Morphology of the mammalian Ossicular auditûs / by Alban H.G. Doran.

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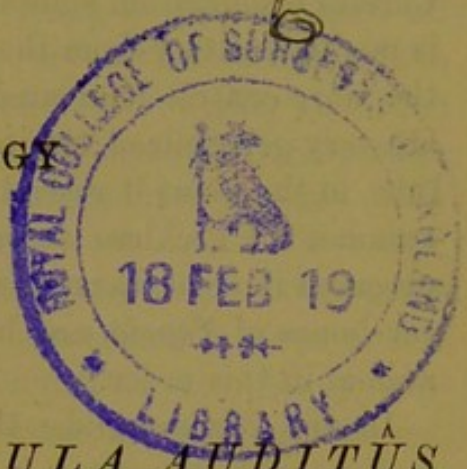

MORPHOLOGY

OF THE

MAMMALIAN *OSSICULA AUDITÛS.*

BY

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(Abstract.)

The complete memoir on the small ear-bones of the Mammals will hereafter be published in the Society's 'Transactions,' with copious illustrations, whereby an excellent comparison of the various forms peculiar to and significant of groups may be instituted. Previously elsewhere* I have given a short *résumé* respecting the material which has afforded the means of study of the series, with a brief reference to what has already been published on the internal auditory apparatus, and added a short notice concerning points among certain of the higher groups of the Mammalia. For the present abstract I shall therefore confine my remarks to the auditory ossicles of the following orders, viz.:—the Insectivora, the Chiroptera, the Cetacea, the Sirenia, the Edentata, the Marsupialia, and the Monotremata.

* Proc. Roy. Soc. vol. xxv. pp. 101–109 (1876).

In the ossicula of the Insectivora no constant positive character can be found. These bones are most specialized in *Chrysochloris*. Careful examination shows that the singular malleus in this genus is modified rather from the higher or anthropoid form than from the more central laminated type. The ossicula of *Galeopithecus* are very generalized; in its malleus it approaches the Macroscelidæ, in the incus it resembles *Tupaia*; in the latter the malleus assumes the neckless character common among the Cebidæ, and observed in some Lemurs and in *Sciurus*. Taken as a whole, the ear-bones of *Tupaia* are higher in type than those of any other animal in this order.

In the Macroscelidæ the extremely constricted neck of the malleus with its narrow lamina and its processus gracilis running straight forwards to the Glaserian fissure are highly characteristic; but in *Petrodromus* the malleus more resembles that of *Sorex* than the same ossicle in *Macroscelides* and *Rhynchocyon*.

In the Soricidæ, Myogalidæ, Talpidæ, Centetidæ, and Erinaceidæ one common feature exists, a malleus with a wide lamina, and a processus gracilis united to the tympanic ring after the fashion of the Marsupials. The processus brevis of the incus is always ill developed except in the Centetidæ and *Gymnura*; the intercrural aperture of the stapes is wide. In the Shrews the malleus bears both a processus muscularis and a peculiar orbicular apophysis, as in *Mus*; this spherical process in *Myogale* appears to replace functionally the processus muscularis, which is absent in that genus.

In the Talpidæ the malleus of *Condylura* most resembles that of *Sorex*; but its orbicular process serves as a processus muscularis, as in *Myogale*. The mallei in *Talpa* and *Scalops* closely resemble each other; but the incus of *Scalops* has not the broad channelled processus longus seen in *Talpa* and *Condylura*. In the Erinaceidæ and Centetidæ the malleus has a broad processus gracilis perforated to transmit the chorda tympani nerve. The processus muscularis and an ill-developed orbicular apophysis coexist.

The ossicula of the Chiroptera resemble those of the Soricidæ and allied Insectivora very strongly, except in *Pteropus*, where the malleus is of a rather lower type. A well-developed processus muscularis is always found in the insectivorous Bats; in *Phyllorhina* and other genera there is another process accessory

to it; an orbicular apophysis, observed in *Sorex*, is also constant, but not pedunculated. The manubrium is quadrilateral, the inner as well as the outer aspect being sharply bordered off from each of the sides. The incus is very similar to that of the Shrews and Marsupials: the stapes is of a rather higher type than the other ossicula; its aperture is generally wide and occupied in the recent skull by a small artery unsupported by any bony canal.

In the Cetacea the malleus is constantly united to the tympanic bone by firm bony ankylosis through the medium of the processus gracilis. The manubrium is ill developed or completely suppressed. The stapedial crus of the incus is greatly developed. The crura of the stapes are thick and encroach upon or obliterate the aperture. This ossicle always fits firmly into the fenestra ovalis, to which it is in no species constantly ankylosed.

These bones are most generalized in type in the genus *Balæna*, particularly as regards the incus; the malleus, too, has the least-modified form of manubrium. Next in order come *Neobalæna* and *Megaptera*; but *Balænoptera* possesses a malleus and incus as modified as in the Dolphins. In the Physeteridæ the malleus is extremely modified, the manubrium and processus muscularis are not borne upon a tubercle projecting from the front of the head as in other Cetacea, but are reduced to two small spines. That representing the manubrium is almost obsolete in *Physeter*, *Hyperoodon*, and *Mesoplodon*, but fairly developed in *Berardius*. The incus has characters intermediate between the same in *Balæna* and *Delphinus*; the stapes assumes a tolerably distinctive form.

In all the Dolphins the incus has a very large stapedial crus and a stapes with stouter crura than in the Whale-bone and Sperm-Whales. The malleus resembles considerably that of *Balænoptera*; the manubrium may be represented by a spine bent downwards (*Orca*, *Pseudorca*) or depressed against the side of the ossicle (*Globiocephalus*, *Lagenorhynchus*, *Phocæna*); or that spine may be almost or quite obsolete (*Delphinus*, *Delphinapterus*): part of the process from the membrana tympani is inserted along a narrow groove in the tubercle. *Monodon* has a spine-like manubrium, but differs from the other Dolphins in the characters of its articular surface and the length of the head and tubercle. The head of the malleus is best developed in *Orca*.

Platanista is distinguished from the above delphinoid Cetaceans by the great length of the process from the head of the malleus, and by other less conspicuous modifications in that ossicle. Such distinctions are hardly discernible in the genus *Inia*.

In the Sirenia the ossicula are modified more in texture, weight, and outline than in the development or suppression of any of their processes as in the Cetacea. Their singular general modifications of form mask any points of resemblance to their representatives in any other order which otherwise might be observable, excepting that in *Halicore* and, apparently, in *Halitherium* there is an approach to a quadrilateral form of stapes, which at least reminds the anatomist of the form of that bone in the larger Ruminants. In no respect do any of the ossicula resemble those of the Whales and Dolphins. *Halicore* differs distinctly from *Manatus* in several particulars, most of which have been already described by Hyrtl. In *Rhytina* the malleus and incus, judging from the description and figures given by Clausius, very closely resemble those of the Manatee. In *Halitherium* the description of the ossicula with which Dr. Krauss has favoured science leads me to consider that the malleus is intermediate in type between those of *Manatus* and *Halicore*, the incus more resembling that of the former Sirenian.

In the Bradypodidæ, among the Edentata, the characters of the malleus and incus are fairly generalized, whilst the stapes assumes, to a certain extent, Sauropsidan characters. Among the Armadillos the genera *Dasypus* and *Tatusia* present much higher characters in the ossicula of adult specimens than can be found in *Priodon* and *Tolypeutes*. The malleus in the adults of the two latter genera resemble the same ossicles in the fully developed fœtus of *Dasypus* and *Tatusia*. This recalls an identical condition in *Bos* and *Ovis*.

In the Manidæ the ossicula possess the most positive characters among all the Edentata. The malleus is more specialized than in the other groups, and the stapes is more absolutely columelliform than in any other placental mammal. In the Ant-eaters the malleus may be known from that of other Edentata by the form of its head; in *Cyclothurus* it resembles that of *Bradypus* more than do the same bones in *Myrmecophaga* and *Tamandua*.

In *Orycteropus* the malleus is quite unlike that of any true Ant-eater, but resembles, to a certain extent, that of *Priodon*, from which, however, it maintains very distinctive features.

The Marsupialia are distinguished for the uniformly low type of their ossicula, although no single feature indicating inferior grade in them is not to be found, in isolated cases, in higher mammals. These bones are of the most ill-developed consistence in the Peramelidæ, and of the highest form in the Didelphyidæ, where the incus has a well-developed processus brevis, and the stapes, alone among Marsupials, is perfectly bicrurate. In the Kangaroos the ossicula are central in character, the malleus bears a large foliaceous processus gracilis, as in the Wombat; but the stapes is always partially bicrurate. In the Phalangistidæ the stapes is generally columelliform, or only slightly bicrurate, the incus is of as high a type as in the American Opossum, the malleus is of the form seen in a new-born *Macropus*; this ossicle has distinctive features in *Phascolarctos*.

In the Wombats the malleus is not so much of high type as an extreme form of the development of that bone in *Macropus*. The incus has a stapedial crus somewhat like that of *Perameles*; the stapes is always columelliform. In the Dasyures, including *Phascogale* and *Myrmecobius*, the incus is of low type, and the stapes columelliform; but all their ossicles are of more solid consistence than in the Bandicoots.

The distinguishing features in the ossicula of the Monotremata are a peculiar form of articulation between the malleus and incus by means of a scale-like development from the head of the former, and the presence of an absolutely columelliform stapes. Yet the three ossicula are not much modified from their representatives in the lower Marsupials. The incus is ankylosed to the malleus in *Echidna* and generally in the adult *Ornithorhynchus*, but not in the same manner as in certain Rodents. These bones are of more solid consistence in *Echidna* than in the other Monotreme. In all cases among mammals where the stapes is columelliform, it clearly represents the entire bicrurate stapes of most animals in that class, but, according to the most recent views of embryologists, only a part of the columella of birds and reptiles, the greater part of that long ossicle in the latter classes probably representing the long process, or at least some other portion, of the incus.