Morphology Of Fin fish

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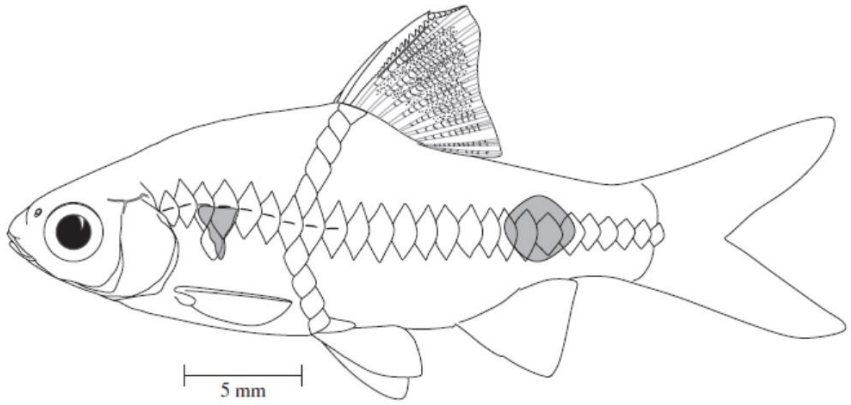
Morphology

- morphology, in biology, the study of the size, shape, and structure of animals, plants, and microorganisms and of the relationships of their constituent parts.
- The term refers to the general aspects of biological form and arrangement of the parts of a plant or an animal.

Fish Morphology

- Various fish morphological features have to be estimated in fish cultures on a daily basis.
- These parameters include the body length and width, the caudal peduncle length, the caudal peduncle width, the pupil diameter, the eye diameter and color and the gill color.



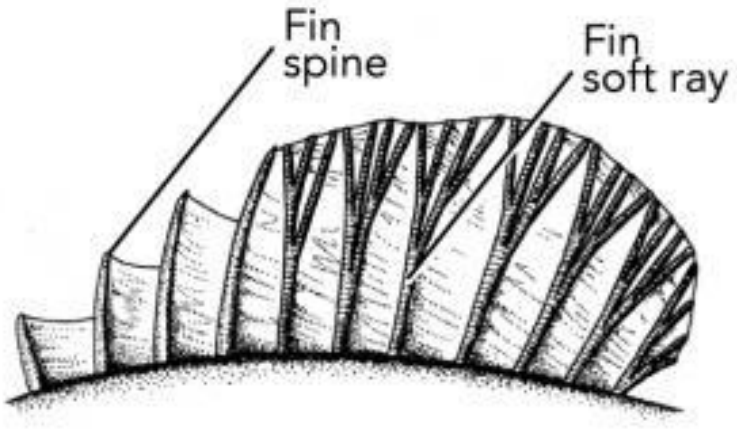
Fins

- Fins are thin appendages on the body of fish.
- They are made of bony spines extended from the body of fish with skin covering them and joining them together in case of bony fish or Osteichthyes.
- In case of cartilaginous fish, fins are present as flippers.
- They primary used for locomotion, stabilizing and treeing in fishes.
- In bony fish (Osteichthyes), most fins may have spines or rays.
- A fin may contain only spiny rays, only soft rays, or a combination of both.

- 1. Pectoral Fins
- 2. Pelvic Fins
- 3. Anal Fin
- 4. Dorsal Fin
- 5. Caudal Fin
- 6. Adipose Fins

Fins

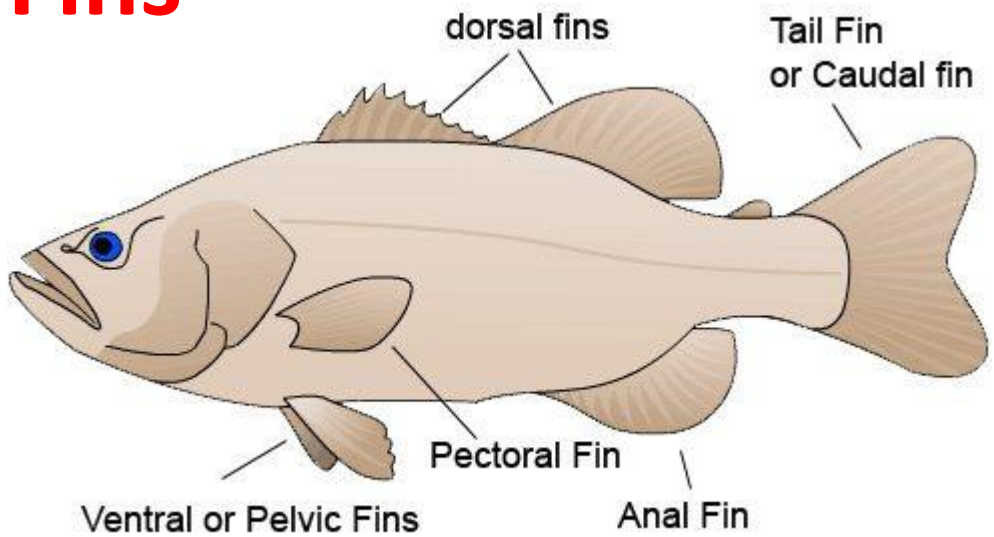
- If both are present, the spiny rays are always anterior.
- Spines are generally stiff and sharp.
- Rays are generally soft, flexible, segmented, and may be branched.
- This segmentation of rays is the main difference that separates them from spines; spines may be flexible in certain species, but they will never be segmented.
- Fins occur in both pairs and single, they may be covered with scales or without scales.



Fins

I. Pectoral Fins

- The pectoral fins occur in pair and are located on each side, usually just behind the operculum (gill cover).
- There are many adaptions to these fins, in some cases they create a dynamic lifting force that assists some fish, such as sharks, in maintaining depth and also allows the "flight" for flying fish.
- In many fish, the pectoral fins aid in walking, especially in the lobe-like fins of some anglerfish and in the mudskipper.



Fins

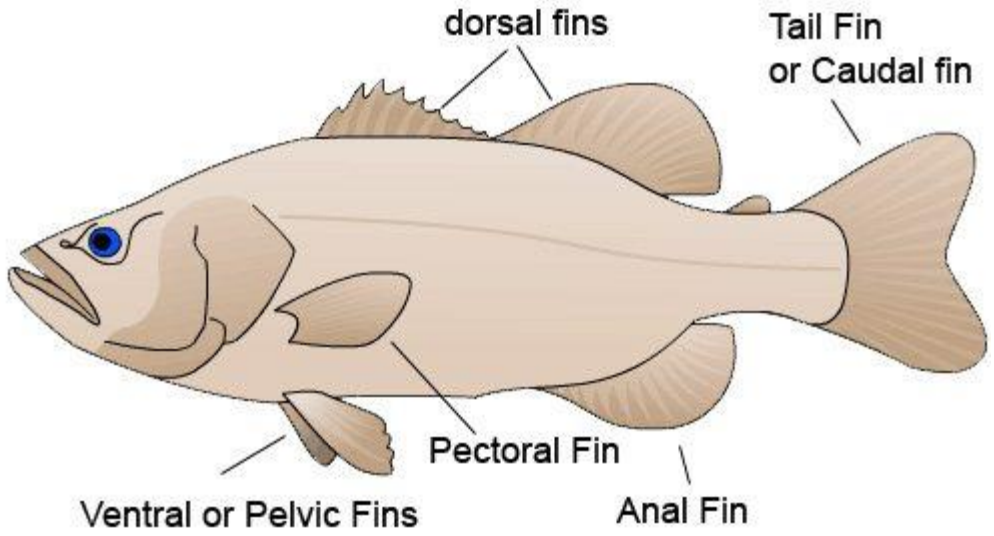
II. Pelvic Fins

- Pelvic fins occur in pairs and are found on the ventral (lower) side of the fish below the pectoral fins.
- They assist the fish in going up and down in water, turning and stopping.
- In some fish like gobies they are joined into a single sucker like disc which is used to attach to objects.

Fins

III. Anal Fin

- The anal fin is a median unpaired fin located on the underside of the fish in front of the tail fin near the anus or vent.
- The anal fin helps to stabilize a fish like the keel on the bottom of a boat.
- The Anal fin is also known as cloacal fin



Fins

IV. Dorsal Fin

- This type of fin is located on the top or back of the fish which help the fish in quick turns or stops.
- It also helps the fish against rolling.
- In fish, there are three distinct dorsal fins such as proximal, central or middle, and distal dorsal fins.
- In perches there are two dorsal fins, one after another.
- The first fin is separated by either a short or long gap, or it may be combined.

Types of Dorsal Fin

- Single
- Pointed
- Split
- Spine triangular
- Trigger
- Trailing

Fins

IV. Dorsal Fin

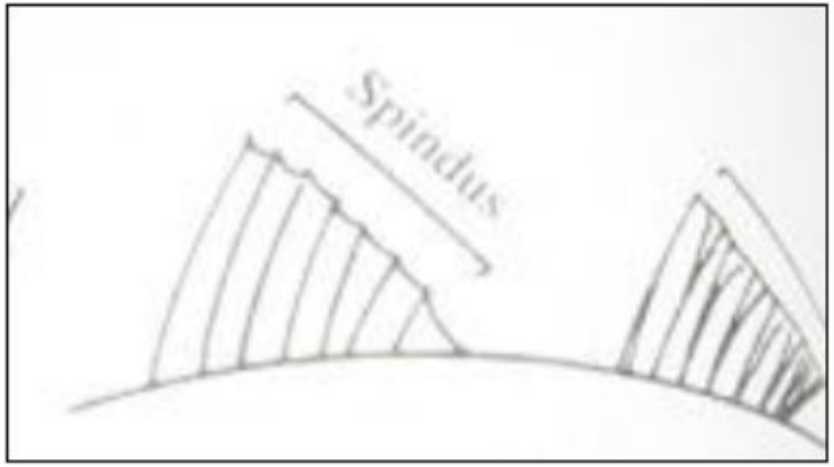


Figure 11. Separate Dorsal fin

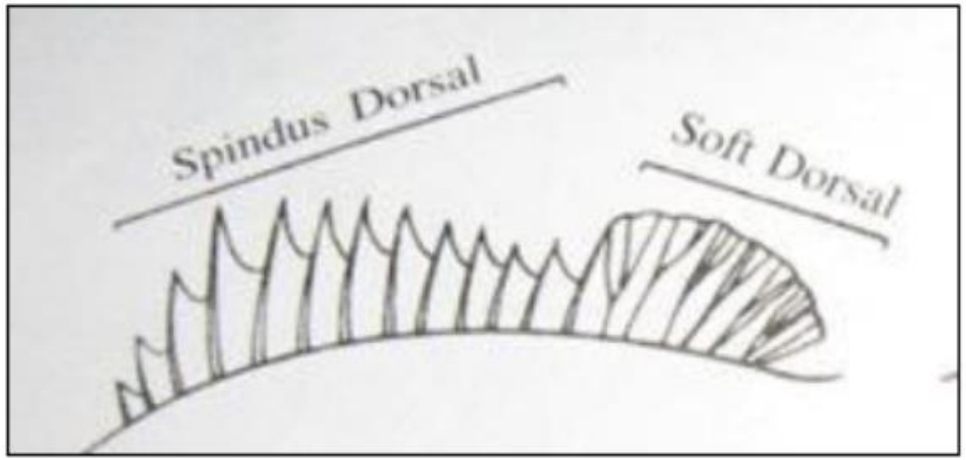


Figure 12. Combined Dorsal fin

Fins

V. Caudal Fin

- Caudal or tail fin is located at the end caudal peduncle of the fish.
- The caudal peduncle is the narrow part of the fish's body to which the caudal or tail fin is attached.
- It is always a single fin and acts as rudder for the fish.
- On the basis of external and internal structure it is classified in different type.

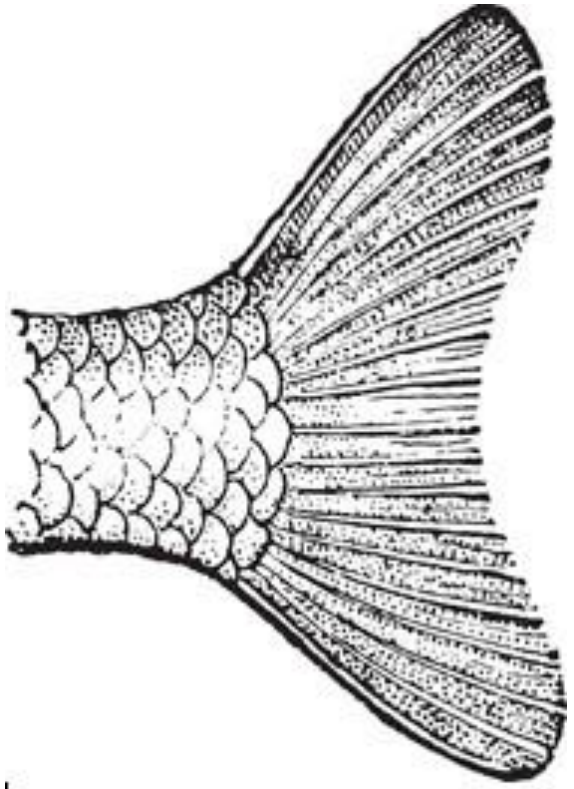
Types of Caudal Fin

- Homocercal
- Heterocercal
- Diphycercal
- Isocercal
- Protocercal
- Hypocercal

Fins

V. Caudal Fin

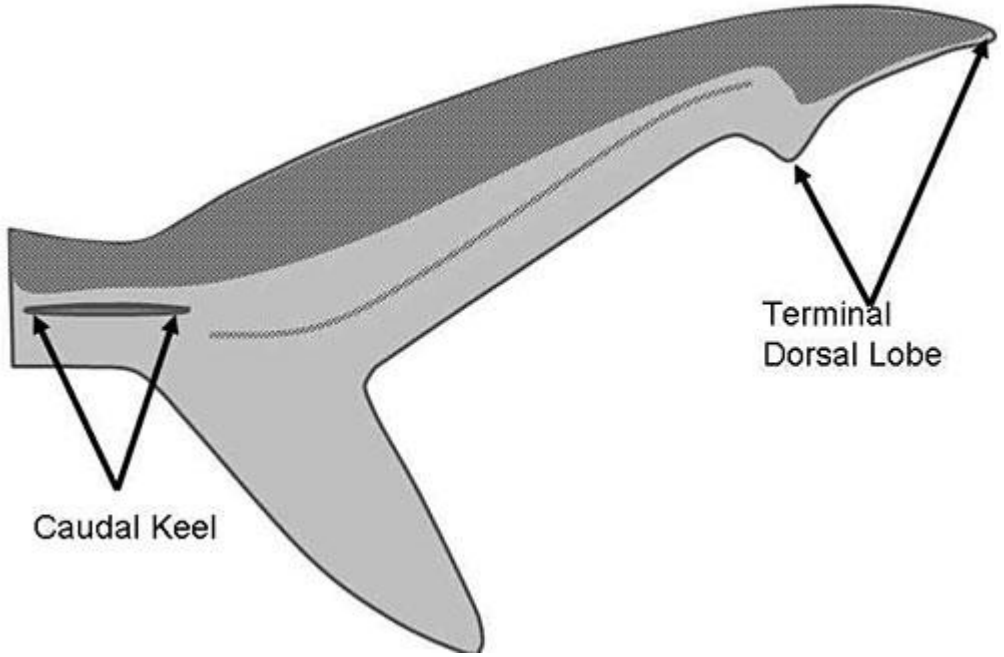
- **Homocercal:**
- Most of the higher teleost's have homocercal caudal fin.
- It has superficially symmetrical and two equal sized lobes such as upper epichordal and the lower hypochordal lobe.
- Internally, this tail is asymmetrical and the hinder end part of the vertebral column is greatly shortened and turned upward.
- In this case, the vertebral column does not touch the posterior limit of the fin.



Fins

V. Caudal Fin

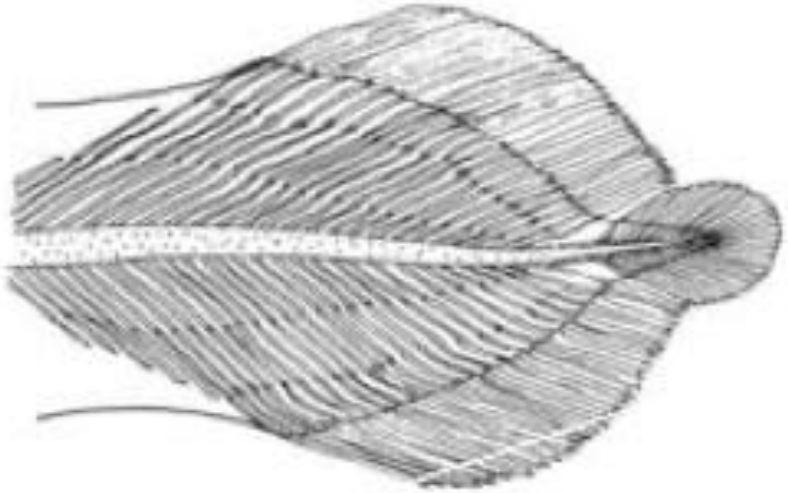
- **Heterocercal:**
- The heterocercal tail is sometimes called the shark-tail type of caudal fin.
- A heterocercal tail is differentiated with a homocercal tail which has equal lobes.
- Elasmobranch (cartilaginous fish) and some primitive type of bony fishes contain this type of fin.



Fins

V. Caudal Fin

- **Diphycercal:**
- Diphycercal caudal fin shape is primitively symmetrical and pointed; the vertebral column runs straight to the tip, dividing the caudal fin symmetrically, e.g. in chimaeras, also: an internally and externally symmetrical tail fin, e.g. in Dipnoi.



Diphycercal

Fins

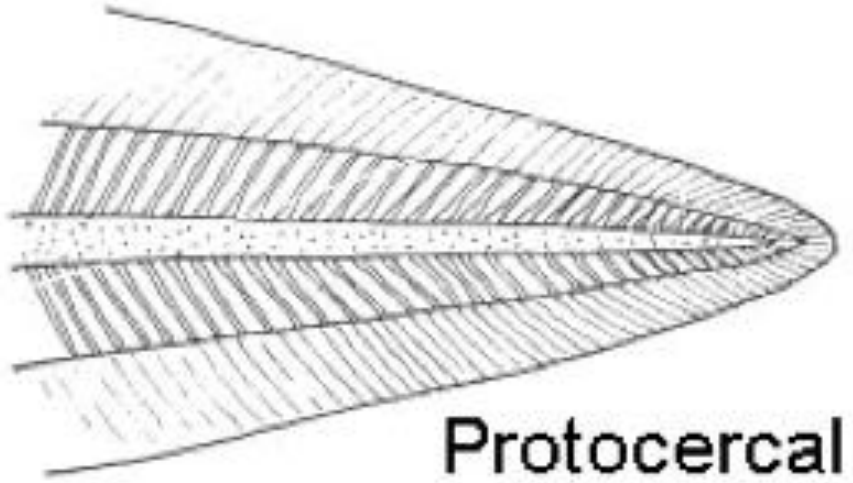
V. Caudal Fin

- **Isocercal:**
- **A tail in which there is an apparent symmetry between the dorsal and ventral regions is known as Isocercal caudal fin.**

Isocercal
Resembles protocercal tails but retains asymmetrical internal structure of homocercal tails. (Gadidae, Notopteridae, Gymn-archidae, Macruridae, Anguilliformes)

Fins

V. Caudal Fin

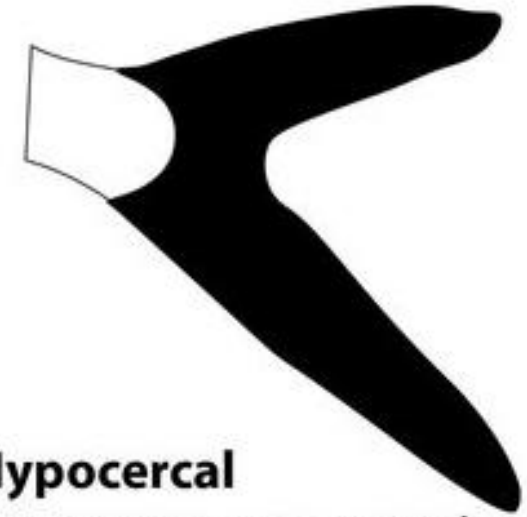


- **Protocercal:**
- It is the most primitive type of caudal fin where the straight vertebral column divides the caudal fin into two equal lobes such as upper lobe and lower lobe.
- In this case, the upper lobe is known as epichordal or epicaudal and the lower lobe is called hypochordal or hypocaudal lobe e.g. hagfish

Fins

V. Caudal Fin

- **Hypocercal:**
- **This type of caudal fin bears much larger dorsal lobe than the ventral lobe which is greatly reduced.**
- **They are found in certain early Agnathans.**
- **It is also known as inverted heterocercal caudal fin.**



Hypocercal
Expresses asymmetry internally and externally; ventral lobe longer (Cypselurus, flying fishes).
Different than **reversed heterocercal** where vertebrae extend into ventral lobe.

Caudal Fin (Tail Fin) Types

(The Quick Reference for Fishes – Simplified Version)

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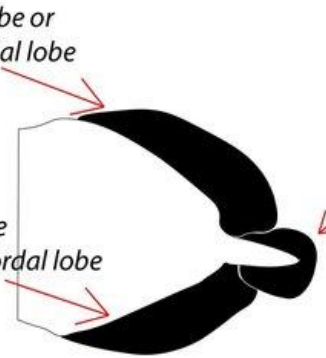
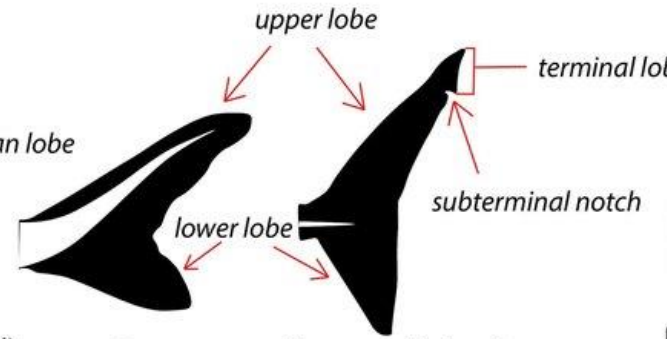
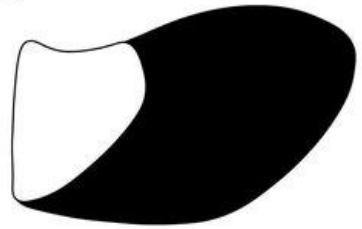
Protocercal (diphycercal)
Primitive and undifferentiated; vertebrae extend to tip of tail symmetrically.
(Lampreys, hagfishes, larvae of advanced teleosts).



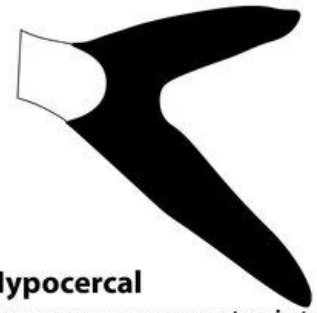
Leptocercal (modified diphycercal)
Vertebrae extend symmetrically to tip of an expanded tail.
(Convergently evolved in coelacanth, lungfishes, ratfishes and many eel-like fishes).



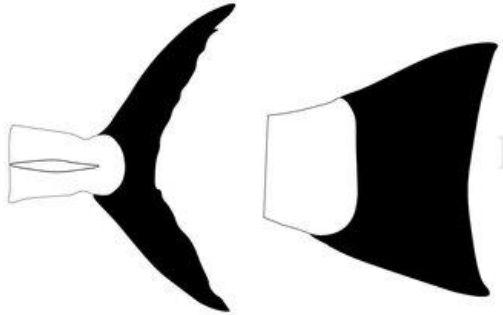
Heterocercal (unequal-lobed)
Vertebrae extend into upper lobe.
(Modern sharks and primitive bony fishes like sturgeon).



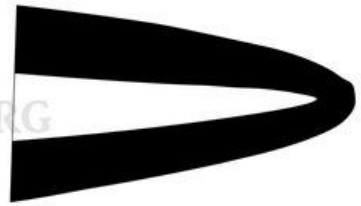
Hemihomocercal (abbreviated homocercal)
An intermediate between heterocercal and homocercal.
(*Amia calva* - bowfin; also in gar)



Hypocercal
Expresses asymmetry internally and externally; ventral lobe longer (Cypselurus, flying fishes).
Different than **reversed heterocercal** where vertebrae extend into ventral lobe.



Homocercal (equal-lobed)
Exists in most advanced teleosts; expresses asymmetry internally but symmetry externally; so can be considered abbreviated heterocercal.



Isocercal
Resembles protocercal tails but retains asymmetrical internal structure of homocercal tails.
(Gadidae, Notopteridae, Gymnarchidae, Macruridae, Anguilliformes)

Gephyrcercal
The clavus is the hardened bridge between anal and dorsal fins. Highly advanced; found in molids (molas/ocean sunfishes); no caudal bones.

Tails of Fishes

Some Common Names

Pointed

Naked & pointed

Pointed (undifferentiated)

Rounded

Rounded (unevenly)

Truncate, flat, square, or straight

Truncate; slightly emarginate

Emarginate, indented, or concave

Double emarginate or biconcave.

Forked (lightly)

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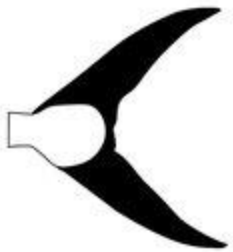
Forked (unevenly)



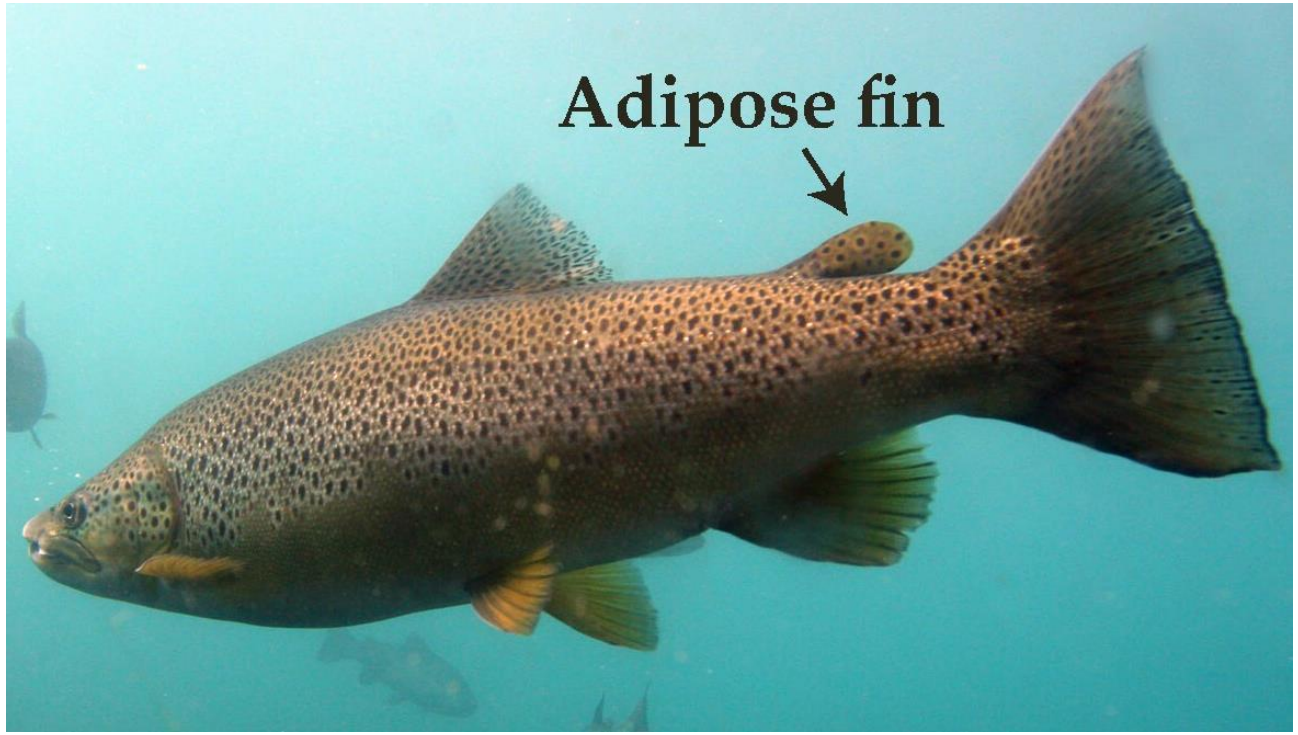
Forked (deeply); can also be considered lunate

Lunate; (looks like a crescent moon)

Fins

VI. Adipose Fins

- The adipose fin is a soft, fleshy fin found on the back behind the dorsal fin and just forward of the caudal fin.
- It is absent in many fish families, but is found in Salmonidae, characins and catfishes.

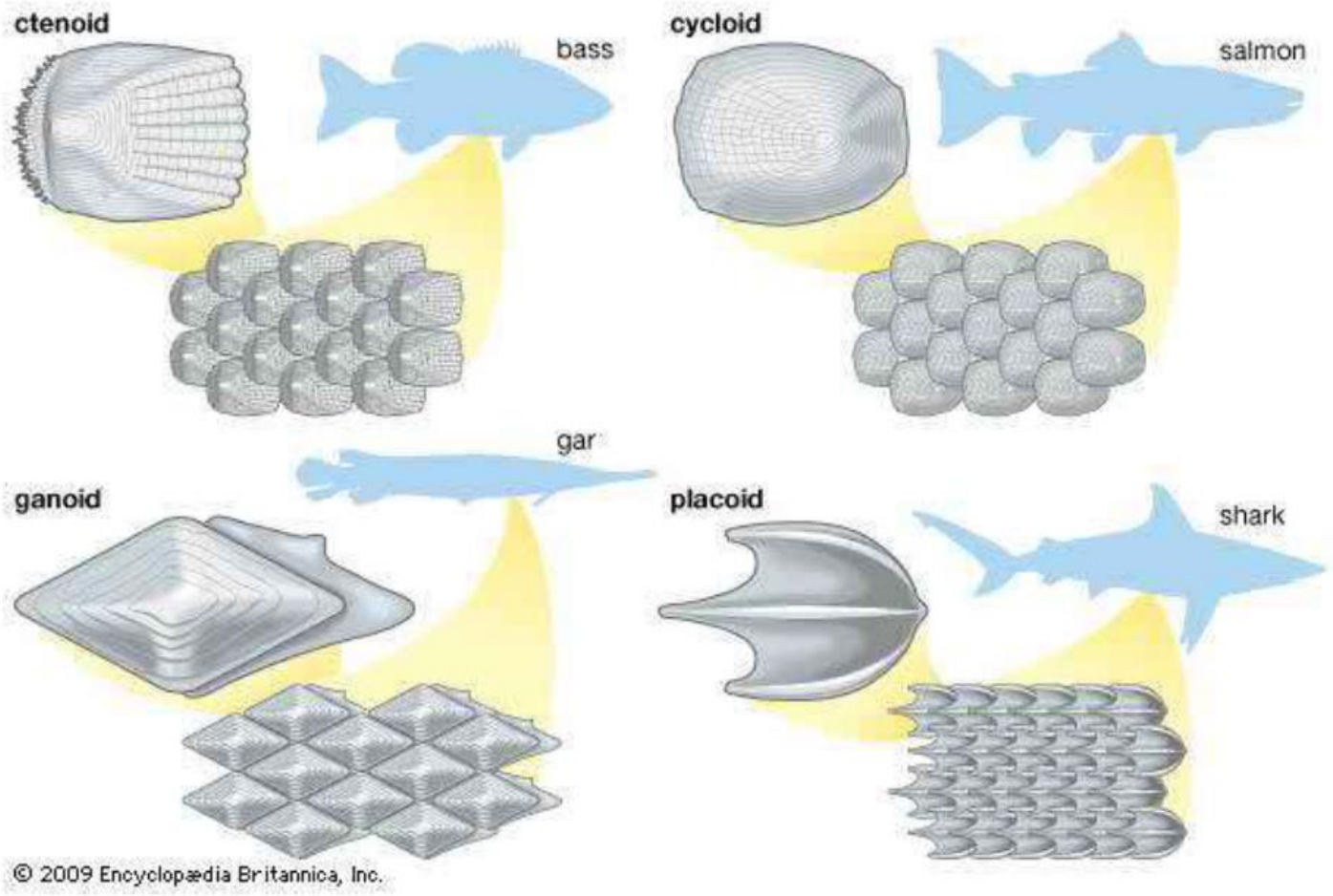


Scales

- The outer body of fishes is covered with scales.
- Some fishes have a other type of scale known as the scute, which is an external shield-like bony plate.

Types of Scales

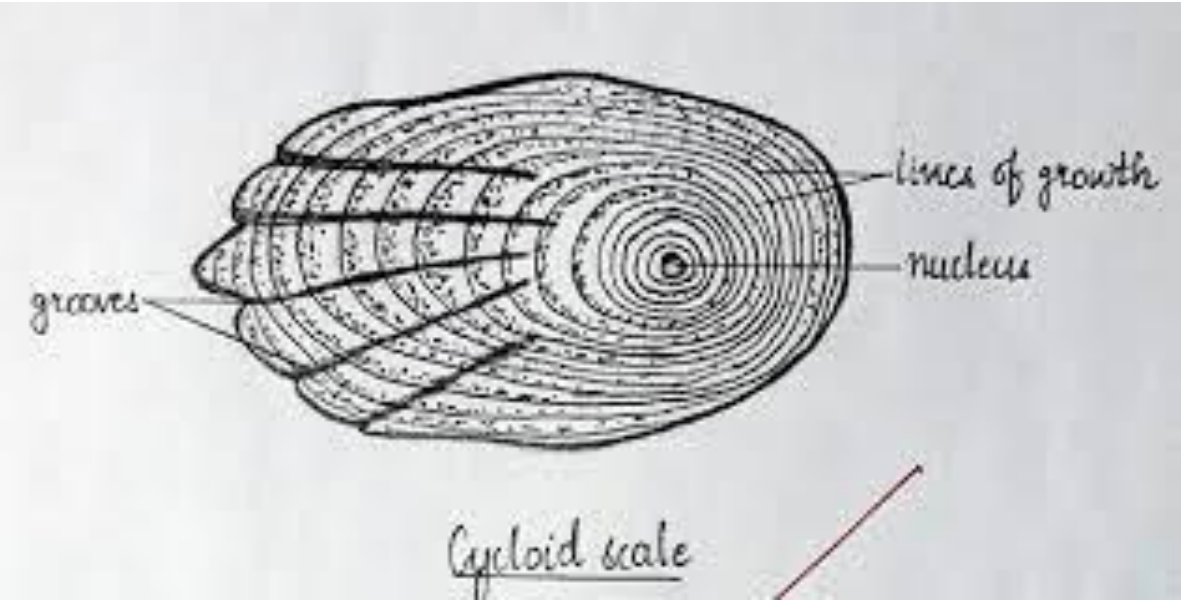
1. Cycloid - e. g. Salmon, Carp
2. Placoid – e. g. Shark, Rays
3. Ctenoid – e. g. Bass, Goby
4. Ganoid – e. g. Gar, Sturgeons



Scales

Cycloid

- Cycloid scales are small oval-shaped scales with growth rings.
- They are found in many Salmon and Carps.
- They providing protection against predators.



Scales

Placoid

- Placoid scales (or denticles) are spiny, toothlike projections seen only in cartilaginous fishes.
- Placoid scales also called dermal denticles,
- These type of scales are similar to teeth, in that they are made of dentin covered by enamel.
- They are typically found in sharks and rays.
- These scales function to protect a fish from predators and can even be used to injure or kill prey.

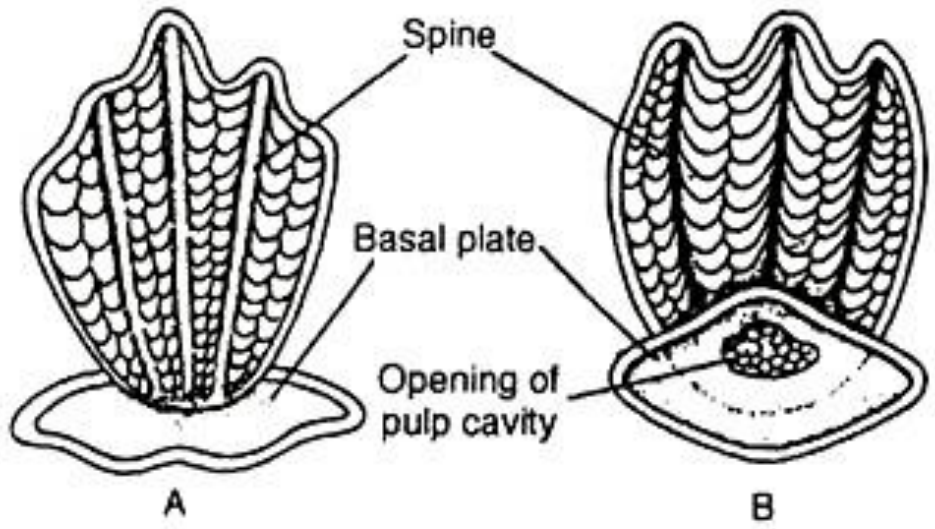
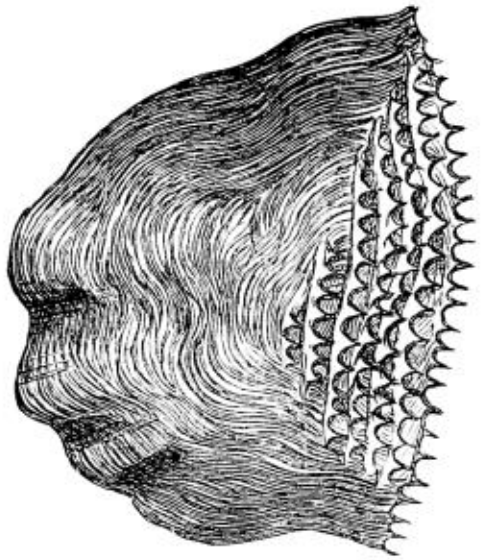


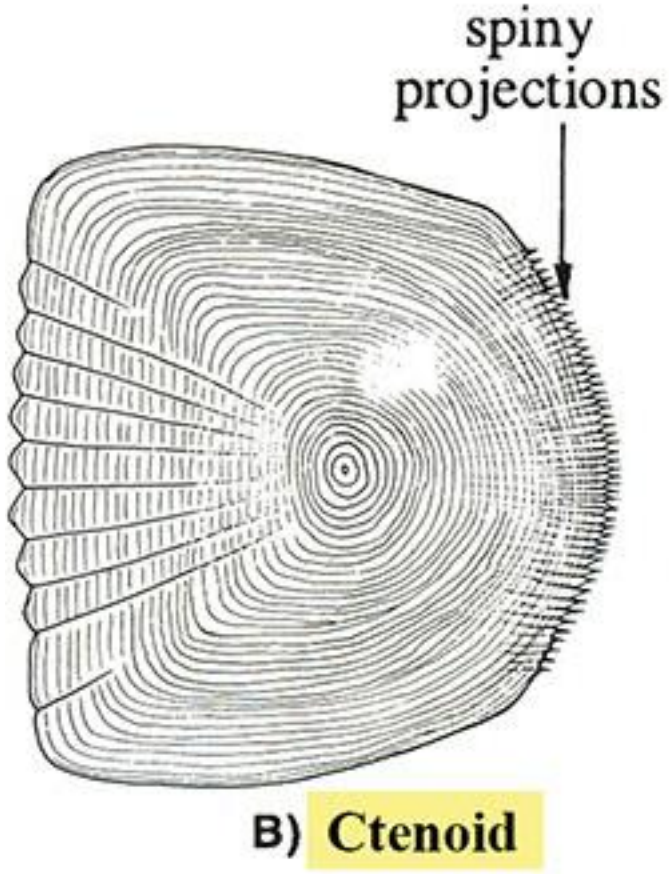
Fig. 2.6 : A placoid scale — A. Dorsal view, B. Ventral view



Scales

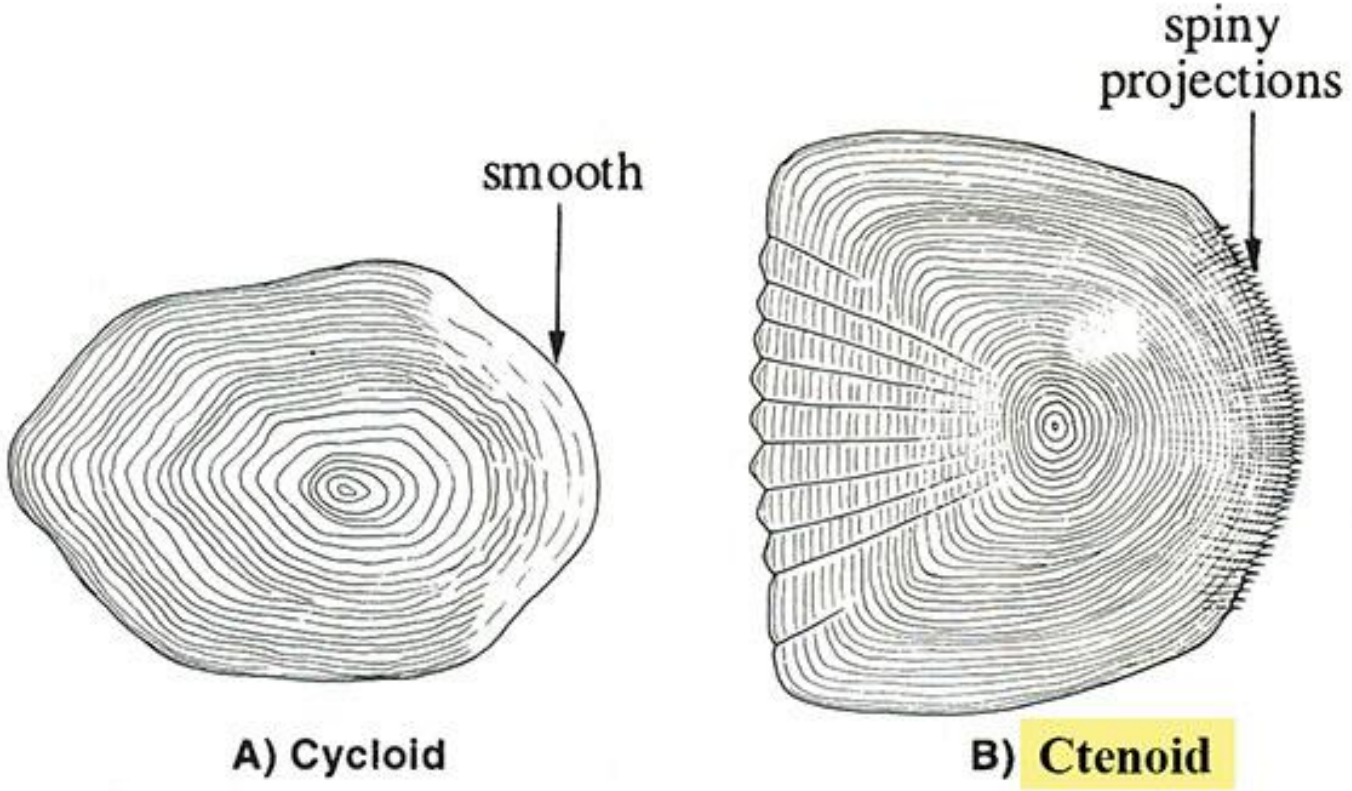
Ctenoid

- Ctenoid scales are scales with comb-like edge found in higher order teleost fishes, such as perch and sunfish.
- Ctenoid scales are similar to the cycloid scales, with growth rings.
- They are distinguished by tiny teeth or spines on the posterior margin of the scale. e. g. Bass and Goby.



Scales

Difference in between Ctenoid and cycloid scales

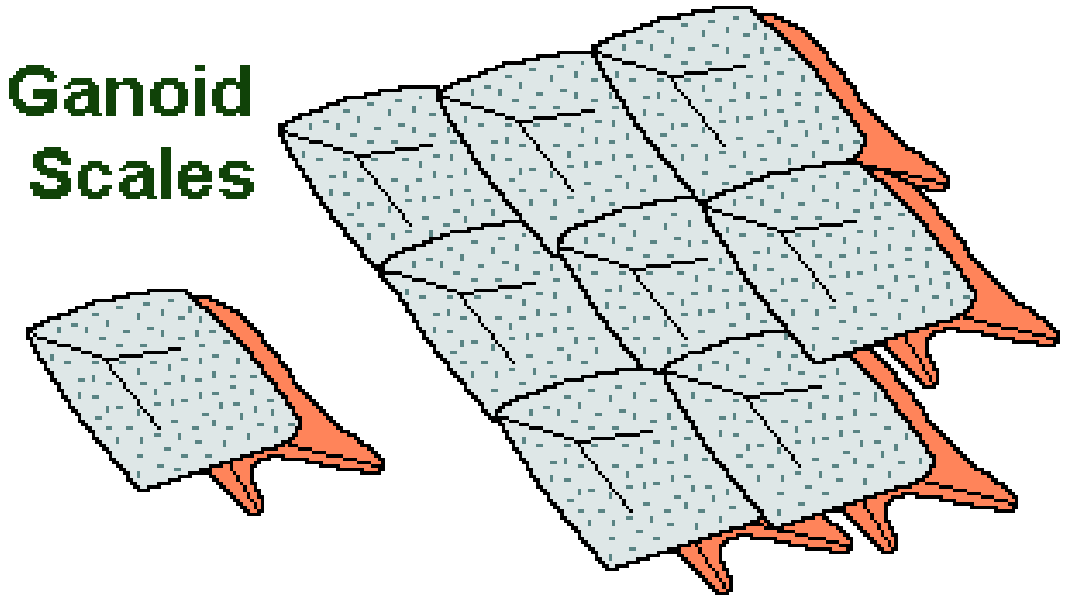


Scales

Scales

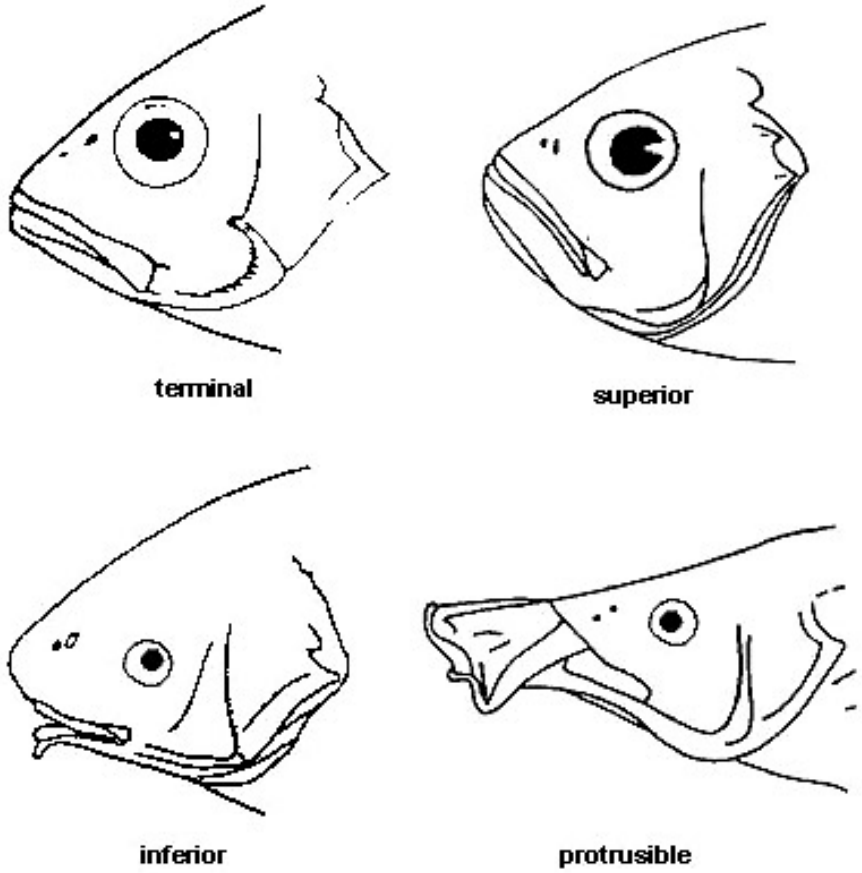
Ganoid

- Diamond- shaped, shiny and hard.
- Ganoid scales are flat, basal-looking scales that cover a fish body with little overlapping.
- They are typical found in gar, Sturgeons and bichirs.



Mouth

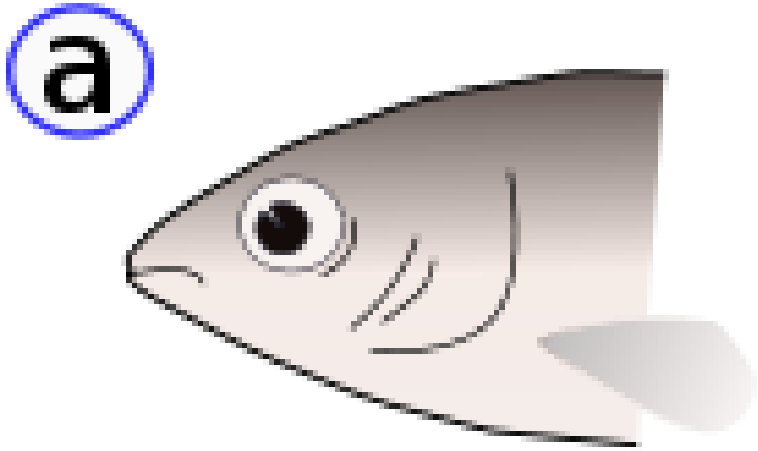
- Mouth is the main organ which fish use while feeding.
- The position and shape of the mouth depends on the type of food a fish eats and the level at which it swims.
- The mouth shapes can be
  1. Terminal Mouth
  2. Superior Mouth
  3. Sub-terminal Mouth
  4. Protrusible Mouth



Mouth

Terminal Mouth

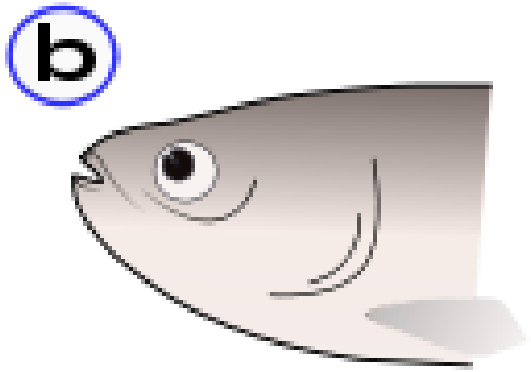
- Terminal mouth is found in those fish, which feed from water column on other fish or zooplankton.
- Terminal mouths are located in the middle of the head and point straight forward; both jaws are of the same length.
- Example- *Danios, Rasbora, Puntius*, etc.



Mouth

Superior Mouth

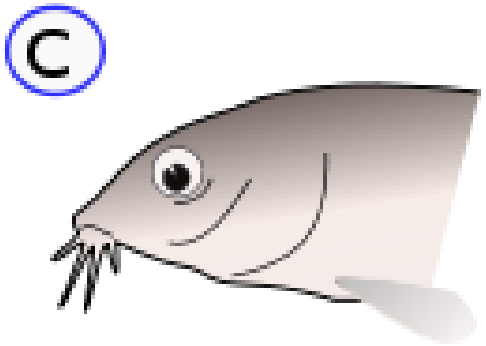
- The superior mouth is oriented upwards and the lower jaw is longer than the upper jaw.
- Usually, fish with this type of mouth feed at the surface.
- They lay in wait for prey to appear above them, then strike suddenly from below.
- Many species of fish with a superior mouth feed largely on insects, however, some may feed on other fish that swim near the surface.
- E. g. Archers, half-beaks, and hatchet fish



Mouth

Sub-terminal or inferior or ventral Mouth

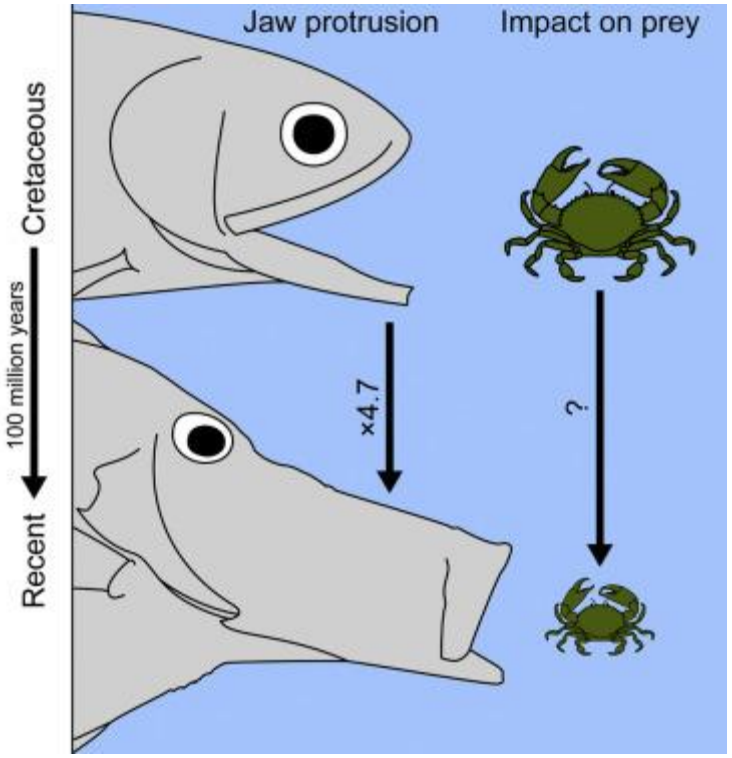
- It is also called an inferior or ventral mouth.
- The inferior mouth is turned downward.
- The lower jaw is shorter than the upper jaw.
- Fish with inferior mouths are bottom feeders and often possess barbels that assist in locating food particles e. g. Catfish



Mouth

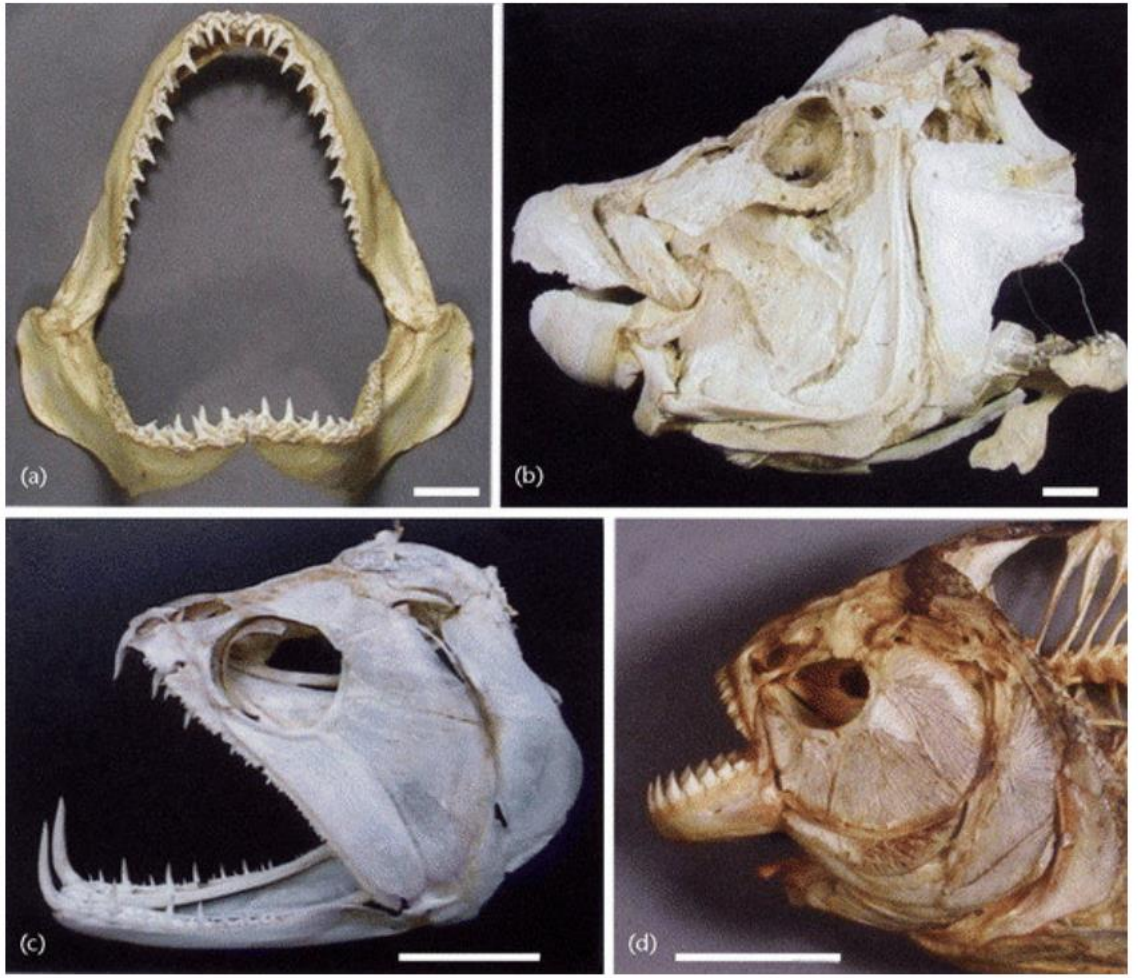
Protrusible Mouth

- Often fish will have a protrusible mouth feature, which allows them to extend their reach when attempting to snatch prey or food particles e. g. Tilapia, kissing gourami



Jaws and teeth

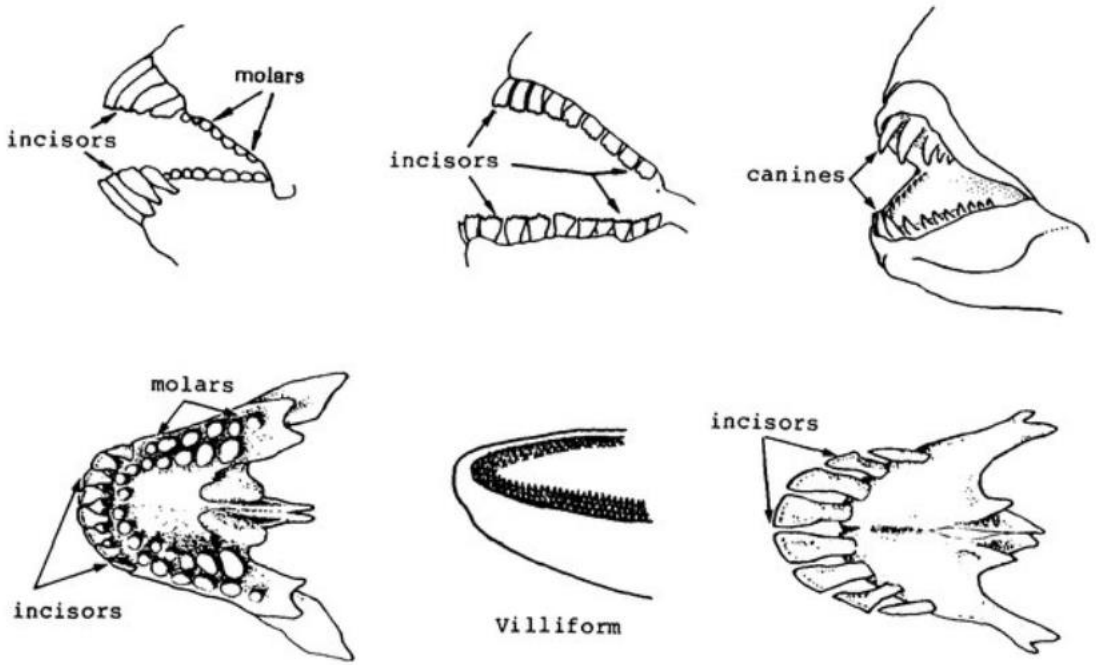
- **Jaws:**
  - The jaw consists of the upper jaw and lower jaw.
  - The upper jaw consists of bones called pre-maxillaries and maxillaries, while the lower jaw consists of mandible bones.
  - These are connected by a joint which allows the fish to open and close the mouth.
  - Jaws contain teeth and frame the shape of the mouth.



Jaws and teeth

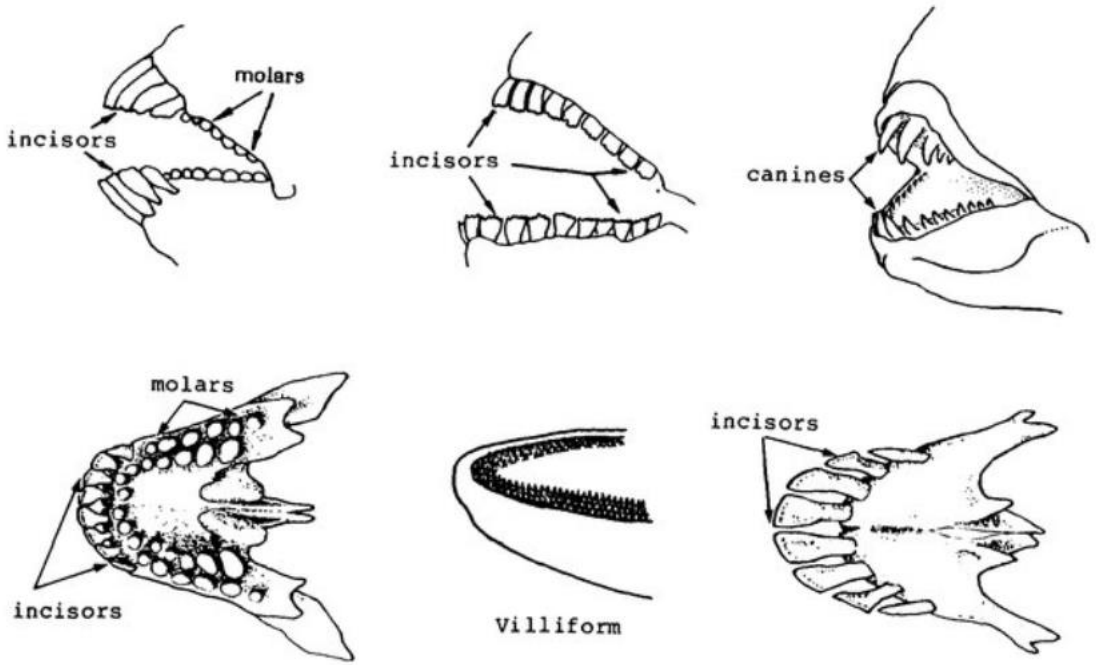
➢ Teeth:

- ➢ Most fish have teeth on jaws and palate.
- ➢ In addition to these teeth some fish have pharyngeal teeth also.
- ➢ However not all fish have teeth like cyprinids. There are many types of teeth
- ➢ 1. Canine: - It is large conical teeth frequently located at the corners of the mouth,
  - ➢ for example, snappers.
- ➢ 2. Villiform: - Villiform teeth is small and fine teeth, for example, Needlefishes



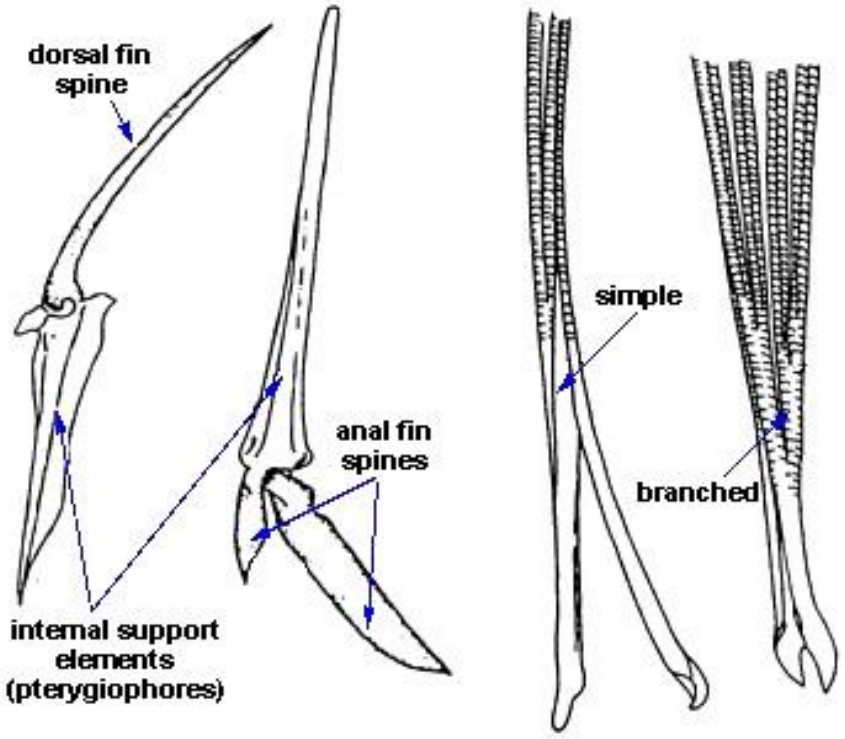
Jaws and teeth

- **Teeth:**
  - **3. Molar form:** - Molariform teeth is molar like broad and rounded.
  - It is used for crushing molluscs and crustaceans.
  - **4. Cardiform**: - It is fine, pointed teeth arranged as in a wool card; for example, the pharyngeal teeth in pickerels (Esox).
  - **5. Incisor**: - Large teeth with flattened cutting surfaces adapted for feeding on molluscs and crustaceans; for example, chimaeras (Holocephali).



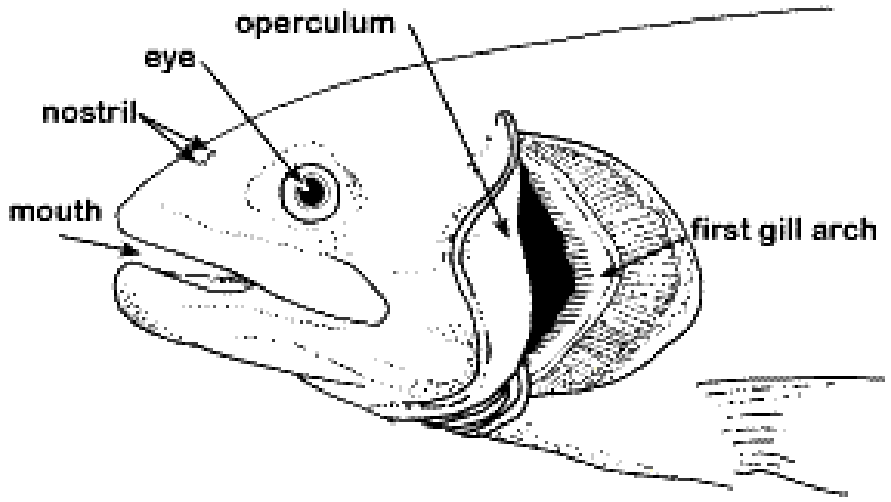
Fin rays & Spine

- Bony fish have spines and fin rays called lepidotrichia.
- They typically have swim bladders, which allows the fish to create a neutral balance between sinking and floating without having to use its fins.



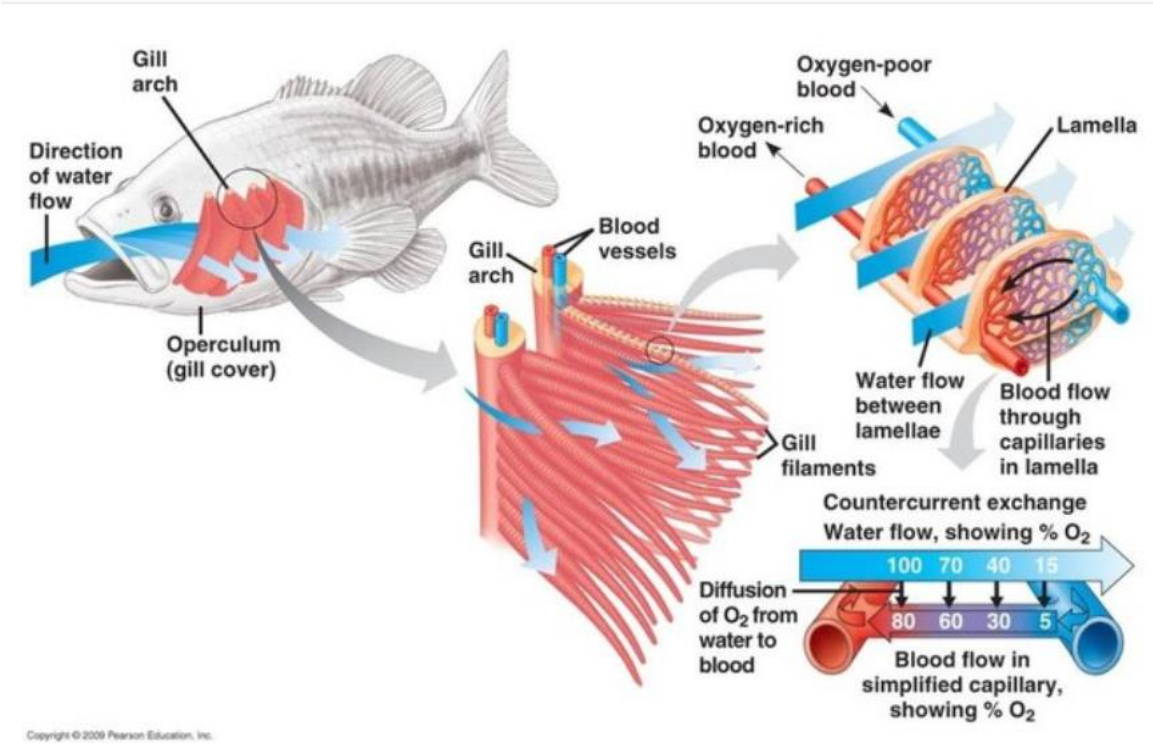
Operculum and Gill

- Operculum along with gills form breathing apparatus for the fish.
- On each side of fish there are slits called gills.
- The gills are composed of comb-like filaments, the gill lamellae, which help increase their surface area for oxygen exchange.
- In bony fish, the gills lie in a branchial chamber covered by a bony operculum.
- A fish breathes by taking in water through its mouth and forcing it out from gills.



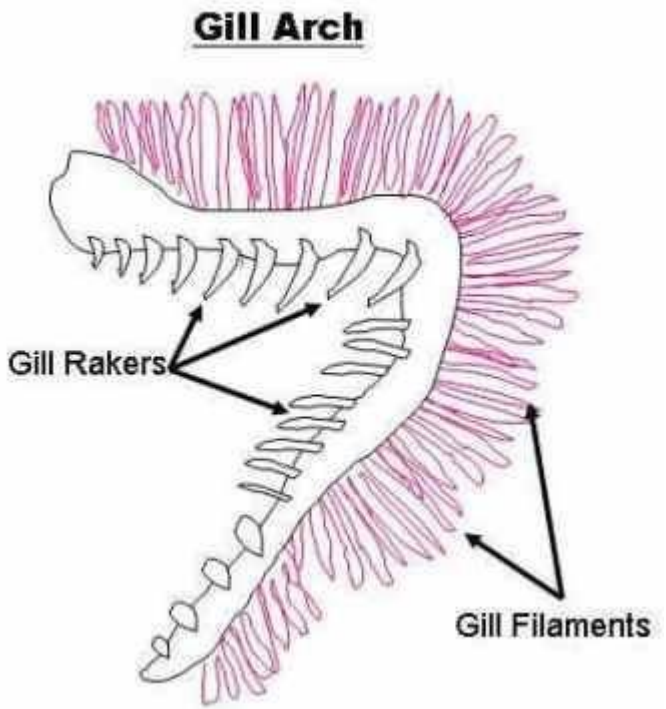
Operculum and Gill

- There are tissue linings in the gills which absorb oxygen and expelled CO2 from the gills.
- The majority of bony fishes have 5 pairs of gills.
- In cartilaginous fish, gill slits are not covered and lie in a row behind the head.
- In general, there are five pairs in cartilaginous fish, but a few species have 6 or 7 pairs.



Gill rakers

- Gill rakers have no any role in gas exchange.
- Gill raker in bony fishes is set of stiff, tooth-like processes, located on the inner side of the gill arch.
- In some fish (e.g. mullet and herring) the gill rakers are long and closely set, thereby acting as a sieve capable of retaining food particles.

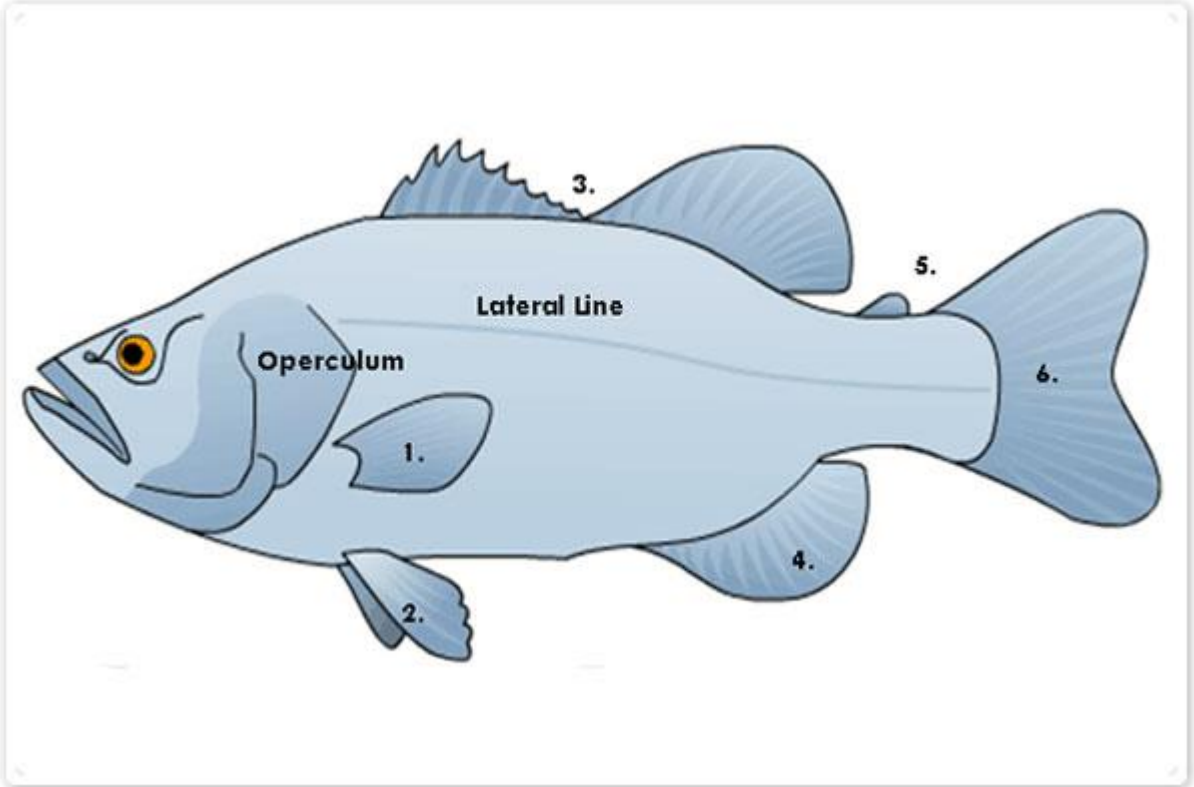


Claspers

- Male cartilaginous fish have claspers formed from the posterior portion of their pelvic fin which serve to channel semen into the female's cloaca during mating.
- The act of mating in some fish including sharks.
- The clasper is then inserted into the cloaca, where it opens like an umbrella to anchor its position.
- The siphon then begins to contract, expelling water and sperm.
- The claspers of many shark species have spines or hooks, which may hold them in place during copulation.

Lateral Line

- The lateral line is a sense organ used to detect movement and vibration in the surrounding water.
- In most species, it consists of a line of receptors running along each side of the fish.
- It can be complete (eg. Pomfrets, Sciaenids), incomplete (eg. Pomacentridae) and interrupted (eg. Serranids, Cichlids).



Thank

You