

## Lateral Line System

The acoustic system comprises the neuromast organ and related structure confined to fishes. The lateral line system and the internal ear are so closely related in structure, function and antagonism that together they constitute the acoustic lateral system.

Lateral line system also found in Urochordata and larvae of Anura and Apoda.

In lateral line system (L.L.S) constitutes a special system of mechanoreception. It is derived for a life in water and comprise two components. The lateral line canal & the neuromast organ.

a- Lateral line canal - The lateral line canal exist as a continuous groove that follows a definite pattern on the head and extends fin. The grooves contain the sensory receptors the neuromast which are arranged in row.

In clamydosteleth the groove and neuromast remain exposed. However, the lips of canal approximately in the head region to enclose the neuromast in this groove.

In Holocephalic and in neuraous ancient amphibians, the grooves remains open in the region.

In lung fishes (eg - Protopterus) the canal is partially roofed over by bordering denticles and the closed type of head region opens by minute pores on the surface of the skin.



(2)

The canals of many fishes including both cartilaginous bony fishes lies deep in the skin and their path can only be traced by the scale to open on the surface. A vertical shaft between the canal and its external pore apparently exist in many fishes. The grooves of canal remains filled with a watery fluid in all fishes & the aperture of their pore contain a mucoid substance.

During embryonic life the lateral line canal differentiates as grooves along the longitudinal axis on dorsal, ventral canal disappears later while only the lateral canal persist in adults. These canals terminate into several branches in the head region which may retain or lose connection with the trunk canal in adults of the various canal in the head region a supra and an infra orbital differentiate respectively above and below the orbits.

A. Hyomandibular canal in lower jaw & supra-temporal stretching across the rear end of the head is normally found. Many more canal in head region also appear in different fishes and named according to their position on the head.

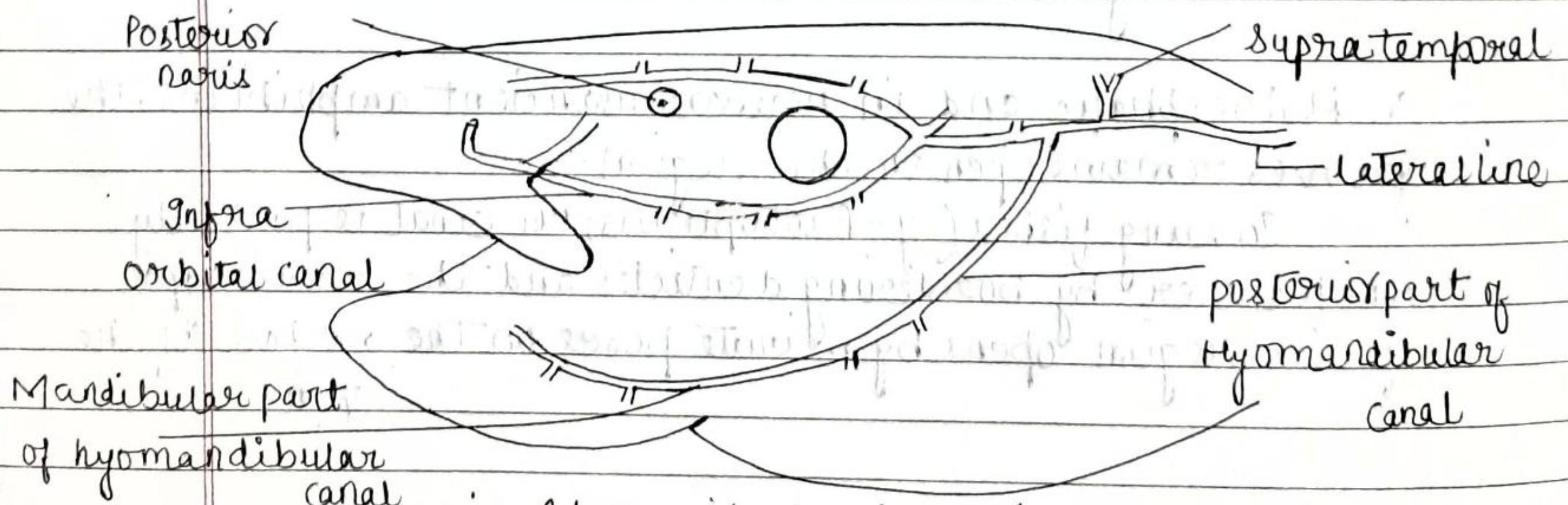
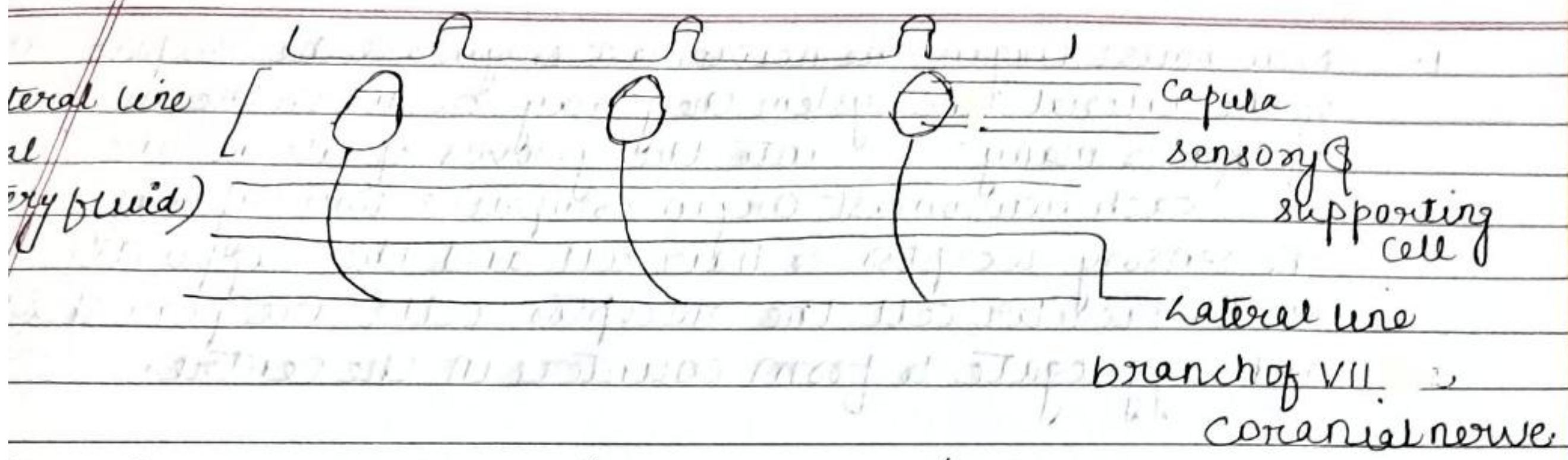
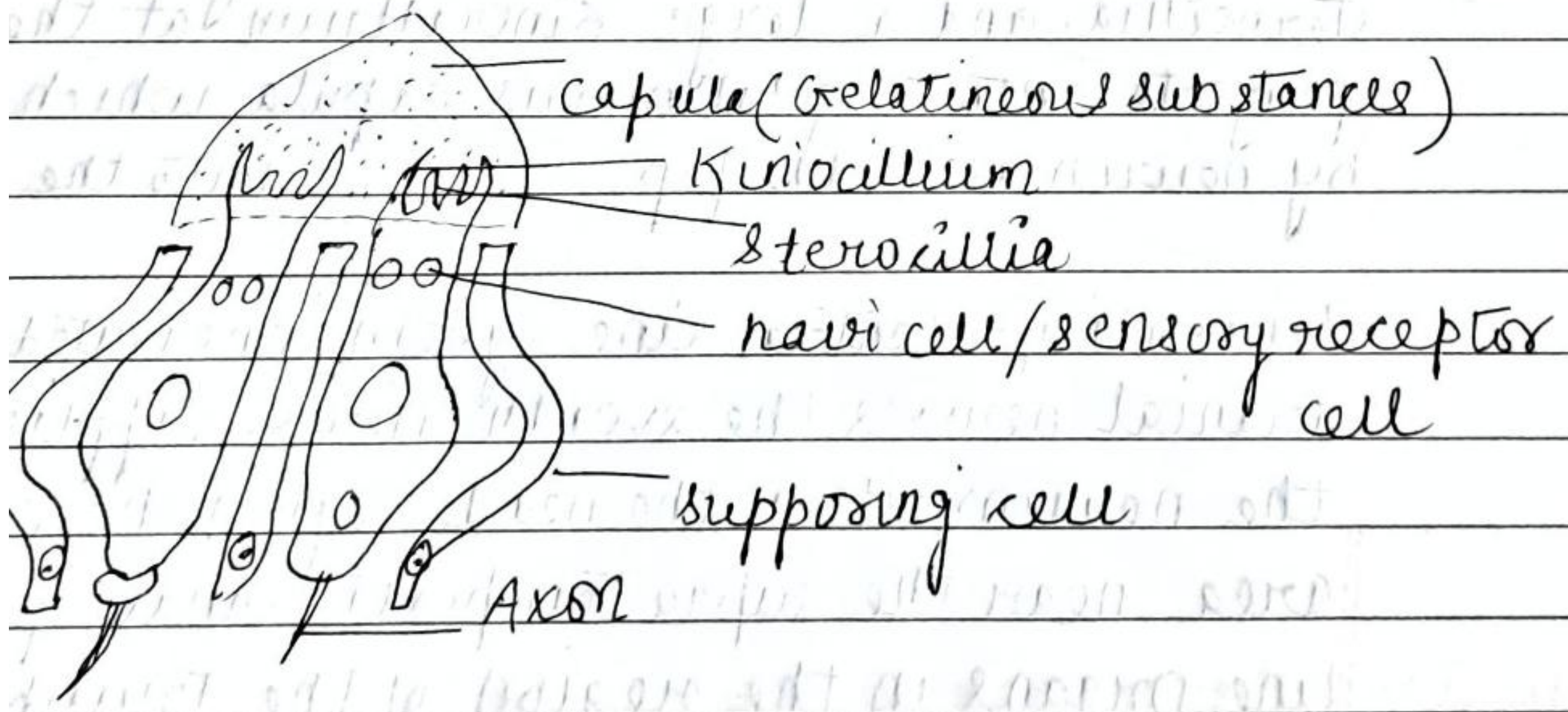


fig - 4 bony fish showing typical arrangement of lateral line canal.





16- A part of lateral line canal magnified to show the neuromast organ in grooves.



neuromast organ



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1. Neuromast Organ - The neuromast Organ are the receptor cell of the lateral line system they may occur on the surface of skin or many into the grooves of lateral line canal. Each neuromast Organ comprise two types of cell. The sensory receptor or hair cell and the supporting or sustentacular cell the receptor cells are pear shaped and aggregate to form counters in the centre.

The supporting cell are long & slender and arrange around the receptor to form periphery of neuromast Organ. Each sensory cells bears a hair like sensory process at its apical end, the hair comprising many small stereocilia and a large kinocilium at the edge project into a gelatinous cupula which is secreted by neuromast cell & p into the water.

Innervation - Central line system innervated by VII, IX & X cranial nerves the seventh nerve supplies branches to the neuromast in the head region the ninth to a limited area near the supra temporal canal & the tenth to lateral line organs in the region of the trunk.

Function - The basic function of lateral line system is monitoring the flow of water.

The lateral line neuromast are sensitive to low frequency vibration and pressure wave built up by the movement of aquatic organisms or solid particles the fishes have been reported to respond up to the frequencies of 200Hz. The slightest displacement of water causes a difference of external pressure between the two successive pore of lateral line canal, deflecting thus the cells.



erical bend of hair process of sensory cells. It generates nerve impulse from the receptor cells. Because of this reason the fish never, the wall of eye detect the distant object in water to a considerable extent.

Another important function ascribed to the system is schooling ability of the fish in which each fish will react to the movement of its closest neighbours.

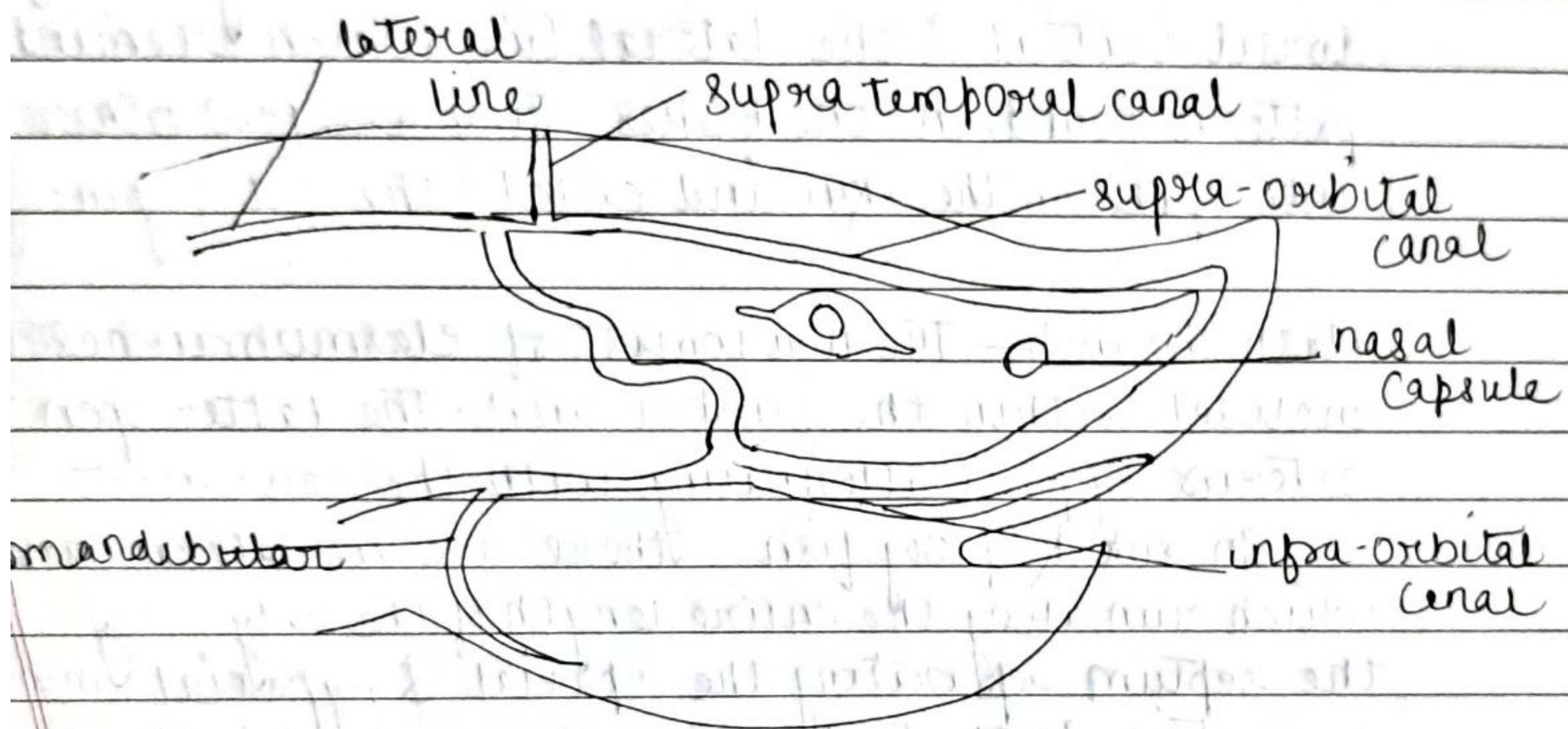


FIG - A Cartilaginous fish - showing arrangement of lateral line.



(6)

## Comparative study of lateral line system -

**Cyclostomes** - In Cyclostomes, the neuromast are not in a canal instead they lie superficially on the head and trunk. In the head region they are arranged into supra-orbital and an infra-orbital line. Each of them comprise two functions consisting of a line below the branchial chamber & a temporal line.

The neuromast in trunk region arranged to form a dorsal ventral & the lateral line which reminds of pattern found in the fishes. They are few other neu into pits on the skin and called the pit organ.

**Elasmobranch** - The neuromast of elasmobranchs is enclosed within the sunken canal. The latter open to exterior by pores alternating with the neuromast.

In shark & dog fish there are two lateral canals which run along the entire length of the body. They are separated by the septum separating the epaxial & hypaxial muscles. In the head region the canals of both sides are connected by a transverse supra-temporal canal to which they both branch. Various cephalic canals include a supra-orbital, a infra-orbital & a mandibular canal. The supra-orbital extend forward above the eye & connect with the infra-orbital behind the eye capsule. The infra-orbital canal after giving a mandibular canal to hyaline arch extend forward to the eye to end near the tip of the snout, mandibular branch extends to tip of the lower jaw & then join to follow of the other sides.



**Holocephali** - In Holocephali (and in a few shark) the canals remain open primitively and their neuromast lie within the open canals. They are better developed on underside of snout probably canals of holosteam comparative with those of elasmobranch but in Amia. The supra-orbital and infra-orbital join the mandibular hyoid & temporal placoids early in embryonic life.

**Bony fishes** - In Bony fishes there are several variations in the pattern of arrangement of lateral line canal & dermal bones in the forms of closed tube & open to the surface by pores or minute tubules.

The neuromast organ lie enclosed within the grooves of canal.

In supra-orbital canal of the head region connects with the temporal canal of lateral line canal & the infra-orbital run its usual course. The hyoid arch canal connects with the temporal canal & mandibular canal is represented only by pit lines on the cheek.

In polypterus the supra-orbital joins the infra-orbital at the tip of snout.

**Teloste** - Greater variations are found among the teloste.

Typically, however all the cephalic canals eg - The supra-orbital, infra-orbital & Hyomandibular connects with the lateral line canals of the trunk.

A supra temporal or occipital canals connect transversely the lateral line canals of the two side at the rear of the Head.



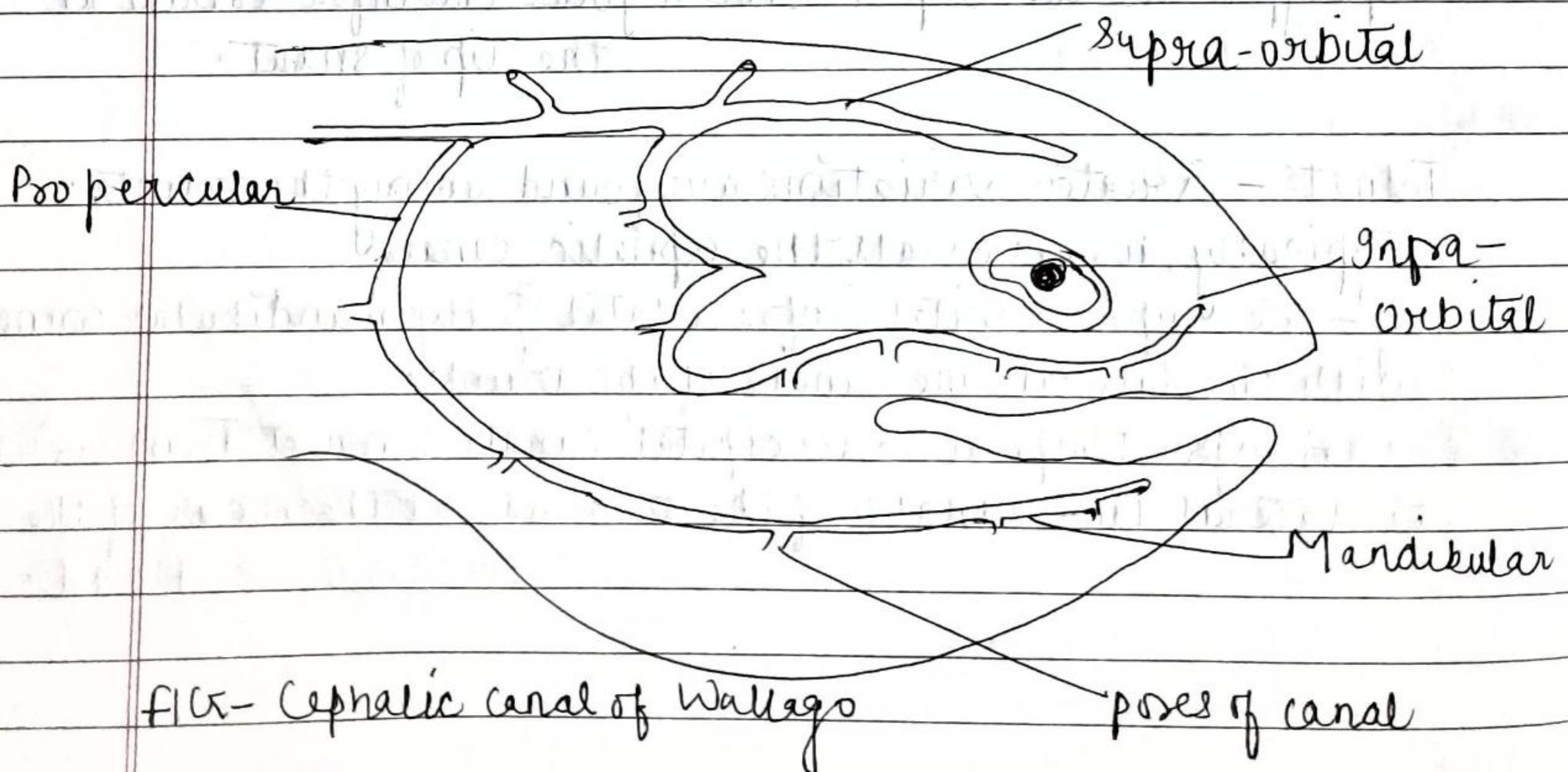
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The supra orbital <sup>may</sup> or may not be connect with temporal canal and at no stage join the infra orbital at the tip of the snout. They however join behind the eye in 'Heteropneustic' fishes & Wallago but remain separated in cyprinids.

The hyoid arch canal joins the temporal canal but often it ends on a line. Mandibular canal is poorly developed in cyprinids but closely marked in the lateral line trunk canal of *Notopterus chilala* do not join the cephalic canals. The latter are represented by closed tube having dilated wall forming sacculations.

The lateral lines are absent from species to species as gulper eels & Ceratoid anglers in which the sense organs lie on the papillae of skin.

The canal are huge in microwidae & organs are wide spread over the face in cobites. In many families a lot many accessory lines who occurs.





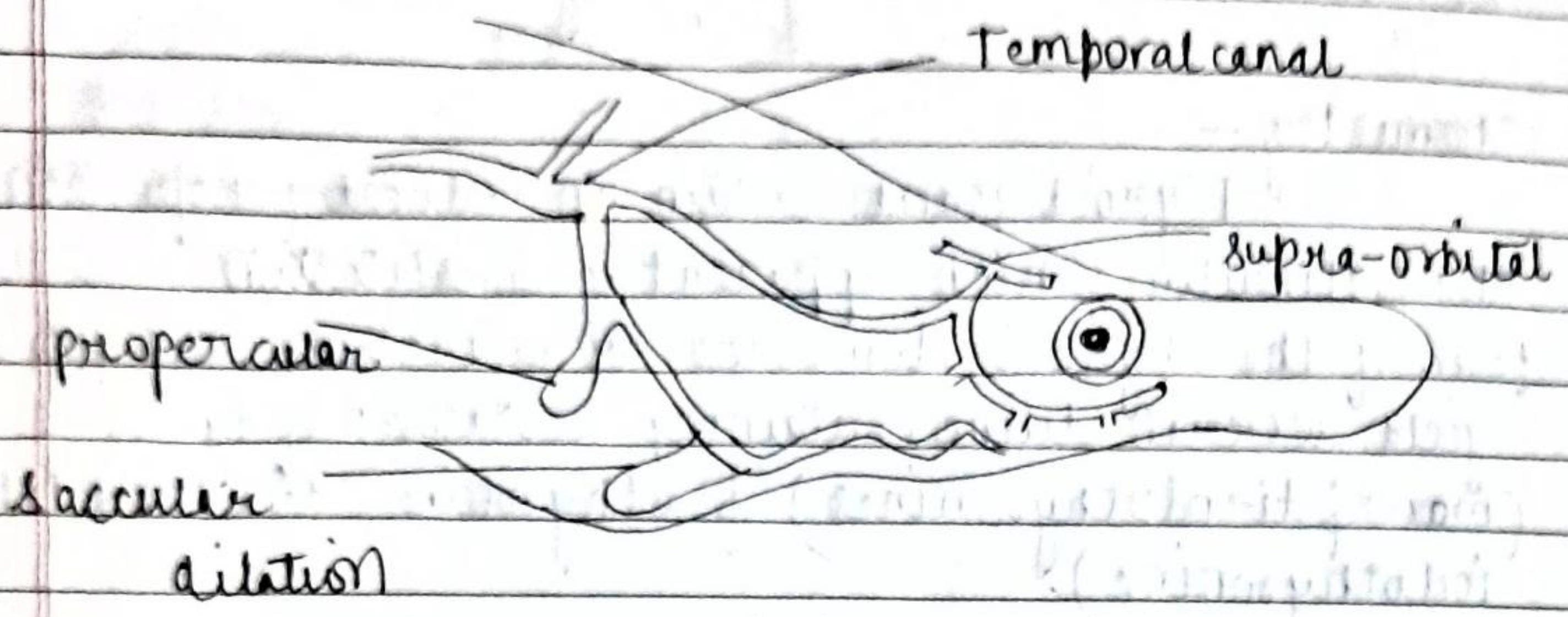


fig - Cephalic canal of Notopterus chital