

An underwater scene with sunlight filtering through the water, creating a shimmering, dappled light effect. The water is a deep blue color, and the light rays are visible as bright, irregular shapes. The overall atmosphere is serene and natural.

# **SENSORY SYSTEM**

# Sense organs in fishes

- Receptor/ sense organs are the structures capable of receiving stimuli by setting up impulses which are transmitted to CNS.
- Sense organs are responsible in receiving stimuli such as smell, touch, taste, sight, pressure, sense of equilibrium, temperature etc.
- They are classified as external and internal.

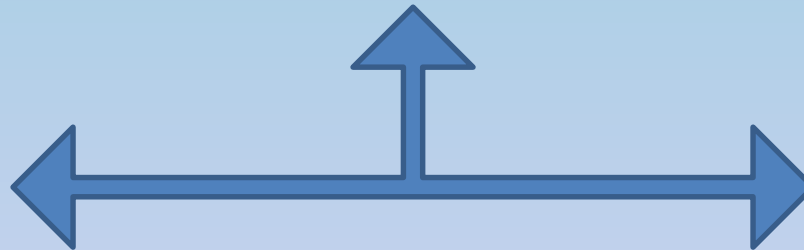
# Classification

Receptor organs

External



Smell, Hearing, Sight,  
Taste, Touch, Pressure,  
Temperature, Pain.



Internal



Statoreceptor.  
Propiropreceptor.  
Interreroceptor.

## Sense and Sensory organs

- Olfactory organ- Sense of smell.
- Taste buds- taste and touch.
- Photoreceptors- Sight.
- Membranous labyrinth- body balance.
- Lateral line system- pressure wave and frequency.
- Electroreceptors- electro sensitivity.

# Olfactory organ

- Able to detect odour with the help of olfactory rosettes connected to the olfactory lobe.
- Olfactory chamber is situated on either side of the head at fore end.
- The olfactory chamber opens to the exterior by a pair of apertures serving as the anterior and posterior nostrils and contain an olfactory rosette in it.
- The anterior and posterior nostrils serves as incurrent and excurrent apertures.

# Structure

- Olfactory rosette is round/ oval in shape.
- Consists of median raphe and no. of lamellae.
- Olfactory epithelium covers the lamellae and the olfactory chamber.
- Olfactory nerves from the bulb spreads around the epithelium.
- The distal end of the dendrites forms a swelling called olfactory knob and the axonal ends forms the olfactory nerve which runs posteriorly to end in the olfactory bulb.

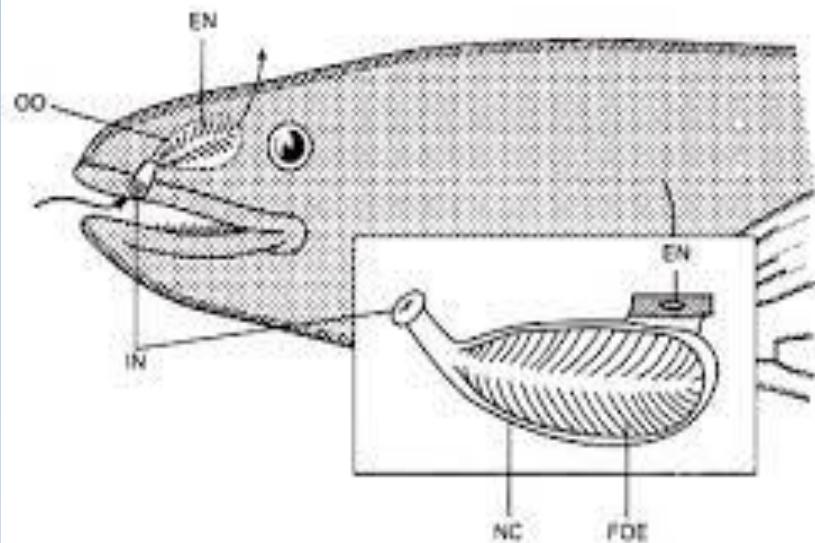
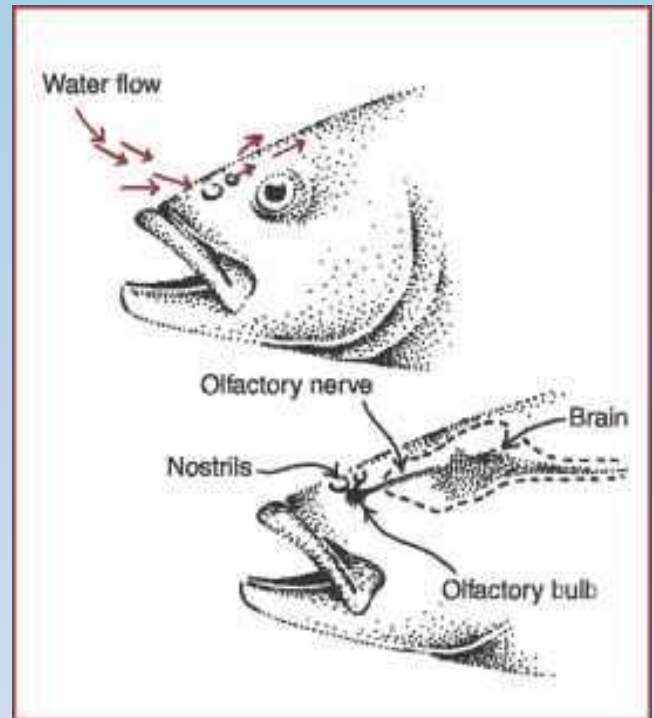
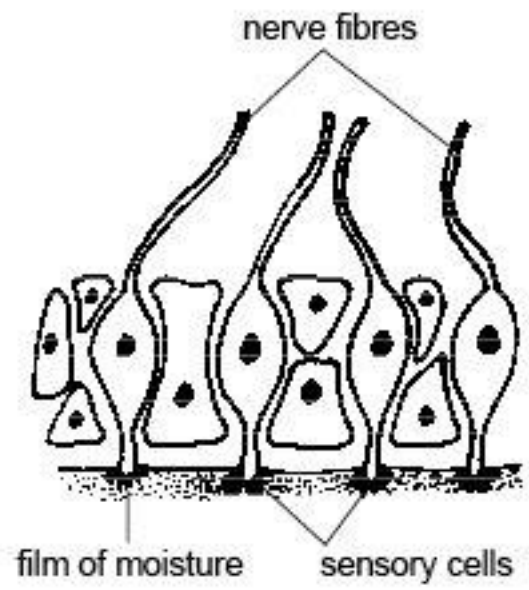
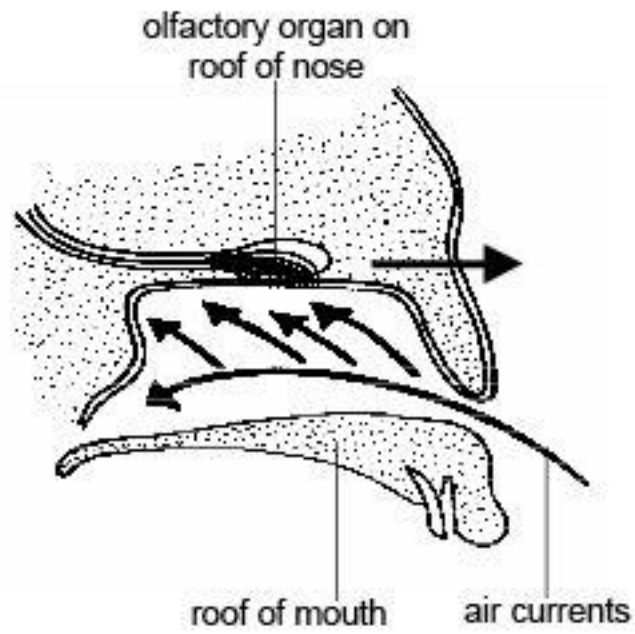


Fig. 15.8 : Diagram of olfactory organ of Anguilla. Box shows section of olfactory organ EN, excurrent naris; FCE, folds of sensory olfactory epithelium; IN, incurrent naris; OO, olfactory organ.



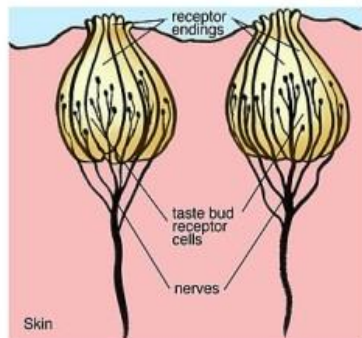
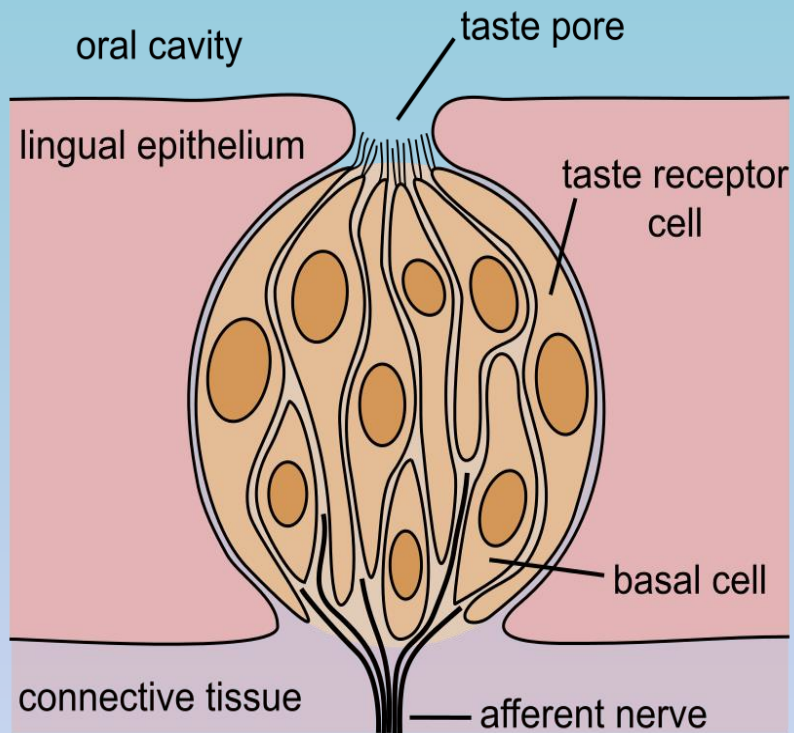


magnification of part of olfactory organ



# Taste buds

- They are present in their buccopharynx, lips, barbels and even on the surface of the body.
- Each taste bud is oval/ circular in shape.
- The structure composed of neuroepithelial cells and supporting cells.
- They are supplied by facial, glossopharyngeal and vagus nerves.
- This enables the fish to detect presence of toxin, CO<sub>2</sub> and even sensitive to touch.



Fish taste buds can be found on all parts of the mouth and tongue. On some species they can be found all over the body, fins, and sometimes on the eyes!

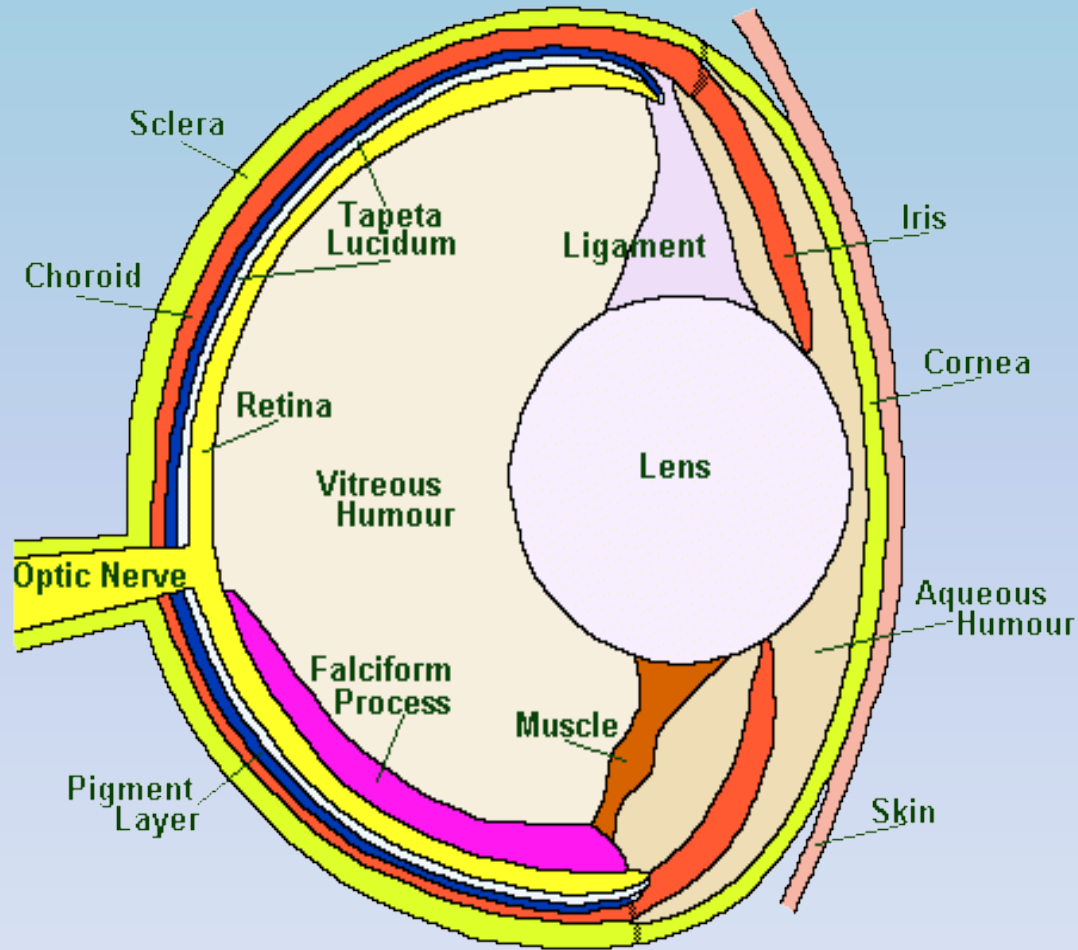
# Photoreceptors

- In fishes they are represented by a pair of eyes.
- Most of fishes have large and complex eyes adapted for the flash of bioluminescence.
- It exhibit modification to increase the area of vision.
- Their eyes adapted to the phenomenon of refraction.
- Other than eyes, pineal body is also considered as a photoreceptor.

# Structure

- Eye ball consists of 3 layers: sclerotic, choroid and retina.
- Sclerotic is composed of dense connective tissue, it slightly bulged outwards and forms cornea.
- Choroid is vascular and a silvery layer called argentia present between sclerotic and choroid.
- Retina consists of an outer pigmentous layer and inner sensory layer.

## A Diagrammatic Representation of a Teleost Eye

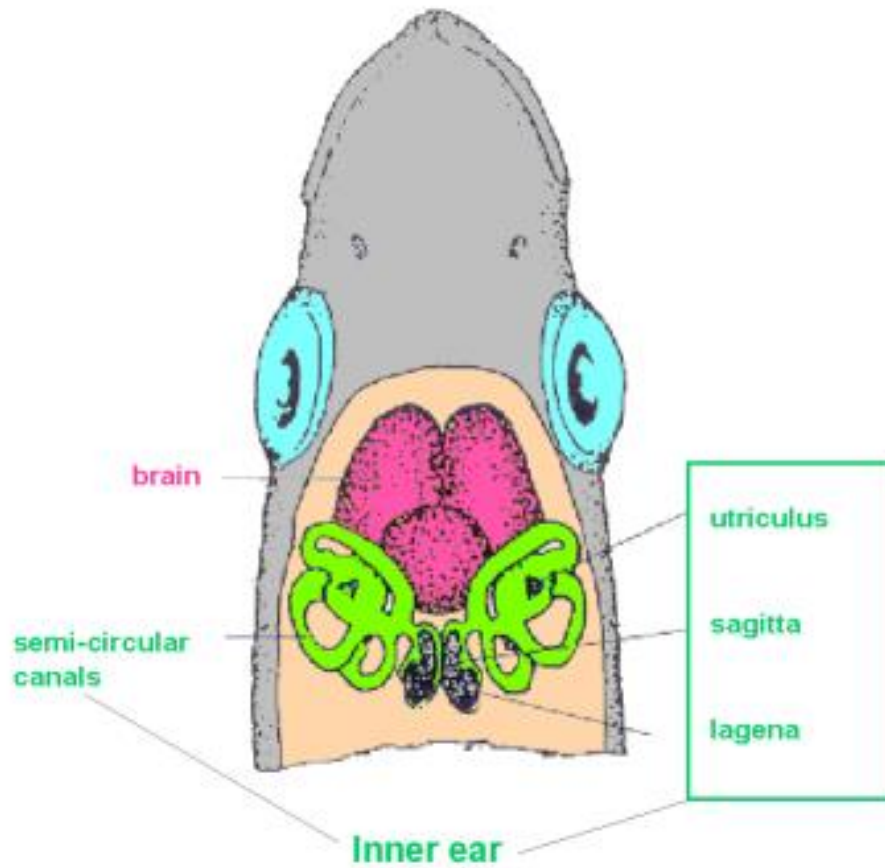


# Membranous Labyrinth

- Fishes lack external and middle ear and inner ear consists of Membranous Labyrinth.
- Seat of sense of hearing and maintaining body balance.
- Membranous sac enclosed in the chamber.
- Sac is partially divided into upper utriculus and lower sacculus.
- Semicircular canals swells into an ampulla in one end and opens into the utriculus at the other end.

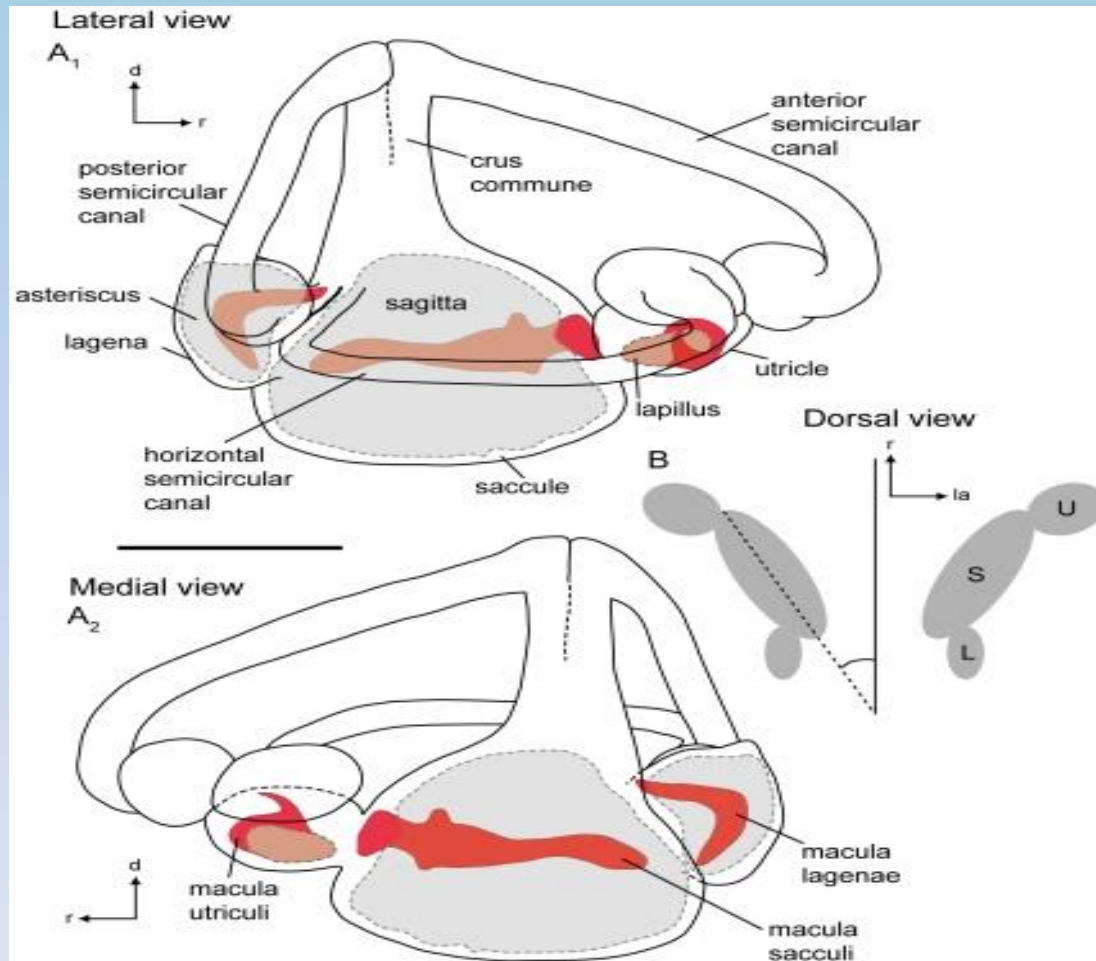
- Semicircular canal and utricle are responsible for equilibrium and saccule and lagena are the centre of hearing.
- Labyrinth is filled with endolymph and surrounding space is filled with perilymph.
- Otoliths are found in the endolymph.
- It is composed of 2 types of sensory patches: cristae and maculae.
- Otolith in the utricle (cupula) lies horizontally and in saccule and lagena it lies vertically on to the sensory hair.

# Position of inner ear





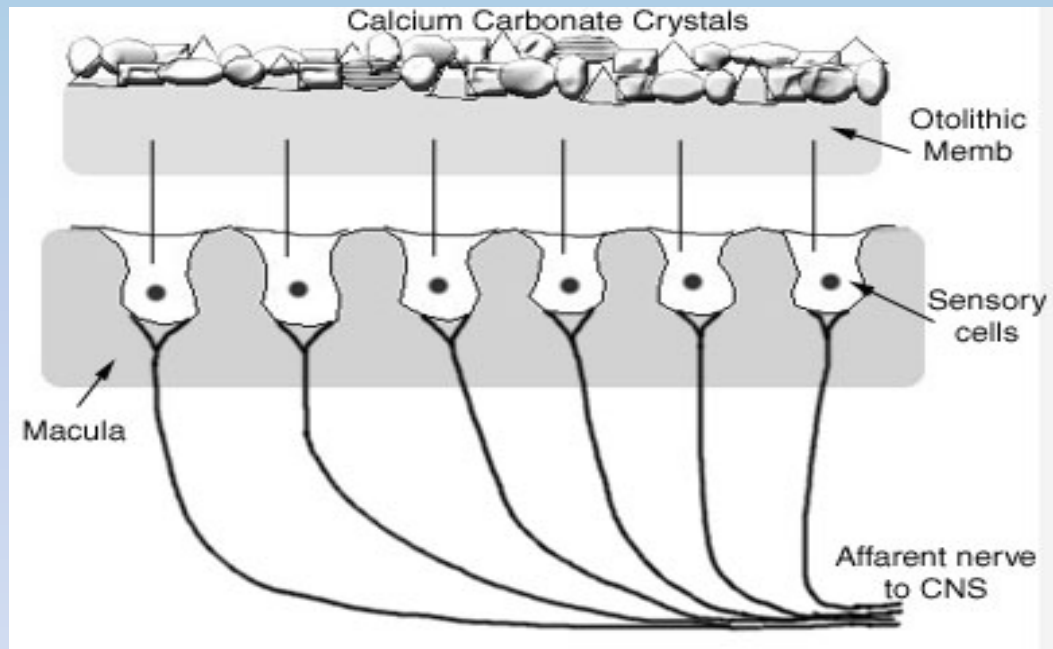
# Labyrinth system



## Hair cells.

- They are elongated and cylindrical, surrounded by supporting cells on a connective tissue base.
- Afferent nerve fibers synapse with the base of cells and pass into the auditory nerve.
- Electrical potential exists at the apical and basolateral end of the cells due to the difference in ionic content between extra and intra cellular fluids.
- Excitation of afferent fibers is maximum when the cilia deflects to kinocilia.

# Hair cells

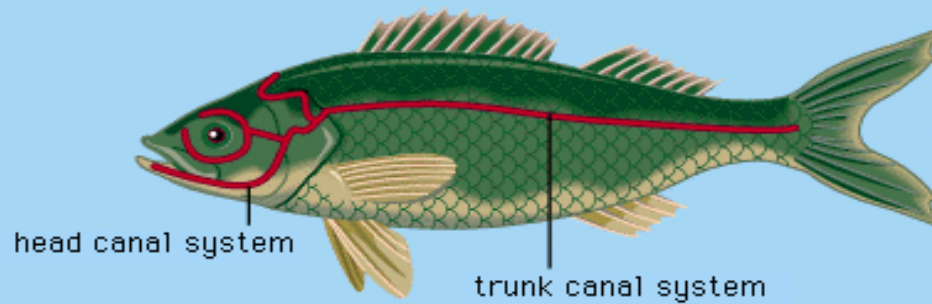


# Lateral line system

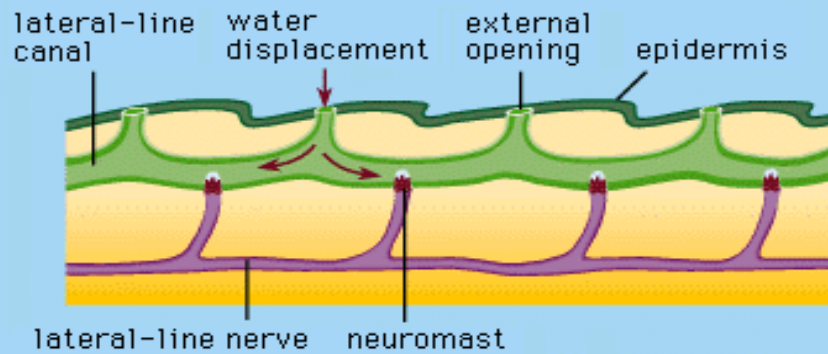
- The lateral line system and the inner ear are closely related in structure, function and together constitute acoustico lateralis system.
- Two components of lateral line system are: lateral line canal and neuromast organ.
- Lateral line exists as a continuous groove extend upto the caudal fin and the sensory receptors are arranged within the groove.

- The groove is continuously branched on the head region and are named according to the position; like supra orbital, infra orbital, mandibular, hyomandibular etc.
- The groove of the canal remain filled with a watery fluid and the aperture contains a mucoid substance.
- The canal is embedded within the skin below the scales and through the pore they come in contact with the surface.

A

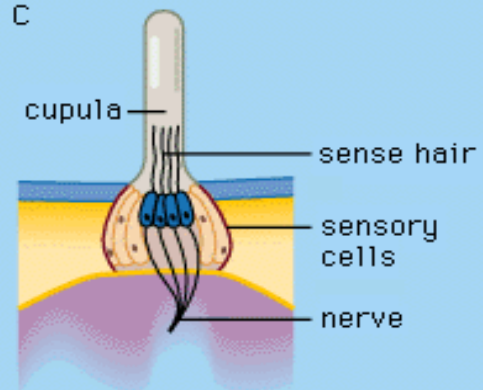


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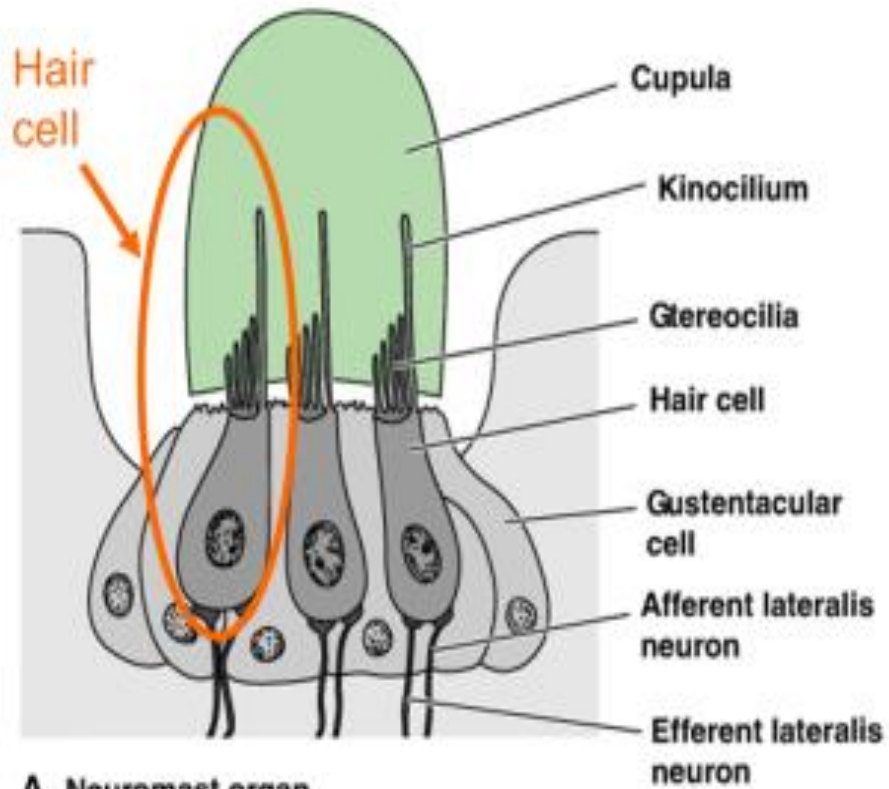
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C



# Neuromast organ

- They are the receptor components/ cells of the lateral line.
- They may occur on the surface, may sink into the groove of lateral line.
- Comprises of two type of cells: Sensory receptors/hair cells and supporting or sustentacular cells.
- Receptor cells are pear shaped and aggregate to form in the center while supporting cells are long and slender and arranged around the periphery to form the organ.
- The hairs projects into gelatinous cupula secreted by neuromast cells and protrude into the water.
- Neuromast organs of certain fishes modify into scattered pit organs, Ampullae of Lorenzini.



**A. Neuromast organ**



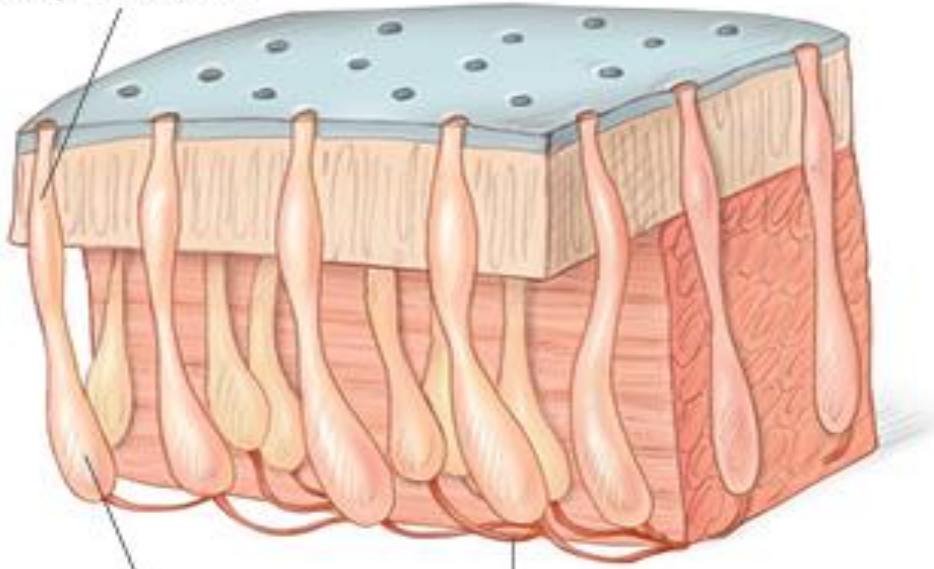
## Function

- Sensitive to low frequency vibrations and pressure wave built up by the movement of other aquatic organisms.
- Monitoring the flow of water.
- Able to detect prey and predator in water.
- Schooling of fish.

# Ampullae of Lorenzini

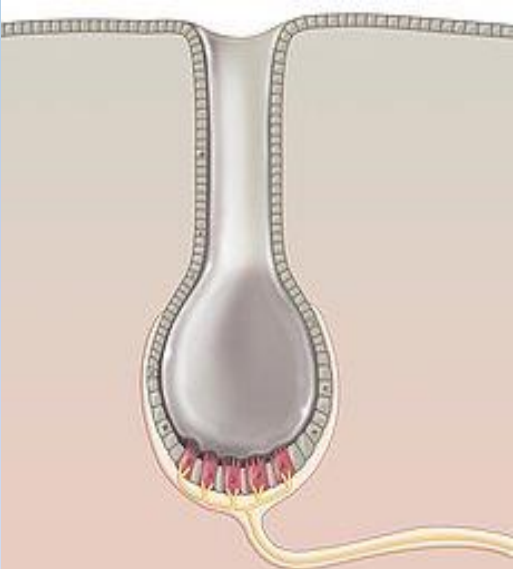
- Jelly filled canals which opens all over the snout region.
- Canals end in swollen bulbs and devoid of sensory hairs.
- They are supplied by branches of facial nerves.
- They were believed as both pressure and temperature receptors.
- It belongs to the ampullary organ which is electroreceptor in nature.

Jelly-filled pore



Bundle of electrosensory cells (ampulla)

Nerve fiber



# Luminous organs

- Luminescent organs are called photophores.
- Special gland cells distributes in the body.
- Two types: self luminescent and light produced by symbiotic bacteria.
- Photophores consists of large number of glandular tubules that secretes luminous bacteria.
- Self luminous organ is a complex cup like structure having pigmented layer, refractory layer, glandular tissue, lense etc.
- The extract from the gland reflects by the spicules present in the cup like structure.

# Photophore

