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Oral region and associated structure

Dr. Amrutha Gopan
Assistant Professor
School of Fisheries

Centurion University of Technology and Management
Odisha



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Adaptations for feeding

(The feeding habits or feeding behaviour of fishes is the search for and ingesting of food)

The diversity in feeding habits that fishes exhibit is the result of evolution leading to structural adaptation for getting food from the environments.

The structural adaptation of feeding organs such as

- 1) position and shape of the mouth
- 2) Presence or absence of “Teeth”.
- 3) Gap of the mouth etc.,

greatly help in predicting the nature of food and mode of feeding of the fish (in question).



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Major feeding types :

On the basis, fishes can be classified, according to their feeding habits as

- 1) Predators
- 2) Grazers
- 3) Food strainers
- 4) Food suckers and
- 5) Parasites.



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1) Predators

Fishes that feed on macroscopic animals, they usually have well developed grasping and holding teeth as in many sharks (Elasmobranch) the Barracuds (Sphyraena), the pikes (Esox) gars (Lepisosteus).



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2) Grazers

In Grazing, the food is taken by bites or continual browsing (Grazing characterize many fishes that feed on planktons or on bottom organisms) (sometimes organisms are taken single or at other times in small groups) may feed on bottom or column – a bluegill (*Lepomis macrochirus*), Parrot fishes (scaridae) Butterfly fishes (chaetodontidae) browsing on coral reef.



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3) Strainers (Filter feeders)

Filter the water for plankton, here foods are selected by size and not by kind.

Herring clupidae, Gizzard, shads (Dorosoma), Paddle fish (polyodon) whale shark (Rhincodon) also have efficient food straining or filtering adaptation.

The principal adaptation for filter feeding or strainers is the developemt of numerous, closely – set and elongated **gill rakers**.



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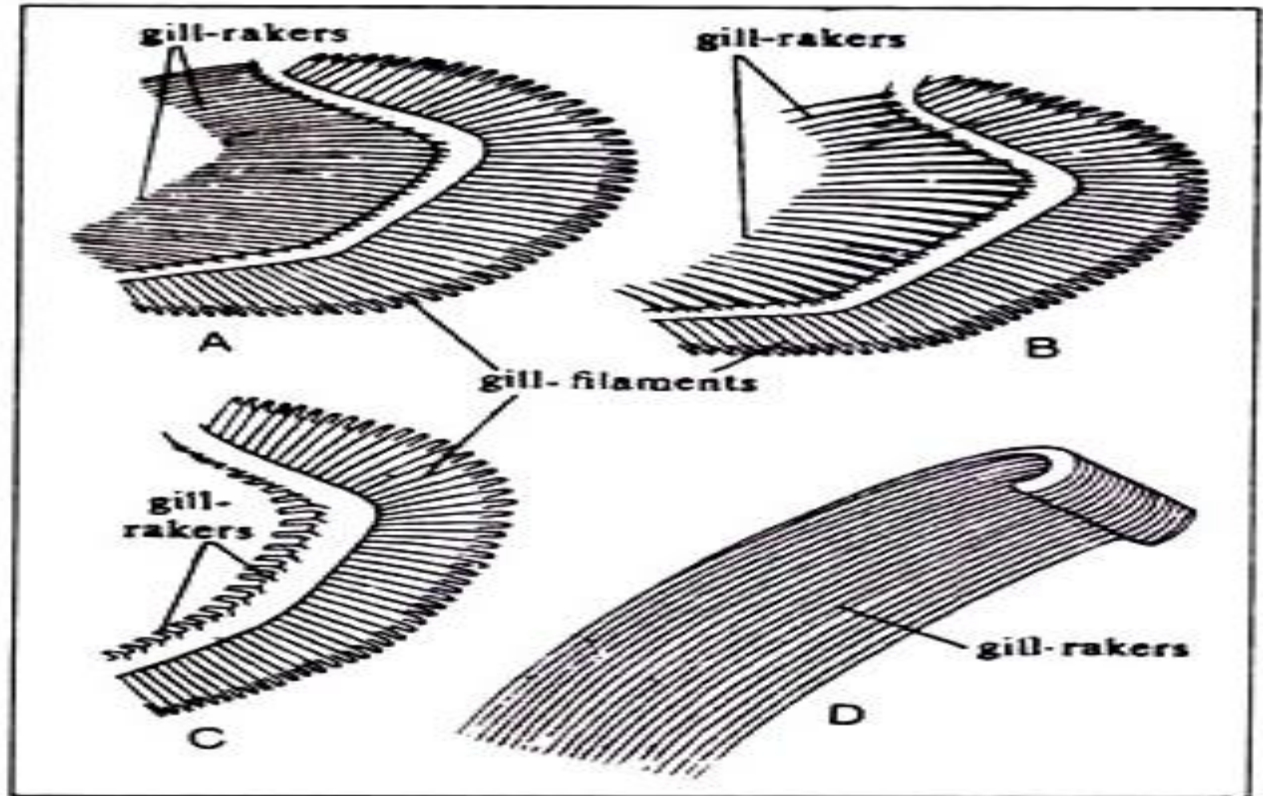
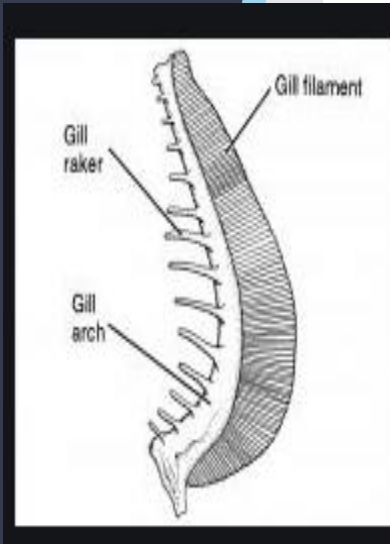


Fig. 6.80 : Showing the gill-rakers in different fishes. A. *Alosa fallax*. B. *Alosa alosa*. C. *Perca fluviatilis*. D. Isolated gill-rakers of *Cetorhinus maximus*.



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4) Suckers

The sucking into the mouth of food or food containing material is taken practiced by bottom feeding fishes such as the sturgeons (Acipenseridae) and suckers (catostomidae)



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5) Parasites

Parasitism is perhaps the most unusual and highly evolved feeding habits among animals.

They suck body fluid after rasping a hole in the sides of the body.

Parasitic lampreys (Petromyzonidae), Sea lamprays (*Petromyzon marinus*) Pacific



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Oral adaptation for feeding



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Lips

Suctorial feeders have an “inferior mouth” and fleshy modification of lips.

Notable among these are the sturgeons (Acipenseridae) and suckeres (catastomidae).

The lips of strurgeons and suckers are mobile and described as “Plicate” (having folds) or papillose (having small tufts of skin or papillose).

Many suctorial feeders also have well developed barbells bordering the mouth.



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Sucker mouth : Moxostoma (Redhorse)
suctorial lips of free – living fishes may also serve as **holdfast organs** in fast flowing mountain streams. For example (Glyptorternum).

In loach – like Gyriocheilid (Gyrinocheilus) has an extremely specialized suctorial adaptation, in addition to suctorial lips the opercular structure has separate water inhalent and exhalent device for respiration



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Modifications in the shape of mouth

Among the grazers and suctorial feeders, there exist not only specially developed **lips** but also adaptations of other **mouth** parts.

The Trumpet fishes (Aulostomidae) the cornet fishes (Fistularidae) and the pipe fishes (syngnathidae) as well as many butterfly fishes (chaetodontidae) of coral reefs, have mouths that resemble elongated beaks.

This adaptation is achieved by a protraction of the hyomandibular bone rather than by a lengthening of the lower jaw bones themselves.



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Among these fishes, the method of feeding may be by **suction** as in the case of trumpet fishes, cornet fishes and pipe fishes or it may be a selective **grazing** action with sharp teeth when the long snout enables the butterfly fish to reach into small crevices of the coral.

A peculiar structure among mouth modification has arisen in the half beaks (Hemiramphidae) where the lower jaw projects into a beak, with the mouth opening above it. Half beaks are usually surface feeding fishes.



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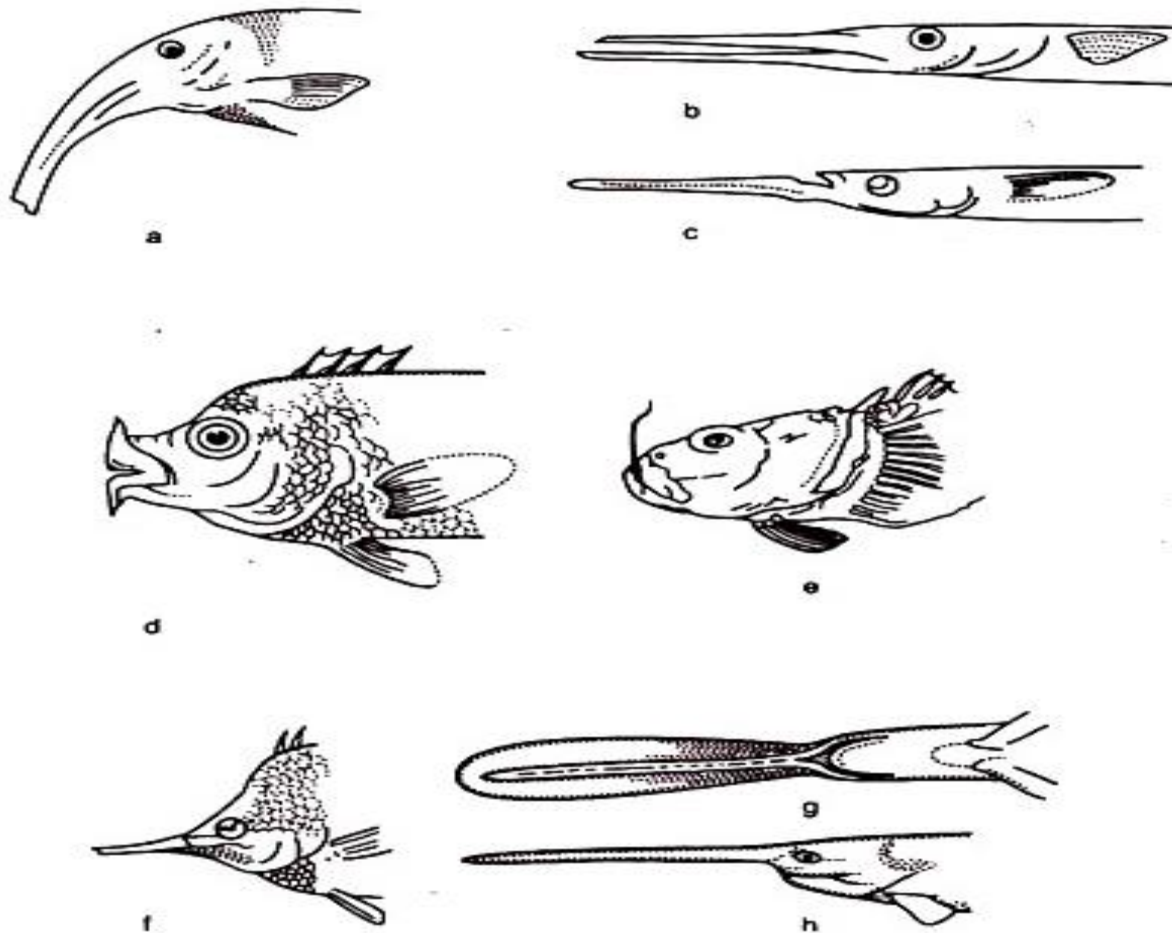


Fig. 4.6a-h : Some adaptation in mouth structure among fishes. (a) Elephant fish, *Gnathonemas elephas*. (b) Gar fish, *Strongylura longirostris*. (c) halfbeak, *Hyporhamphus unifaciatus*. (d) thick-lipped mojarra, *Cichasoma lobocheilus*. (e) stargazer, *Zaloscopus tosae*. (f) longnose butterfly fish, *Forcipiger longirostris*. (g) and (h) Paddle fish, *Polydon spathula* (source, Lagler et al. 1977).



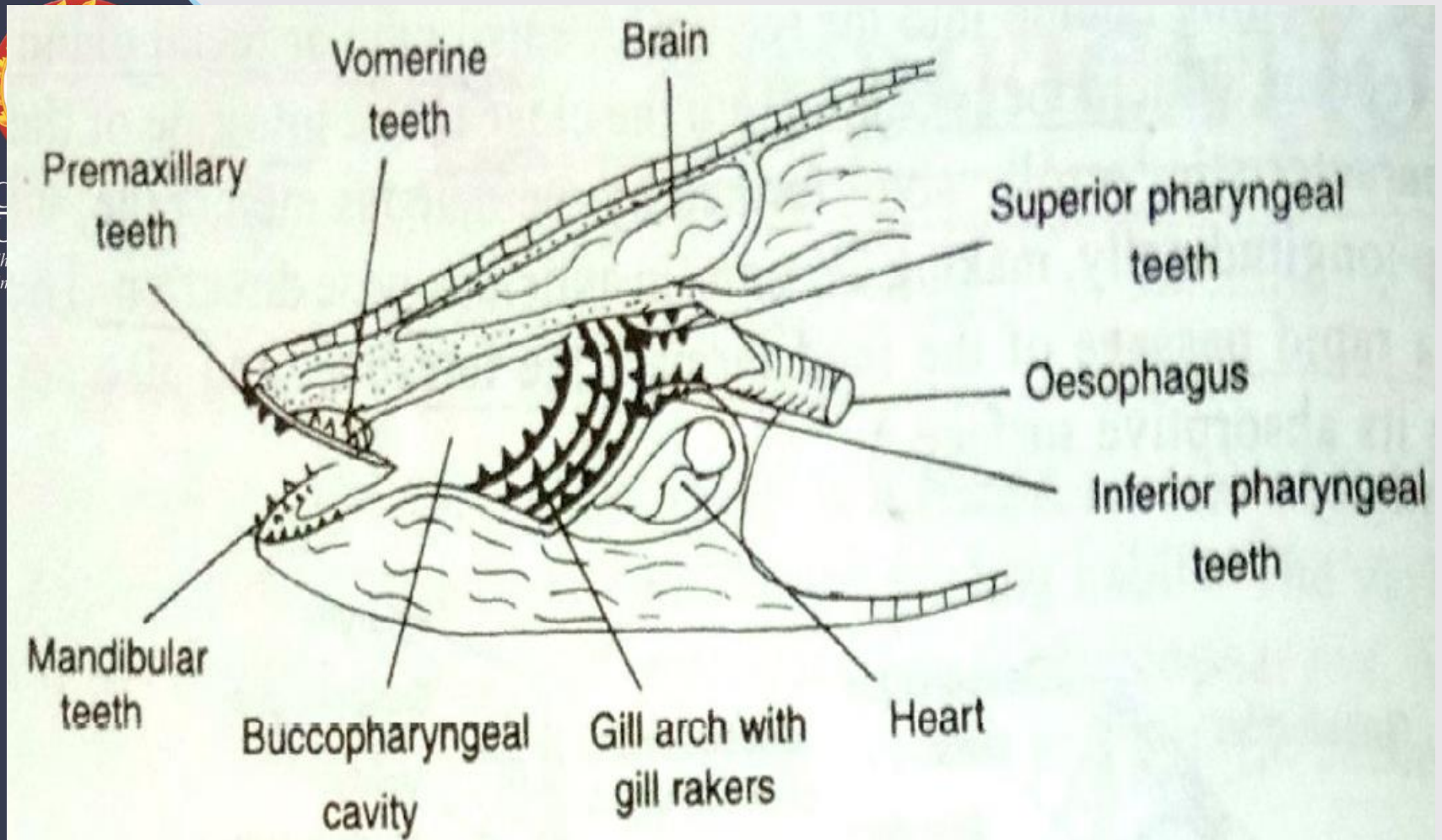
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Teeth

Outstanding among the obvious oral adaptation for feeding in fishes are the teeth.

They are thought to have arisen from scales covering the lips, as represented in living sharks (squaliformies) where the placoid scales of the skin visibly grade into teeth on the jaws.

In bony fishes (Osteichthyes) Teeth are of three kinds, based on where they are found
Jaw, Mouth and Pharyngeal.



Buccopharynx of *Wallago attu*



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Jaw teeth are variously those on the maxillary and premaxillary bones above and on the dentaries below.

In the roof of the oral cavity teeth are variously borne by the median vomer and by the palatine and ectopterygoid bones on each side.

In the floor of the mouth the tongue often has teeth on it.

Pharyngeal teeth occur as pads on various gill arch elements in many species.

In the carps and suckers the only teeth are those in deep in the pharynx (gut, mouth and oesophagus) that developed modification of lower elements after last gill arch, in clarius and labeo the teeth are modified for grasping, tearing, grinding and razor like cutting teeth have developed in predacious fishes.



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Kinds of jaw teeth

Based on their form major kinds of Jaw teeth are

- 1) Cardiform
- 2) Villiform
- 3) Canine
- 4) Incisor and
- 5) Molariform.



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Cardiform Teeth

Cardiform teeth are numerous, short, fine and pointed. Such dentition with variations is found in many fishes that have multiple rows of teeth. For example American catfish (Ictaluridae), perches (Percidae) and many sea basses (Serranidae).

Villiform teeth

Villiform teeth are more or less elongated cardiform teeth. For example: Needlefishes (Belontiidae) and Lionfishes (Pterois).



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Canine teeth

Canines are dog tooth like or fange like (long pointed tooth) they are elongated and subconical, straight or curved and are adapted for piercing and holding for example walleyes (Alaska pollock) (*Stizostedion*).

In certain fishes such as morays (*Muraenidae*) the canines are hinged (the hook) yield to backward pressure but lock when moved forward and adaptation to retain living moving prey inside the mouth.

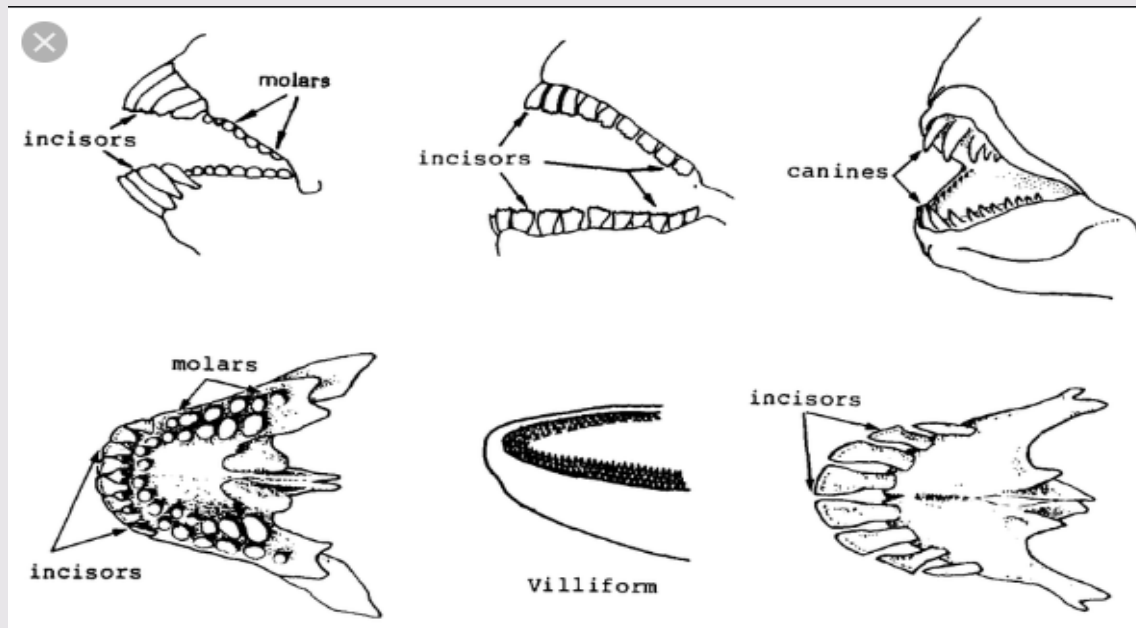


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Incisors teeth

Incisors are sharp edged cutting teeth. In some fishes incisors fuse together in cutting beak as in parrot fishes (scaridae).





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Molariform teeth

Molariform teeth are for crushing and grinding thus flat with protruding denticles on the surface.

These teeth are found in bottom dwelling fishes like skates and rays and some sciaenidae (drums).

Within a single group the diversity of dentition on identical bones may vary largely.

For example In carps and minnows (cyprinidae) the pharyngeal teeth range from sharp in carnivores such as in semotilus to molariform in the common carp (*Cyprinus carpio*).



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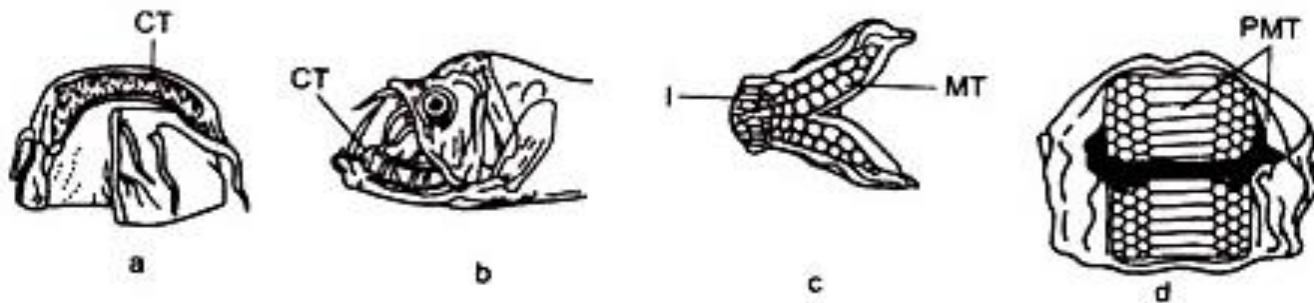


Fig. 4.8a-d : Some variations in structure and location of teeth in fishes.

(a) Upper jaw of flathead catfish, *Polydictis olivaris*. (b) Deepsea viperfish, *Chauliodus sloani*. (c) Lower jaw of a porgy, *sparidae*. (d) Pavement teeth on roof and floor of mouth of an eagle ray, *Mylisbats*.

C.T, cardiform teeth; I, incisor, PMT, pavement molariform teeth; MT, molariform teeth.



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Gill Rakers

Besides protecting the tender gill filaments from abrasion by ingested material that are coarse in texture, gill rakers are specialization in relation to food and feeding habits. They are very stubby (short and thick) and unornamented in most omnivores (sunfish).

In plankton feeders, the gill rakers are elongated, numerous and variously lamellate or ornamented to increase efficiency of filtering.

Simple but very numerous rakers are possessed by gizzard shads (*Dorosoma*) and paddlefish (*Polyodon*). Ornamentation of gill rakers are of taxonomic value. In pleuronectidae the gill rakers resemble feather having a main axis with lateral processes these lateral processes are branched. The adjacent gill rakers overlap to form a very fine sieve.



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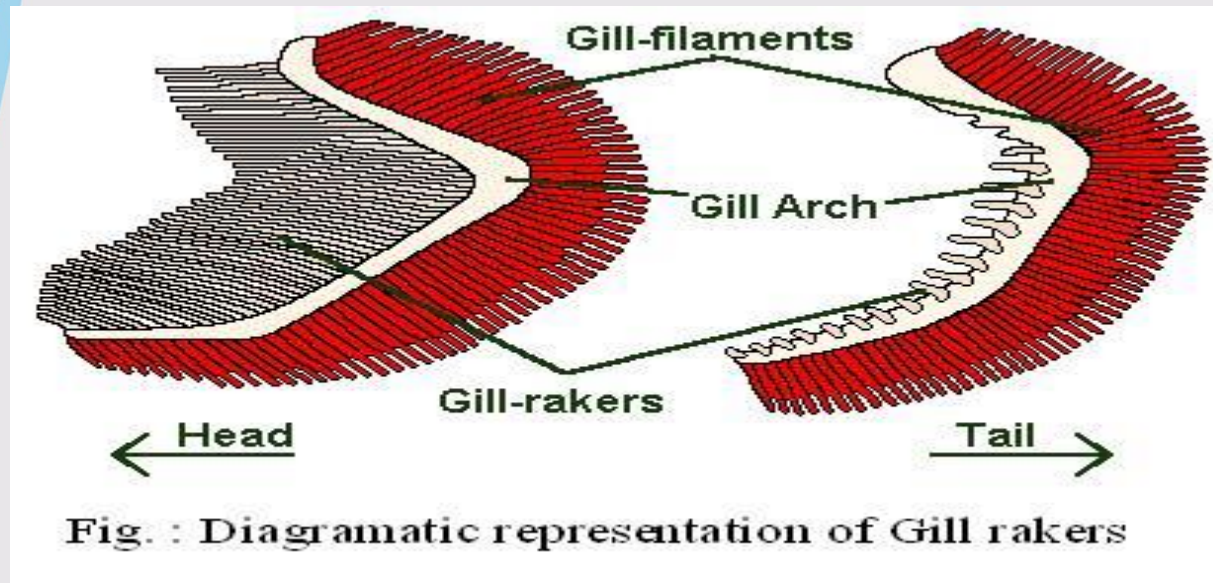


Fig. : Diagrammatic representation of Gill rakers



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Thank you



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