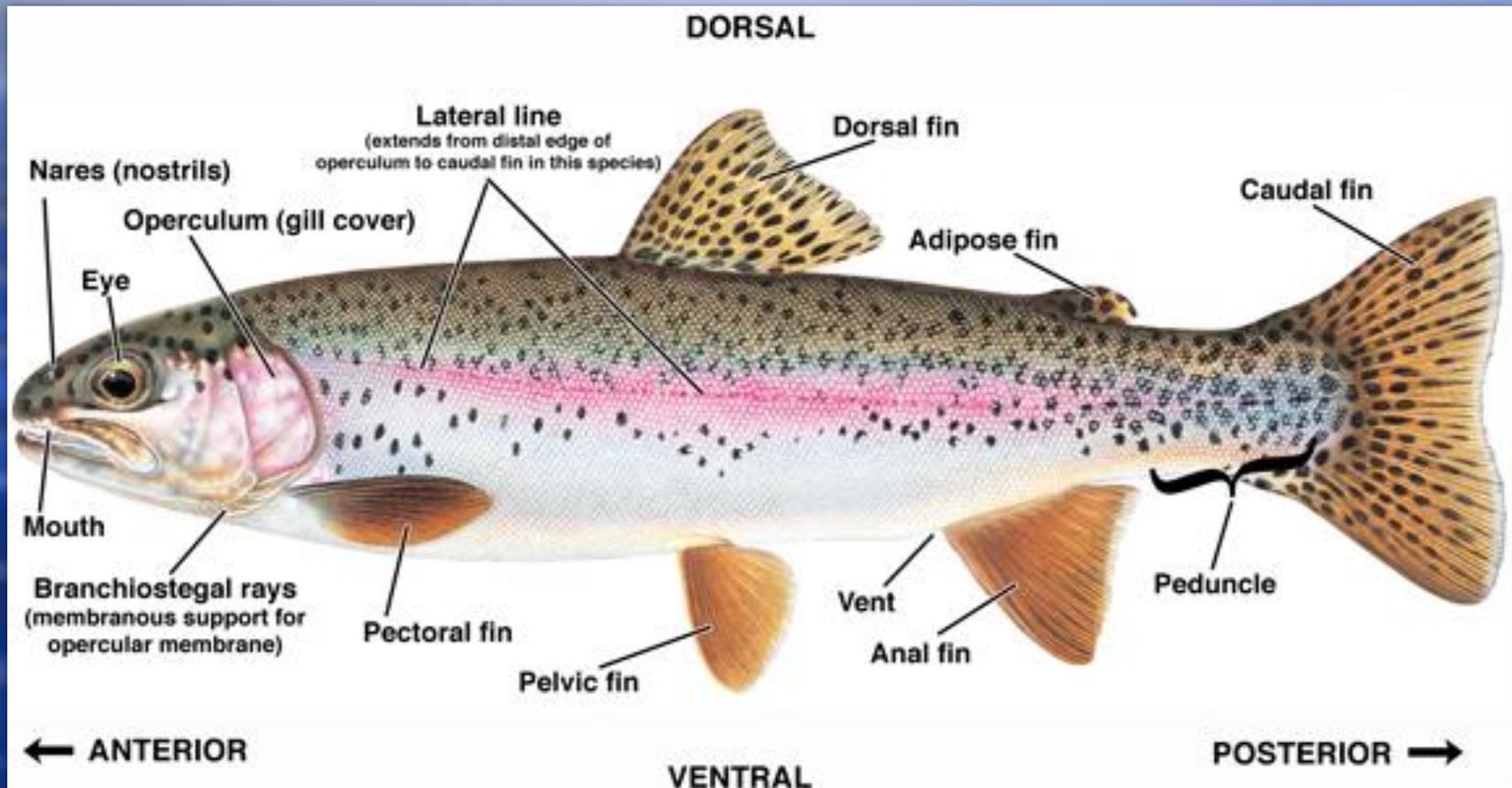
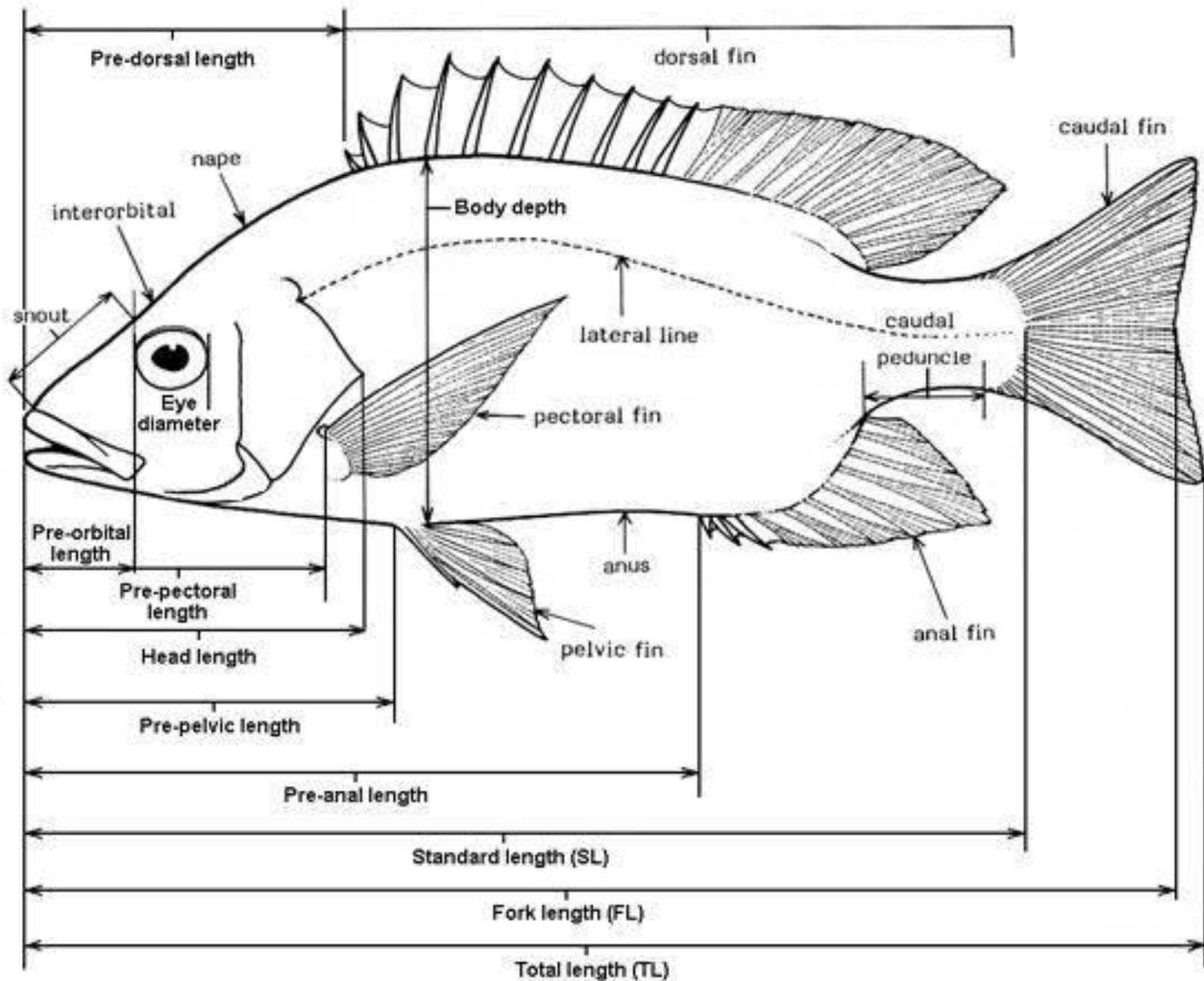


General External Morphology





Variations are many

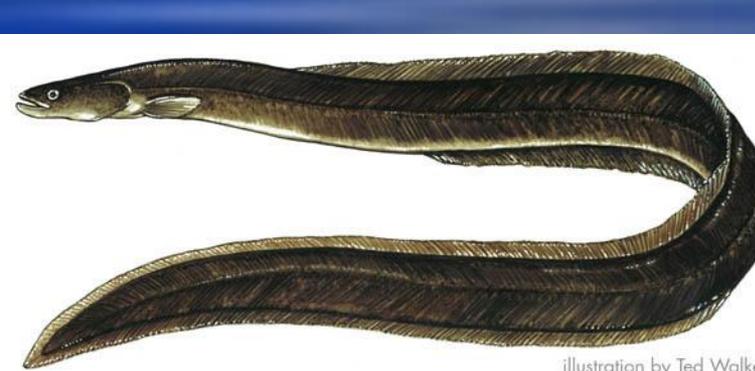
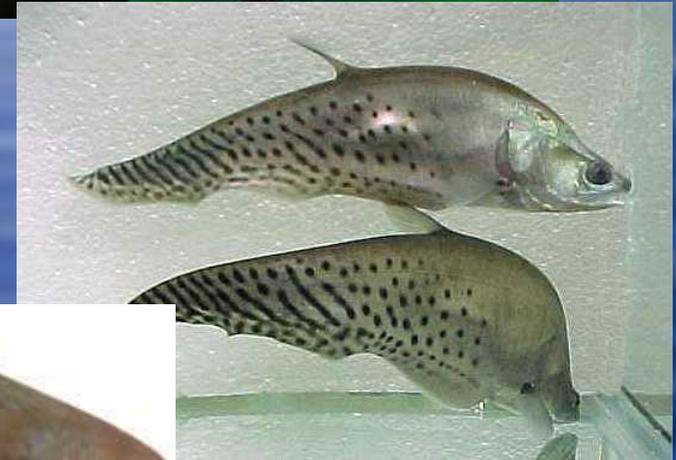
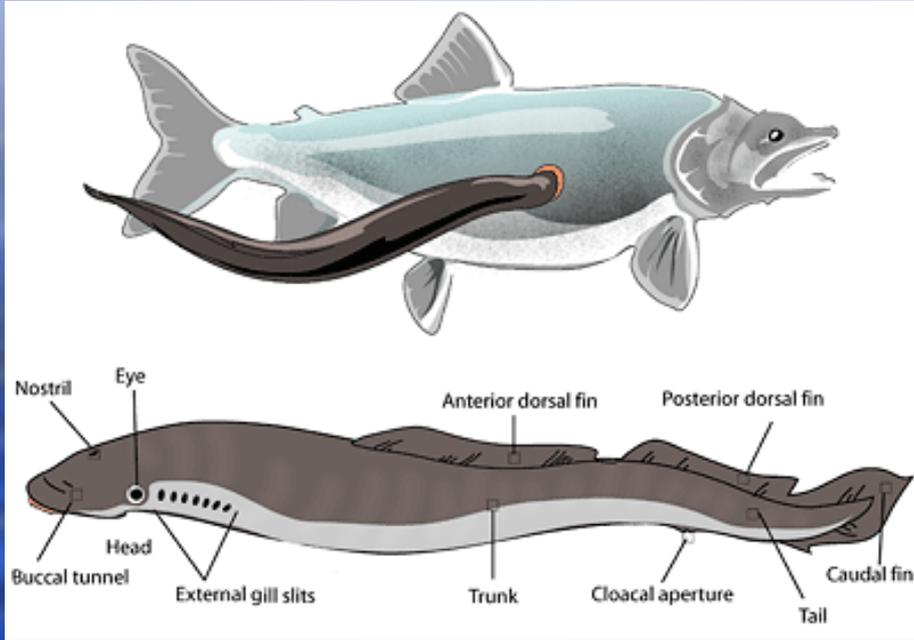
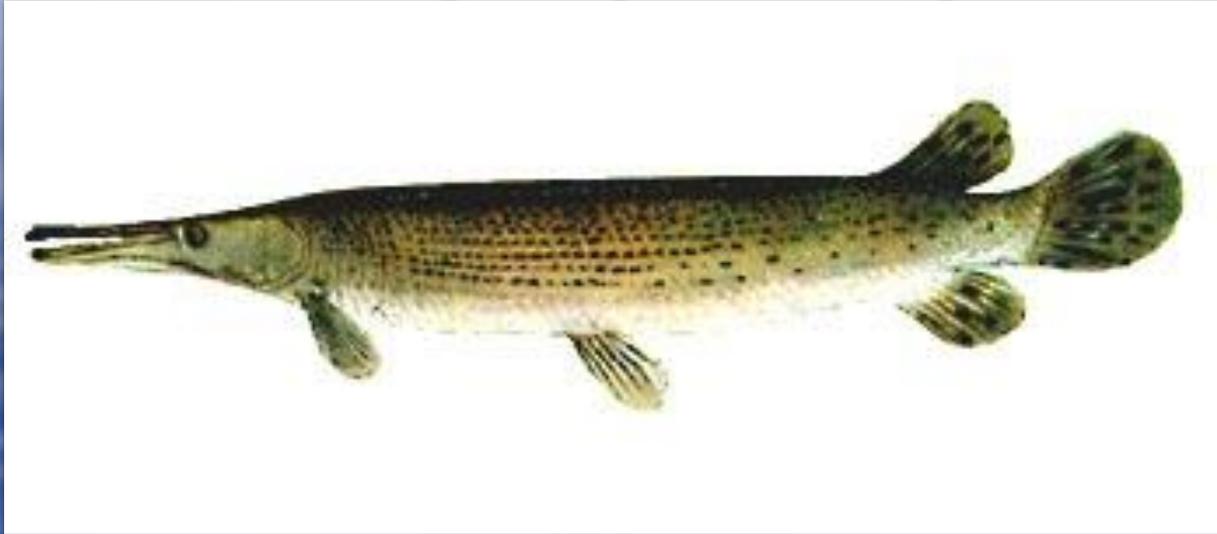


illustration by Ted Walker



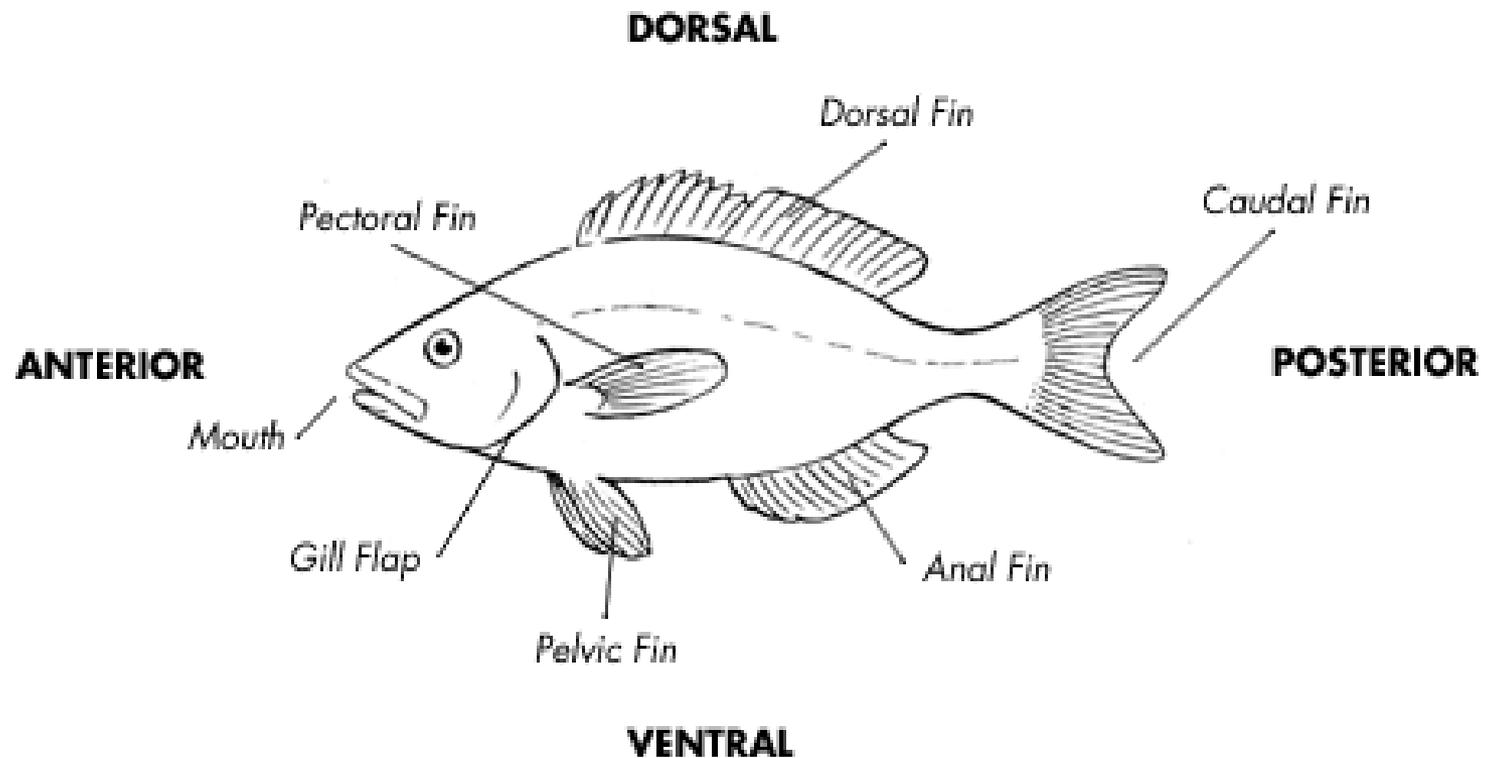
Medial (Unpaired) Fins



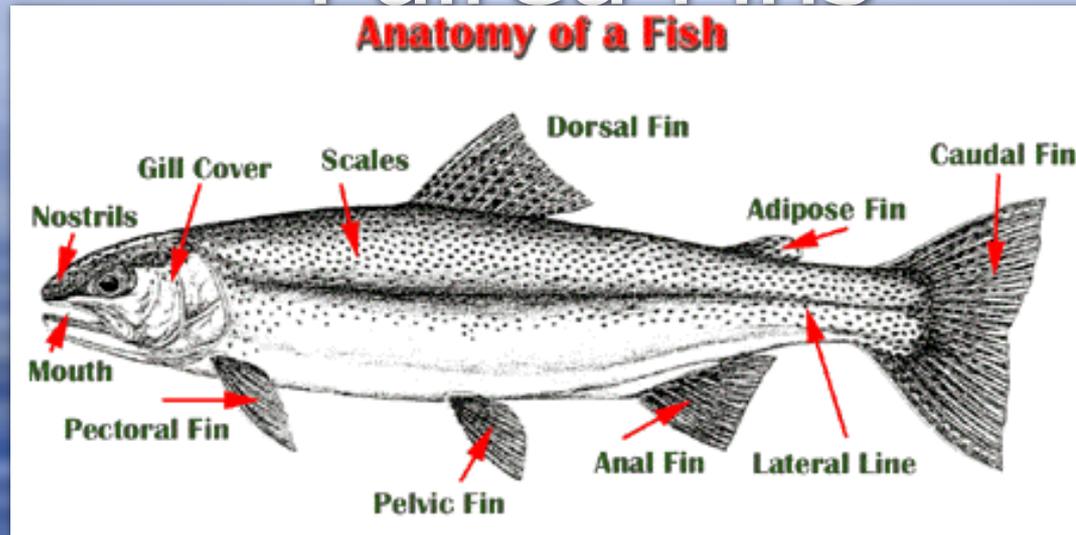
- ◆ Unpaired fins with fin rays of bone or cartilage
- ◆ Dorsal (one or more), caudal, anal
- ◆ Some have adipose (no rays) – Salmonidae, Ictaluridae, Osmeridae



Paired Fins

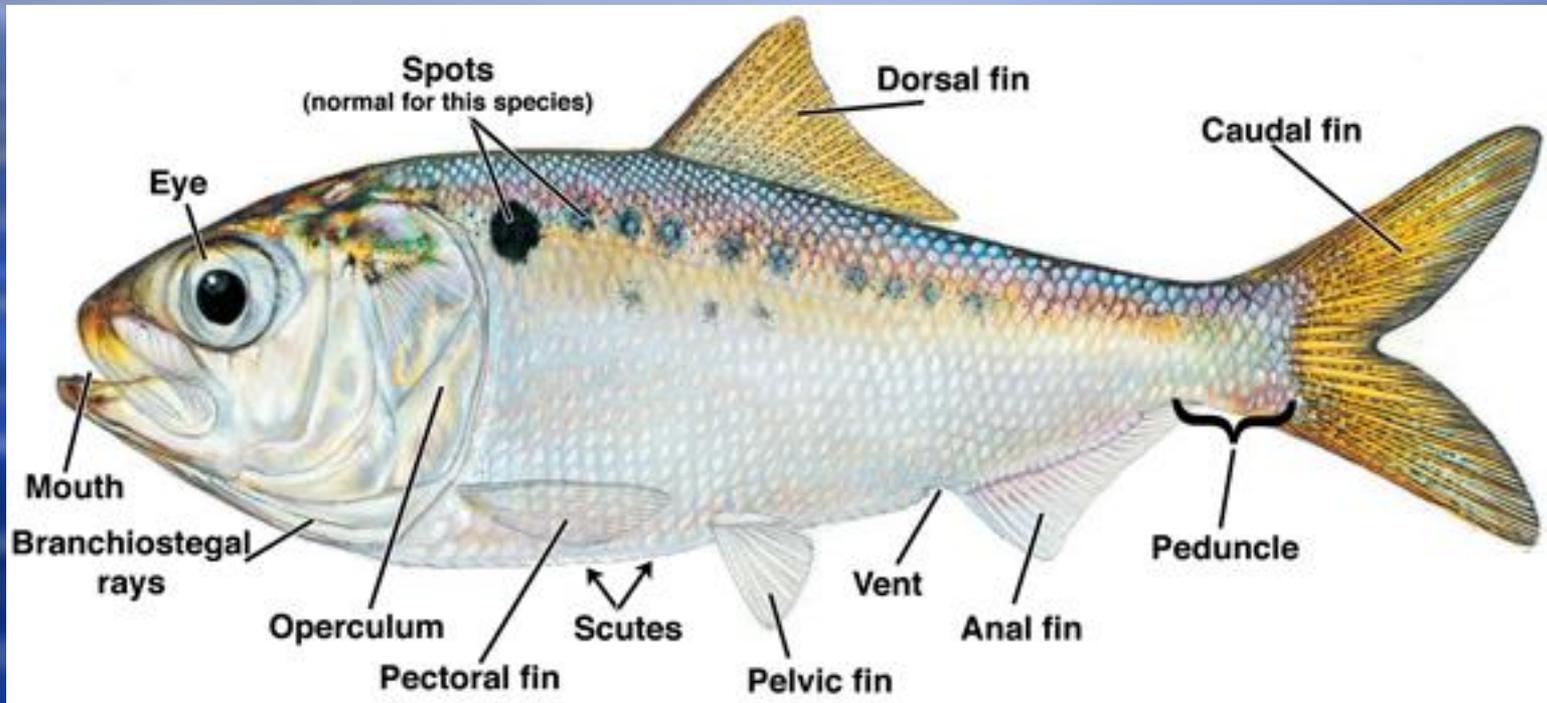


Paired Fins

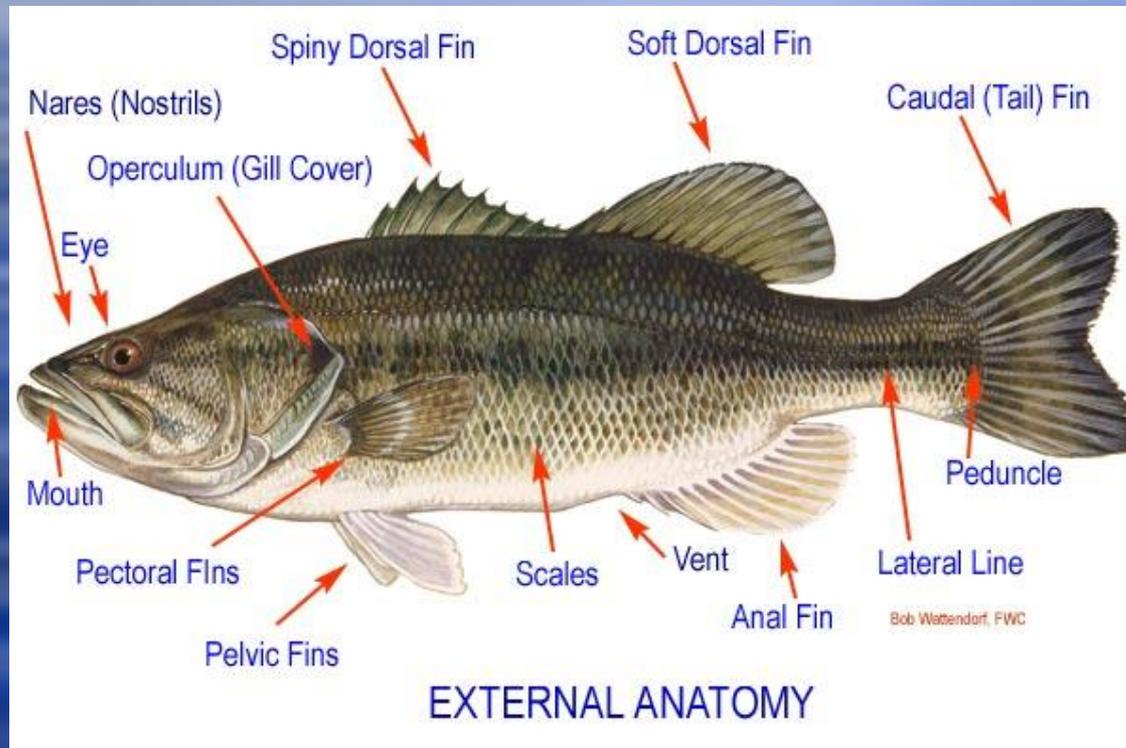


- ◆ Pectoral fins - homologous to front legs
- ◆ Pelvic fins - homologous to hind legs
 - ◆ Abdominal in position in more primitive fishes
 - ◆ Thoracic in position in more advanced fishes

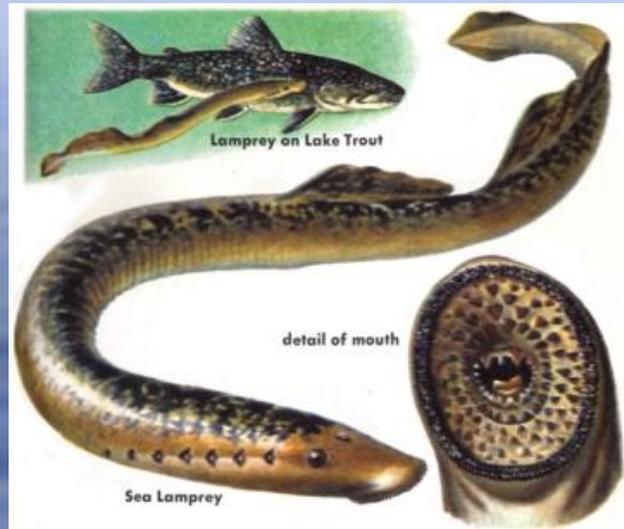
Abdominal pelvics



Thoracic pelvics

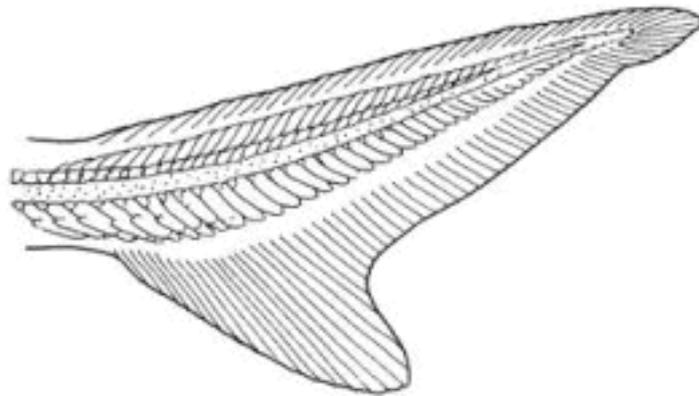


Missing pelvics

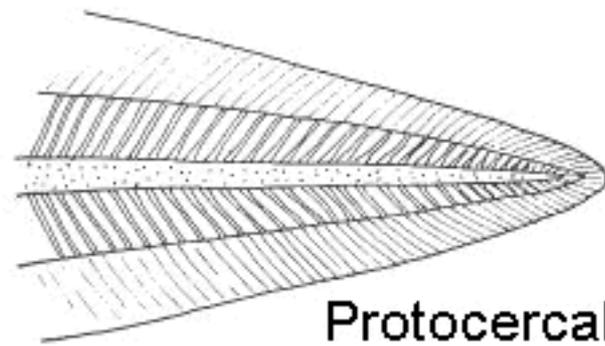


- ◆ Eels, ocean sunfish lack pelvics
- ◆ Lampreys, hagfish lack pelvics, pectorals

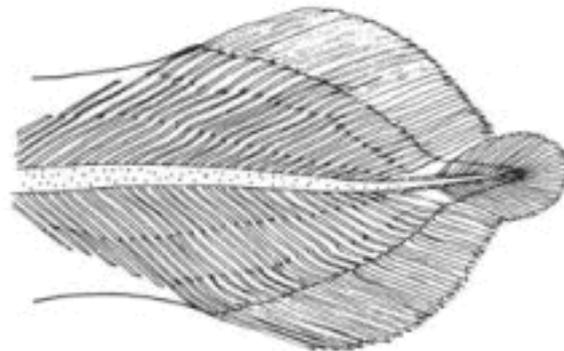
Caudal fins



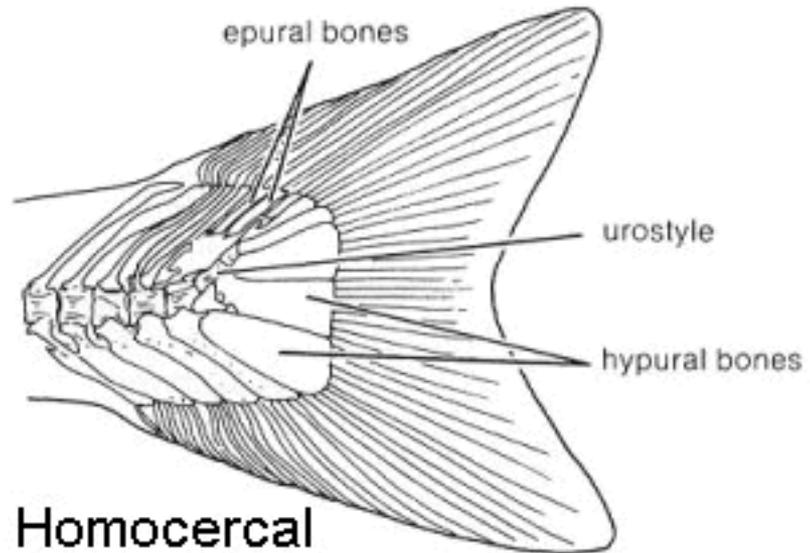
Heterocercal



Protocercal



Diphyccercal



Homocercal

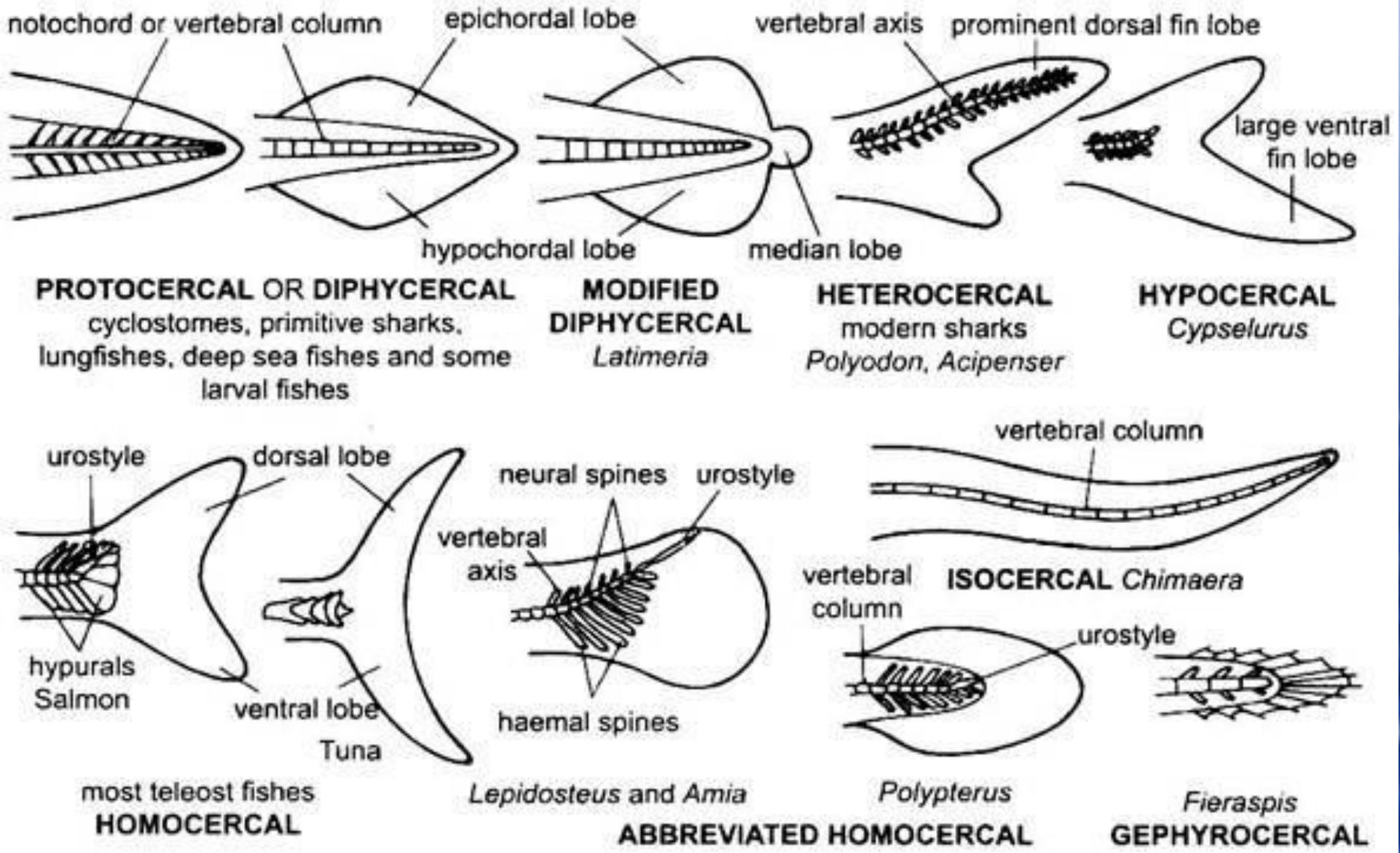


Fig. 17.4. Different types of caudal fins or tails in fishes.

Heterocercal

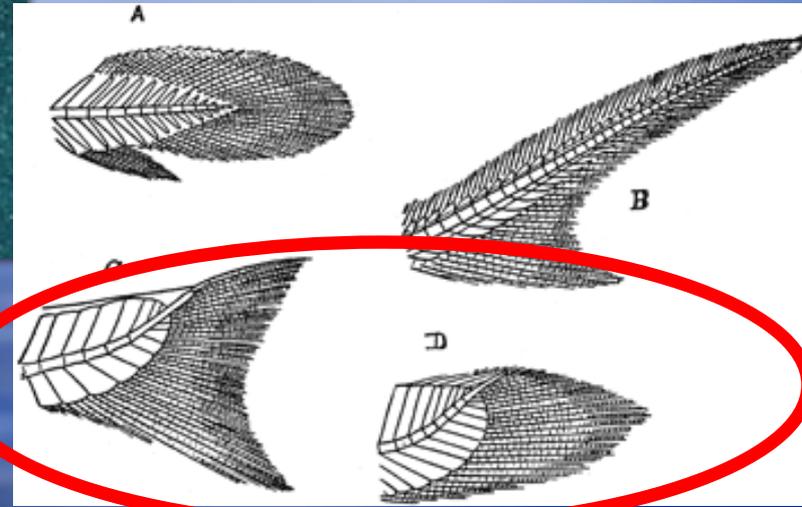
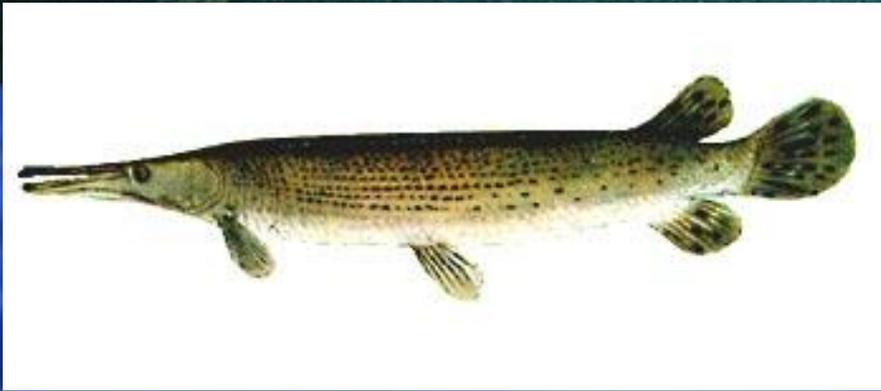


Lake Sturgeon (*Acipenser fulvescens*)



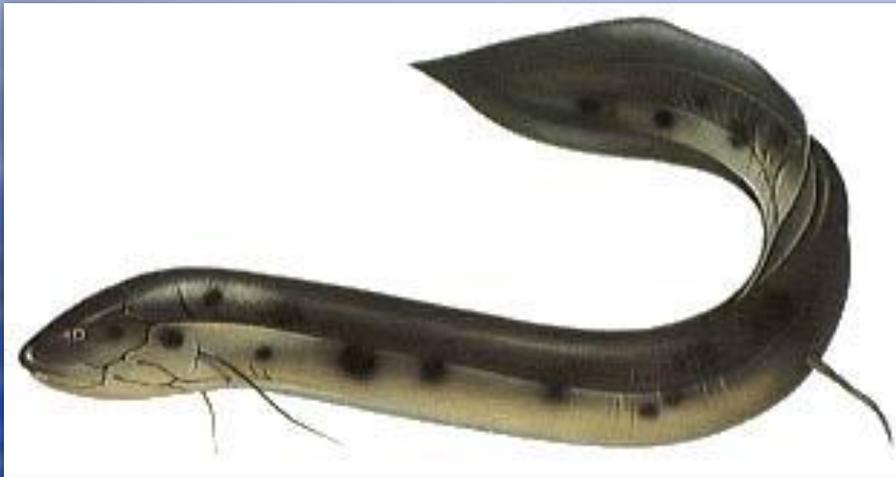
- ◆ Heterocercal - primitive fish like sturgeons, paddlefish, plus cartilaginous fishes
- ◆ Superorder Chondrostei and Class Chondrichthyes

Modified heterocercal



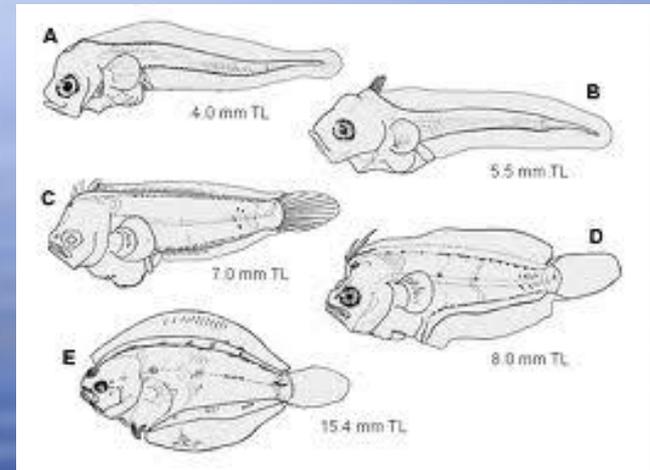
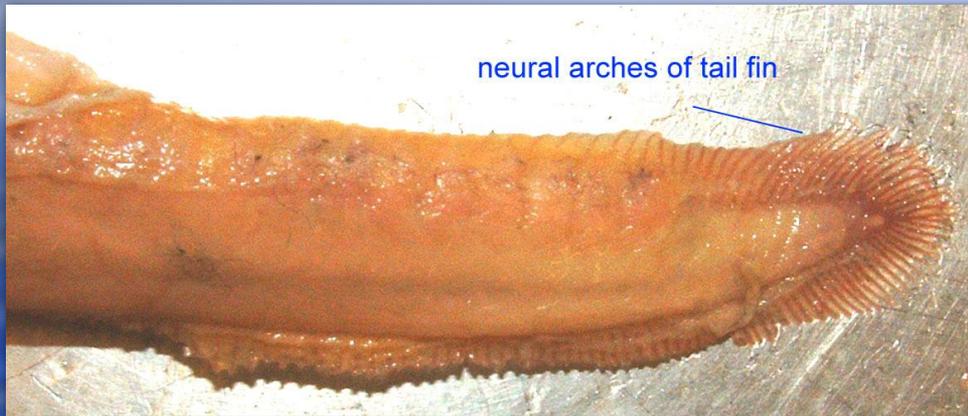
- ◆ Modified heterocercal - bowfin and gars
- ◆ Superorder Holostei (bony ganoids)

Diphycercal



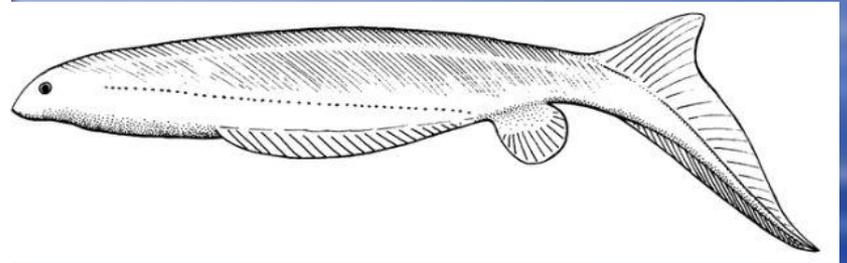
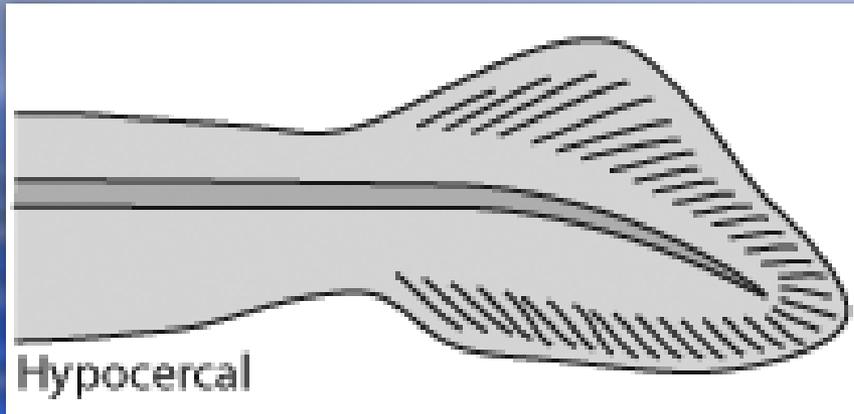
- ◆ Diphycercal - lungfish and crossopterygians
- ◆ Subclass Sarcopterygii (fleshy-finned)

Protocercal



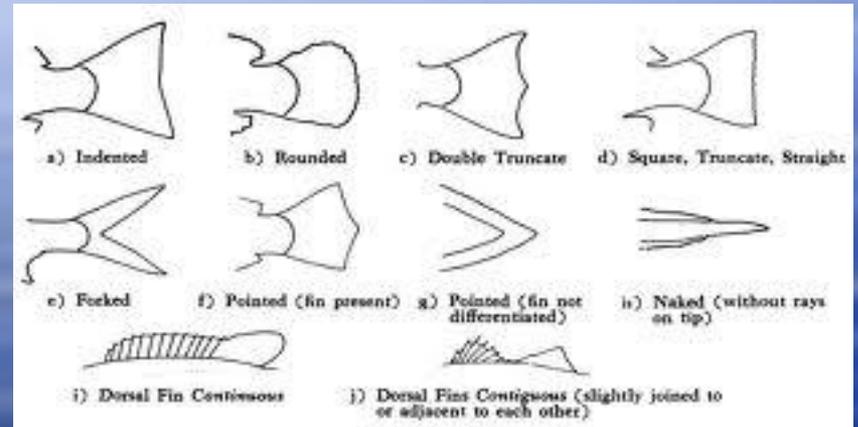
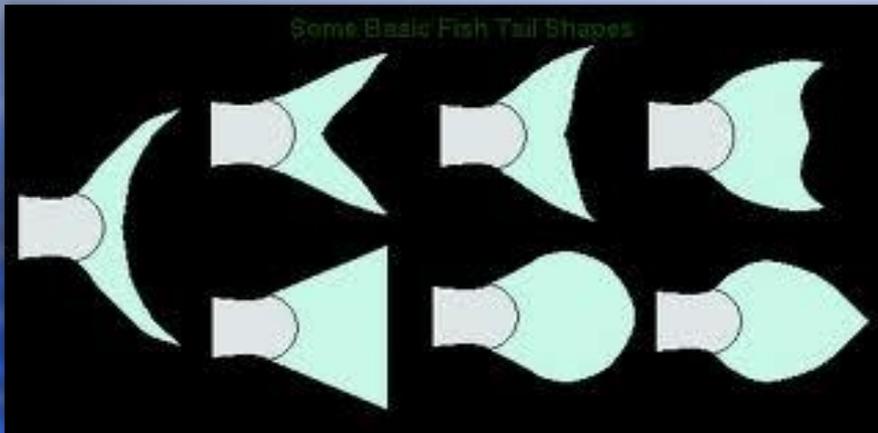
- ◆ caudal fin extends around the vertebral column
- ◆ present in embryonic fish and hagfish

Hypocercal

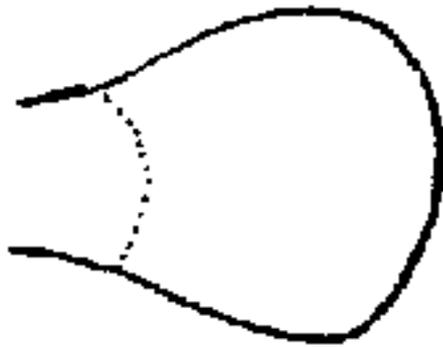


- ◆ Vertebral column extends into lower lobe
- ◆ Fossilized ostracoderms (anapsids)

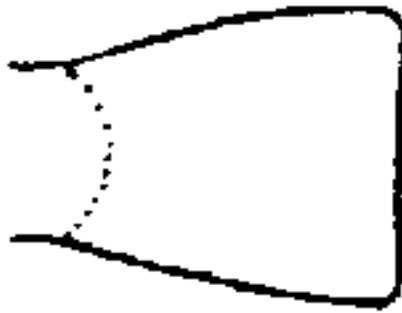
Homocercal



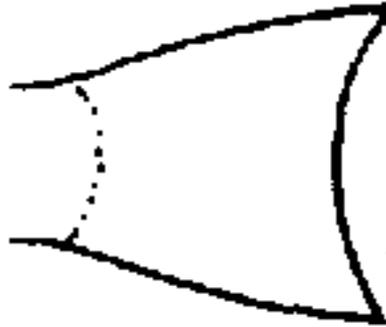
- ◆ Vertebrae do not extend into a tail lobe
- ◆ Fin more or less symmetrical
- ◆ Pointed, rounded, truncate (squared), emarginate, forked, lunate



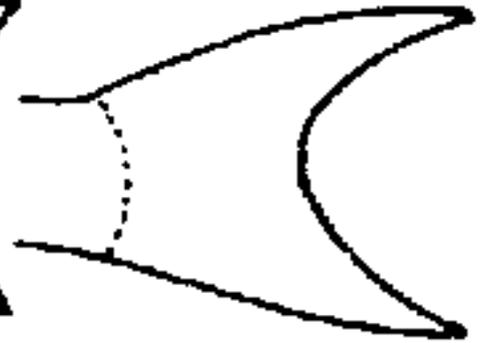
Rounded



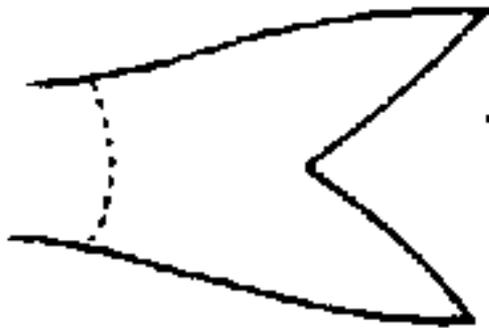
Truncate



Emarginate



Lunate



Forked



Pointed

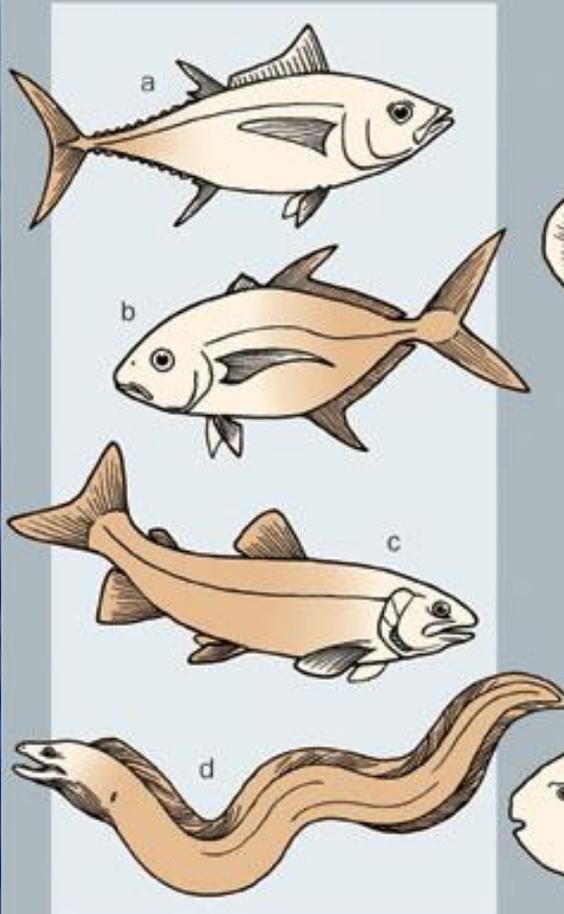


Rhomboid

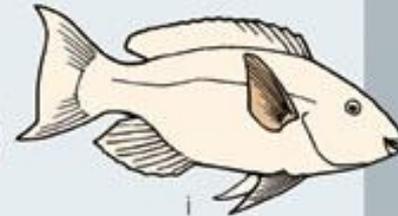
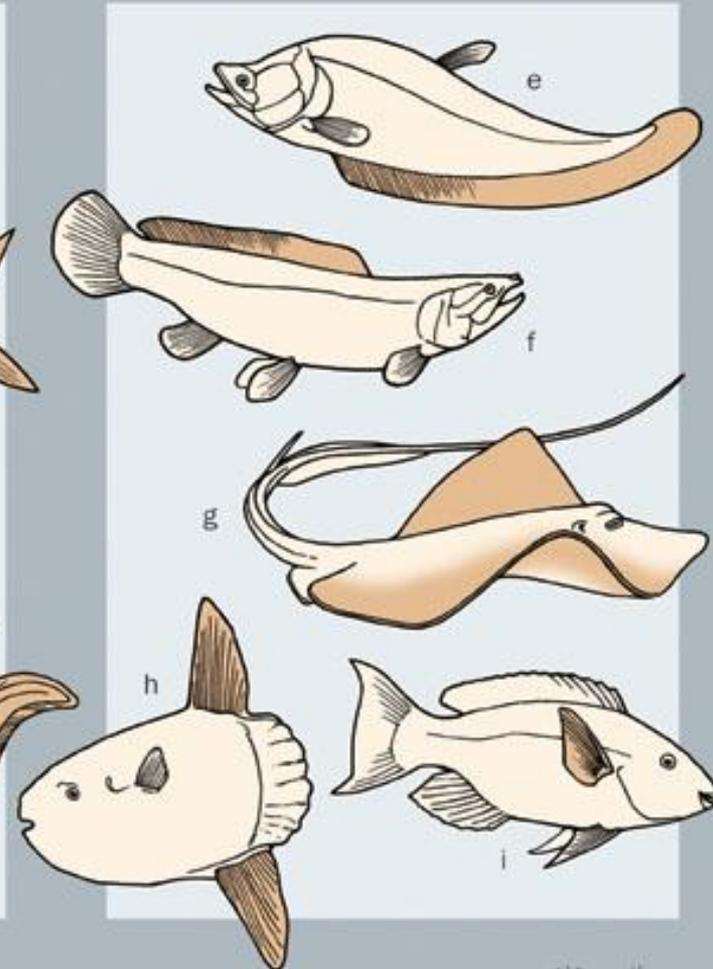
Common caudal fin shapes

Body Shape

Swims with trunk and tail



Swims with fins



Shading represents primary body region that is used during propulsion.

©2002 M. Donaghy

Fish Morphology/ Fish Shape

A			Fusiform (Tuna)
B			Compressiform (Tautog)
C			Depressiform (Skate)
D			Anguilliform (Eel fish)
E			Filiform (Pipe fish)
F			Taeniform (Ribbon fish)
G			Sagittiform (Snake head)
H			Globiform

General Patterns

Fusiform



side



front

Attenuated



Depressed

(flattened-dorso ventrally)



Compressed

(flattened- side to side)



Rover-Predator



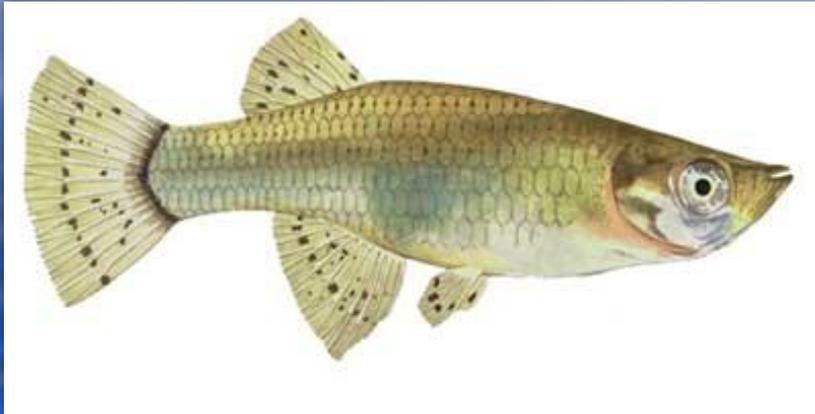
- ◆ Streamlined (fusiform), stability and maneuverability produced by even fin distribution

Lie-in-wait Predator



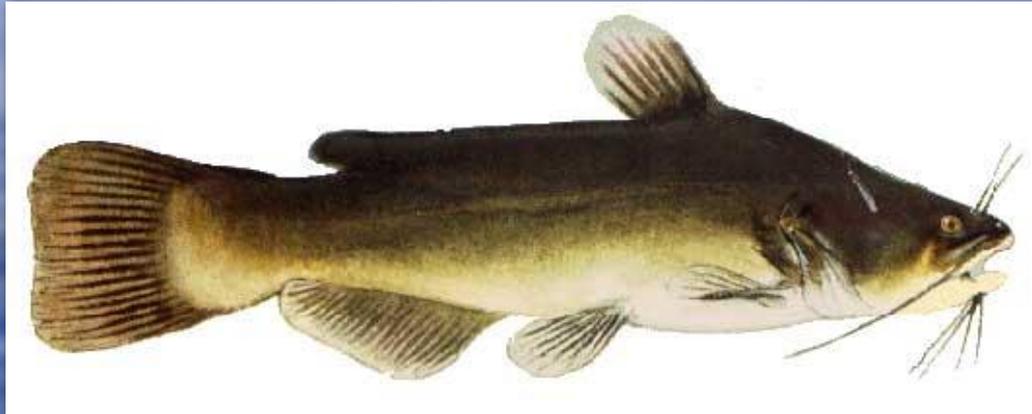
- ◆ Elongate, torpedo-like
- ◆ Pointy head with teeth
- ◆ Thrust generated by large caudal, posteriorly-located dorsal, anal fins

Surface-oriented Fish



- ◆ Small, with upward-directed mouth and DV flattened head
- ◆ Tend to have dorsal fin posterior
- ◆ E.g., mosquitofish

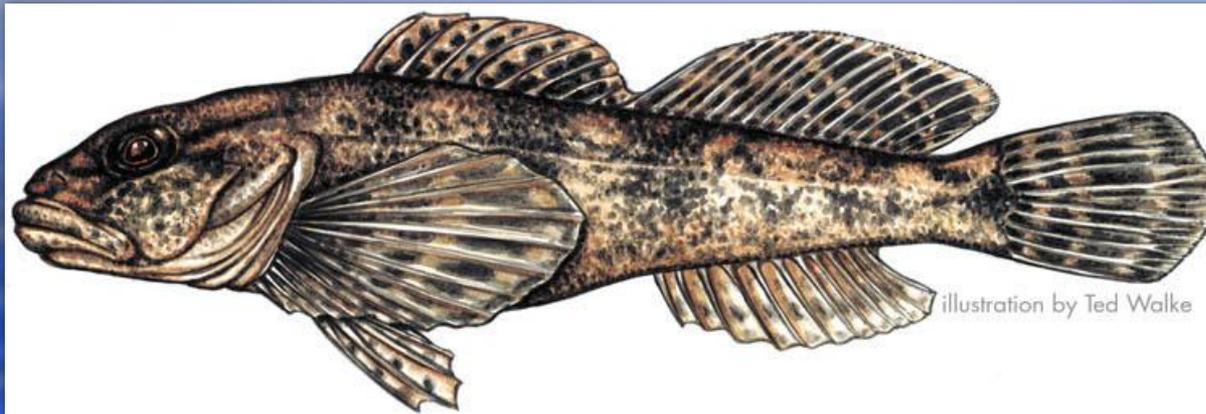
Bottom Rover



- ◆ Flattened heads, fusiform to humped backs, enlarged pectorals, mouths terminal to inferior, barbels
- ◆ Catfishes, sturgeons



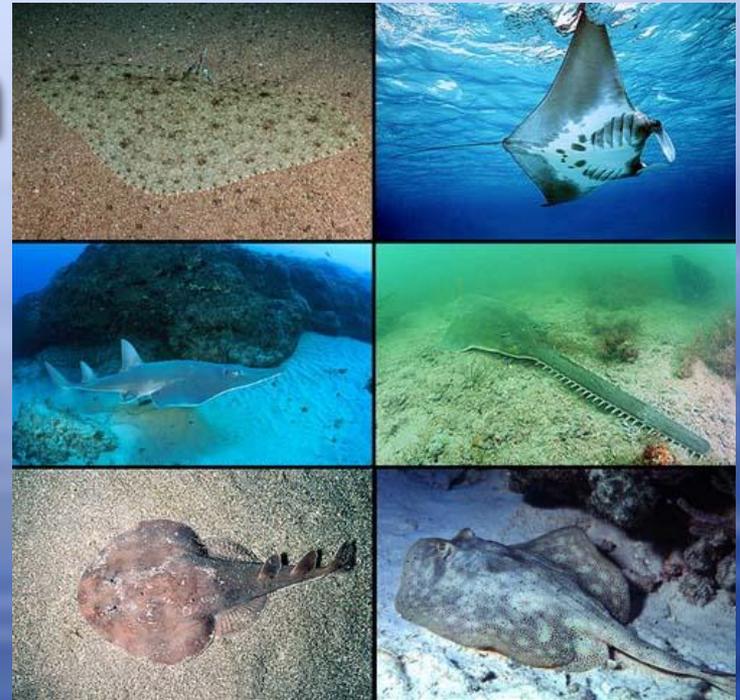
Bottom Clinger



- ◆ Small, with flattened heads, large pectorals, structures to hold to bottom in strong currents
- ◆ Sculpin, gobies, clingfishes

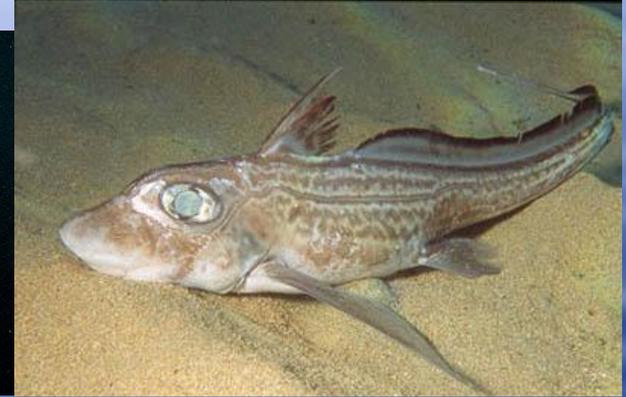
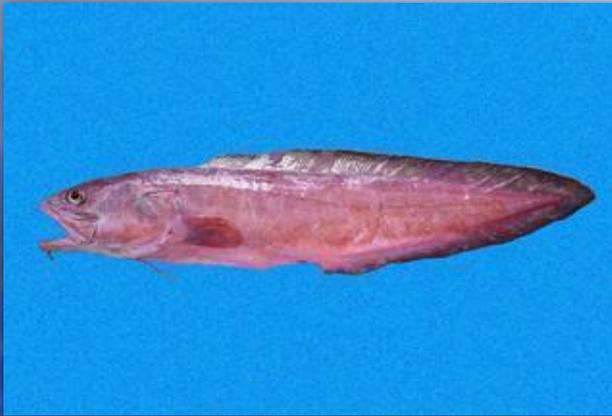


Flatfish



- ◆ Extreme flattening for life on bottom
- ◆ Lateral – live on side – flounders, halibut
- ◆ Dorsoventral – skates, rays

Rattail Fish



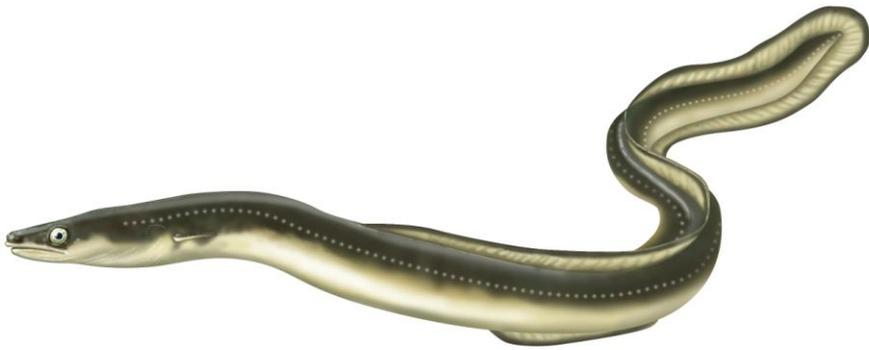
- ◆ Large heads, pointy snouts, large pectorals, rat-like tails
- ◆ Benthic deepsea dwellers
- ◆ Genadiers, brotulas, chimaeras

Deep-bodied Fish



- ◆ Laterally flattened, small mouth, short snout
- ◆ Body depth $\geq 1/3$ standard length
- ◆ Adapted for maneuverability

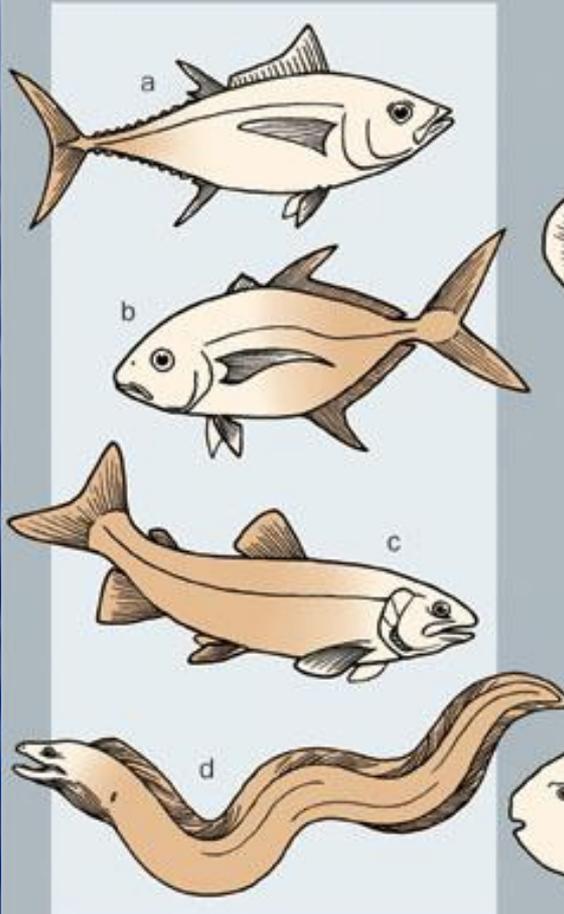
Eel-like Fish



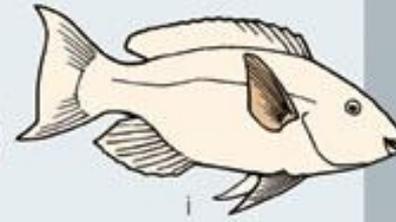
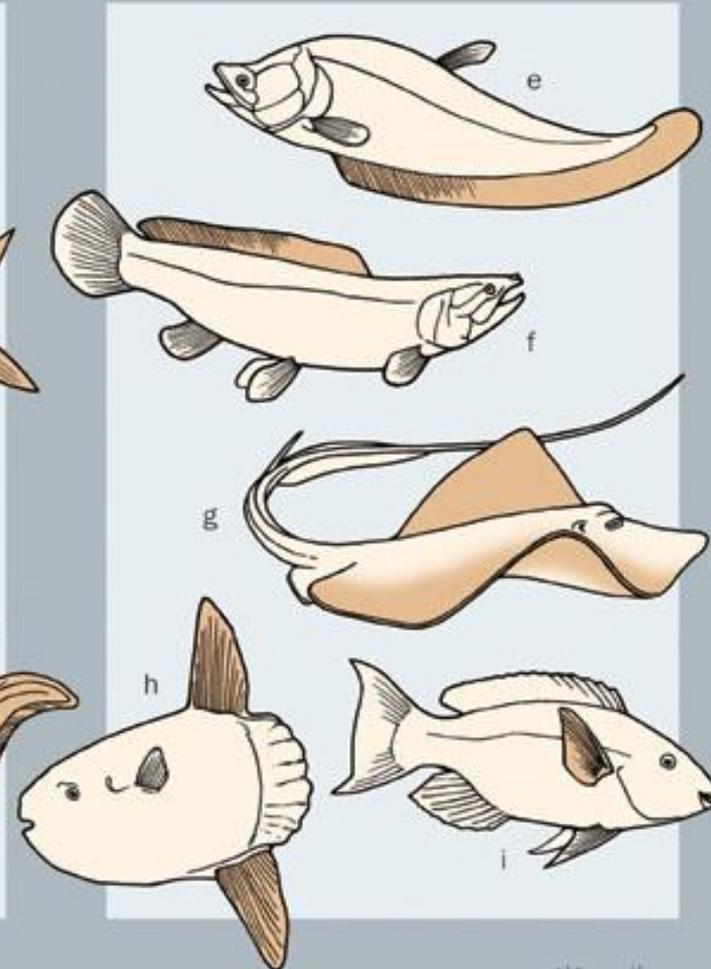
- ◆ Elongate bodies adapted for entering holes, crevices
- ◆ May be missing paired fins
- ◆ Eels, loaches

Body Shape

Swims with trunk and tail



Swims with fins



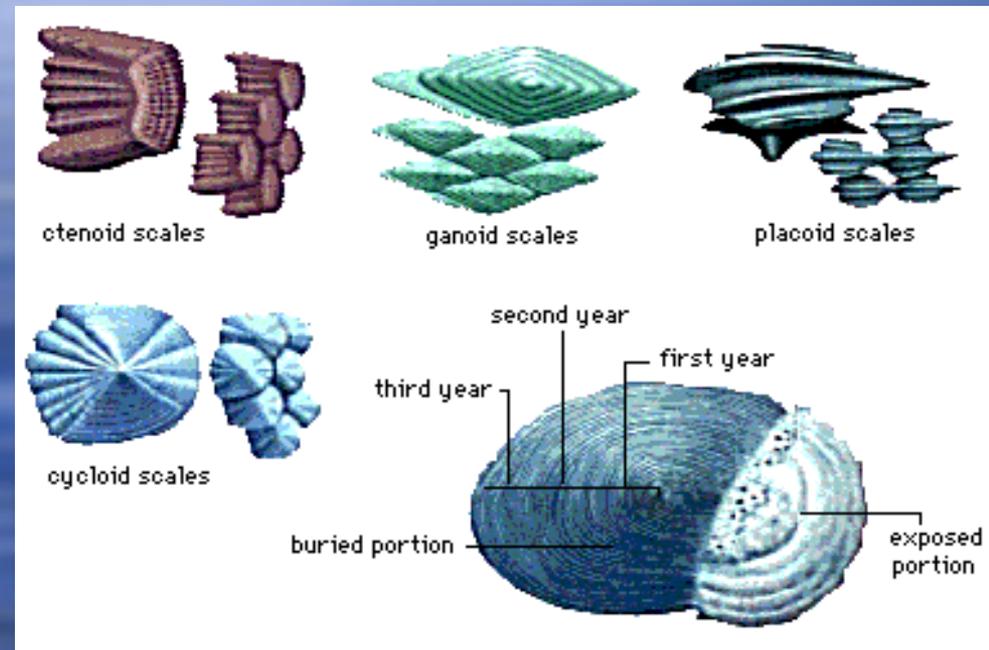
Shading represents primary body region that is used during propulsion.

Scales

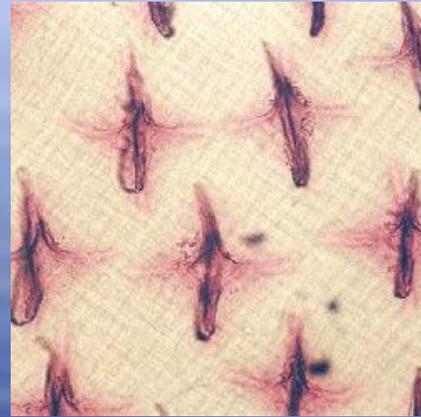
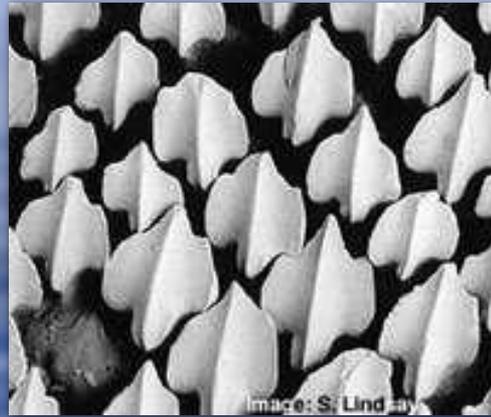


Types of scales

- ◆ Placoid
- ◆ Ganoid
- ◆ Elasmoid (bony ridge)
 - ◆ Cycloid
 - ◆ Ctenoid



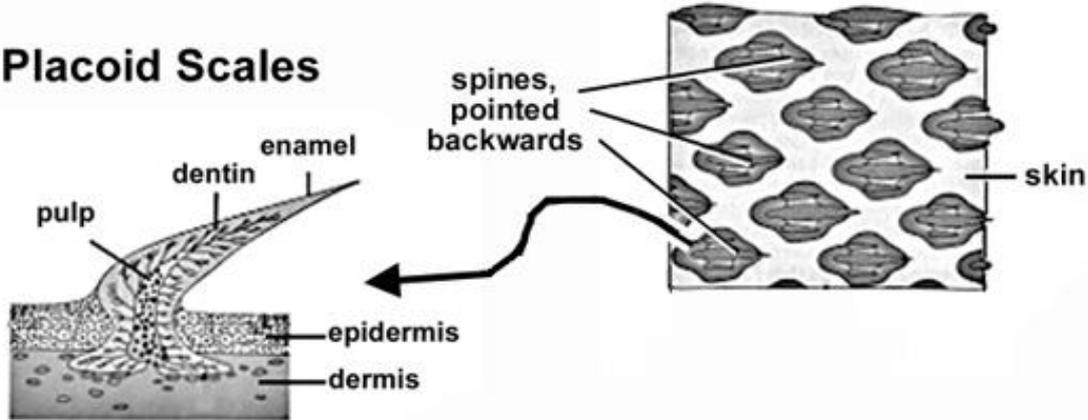
Class Chondrichthyes



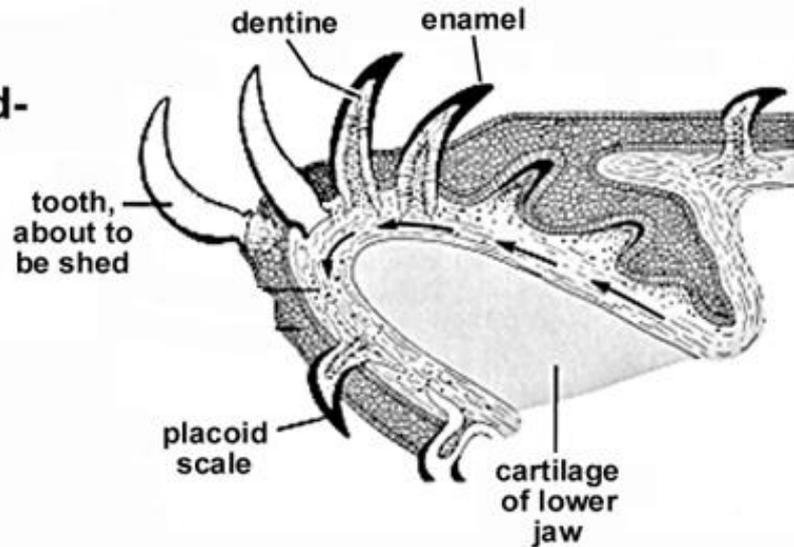
- ◆ Skin contains placoid scales
- ◆ Similar in structure to teeth
- ◆ Dentine-like core surrounded by enamel-like covering

Class Chondrichthyes

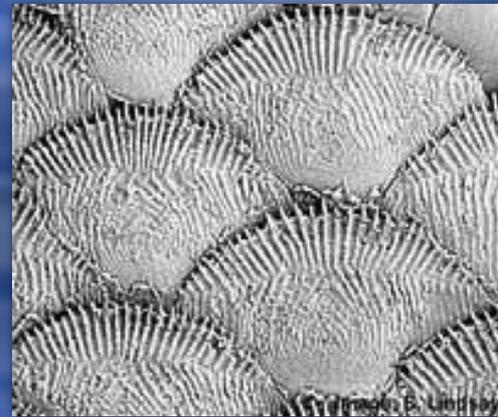
Placoid Scales

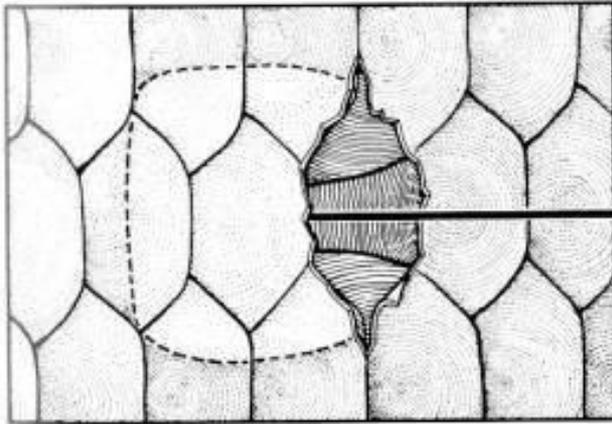


Jaw Longitudinal Section, With Teeth

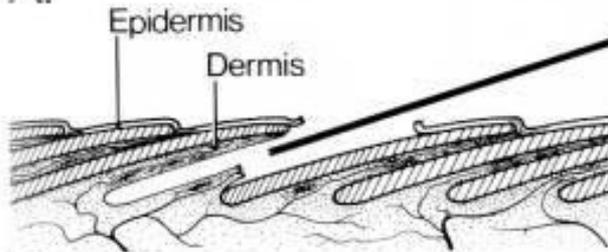


- ◆ Skin of most bony fishes is covered with mucous glands and embedded dermal scales

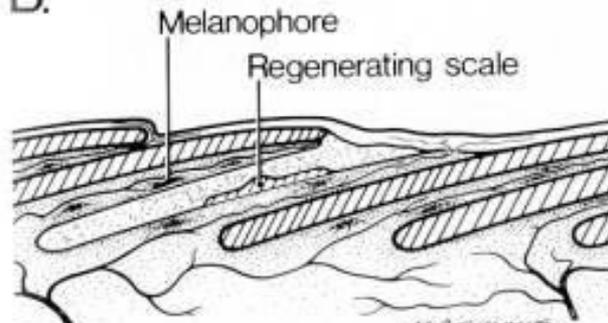




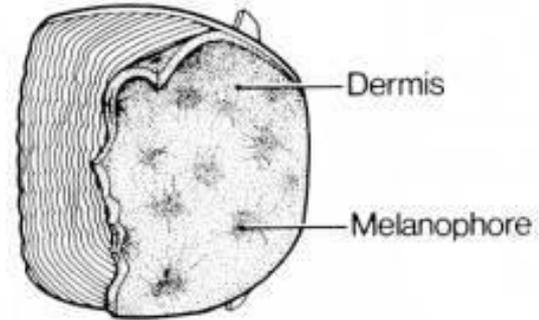
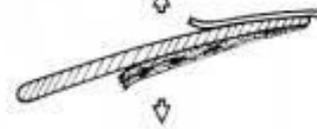
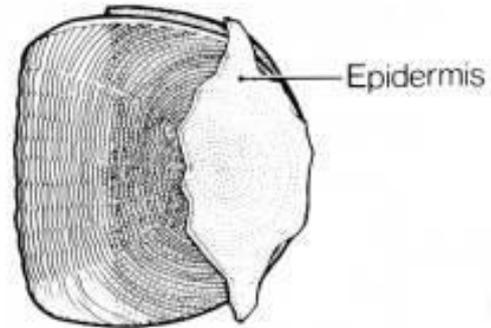
A.



B.



C.



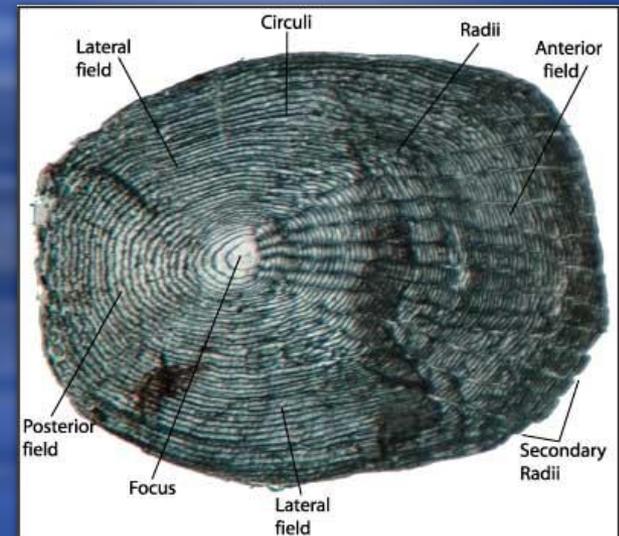
Class Osteichthyes

- ◆ Ganoid or rhomboid scales (ganoin)
- ◆ Heavy, diamond-shaped, non-overlapping
- ◆ Primitive fish like gars



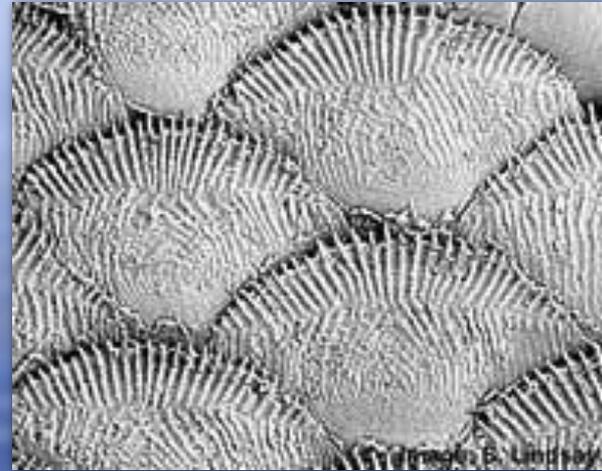
Class Osteichthyes

- ◆ Cycloid scales - roughly circular
- ◆ Thin, flexible, overlapping
- ◆ Modern bony fishes such as minnows, suckers, trout



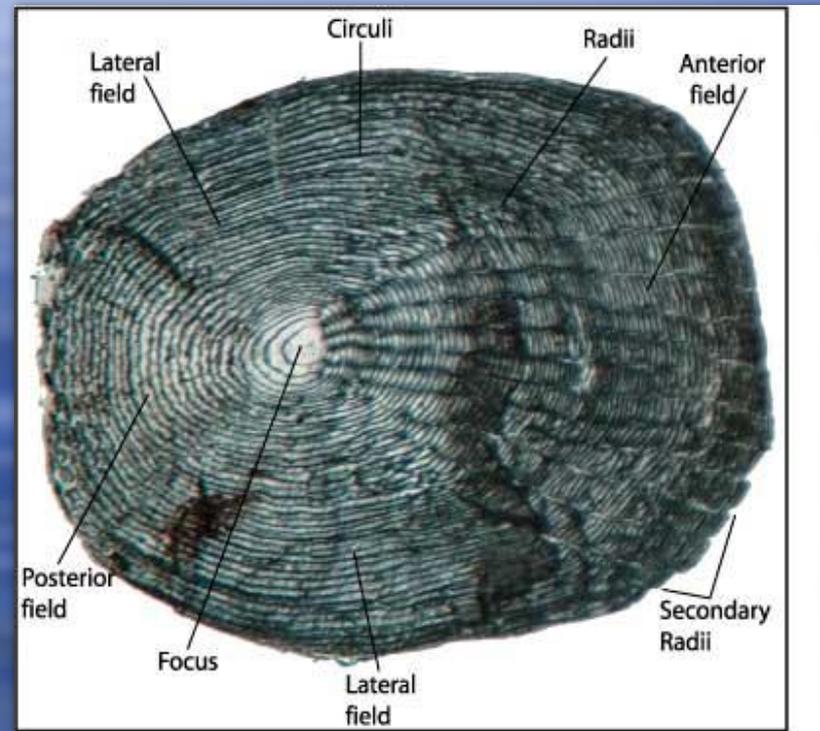
Class Osteichthyes

- ◆ Ctenoid scales - with minute ctenae or teeth - roughly rectangular
- ◆ Thin, flexible, overlapping
- ◆ Modern bony fishes such as sunfishes, perches



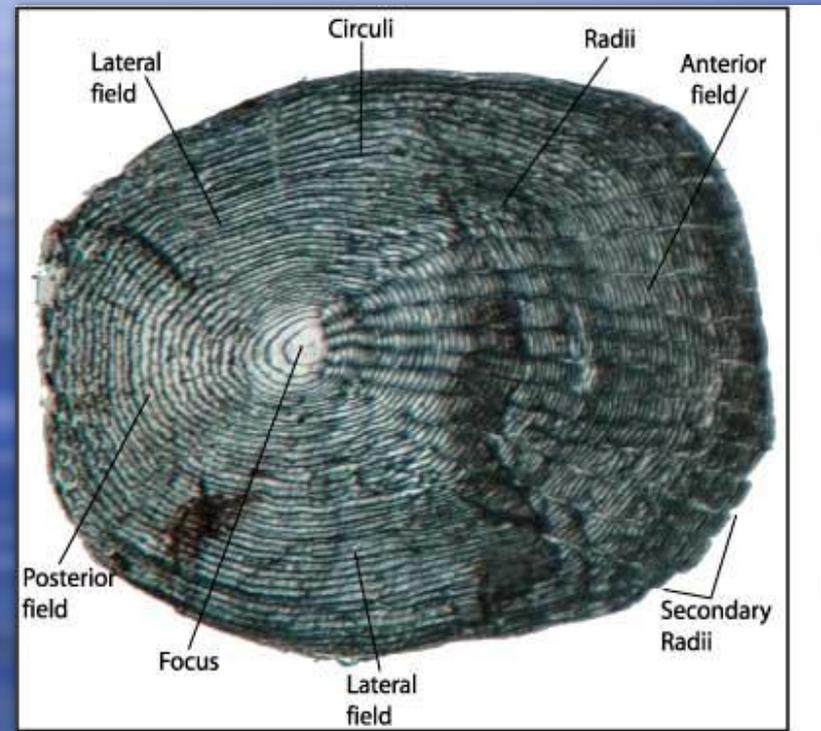
Class Osteichthyes

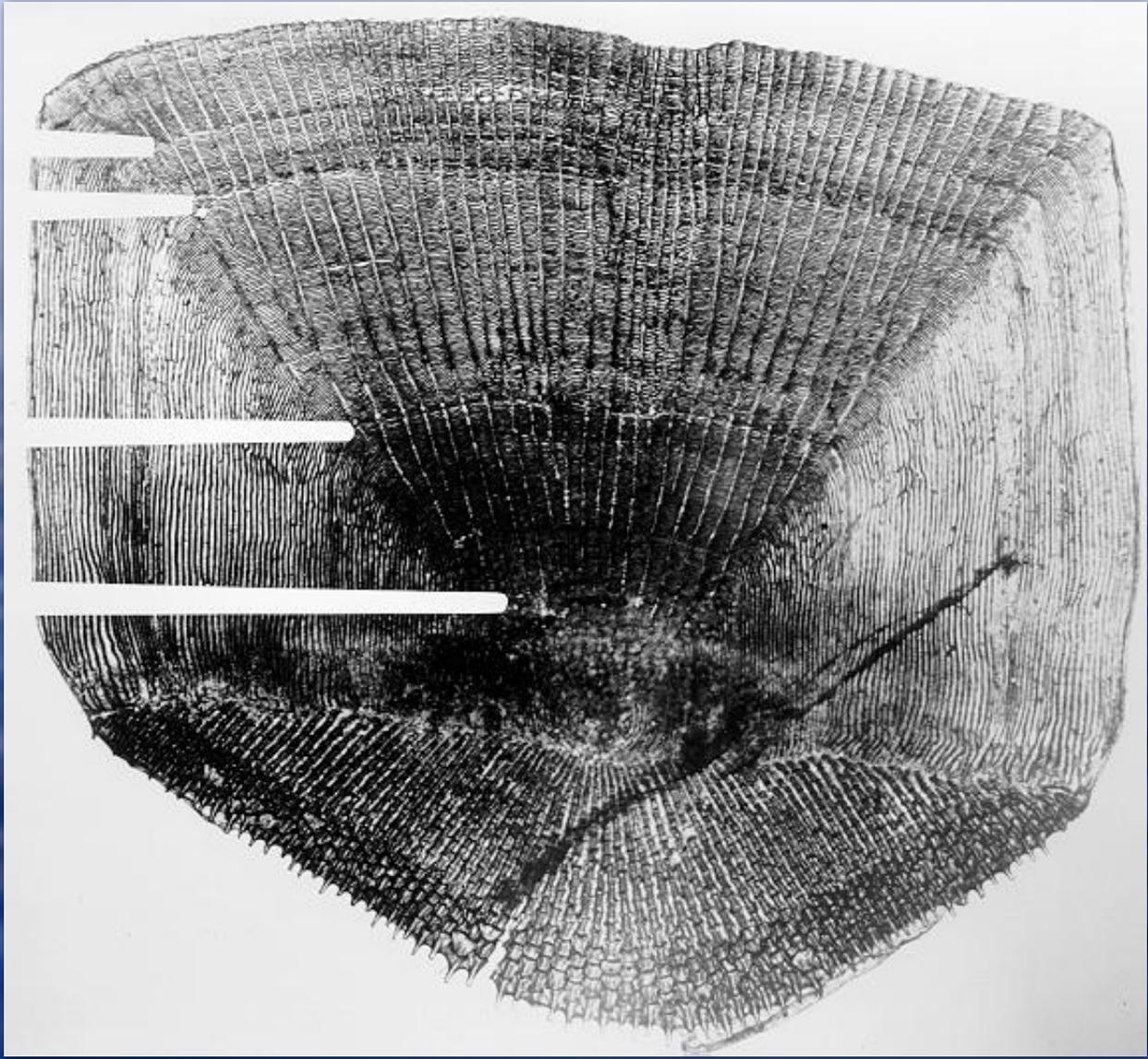
- ◆ Fish growth is reflected in scale growth
- ◆ Larger fish have larger scales
- ◆ Scales continually growing - temperature dependent

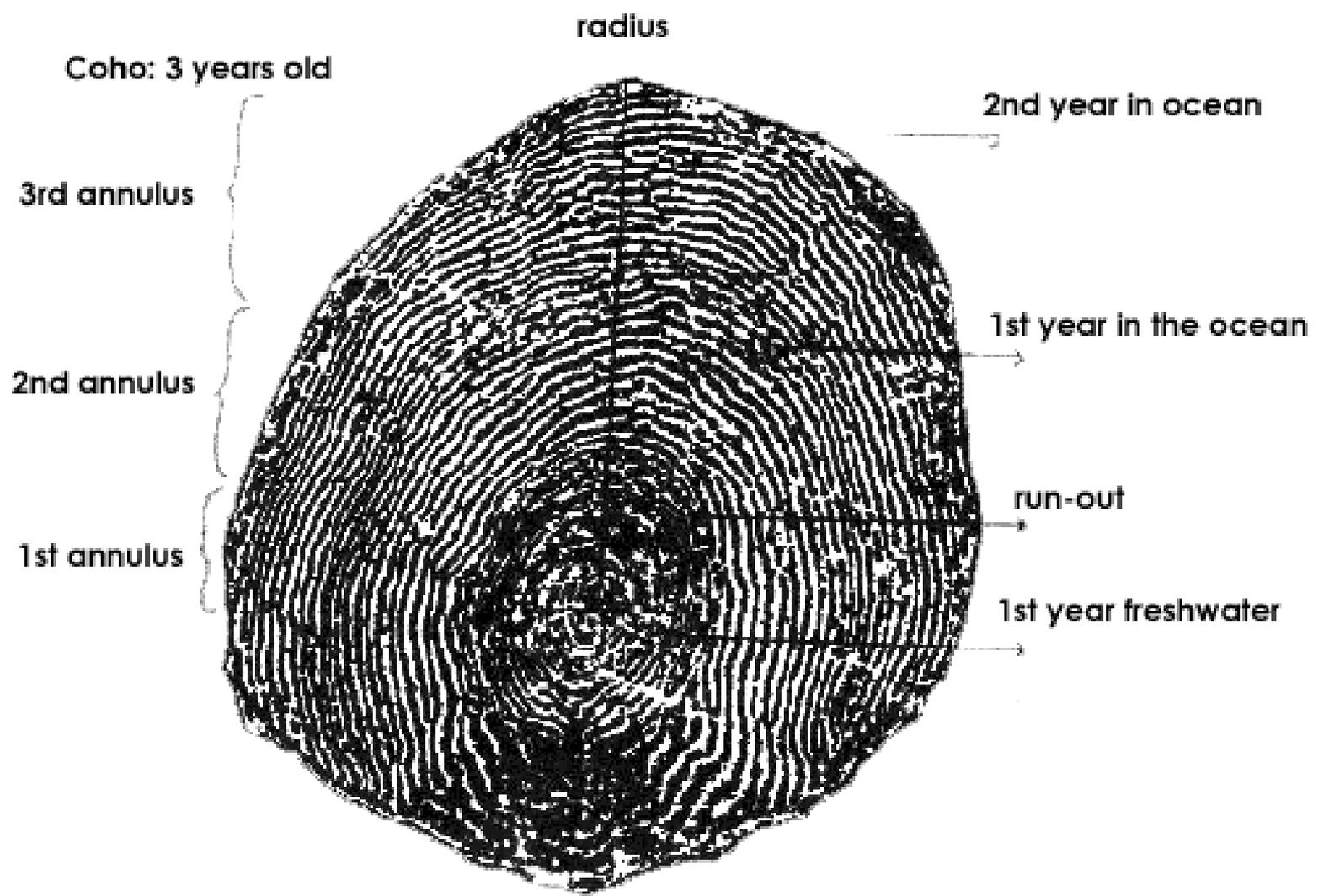


Class Osteichthyes

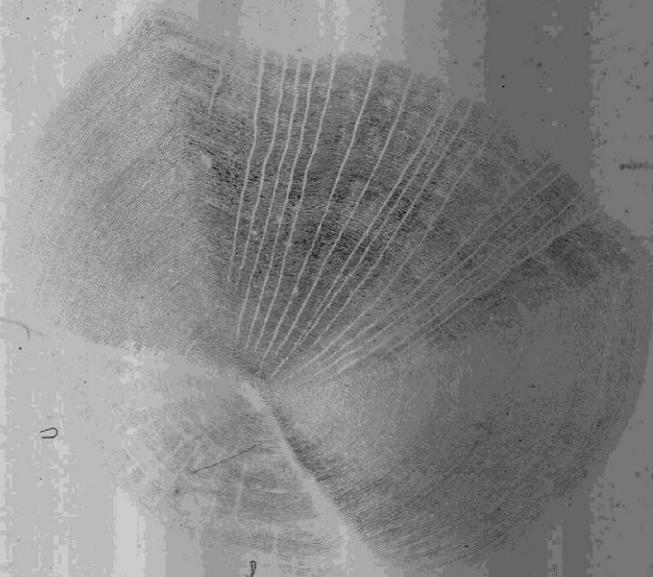
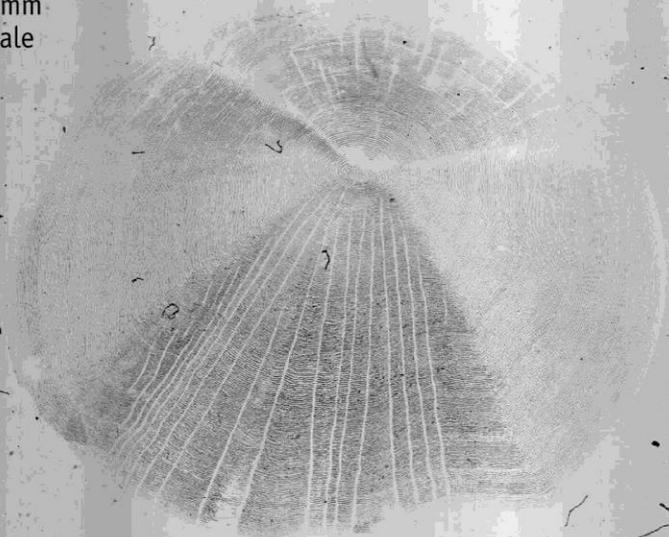
- ◆ Able to determine age of fish in areas with winter - greatly reduced growth
- ◆ “Rings” get closer together and form bands







Hiodon tergisus
300mm
female
7+





Barbels



Barbels



- ◆ Found in fishes in many groups
- ◆ Catfishes
- ◆ Loaches
- ◆ Sturgeons
- ◆ Minnows
- ◆ Others

Catfishes



Loaches



Sturgeons



© Pat Morris / www.ardea.com

Minnows



Hagfishes



Cod

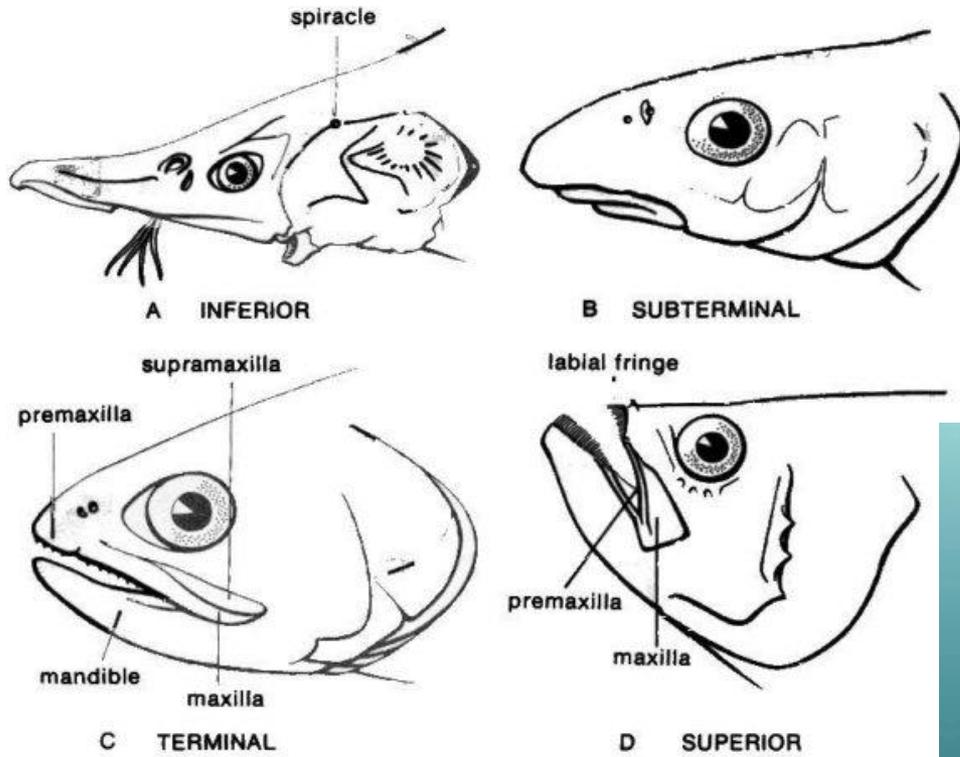


Barbels

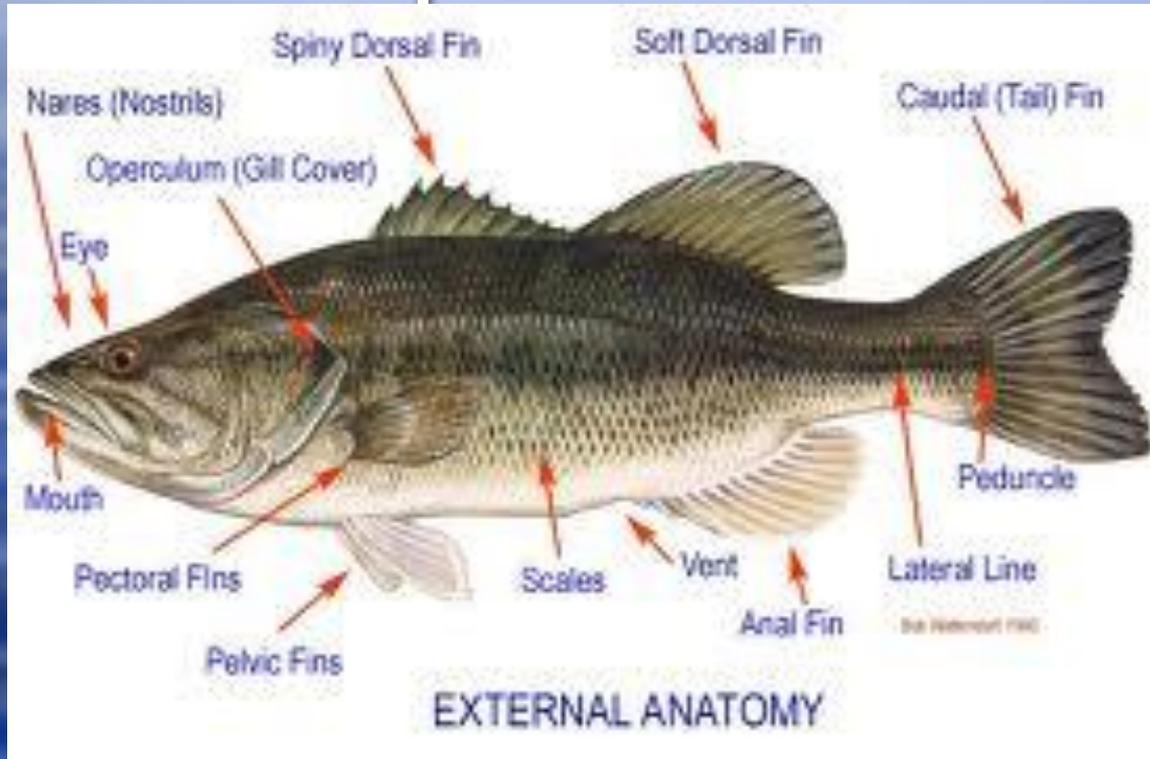
- ◆ Slender tactile organs near the mouth
- ◆ Taste buds – used to search for food in murky water
- ◆ Maxillary, nasal, mandibular or mental (chin)



Mouths



Gill Openings – single operculum



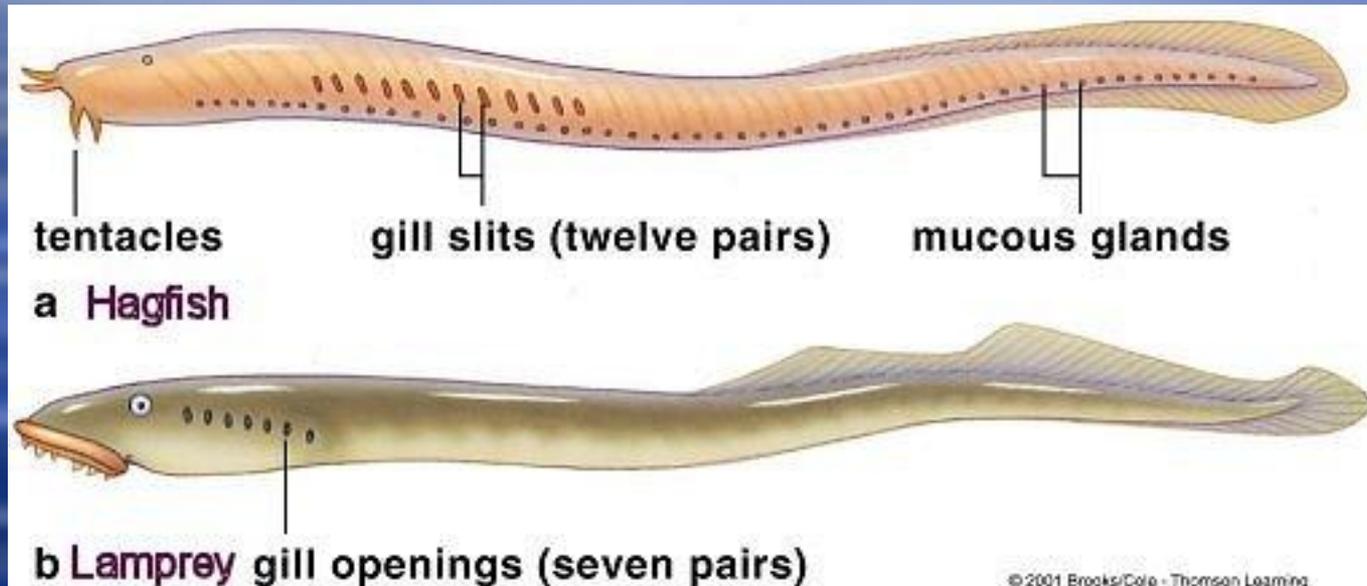
Gill Openings - 5-7 slits



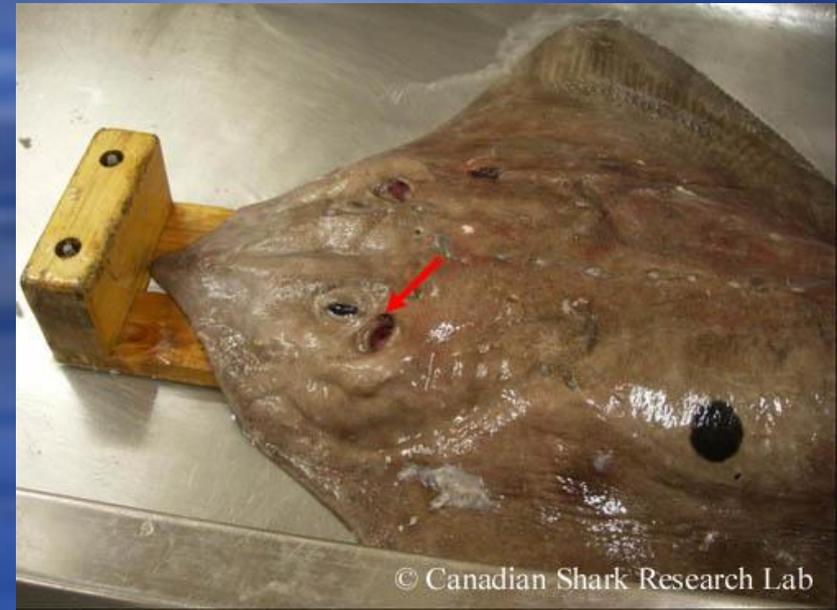
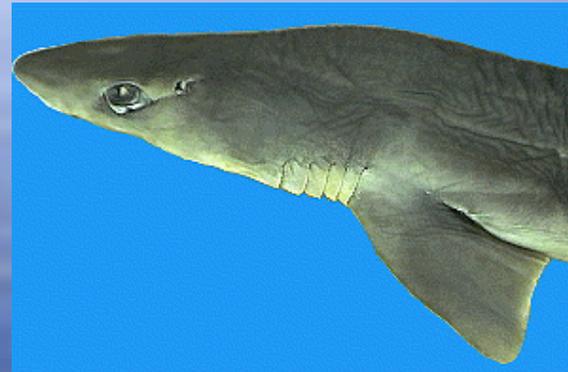
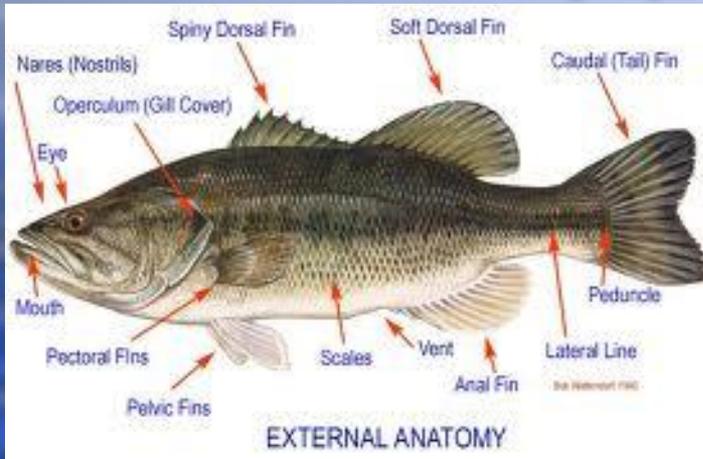
Gill Openings - 7 pores



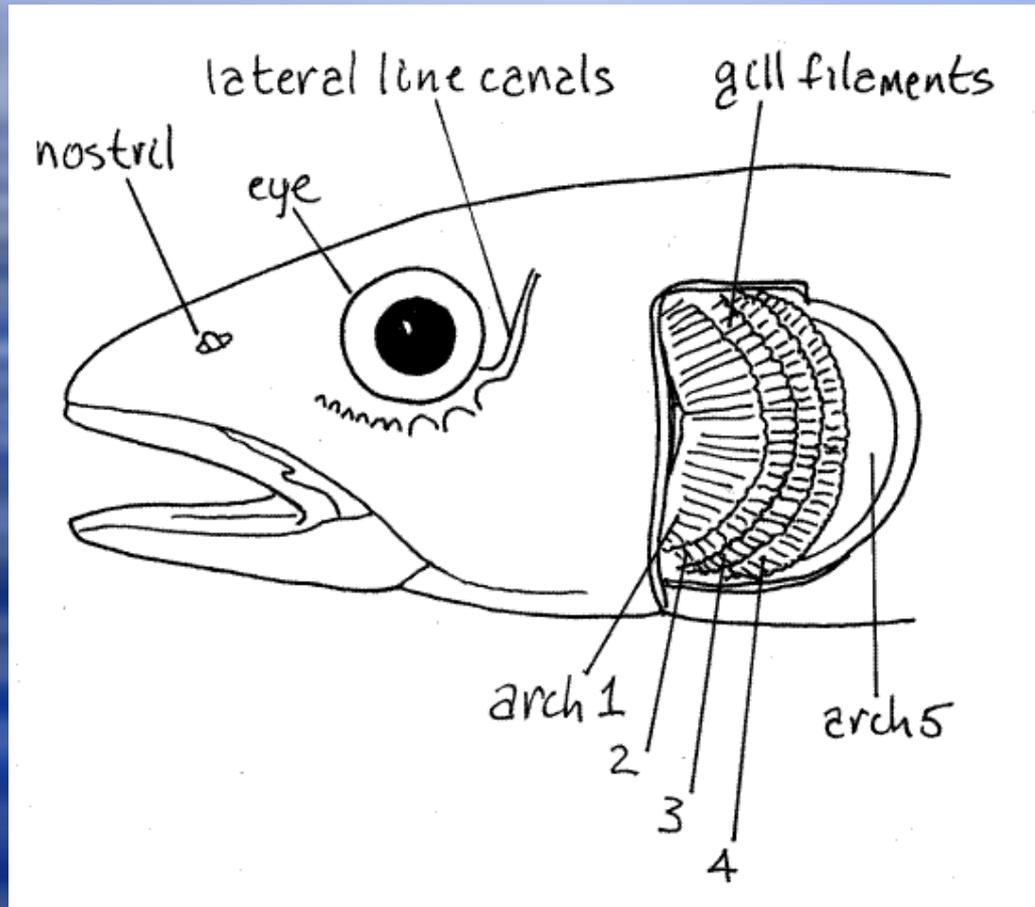
Gill Openings



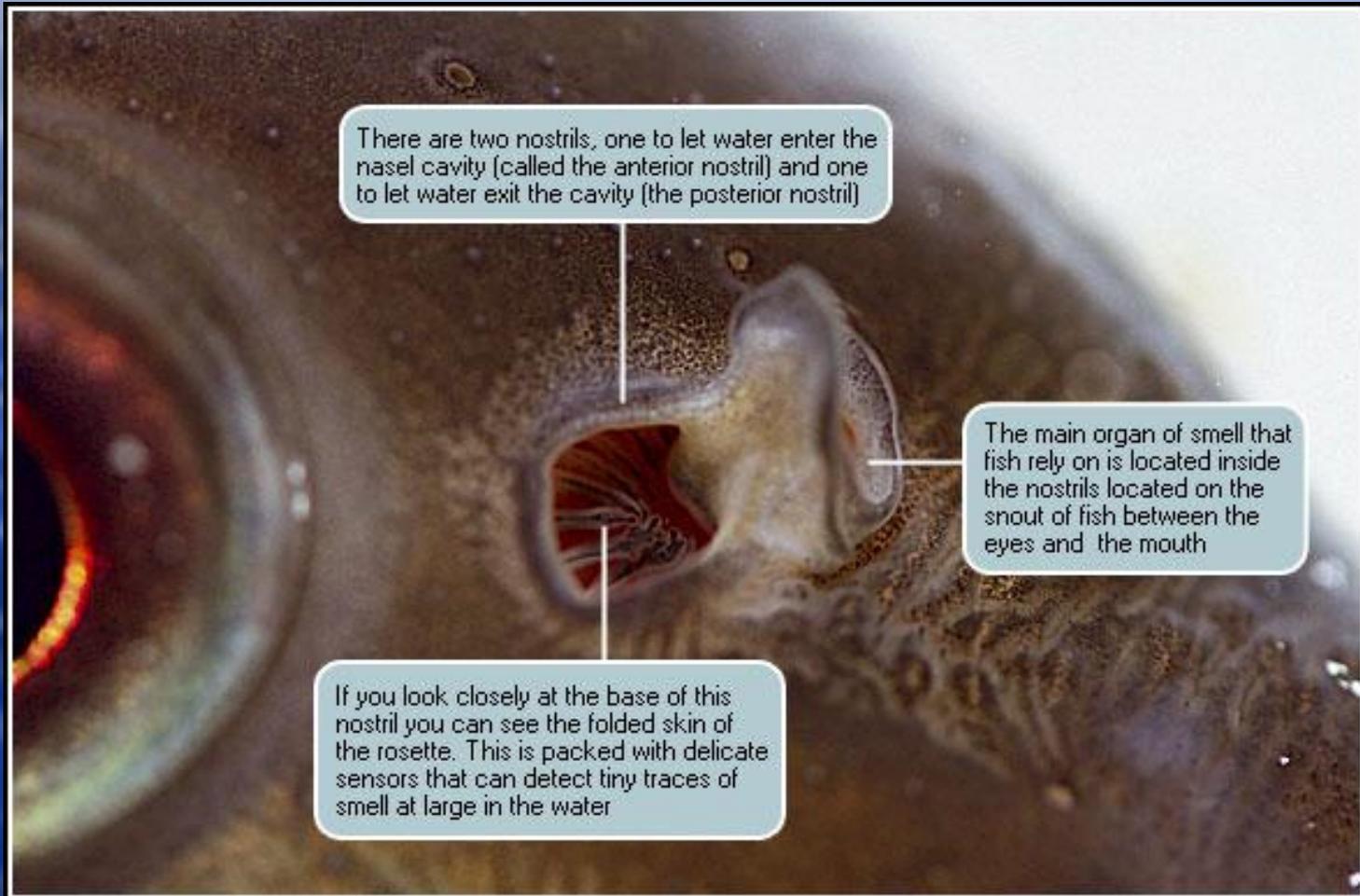
Oxygenated H₂O Intake (spiracles)



Nostrils

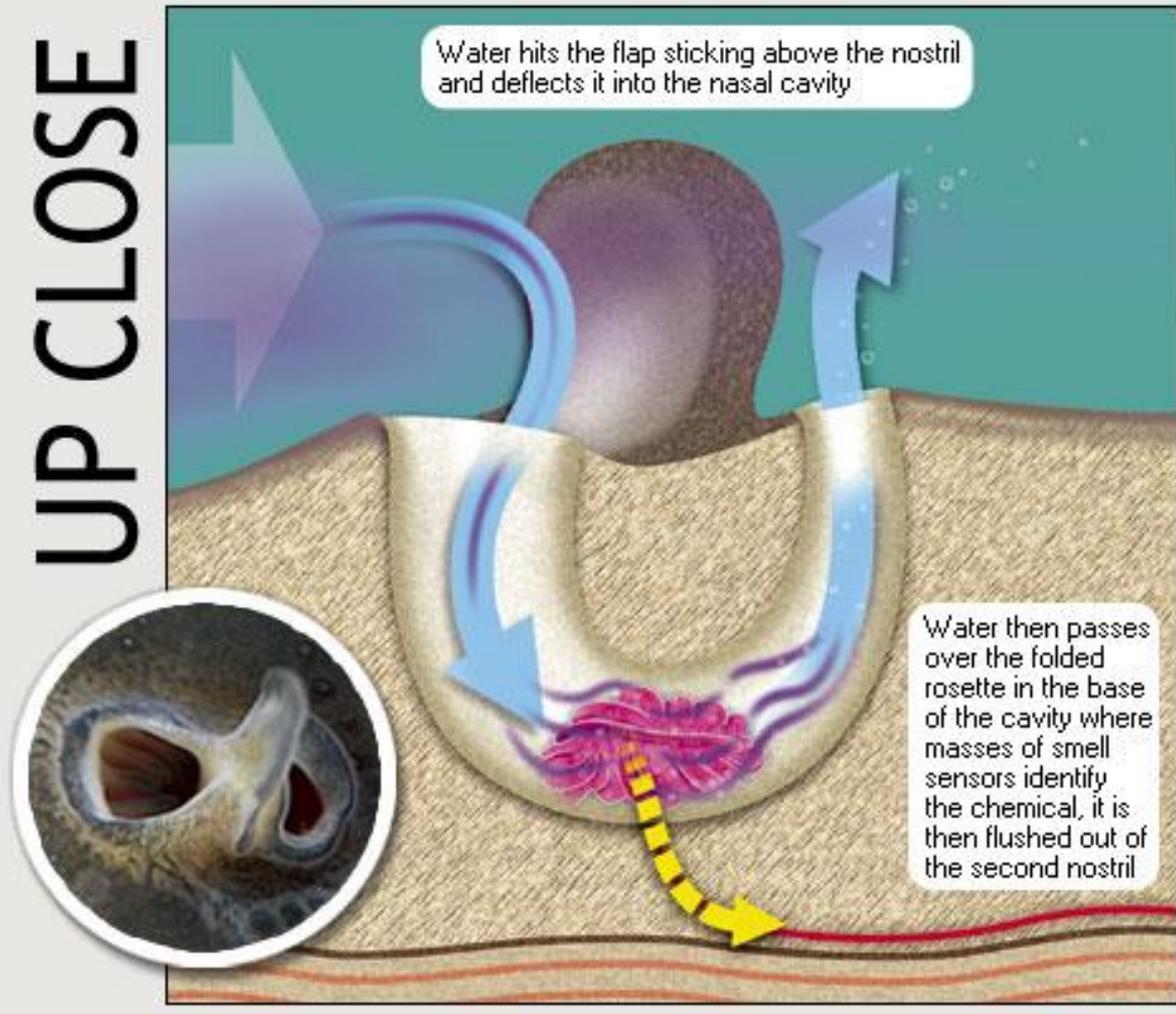


Nostrils



Nostrils

UP CLOSE



Lateral Line

