:** In ganoid scale the outer layer is a hard inorganic substances called ganoine which is different from Vitrodentine. The layer below the ganoine is a cosmine like layer. The innermost layer is called isopedine. These types of scales are found in bichirs (pdypterus) and gars (Lepisosteidae).

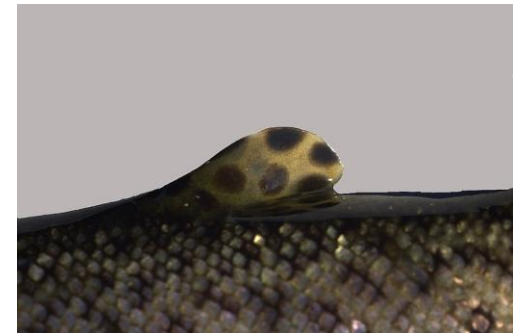
Non-Placoid Scales

- 3. Bony Ridges Scales:** Bony –ridged scales are typically thin and translucent scales lacking both dense enameled and dentinal layers. Bony ridged scales are characteristics of many living species of bony fishes (Osteichthyes) that have either cycloid or ctenoid scales. The outer layer of these scales are marked with bony ridges alternating with depression. The inner part or plate of the scale is made up of layers of criss–crossing fibrous connective tissues forming ring like impressions. In both cycloid and ctenoid scales, have nuclear central zone that are called as “focus” the scale.

Medial (Unpaired) Fins

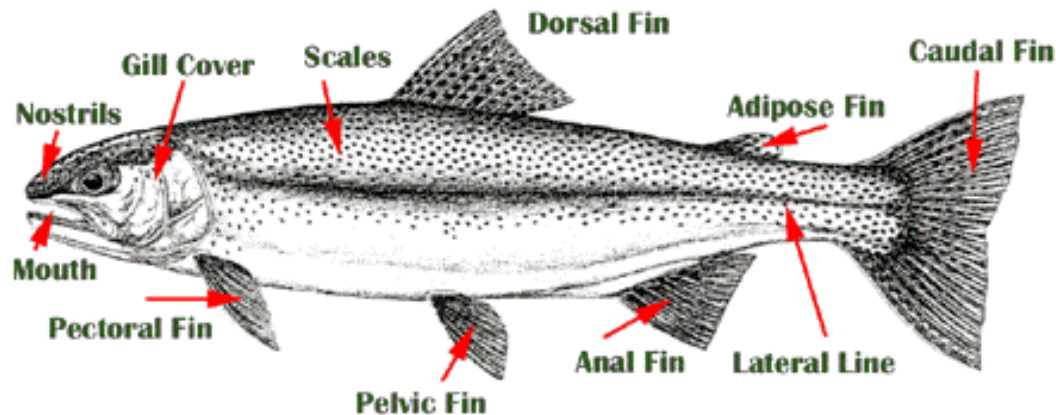


- Unpaired fins with fin rays of bone or cartilage
- Dorsal (one or more), caudal, anal
- Some have adipose (no rays) –
Salmonidae, Ictaluridae, Osmeridae



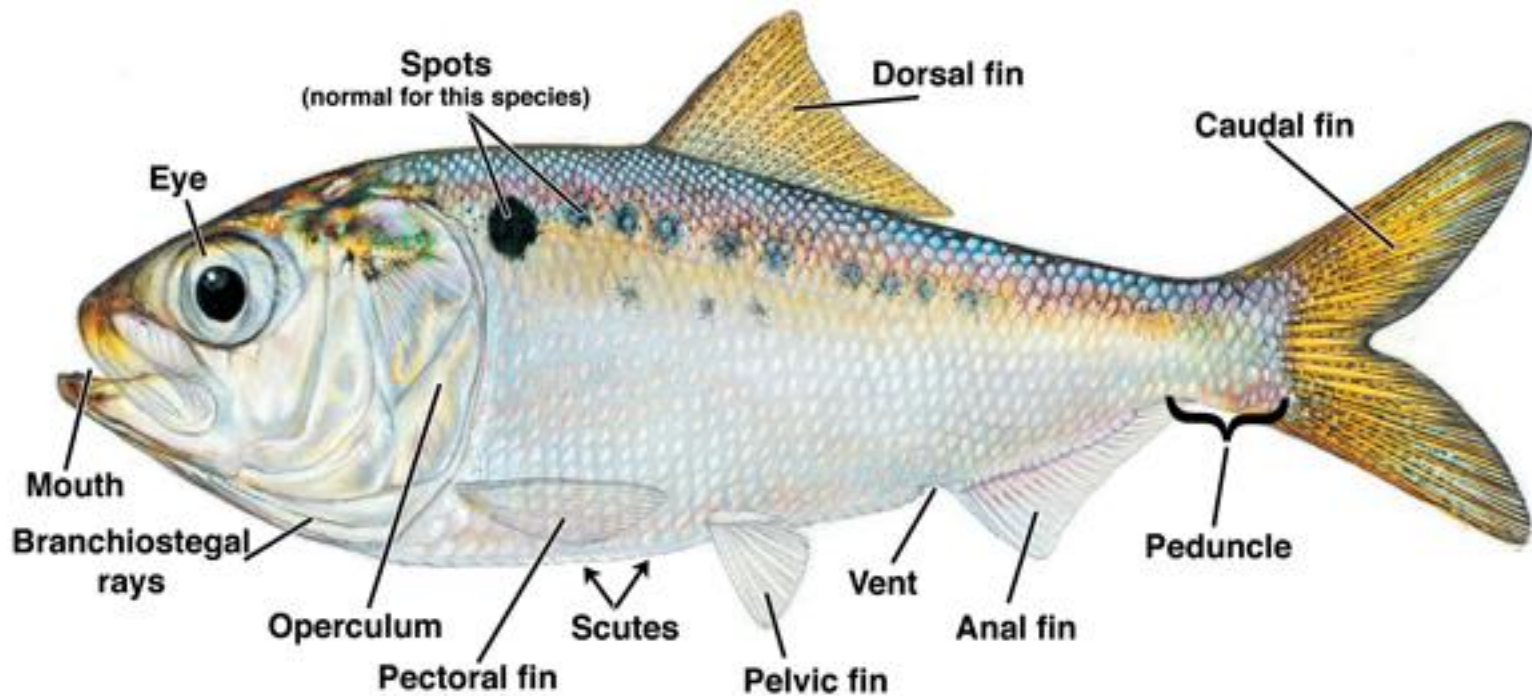
Paired Fins

Anatomy of a Fish

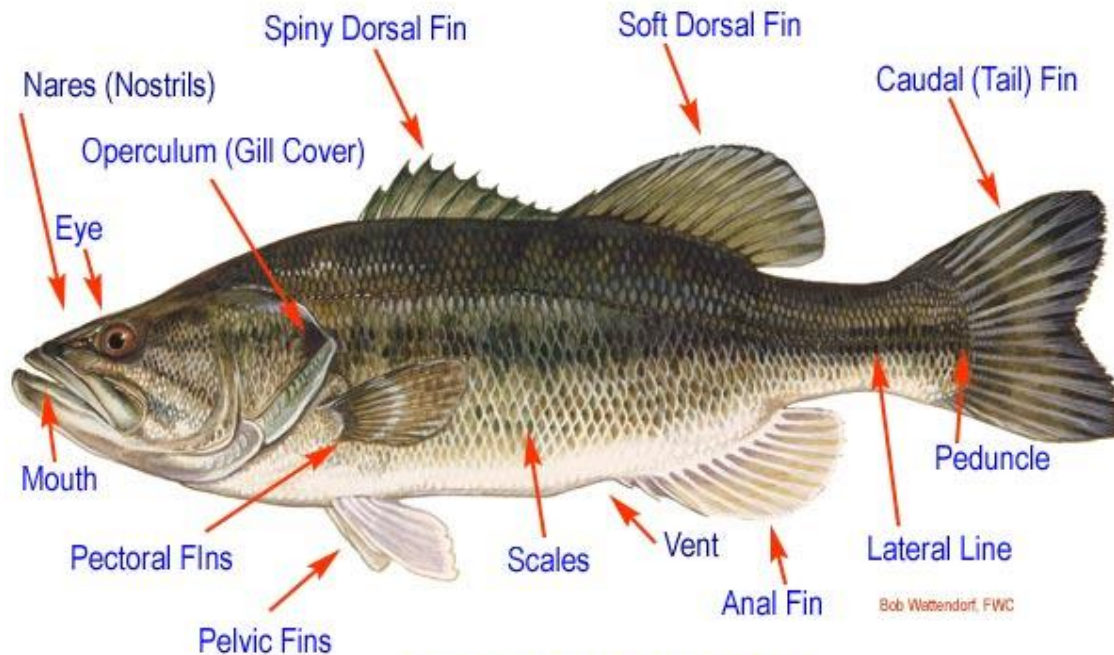


- ◆ Pectoral fins - homologous to front legs
- ◆ Pelvic fins - homologous to hind legs
 - ◆ Abdominal in position in more primitive fishes
 - ◆ Thoracic in position in more advanced fishes

Abdominal pelvics



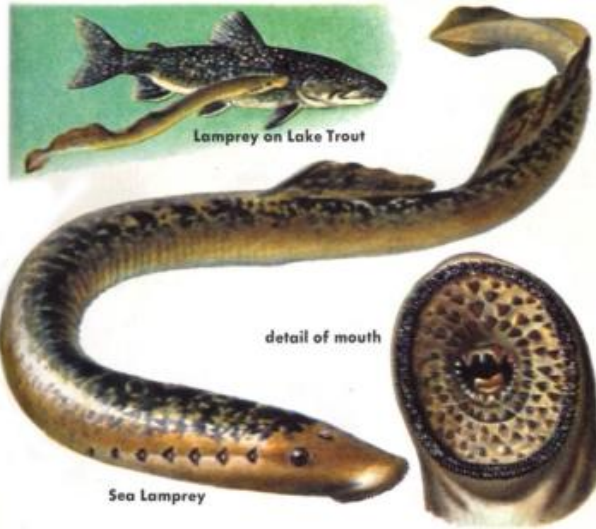
Thoracic pelvics



Bob Wattendorf, FWC

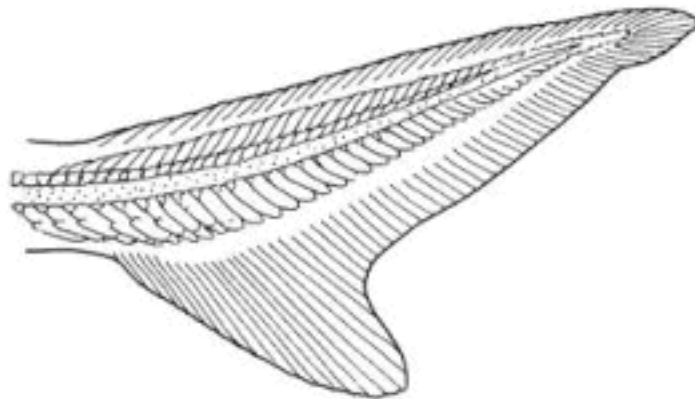
EXTERNAL ANATOMY

Missing pelvics

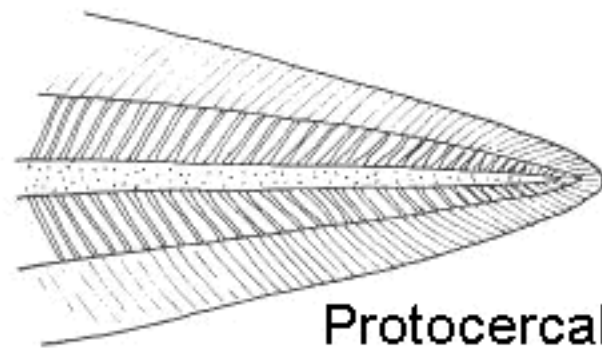


- ◆ Eels, ocean sunfish lack pelvics
- ◆ Lampreys, hagfish lack pelvics, pectorals

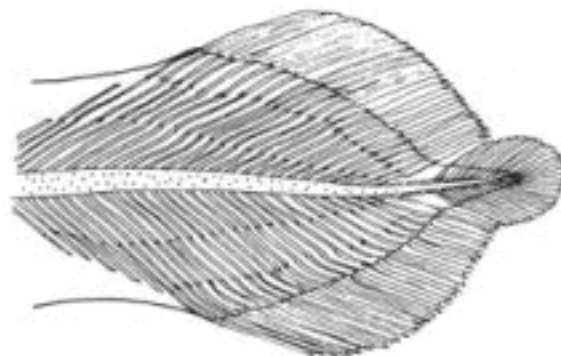
Caudal fins



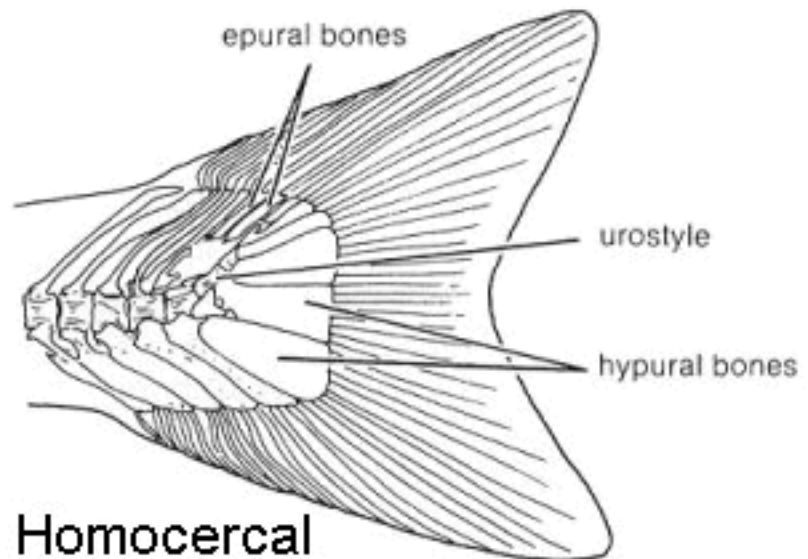
Heterocercal



Protocercal



Diphyccercal



Homocercal