

Genus *LEPTASTRÆA*, *Milne-Edwards & Jules Haime*.

This is a genus typical of incrusting and solid Aporose Astræidæ, and the species are very well characterized by their thick intercorallite walls and intercorallite tissue. In a species from Mergui many scores of corallites of 5 or 6 millim. in height covered the uneven surface of a piece of conglomerate; and it is evident that although extracalicular gemmation occurs in a few instances, the majority of the corallites grew side by side from a basal structure, and usually upwards in a vertical line. The base is not a wall, but a very thin epitheca; and there is no true wall.

There is no doubt that this epithelial replacement is very common in the incrusting species of most genera; and the peculiar increase of the corallum is at first by growth from the common epithecate basal expansion and then by gemmation from the wall of the corallite.

On the Auditory Ossicles of *Rhytina Stelleri*. By ALBAN DORAN, F.R.C.S. (Communicated by Professor W. H. FLOWER, F.R.S., F.L.S.)

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IN a recent monograph contributed to this Society and published in its Transactions*, I described the characters of the auditory ossicles of the Mammalia, having succeeded in procuring for the purposes of description and study a very large series of these little bones, which now constitute a special collection, preserved in the Museum of the Royal College of Surgeons of England. It was only with regard to a very few species indeed that I was compelled to rely upon descriptions found in the works of comparative anatomists; for where the vast resources of the College, kindly placed at my disposal by Professor Flower, failed to enlighten me, I generally succeeded in borrowing the desired ossicles from other collections. In describing the ear-bones of the Sirenia, however, I had to rely entirely on description in the case of *Rhytina*, my source of information being a paper by Claudius entitled "Das Gehörorgan von *Rhytina Stelleri*," published in the 'Mémoires de l'Académie des Sciences de St. Pétersbourg,' 1867. Claudius describes the malleus very clearly; but ever since the publication of my own monograph, I have been seeking an oppor-

* "Morphology of the Mammalian Ossicula auditus," Linn. Soc. Trans. 2nd ser. Zoology, vol. i. pp. 371-497, pls. 58-64.

tunity of examining an actual specimen. Through the courtesy of Professor F. A. Smitt, of Stockholm, Superintendent of the Collection of Mammalian Skeletons in the Swedish Department of the recent International Fisheries Exhibition, I have been enabled to examine the malleus of the *Rhytina* obtained in the 'Vega' Expedition. The skeleton in question formed a conspicuous object in the Exhibition. By taking the specimens of mallei of *Halicore* and *Manatus* to the Swedish Department, I had an opportunity of comparing the bones and of making measurements. I have also been able to inspect the right ossicula *in situ* from a specimen kindly lent to Professor Flower by the Commissioners of the United-States Department of the same exhibition.

The malleus in the 'Vega' skeleton only exists on the left side, and is firmly fixed to the tympanic bone by a very stout processus gracilis over 3 centimetres in length. It resembles the malleus of *Manatus* rather than the same bone in *Halicore*. The body, as in the second genus, is very bulky, and well-developed anteriorly and internally; in *Halicore* the body is much smaller, the manubrium forming almost half the bulk of the bone. Bulky, however, as is the body of the malleus in *Rhytina*, the manubrium forms a larger proportion of the entire ossicle than is the case in *Manatus*.

The manubrium in *Rhytina* is, I find, of a different character from the same process in *Manatus*; nor does it resemble that of *Halicore*. In all three genera a groove separates the root of the manubrium, superiorly from the body; this groove is relatively faint in *Rhytina*. In this extinct species the outer border of the manubrium forms a very wide and perfectly regular curve directed outwards. This border is very narrow, though well separated from the sides of the manubrium by sharp edges; the tip is hardly dilated. The inner border is distinctly sharper than the outer: in this point *Rhytina* agrees with *Halicore*; whilst in *Manatus* the corresponding border is exceedingly blunt.

The manubrium in the malleus of the American specimen has been broken off inferiorly, or worn down by the action of water*, and bruised at its upper angle; though that angle with the upper border is still well marked and straight compared to the same border in *Manatus*. The inner border is sharp, and bears a notch produced apparently by injury. The length of the entire manu-

* The plates accompanying Claudius's work (*loc. cit.*) represent a malleus with the manubrium worn down in the same manner.

brium in this specimen from the American skeleton is 1.9 centim., nearly 1 centim. less than in the 'Vega' malleus. In other respects the mallei from the two specimens are very similar.

In my monograph, when describing the manubrium of *Manatus*, I wrote:—"The upper border is very sharp and narrow; it forms a semicircle, and projects against the membrana tympani in the live subject; the outer border is short, and its margins, united above, diverge but little towards the extremity; its surface is concave vertically, and slightly convex horizontally"*.

Careful examination and comparison of the manubrium in all three genera lead me to believe that what I termed the upper border in the manubrium of *Manatus* is in reality only the upper part of the outer border. A small projection where this border joins the body of the malleus above represents a suppressed upper border. What I termed the outer border is, properly speaking, only its spatulate termination, sharply deflected from the superior portion of the same border.

The upper border of the manubrium, then, is obsolete in *Manatus*. In *Halicore* "it is very broad . . . and sharply bordered from the sides; externally it runs into the outer aspect by forming a prominent bold convexity instead of a processus brevis"†.

In *Rhytina* the upper border of the manubrium is quite distinct, running for nearly half a centimeter from the body of the malleus to the outer border, from which it is separated by a very distinct "processus brevis." This in itself gives the malleus of *Rhytina* a far more generalized character than can be detected either in *Manatus* or in *Halicore*. It is a distinct approach in form to the long scythe-like manubrium of many ruminants.

Returning to the body of the malleus, it appears even bulkier than in *Manatus*. It bulges more posteriorly than forwards, whilst in the Manatee the anterior projection is greater, as the appended measurements will show. The processus gracilis is much stouter than in *Manatus*. The articulated surfaces are very deep, and of the *Manatus* type‡. The incus is as in *Manatus*, the body is equally shallow and wide, and the crura are very divergent. This bone occupies the same position to the malleus as seen in the other Sirenia.

The following measurements will give some idea of the bulk of

* *Loc. cit.* p. 468.

† *Loc. cit.* p. 466.

‡ There is no peg-like process below the superior facet, like that which I have seen in *Manatus americanus*, but never found in *M. senegalensis*.

the malleus of *Rhytina*. The 'Vega' specimen, being the more perfect, has been selected for this purpose.

		centim.
Antero-posterior measurement of malleus (root of manubrium to root of processus gracilis)....	Rhytina	1·8
	Manatus	1·8
	Halicore	1·1
Measurement from manubrium to most internal part of body of malleus	Rhytina	2·5
	Manatus	1·8
	Halicore	1·3
Length of manubrium	Rhytina	2·7
	Manatus	1·8 *
	Halicore	1·5

The incus, both in the 'Vega' and the American specimen, is very similar to the same bone in *Manatus*. The body is shallow and wide between the crura. There is not the prominence behind the upper and more posterior of the two lower facets so conspicuous in *Halicore*; so that the posterior part of the body is not larger than in the otherwise much smaller incus of *Halicore*. The upper facet is wider and deeper than in *Manatus*, but, as far as I could judge (not being able to disarticulate the bone from the malleus), of much the same shape. Its dimensions were as follows :—

	Distance between extremities of crura.	Depth of body to point of proc. brev.
Rhytina	2·4	1·5
Manatus	1·6	1·2
Halicore	1·6	1·0

(As it is difficult to fix a precise "root" to the processus brevis, the "depth" is taken from the highest part of the body to the extremity—that is, to the point of ankylosis—of that process.)

Lastly, in the American specimen the stapes existed. It fell out of its place in examination, which proved convenient, as will be seen; moreover it was readily replaced. In shape it is very similar to the stapes of *Manatus senegalensis*. The head is equally well developed, and bears an almost circular articular surface 0·5 centim. in diameter (0·4 centim. in *Manatus*). As in *Manatus*, also, both crura are long and hardly divergent; both also are crooked; the anterior, too, is the straighter, and is much thinner in proportion to the posterior than even in *Manatus*. The posterior crus is very bulky, and bulges higher up than in *Manatus*; the thickness of this crus encroaches upon the aperture, which is therefore much smaller proportionately than in the

* The greater curving of the manubrium in this Sirenian, compared with *Rhytina*, must be taken into account, as the extremities are thereby approximated.

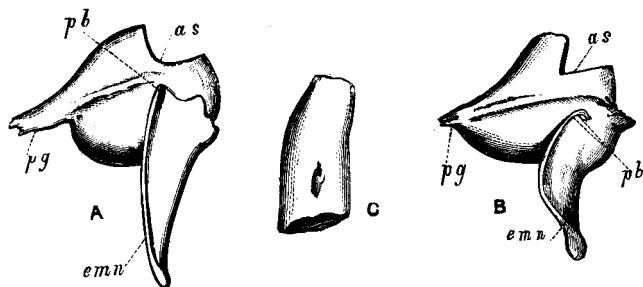
Manatee, and is situated lower down or closer to the foot-plate. This plate is proportionately broader than in *Manatus*; so (as the appended measurements prove) it is as wide as the widest expanse of the crura.

The following measurements (in centimeters) show that *Rhytina* possesses a stapes absolutely larger than that of any other animal. It must be remembered that the ossicula of the Sirenia are bulkier than those of the Cetacea.

	Vertical measurement.	Greatest breadth across crura.	Breadth of foot-plate.
<i>Rhytina</i>	1.9	0.9	0.9
<i>Manatus</i>	1.6	0.8	0.6
<i>Halicore</i>	1.0	0.5	0.6
<i>Balæna mysticetus</i>	1.1	Crura expanded regularly to foot-plate.	{ 0.5
<i>Balænoptera Sibbaldii</i> ..	1.0		
<i>Elephas indicus</i>	0.6	0.4

In conclusion, it may be said that the malleus of *Rhytina* is larger than in *Manatus*; and therefore it is the largest and bulkiest malleus to be found in the whole section of the animal kingdom where such a bone exists; that in the characters of its body it resembles *Manatus* rather than *Halicore*; and that in the manubrium it differs from the other Sirenia, and is far more generalized. The incus is of the *Manatus* type*, and so is the stapes, which is also the largest and bulkiest stapes to be found in any animal.

In the appended drawings I have placed the mallei of *Rhytina* and *Manatus* in the position best adapted for showing the differences in the manubrium.



A. Malleus of *Rhytina Stelleri*. B. Malleus of *Manatus americanus*. Both natural size and outer aspects. C. Stapes of *Rhytina*, natural size. The lettering applies as follows:—*a.s.* articular surface; *p.b.* processus brevis; *p.g.* processus gracilis; *e.m.n.* external surface of manubrium.

* The body of this bone is bulkier in *Macrorhinus* than in *Rhytina*; but the crura are slender as in other allied Seals. Hence *Rhytina* exceeds every living animal in the size of all its ossicula.