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B O S T O N

JOURNAL OF NATURAL HISTORY,

CONTAINING

PAPERS AND COMMUNICATIONS,

READ TO THE

BOSTON SOCIETY OF NATURAL HISTORY,

1859—1863.

PUBLISHED BY THEIR DIRECTION.

VOL. VII.

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BOTANICAL  
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BOSTON:

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in some characters, while they are widely different in others. Thus the external maxillipeds, the chelipeds, the pterygostomian region, the posterior tooth of the antero-lateral border, in all except *tumidus*, are very much alike. The shape of the abdomen in both the male and female, is quite characteristic of the species, in this genus.

The materials upon which the above observations were made are in the Museum of Comparative Zoölogy at Cambridge and that of the Smithsonian Institution at Washington.

ART. XIV. — *On the Fossil Crab of Gay Head.* — By  
DR. WILLIAM STIMPSON.

[Communicated January 21, 1863.]

THE occurrence of remains of Crustacea in the green-sand layer of the interesting series of strata exposed at Gay Head, the southwestern extremity of Martha's Vineyard, has long been known. Dr. Hitchcock alludes to them in the first edition of his "Geology of Massachusetts," published in 1833, as well as in the second edition of the same work (1841). They are there described in the following terms, which we give entire, as showing the *lithological* character of the specimens:—

"*Crustacea.* In the green sand at Gay Head, we meet with well-characterized specimens of the genus *Cancer*, although they are in general much broken; showing that they originally belonged to a formation which was abraded or destroyed anterior to the production of the green sand. The interior part of the specimen consisted of argillaceous matter, probably containing a large proportion of oxide of iron; but the covering of the animal still retains its black shining color, although apparently carbonaceous. The broken state of nearly all the specimens, renders it difficult to determine whether they belonged to more than one spe-

APRIL, 1863.



cies, although they probably did ; and for the same reason I have thought that drawings would not be of use."

In the summer of 1859 a large number of specimens of these fossil crabs were collected by Mr. Ordway\* and myself, and in 1862 collections were made at the locality by Messrs. Hyatt and Shaler, which include some of the best examples yet found. These materials, though abundant, consist for the most part of small fragments ; and there are none which are sufficiently well-preserved to give a proper idea of the entire crab. By the study and comparison of these fragments, however, I have been able to refer them all to two species, both brachyuran. Only one of them is sufficiently well represented by specimens to enable me to judge of its perfect form and true place in the system. To this species nine tenths of the fragments belong, and by the combination of these, I have endeavored to reproduce the essential parts of the crab, and to represent them in the accompanying diagrams.

I cannot refer the species to any described genus, either recent or fossil ; but there is abundant evidence that it belongs to the *Carcinoplacidae* of Milne-Edwards,† of which family it forms a new genus and species. It may be called

ARCHAEOPLAX SIGNIFERA.

Pl. XII., figs. 1-4.

The *carapax* is remarkable for its great posterior breadth. This is, indeed, characteristic of the family *Carcinoplacidae*, which are consequently placed in the great group *Ocypodoidea*, notwithstanding that the conformation of their maxillipeds and sternum resembles closely that found in Cancroids. The approximate length of the carapax (Pl. XII., fig. 1.) in the best specimen is 1.6 of an inch ; its greatest breadth is 2 in., and the breadth at the posterior

\* The instructive specimens in the Museum of Comparative Zoölogy, developed by this gentleman, have aided me much.

† *Mélanges Carcinologiques*, p. 128.



1.5. It is much curved, in a longitudinal sense, so that the superior outline in a side view forms the arc of a circle, the middle height of which would be nearly half an inch. It must be here stated that the diagram, (Plate XII., fig. 1,) represents the crab turned up into such a position as best to show the anterior portion, while the posterior portion is foreshortened. In a transverse sense, the carapax is but slightly convex anteriorly; posteriorly the median or greater part is nearly flat, but there is on either side a well-defined longitudinal channel or concave depression, where the branchial region slopes abruptly toward the postero-lateral margin. The surface is smooth and covered with minute punctures, except anteriorly and at the margins, where it becomes distinctly granulated. The central region is defined by two lunate marks, which, though not projecting above the general surface, are conspicuous by their smoothness and darker color, and serve as a sign by which some fragments of the carapax of this crab may always be recognized.

The *antero-lateral margin* is armed with four teeth, the first or anterior one forming the outer angle of the orbit. The second and fourth teeth are about equal, and scarcely more distant from each other than the first and second, while the third is very small, as if supplementary and intercalated between its neighbors. The *orbits* are elongated, each occupying nearly one third the width of the carapax, and have an entire, though granulated superior margin. As far as can be discovered in the specimens at hand, there is no notch between the front and the orbit, at the attachment of the external antennæ, for the inner angle of the orbit forms, apparently, the outer angle of the front. The *front* occupies about one fourth the breadth of the facial region, and has a small projecting lobe at the middle, which is divided in two by a median emargination.

The *chelipeds* are of moderate size, and resemble in gen-



eral form those of the *Cancridae*. They are almost exactly similar to those of *Pseudorhombila* as figured by Milne-Edwards,\* but are somewhat shorter. The carpus is nearly quadrangular, a little uneven on the upper surface, and armed with a strong tooth at the inner angle. The hands are smooth and unarmed, with fingers not longer than the palm, and somewhat tuberculated toward their extremities. Of the *ambulatory feet* we have few and very imperfect indications. It can only be said, that they appear to be smooth, without teeth or spines; and that the thighs or meros-joints are of great breadth, though not particularly compressed.

Of the *outer maxillipeds*, (Pl. XII., fig. 2,) I find reliable specimens only of the ischium-joint of the endognath, and of the first joint of the exognath. The latter is remarkable for its very considerable breadth, being more than half as broad as the ischium of the endognath. This ischium is a little more than one half longer than broad, marked with scattered shallow pits and with the usual longitudinal sulcus, and ornamented along its inner margin with crowded and minute punctures for the attachment of bristles, with which this margin was in life densely clothed. Of the meros of these maxillipeds I find only small and doubtful fragments, which, however, seem to indicate a strong prominence of the external angle of this joint,—stronger in fact than I have ventured to represent in the diagram.

The *sternum* (Pl. XII., fig. 3), is quite well preserved, except as regards its posterior extremity, in several specimens, which have all belonged to male individuals. It is rather broadly expanded anteriorly, and very little convex, even in a longitudinal sense. Its anterior triangular projection is separated by a slight transverse sulcus, and there are, in some examples, slight indications of a transverse sulcus posterior to this, arising from the next notches of the margin, and bending backward. At the posterior margin of the second

\* Arch. du Muséum, T. VII., Pl. xi. f. 4.



segment on each side, where it passes beneath the abdomen, we find the genital tubercle, as represented in fig. 4. These tubercles have thus the same situation as in Portunids, while in the crabs most nearly allied to that here described, it is more frequently found near the anterior margin of the segment. The last or posterior segment of the sternum does not project laterally beyond the margin of the male abdomen, as is usual in Ocypodoids, but is much narrower than the preceding segment, and entirely concealed, as in Cancroids.

The *abdomen* of the male only has occurred (Pl. XII., fig. 3). It is quite broad for a male abdomen, and its middle three segments are not soldered together, but distinct. I have seen no specimens in which its basal joints are well preserved, but they cannot differ much from the representation given of them in the diagram.

The male organs, or *verges*, in this genus arise directly from the coxal joints of the posterior feet, and not from the sternum. The posterior segment of the sternum is not distinctly grooved for their passage to the intromittent organs, although there is a slight depression; but this is very little deeper than in *Carcinus*, with which genus ours shows much resemblance in the structure of this part of the body.

As illustrations of this fossil crab, I have given my working diagrams, instead of figures drawn from nature; for to represent all the parts in the diagrams by the latter method, the delineation of an inconveniently large number of specimens would be required.

It will be seen from the foregoing description that *Archaeoplax signifera* presents, in its different parts, the characters of widely-removed groups of Brachyura. This indeed is the case with most of the genera of the family *Carcinoplacidae*, in which I have placed it. In its carapax and elongated orbits we find most resemblance to Ocypodoids, for though certain Cancroids, like *Trapezia*, have a quadri-



lateral carapax, this character is not in them accompanied by the form of orbit alluded to, which indicates considerable length in the ocular peduncles. In the outer maxillipeds, and in the shape and anterior breadth of the sternum, we have an unmistakable resemblance to the *Portunidae*; but in the seven-jointed male abdomen we find a return to the Ocypodoid character, for that part of the body in all male Portunids is five-jointed.

With regard to the more intimate relations of *Archaeoplax*, it may be remarked that while the shape of the carapax and its postero-lateral depressions or channels are the same as in the *Carcinoplacidae*, the orbits and antero-lateral margins more closely resemble those of *Prionoplax*, a genus of *Gonoplacidae*. But our genus is removed from the latter family by the form of the posterior segment of the sternum, which is not "*debordant*" or exposed on either side beyond the abdomen, this being, in *Gonoplacidae*, narrow at the base. From the genera of *Carcinoplacidae* already known, the new fossil genus differs as follows:— From *Eucrate*,\* which it exactly resembles in the shape of the front, it differs in its elongated orbits, and broader male abdomen. From *Pseudorhombila*,— to which I have already alluded as having similar chelipeds,— in the form of the orbits and antero-lateral margin. From *Carcinoplax* and *Pilumnoplax*, it also differs in the character of the orbits. Finally,

\* Professor Dana has misapprehended the genus *Eucrate* of De Haan, in placing it in the *Gonoplacidae*, having been very naturally misled by that author's neglect to give the position of the genital appendages of the male, a point of the highest importance. The resemblance to the *Gonoplacidae* in De Haan's genus, is indeed great; but I have recently had occasion to examine, in the Museum of Comparative Zoölogy, wet specimens of *Eucrate crenatus*, the typical, and indeed the only species yet known, in which I find that the male organs arise from the coxæ of the posterior feet, and are not "*e sterno ortæ abdominisque tectæ*," as given in Dana's diagnosis of the genus (Crustacea of the U. S. Exploring Expedition, I. p. 310). The crab, therefore, will fall into the *Carcinoplacidae*. The *Eucrate crassimanus* of Dana, having sternal verges, is, therefore, not a true *Eucrate*, but will be the type of a new genus, upon which I will not here impose a name, but merely point it out for the benefit of whomsoever may hereafter monograph the group.



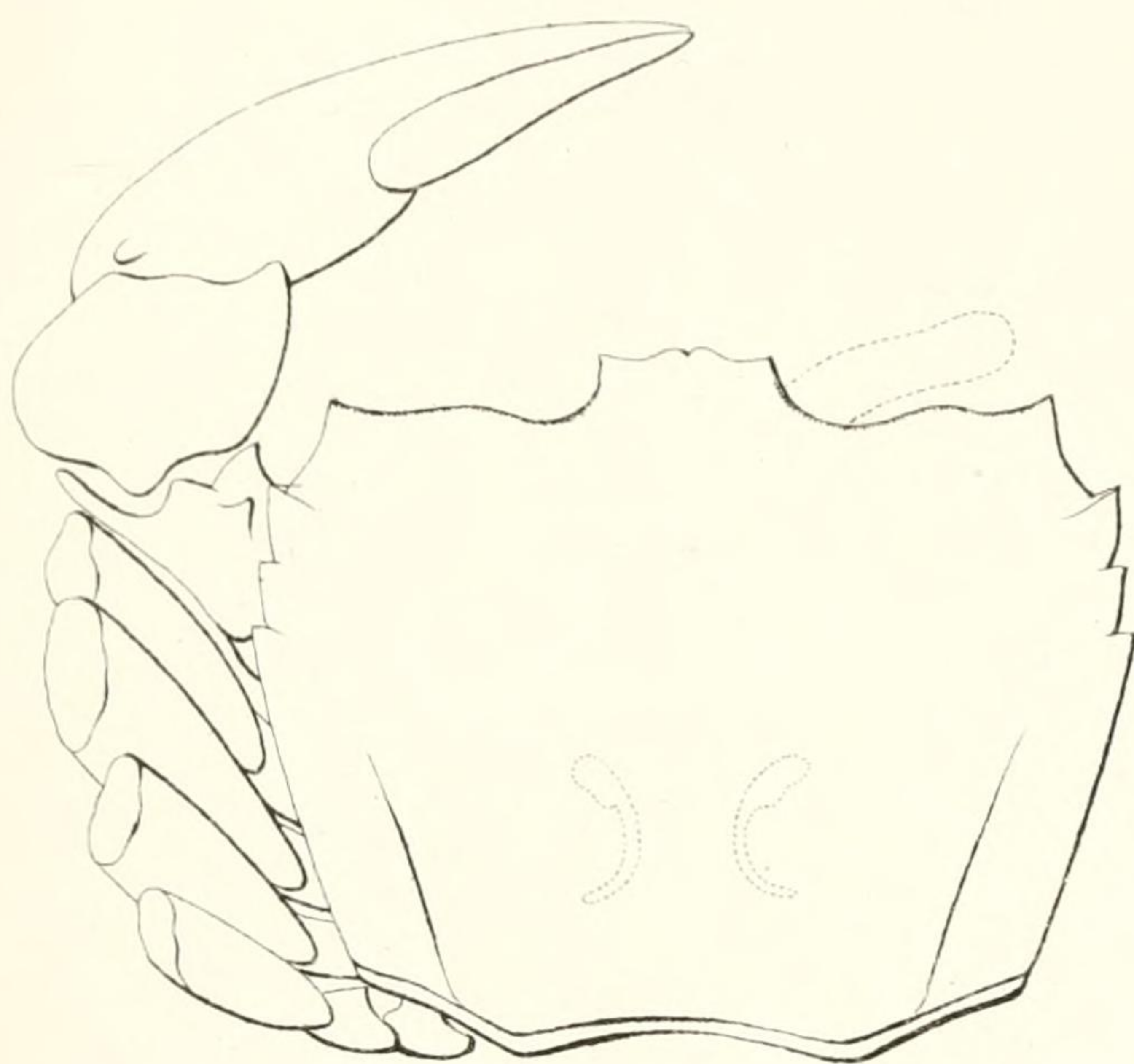
from *Heteroplax* Stm., (Prodr. descr. anim. evert. etc., p. 40,) to which, of all existing Crustacea, our fossil genus approaches nearest, it is removed by the presence of a median frontal emargination, and also, if I have rightly interpreted the scanty material at hand for this point, in the want of the antennary notch which separates the front from the inner angle of the orbit.

No fossil crab, to which *Archaeoplax* has any close relations has yet been described, with the exception of *Arges* of De Haan, (Fauna Japonica, Crust., p. 62, Pl. v., f. 4,) which differs from our genus in its shorter carapax, unarmed antero-lateral margin, and narrower exognath of the outer maxillipeds. Nothing is known with regard to the formation in which *Arges* occurs.

The study of the *Archaeoplax*, as an isolated fact, affords but little aid in the determination of the age of the Gay Head deposit. It belongs to one of the highest grades of Crustacea, but still higher forms have been found in the Eocene Tertiary, for instance *Xanthopsis* of McCoy in the London clay. I was probably wrong in referring the green-sand layer to the Cretaceous in the Am. Journal of Science for January, 1860, although Dr. Hitchcock suggests that this layer may consist of the *débris* of some older deposit, such as the Cretaceous; but there is nothing to confirm this view in the character of the fossils accompanying the crabs.

The abundance of specimens of the *Archaeoplax* at Gay Head, indicates a warm climate in that region at the time they were living. At the present day all *Carcinoplacidae* are inhabitants of warm seas. The nearest allied genus, *Heteroplax*, lives on the coast of China at the northern limit of the torrid zone.





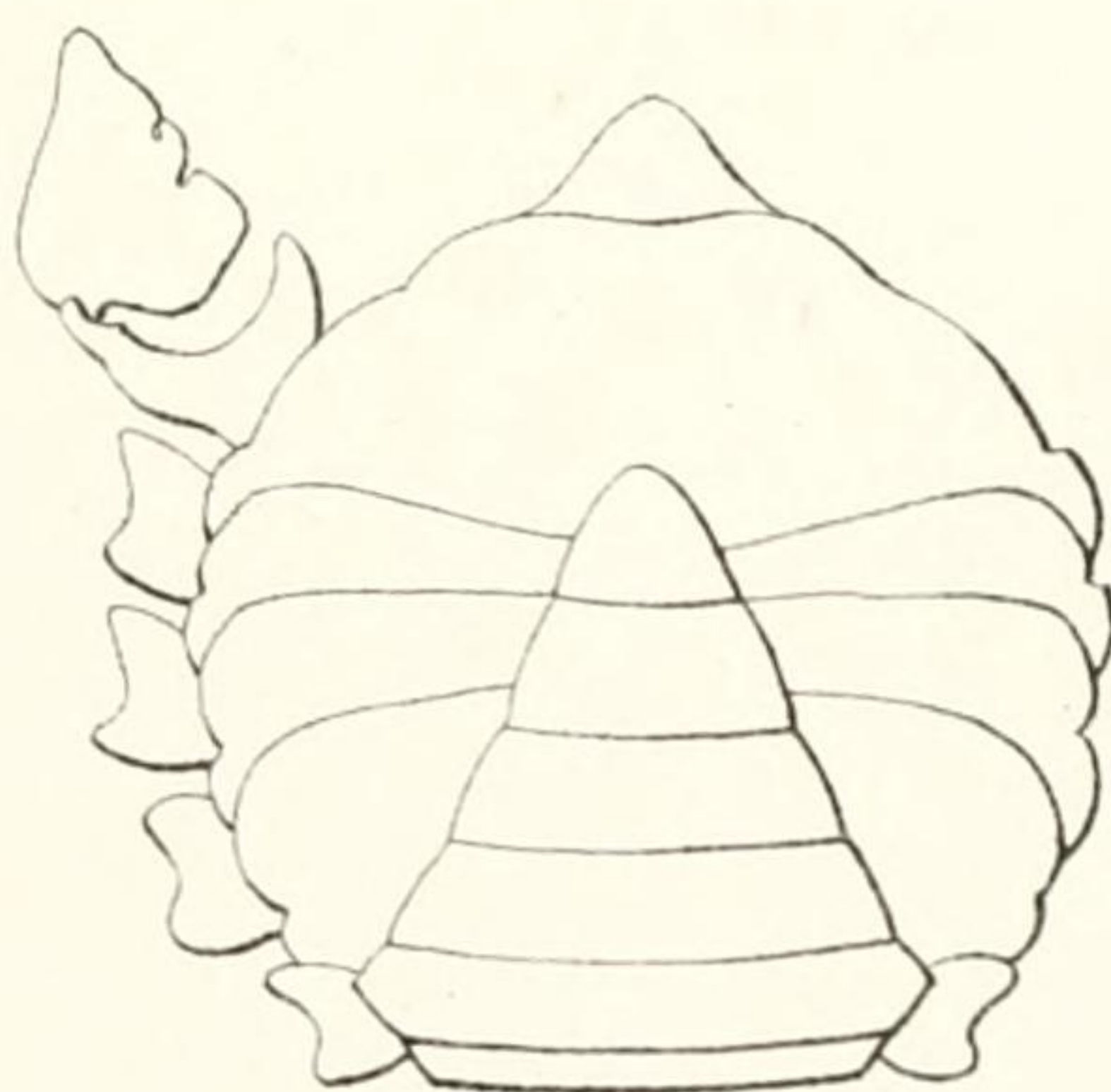
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