
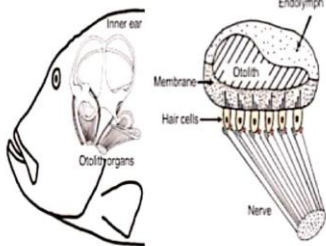


Inner Ear and Weberian Apparatus

c. cataloctocan

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- As in all higher vertebrates, receptors of hearing and balance in fishes are concentrated in the ear.
 - Only the inner ear is present in fishes

Inner Ear



- Delicate membranous labyrinth filled with a fluid (endolymph) and bathed by perilymph.
- Encapsulated in the posterior angles of the cranium
- Housed in the organ are receptors for vibrations and for stimuli that affect the maintenance of the equilibrium.

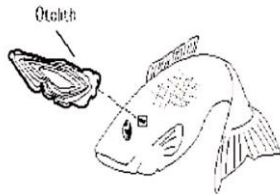
Parts

- Otolith

- "earstones" or "fish ear bones."
- hard, calcium carbonate structures located directly behind the brain of teleost (bony) fish.
- they are not attached to the skull, but "float" beneath the brain inside the soft, transparent inner ear canals.

- 3 main pockets

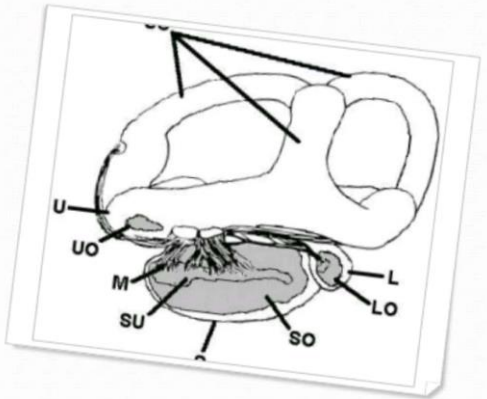
- utricle
- sacculus
- lagena



Parts

Figure 1.

Inner Ear of Fishes, Lateral View. SC= Semicircular Canals, U= Utriculus, UO=Utricular Otolith or Lapillus, M=Macula, SU=Sulcus, S=Sacculus, SO=Sacculus Otolith or Sagitta, L=Lagena, LO=Lagenar Otolith or Asteriscus. Modified from Popper and Coombs (1982).



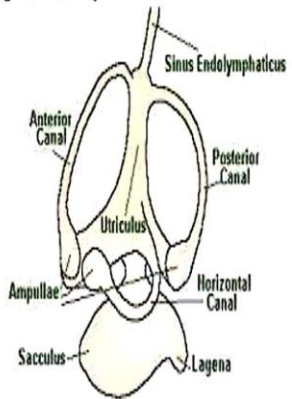
Labyrinth

- Pars superior
 - composed of three major canals collectively known as semicircular canals and their ampullae
 - One sac like structure (utricle)
- Pars inferior
 - composed of two vesicles, the sacculus and lagena

Pars superior

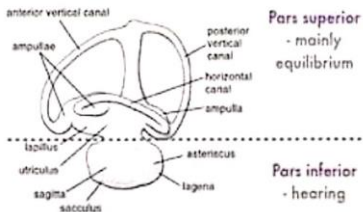
- each semicircular canals connects at both ends with the utriculus.
- Lapillus (otolith in the utriculus)
- Ampulla/e
 - Spherical expansion of each semicircular canal
- Cristae staticae
 - patches of receptor tissue in each ampulla
 - have longer sensory hairs at the apices of their sensory cells covered by a gelatinous cupula

Diagrammatic Representation of a Teleost Ear



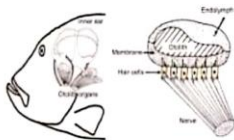
Pars inferior

- the sacculus and the lagena, function primarily in sound reception
- Asteriscus and sagitta(otolith in the sacculus and lagena)



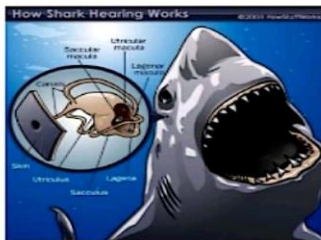
Bony fishes

- The utriculus contains an otolith (lapillus)



Sharks and rays

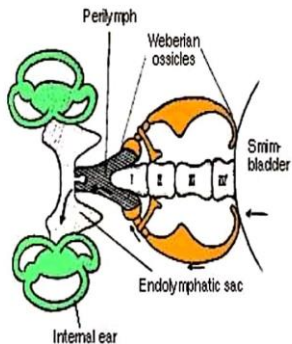
- An endolymphatic duct leads from the inner ear to the outside



Weberian apparatus

Weberian apparatus

- specialized auditory structure
- One of the most notable complex system in teleost fish especially in the order Cypriniformes
- It is a mechanical device improving audition, consisting of a double chain of ossicles joining to the air bladder to the inner ear.
- comprises four bony elements or **Weberian ossicles**



Weberian ossicles

- (From posterior to anterior) the Weberian ossicles are the **tripus**, **intercalarium**, **scaphium** and **claustrum**

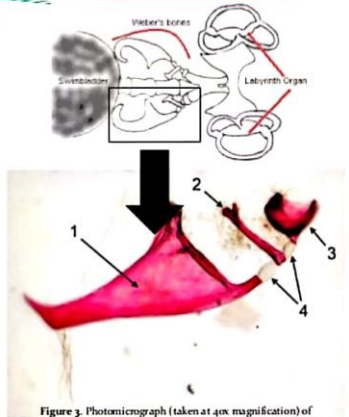
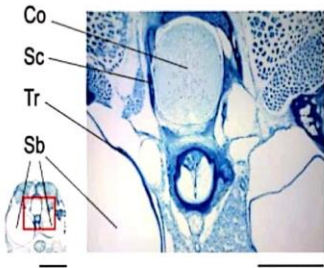



Figure 3. Photomicrograph (taken at 40x magnification) of three of the four Weberian ossicles dissected from an adult male zebrafish. The tripus (1), intercalarium (2) and part of the scaphium (3) are still attached in their chain via inter-ossicular ligaments (4). The fish had been fixed with PFA and stained using the alizarin red staining process, rendering the flesh transparent and calcified matrix (such as bone) pink.

- The ossicles are derived from the **apophyses of anterior vertebrae**
- **Parts**

PART	LOCATION
TRIPUS	HINDMOST
SCAPHIUM	ATTACHED TO TRIPUS AND CLAUSTRUM
CLAUSTRUM	TOUCHES THE MEMBRANOUS WINDOW OF SINUS IMPAR
SINUS IMPAR	LIES IN THE BASSIOCCIPITAL BONE



Volume changes of the gas bladder cause the Weberian ossicles to move in such a manner that pressure changes are transmitted to the perilymph and thence to the sensory cells of the inferior portion of the labyrinth which is the seat of sound reception.