

Proceedings of the Iowa Academy of Science

Volume 37 | Annual Issue

Article 104

1930

Some Peculiarities of the Plagiostome Ear

H. W. Norris

Let us know how access to this document benefits you

Copyright ©1930 Iowa Academy of Science, Inc.

Follow this and additional works at: <https://scholarworks.uni.edu/pias>

Recommended Citation

Norris, H. W. (1930) "Some Peculiarities of the Plagiostome Ear," *Proceedings of the Iowa Academy of Science*, 37(1), 381-383.

Available at: <https://scholarworks.uni.edu/pias/vol37/iss1/104>

This Research is brought to you for free and open access by the Iowa Academy of Science at UNI ScholarWorks. It has been accepted for inclusion in Proceedings of the Iowa Academy of Science by an authorized editor of UNI ScholarWorks. For more information, please contact scholarworks@uni.edu.

SOME PECULIARITIES OF THE PLAGIOSTOME EAR

H. W. NORRIS

SUMMARY:

1. External pore (leading to labyrinth. Willughby (?), 1686.
2. Endolymphatic pouch (doubtfully homologous to endolymphatic sac) lying in the parietal fossa. Monro, 1785.
3. Muscle of parietal fossa (inserted on endolymphatic pouch). Weber, 1820.
4. Utriculus divided into anterior and posterior sections, not directly connected with each other. Retzius, 1878, 1881.
5. Otoconia instead of otoliths. Breschet, 1838.

These peculiarities were discovered many decades ago; most of them are in general ignored by present day comparative anatomists and writers of laboratory manuals.

The external pore by which the membranous labyrinth communicates directly with the exterior was discovered, in the opinion of Hunter (1782), by Willughby (1686). But a careful perusal of the latter's treatise indicates that he saw a spiracle rather than an acoustic pore. Hunter and Monro (1785) seem each to have independently discovered the relation of the pore to the labyrinth. Monro gave a very clear description and excellent figures of the ear of the skate. His findings were rejected by all his contemporaries except Hunter, and their full confirmation awaited the researches of Retzius (1881).

The endolymphatic pouch, or enlargement of the duct leading in from the external pore, was discovered and figured by Monro. He saw in it the analogue of the external auditory meatus of the mammalian ear. The developmental history of the endolymphatic "sac" of the higher vertebrates lends doubt to the generally accepted homology of the sac with the structure termed endolymphatic pouch in this paper. The term "endolymphatic pouch" was first used by Portmann ('20).

Weber (1820) discovered in the parietal fossa a small muscle originating from the wall of the fossa and inserted on the endolymphatic pouch. Breschet ('38) confirmed Weber's discovery and later observers have noted the small muscle. Retzius ('81) figures it in *Acanthias* and *Raia*. In recent years this muscle has been

overlooked quite generally; hence we find it newly discovered (Davidson, '18; Daniel, '22), but incorrectly described. Its function is conjectural and must be investigated experimentally before definite statements can be made.

Monro noted that in *Raia* the posterior semicircular canal shows a marked independence of the rest of the membranous labyrinth. Retzius advanced the view that in the plagiostomes the utriculus is divided. A posterior portion with the posterior canal forms a nearly circular structure connecting directly with the sacculus or by way of a short canal. Two sense organs are found in this posterior part of the labyrinth, the crista of the posterior ampulla and the macula neglecta of the utricular portion. With an anterior utriculus, containing a macula recessus utriculi, are connected the anterior and horizontal semicircular canals, each with its crista.

A perusal of eleven laboratory manuals, in which the anatomy and dissection of the ear of the dogfish (or skate) is described and directed, reveals that not one of them gives an adequate, and few a correct description of the membranous labyrinth of the plagiostome ear. The dates of publication of these books range from 1892 to 1928, the older texts being less defective than the newer ones. The latest of these manuals has this statement: "The membranous semicircular canals are delicate tubes, both ends of which open into the utriculus." This statement summarizes what the other texts state in different words. The fact that the so-called posterior semicircular canal of the plagiostome fishes does not connect with the utriculus (except as we recognize a posterior utriculus), but with the sacculus, and that it is approximately circular and hence does not have two distinct ends, seems to have escaped the notice of makers of present-day laboratory manuals in zoology and comparative anatomy. But the true relations have long been known.

The writers of our recent laboratory manuals in comparative anatomy seem to have derived their descriptions of the anatomy of the plagiostome ear by paraphrasing older and erroneous accounts, rather than by verification from actual specimens. Obviously the membranous labyrinth in any vertebrate is a difficult structure for the novice to identify and understand its parts. But at least the laboratory directions should be in accord with the facts. Reference to the works of Retzius ('81), Everett ('96), Hellmann ('98), Stewart ('06), Goodey ('10), and Daniel ('22) would certainly preclude the publication of such erroneous statements as have occurred in recent manuals.

Some of the early accounts of the ear of fishes deal largely with the earstones or otoliths found in the vestibule of the ear. Willughby found that in the cartilaginous fishes these bodies were soft chalky masses instead of hard pebble-like otoliths. Breschet designated them "otoconia" and as such we know them today.

LITERATURE CITED

- BRESCHET, G., 1838. Recherches anatomiques et physiologiques sur l'organe de l'ouïe des poissons. Mém. Math. Phys. pres. Acad. Sci., Paris, T. 5.
- DANIEL, J. F., 1922. The elasmobranch fishes. Berkeley.
- DAVIDSON, PRUE, 1918. The musculature of *Heptanchus maculatus*. Univ. Calif. Publ. (Zool.), vol. 18.
- EVERETT, W. H., 1896. Anatomy of the ear of the dogfish (*Galeus canis*). Preliminary paper. Trans. N. Y. Acad. Sci., vol. 15.
- GOODEY, T. A., 1910. A contribution to the skeletal anatomy of the Frilled Shark, *Chlamydoselachus anguineus*, Garman. Proc. Zool. Soc. London.
- HELLMANN, 1898. Die Entwicklung des Labyrinthes bei *Torpedo ocellata*. Verhandl. deutsch. otol. Gesellsch. Versamml. 7.
- HUNTER, JOHN, 1782. Works of John Hunter, edited by J. F. Palmer, 3rd ed., vol. 4, 1837. On the organ of hearing in fish. Original paper: Phil. Trans. Roy. Soc., vol. 63, 1782.
- MONRO, A., 1785. The structure and physiology of fishes, explained and compared with those of man and other animals. Edinburgh.
- PORTMANN, G., 1920. Organe endolymphatique des Selaciens. Compt. Rend. d. l. Soc. Biol., Paris, T. 83.
- RETZIUS, G., 1878. Zur Kenntniss von dem membranösen Gehörlabyrinth bei den Knorpelfischen. Archiv Anat. u. Physiol., Anat. Abt.
- 1881. Das Gehörorgan der Wirbelthiere. Stockholm.
- STEWART, C., 1906. On the membranous labyrinth of certain sharks. Jour. Linn. Soc., London, vol. 39.
- WEBER, E. H., 1820. De aure et auditu hominis et animalium, pt. I: De aure animalium aquatiliū. Lipsiae.
- WILLUGHBY, FRANCIS, 1686. De Historia Piscium. Oxonii.