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EDITED BY

THE ASSISTANT-SECRETARY OF THE GEOLOGICAL SOCIETY.

Quod si cui mortalium cordi et curæ sit non tantum inventis hæere, atque iis uti, sed ad ulteriora penetrare; atque non disputando adversarium, sed opere naturam vincere; denique non belle et probabiliter opinari, sed certo et ostensive scire; tales, tanquam veri scientiarum filii, nobis (si videbitur) se adjungant.
—*Novum Organum, Præfatio.*

VOLUME THE TWENTY-NINTH.

1873.

PART THE FIRST.
PROCEEDINGS OF THE GEOLOGICAL SOCIETY.



LONDON:

LONGMANS, GREEN, READER, AND DYER.

PARIS: FRIED. KLINCK'SIECK, 11 RUE DE LILLE; F. SAVY, 24 RUE HAUTEFEUILLE.
LEIPZIG: T. O. WEIGEL.

SOLD ALSO AT THE APARTMENTS OF THE SOCIETY.

MDCCCLXXIII.

species, has much resemblance in its general facies, and especially in its richness in ferns, to that of the Coal-formation.

To geologists acquainted with the stratigraphy and the accompanying animal fossils, Dr. Heer's conclusions will of course appear untenable; but they may regard them as invalidating the evidence of fossil plants; and for this reason it is, I think, desirable to give publicity to the above statements.

I may add that, since the publication of my paper in 1858, much additional material from the Lower Carboniferous Coal-measures has come into my hands from Nova Scotia, New Brunswick, and Newfoundland, which may throw light on the corresponding floras of the more northern regions, and which I hope to publish in the form of a Report similar to that lately issued on the Devonian flora.

P.S.—I consider the British equivalent of the Lower Coal-measures of Eastern America to be the Lower Limestone Shales, the *Tuedian group* of Mr. Tate (1858), but which have recently been called the "Calciferosus Sandstone" (a name preoccupied for a Cambrian group in America). This group does not constitute "beds of passage" to the Devonian, more especially in Eastern America, where the Lower Coal-formation rests unconformably on the Devonian, and is broadly distinguished by its fossils.

DISCUSSION.

Mr. CARRUTHERS stated that the list of the eleven Lower Carboniferous plants published in Principal Dawson's 'Acadian Geology' did not contain a single species found in Bear Island; but, on the other hand, some species and several well-marked forms were common to the Bear-Island deposits and the Devonians of North America, and he had no doubt that Prof. Heer had in his paper rightly correlated these floras. As to the age of these plant-bearing beds, found alike in Bear Island, Ireland, the Vosges Mountains, Canada, and Australia, Mr. Carruthers said that it was difficult to draw any lines which would separate the Palæozoic plants into clearly marked and distinct floras; but if the Devonian is to be retained as a system, all these plant-bearing beds belonged rather to that system than to the Carboniferous.

3. FURTHER NOTES on EOCENE CRUSTACEA from PORTSMOUTH. By HENRY WOODWARD, Esq., F.G.S., F.Z.S., of the British Museum.

[PLATES I. & II.]

ON December 21st, 1870, I laid before this Society descriptions of three new forms of Crustacea, obtained by Messrs. C. J. A. Meyer and Caleb Evans, during the progress of the "Dockyard Extension Works" at Portsmouth, from strata of Lower Eocene age. Since that date, these ardent collectors have pursued their studies of the beds exposed, and continued to secure all the fossils within their reach. Through their kindness I have from time to time been enabled to

examine and study the additions made to the Crustacea from this rich locality, and I now beg leave to submit my further notes upon them to the Society.

On the first form (named by me, in my former paper, *Palæocorystes glabra*) I have no additional materials to present; but of the genus *Rhachiosoma* (represented at first by only *two* imperfectly preserved specimens, named respectively *R. bispinosa*, and *R. echinata*) there are now nine examples known.

The accession of these very perfect specimens, necessitates the re-description of *R. bispinosa*, for which there are now ample materials.

Four other specimens, representing two new Eocene forms, about to be described, and a large *Thenops*, near to *T. scyllariformis*, complete the series.

RHACHIOSOMA BISPINOSA, H. Woodw., 1870, Quart. Journ. Geol. Soc. 1871, vol. xxvii. pl. iv. fig. 3, p. 91. Pl. I.

Although originally supposed to be the smaller form, the discovery of several new specimens of this species shows it to have been fully as large as, or perhaps even larger than, *R. echinata*. It also proves that the remarkable development of the two lateral spines is a very persistent character in all the individuals; none of the new examples show a tendency to a *branched lateral spine*, like that seen in *R. echinata*, in which the spine appears also to be somewhat flattened, whereas in *R. bispinosa* it is nearly, if not quite, round in section. These spines have been erroneously spoken of in my former description as "hepatic;" they should more correctly have been styled "branchial" or "epibranchial" spines.

If we compare the figure of *R. bispinosa* accompanying the earlier description with those now presented (see Pl. I.), it will be seen that we are now made acquainted, not only with all the limbs (then only known from a single chela in *R. echinata*), but also with the frontal border of the carapace (so very important and characteristic a part), and with the underside (not visible in either of the first-found examples), revealing the abdomen of both the male and female, and the maxillipeds.

The hepatic border is armed with three prominent nearly equidistant spines, whilst a fourth forms the outer boundary of the orbital fossa. The frontal region displays a slight median depression, which may be traced as far back as to the centre of the gastric region, and is marked by a cleft in the rostrum, which thus presents three small, nearly equal serrations on either side, descending towards and forming the inner margin of the orbit.

The superior orbital border is marked by two equidistant fissures—a character, however, which is observable also in the *Canceridæ* and *Corystidæ*, as well as in *Portunidæ*, to which our genus *Rhachiosoma* undoubtedly belongs.

The marginal spines on the latero-anterior or hepatic border give to the front of the carapace a slightly sinuous or wavy surface, as do also the two great epibranchial spines, whilst the three tubercles, arranged in a line on either branchial region, contribute by their

tumid bases to relieve and diversify the surface of the carapace of this elegant crustacean.

Underside.—We have six specimens of *R. bispinosa*, which exhibit the underside in a more or less satisfactory manner. Of these, four are males, and two are females, the difference in sex being indicated, as in other Brachyures, by the disparity in the breadth of the abdominal somites (Pl. I. figs. 2, 3, 5, & 6).

The Branchiostegal Plate.—The suture formed by the union of the carapace with the branchiostegal plate is nearly parallel with the latero-anterior margin, it then turns almost at a right angle at the base of the great epibranchial spine; and the plate rapidly becomes narrower, ending at a point opposite that at which the limbs of the fourth pair take their rise. The inner margin is deeply excavated, to admit of the insertion of the legs along the margin of the plastro-sternal plates.

The Plastrosternum.—The five pairs of plates*, which are visible and which, soldered together, compose the plastrosternum, differ but slightly (save in their relative breadth) in the male and female, the deep median *sulcus* being narrower in the former (♂), and broader in the latter (♀), to admit the broader abdominal plates of the female. It closely agrees in form with that of other Portunidæ.

The Maxillipeds.—Three specimens of this crab show remains of the external jaw-feet, or maxillipeds, more or less perfect. The endopodite is broad, straight-sided, and divided by a suture near its anterior third; the surface is marked by a longitudinal furrow; the exopodite is straight and narrow; both rise side by side, from a common triangular basal joint.

The three slender distal articulations of the maxilliped are not preserved.

The Abdomen.—The abdomen is composed of seven articulations; but the fifth and sixth joints appear to be soldered together in the male. In the female the seven articulations are distinct, and increase slightly in breadth from the first to the fifth, when they again decrease, terminating in a broadly oval extremity.

In the male, the seven articulations gradually but slowly decrease in breadth to the seventh, which is bluntly rounded at its extremity.

In the female, the first three segments are nearly linear; but they gradually increase in length as well as in breadth, to the sixth joint. In the male the first two segments are also nearly linear; but the third and fourth are nearly equal in length to half their breadth, whilst the conjoined fifth and sixth segments are proportionally longer than wide. The seventh, or terminal segment, in the male, is very small, as compared with the same segment in the female.

The abdomen is without ornamentation; but the caudal segments are slightly trilobate in the female.

* The *Plastrosternum* (which is homologous with the thoracic segments of less highly cephalized forms) is really composed of *seven* plates; but the two most anterior, which bear the two pairs of maxillipeds or jaw-feet are very small and are concealed beneath the matrix.

Chelæ.—The first pair of limbs are nearly equal in size; the inner margin of both the fixed and the movable digit of the chelæ is armed with small irregular-sized teeth; one of the hands is slightly more tumid than the other; the forearm, or wrist, is armed with a somewhat prominent spine on the inner margin, and its distal margin is triangular in outline on the upper surface. The arm is short, straight, and robust (Pl. I. figs. 1 & 2).

Walking-feet (2nd 3rd and 4th pairs).—The three succeeding pairs of limbs are rather slender and compressed, the terminal joint long and tapering (Pl. I. figs. 1 & 2).

Fifth pair.—The fifth pair are wanting; but from the projecting position of their primary or basal joints (well seen in one of the specimens obtained by Mr. Meyer) they may have been modified as in the living species of *Portunidæ*, so as to fulfil the office of swimming-feet.

Antennæ.—The antennæ are not preserved.

I subjoin a list of the principal measurements of *R. bispinosa*, obtained from the new specimens in Mr. Meyer's collection.

Length of carapace, from the rostrum to the posterior border, in the *largest specimen* (Pl. I. fig. 1), $1\frac{1}{2}$ inch; breadth to base of epibranchial spines, $2\frac{1}{4}$ inches; breadth to tips of epibranchial spines, $4\frac{1}{4}$ inches; breadth of the posterior border of the carapace, 1 inch.

Another smaller individual, in which both the epibranchial spines are preserved, also measures nearly $4\frac{1}{4}$ inches from tip to tip of spines.

The figures on the plates are all of the natural size, the restored figures giving the size of the *largest* specimens in Mr. Meyer's collection in which both the spines, the chelæ, and the running-legs are preserved.

*LITORICOLA**, gen. nov. Pl. II. figs. 1–5.

Carapace about one third broader than long, greatest breadth of carapace between the epibranchial spines. Length of carapace equal to breadth of anterior border; breadth of posterior border equal to half the greatest breadth of carapace.

Carapace smooth, or nearly so; anterior angles of carapace truncated; marginal dentations small; rostrum squarish, bent downwards; orbits (and eyestalks†) long.

Chelæ smooth, flattened, of unequal size (smallest in the female?)
Legs well adapted for running.

Underside and abdomen.—At present unknown.

It affords me no little gratification to be able to add another genus to our small list of Fossil Shore-Crabs.

In December 1867 I published the figure and description of *Goniocypoda Edwardsi*, a new genus of British fossil Shore-Crabs, from the lower Eocene of High Cliff, Hampshire (see Geol. Mag. 1867, vol. iv. p. 529, pl. xxi. fig. 1).

This was the first instance of a fossil Crab occurring, belonging either to the *Ocypodidæ* or to the *Grapsoididæ* (forming Milne-

* From *litus*, shore, and *colo*, I inhabit.

† Only a trace of what appears to me to be an eyestalk remains.

Edwards's tribe *Catométopes*), save the undoubted Eastern forms figured and described by M. Desmarest so long ago as 1822, belonging to the genera *Grapsus*, *Gonoplax**, *Gelasimus*, and *Gecarcinus*.

The occurrence of these forms in our Eocene deposits tends to confirm (if confirmation were necessary) the conclusions already arrived at by Sir Charles Lyell and other eminent geologists (on the evidence of the land animals, marine shells, fossil fruits, and other organisms found in these deposits)—namely, that they attest the existence of a warmer climate than that which we enjoy in the same latitude at the present day.

There is moreover throughout these Eocene deposits, frequent evidence of the proximity of land, indicating that they were laid down in an estuary or near the shore.

LITORICOLA GLABRA, H. Woodw. Pl. II. fig. 1.

Of the four specimens representing this genus I have been able, after careful study, to form two species, the larger of which I propose to name *Litoricola glabra*.

The carapace of this crustacean is remarkably smooth; and it requires considerable patience and lengthened examination (with oblique light) to make out the regions on its surface. The broadest measurement is at the angles formed by the epibranchial spines, where the carapace is 15 lines broad; the anterior border measures 11 lines, and the posterior 6 lines; the length of the carapace is 11 lines. The hepatic margin is entire, being only marked by a single spine at each lateral angle, and one at each anterior angle, which is separated only by a notch from the outer orbital spine; the orbital border is straight, and measures 2 lines in length; the frontal or rostral border measures 3 lines in breadth; is plain and bent down, so as to form almost an obtuse angle with the rest of the carapace; the eyes appear to have been provided with rather long eye-stalks as in *Macrophthalmus* and other genera of land-dwelling shore-crabs.

A somewhat sinuous line marks out the epicardiac and metacardiac lobes, the epibranchial, mesobranchial, and metabranchial being also indicated by three nearly equidistant divergent lines; the hepatic region is small: the gastric region forms the most tumid portion of the carapace; a slight depression passes from it anteriorly, so as to form a shallow groove down the centre of the frontal border or rostrum.

First pair of Limbs.—The arm is small and slender, the forearm or wrist short, slightly angular and armed with three minute spines at its distal edge; the right hand is about one third larger than the left; but in imparichelate forms the hands are not constantly larger on one side.

The four succeeding pairs of limbs are long and flattened, and agree closely with the typical running-forms among living crabs. The terminal joints are long, slender, and pointed.

The first specimens from this locality (described by me in 1870)

* The *Gonoplax* of Desmarest is really a *Macrophthalmus*.

were in a hard quartzite matrix (like the sarsen stones) and almost incapable of development, on account of the intense toughness of the matrix.

The present examples are from a fine sandy loamy bed, which allows of the fossils being readily extracted; but they are usually in a most friable state, and constantly give way, owing to their imperfect fossilization and to cavities in their interior not filled up solid by the matrix. The specimen here described (from Mr. Caleb Evans's collection) is in this crumbling state, and I have had great anxiety on account of its unsafe condition.

It is to be hoped that others may be found of this new and interesting type.

LITORICOLA DENTATA, H. Woodw. Pl. II. figs. 2-5.

This species is considerably smaller than the preceding one; like it the surface of the carapace is smooth and destitute of those strongly marked divisions which characterize many forms among the Portunidæ and Canceridæ. The relative proportions of the carapace are about the same.

Anterior border 8 lines; posterior border 5 lines; greatest breadth (at the angle formed by the two lateral or epibranchial spines) 12 lines; greatest length 8 lines. Each branchial border is armed with a single small spine just behind the epibranchial spine which marks the greatest breadth of the carapace.

The hepatic margin is marked by three nearly equal spines, the anterior one being confluent with that forming the orbital border.

The orbits measure 2 lines in breadth; the margin appears to be straight; the frontal or rostral border projects and forms the inner boundary to the orbits, it is 3 lines in breadth, and is deeply furrowed down the centre, which is bent downwards (as in the preceding species), and appears to be blunt in front, with a slightly raised border. The regions of the carapace differ but slightly from those of *L. glabra*, save that the cardiac region is more expanded posteriorly, and less broad in front.

The hands are unequal in size, as in the preceding species. The four pairs of running-feet are flattened laterally, and well suited for rapid locomotion on land.

Only two specimens of this crab, displaying the dorsal aspect, are preserved: the other two examples exhibit the ventral aspect; but, save for the limbs, they do not offer any clear evidence of the abdomen or the plastrosternal plates or maxillipeds.

The specimens of *L. dentata* are all from the cabinet of Mr. C. J. A. Meyer, F.G.S.

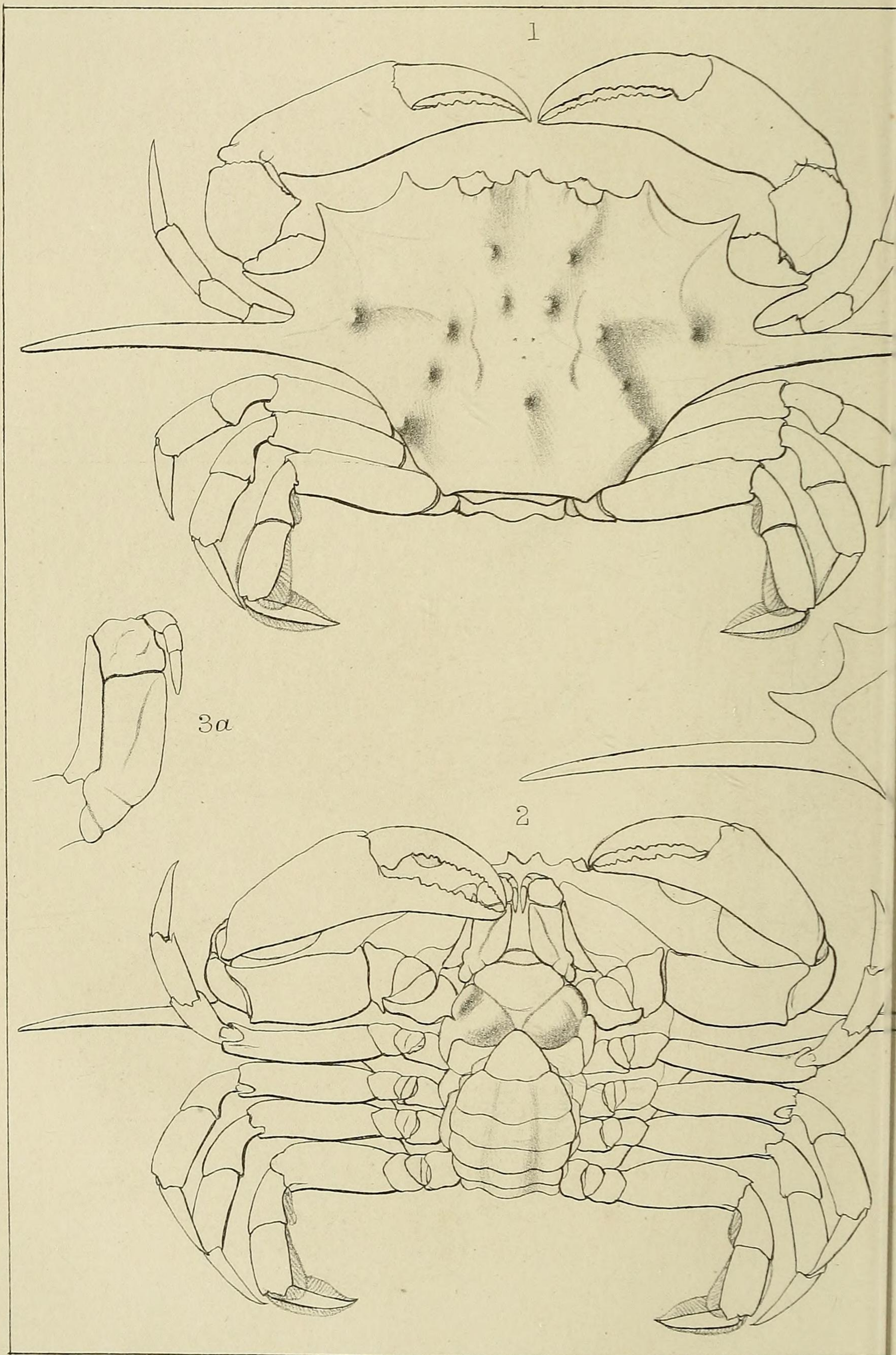
EXPLANATION OF PLATES.

PLATE I.

Figs. 1-6. *Rhachiosoma bispinosa*, H. Woodw.

Fig. 1. Outline figure, natural size, of largest specimen in Mr. Meyer's collection, restored from the details furnished by other examples of the same species.

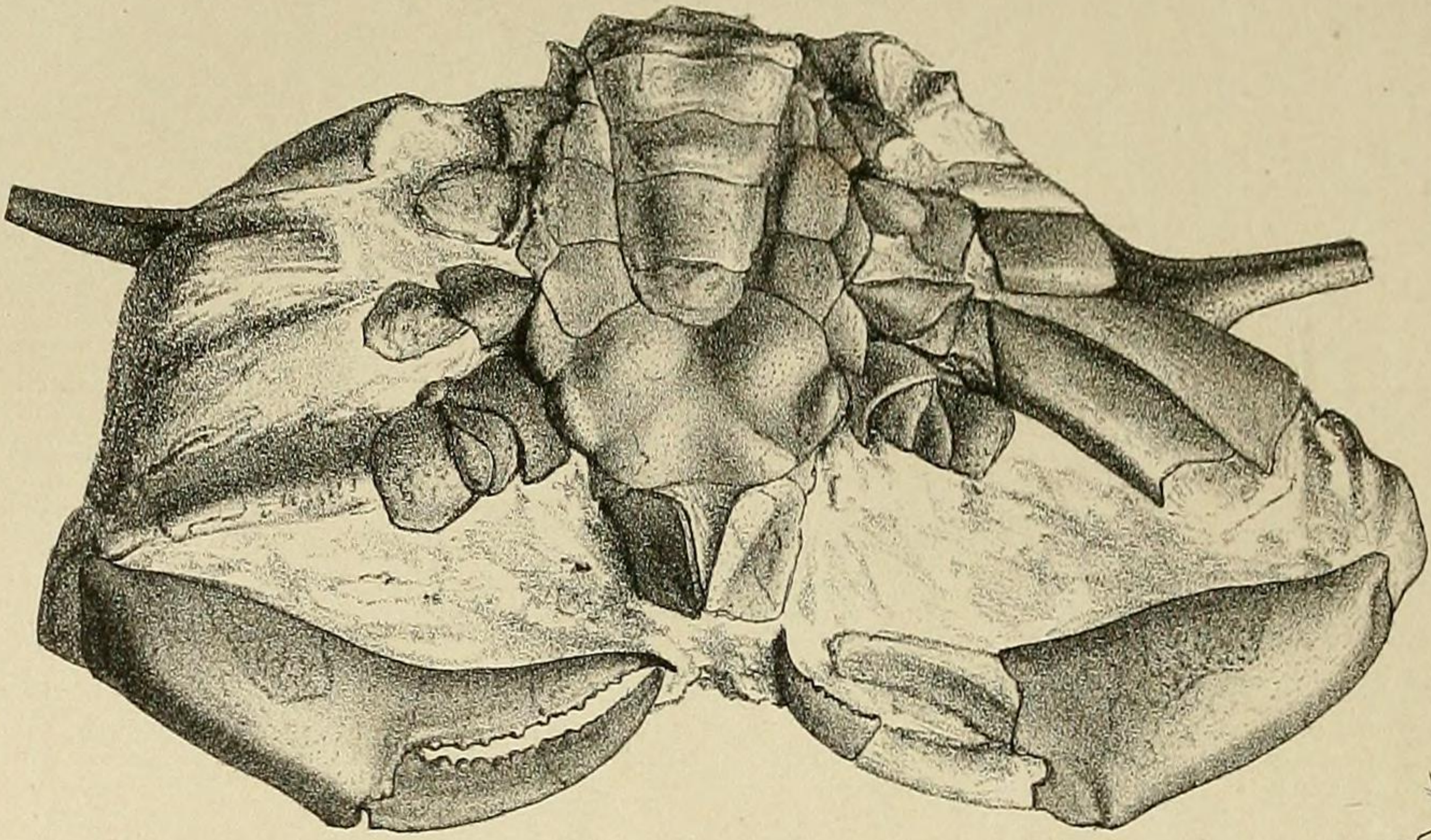




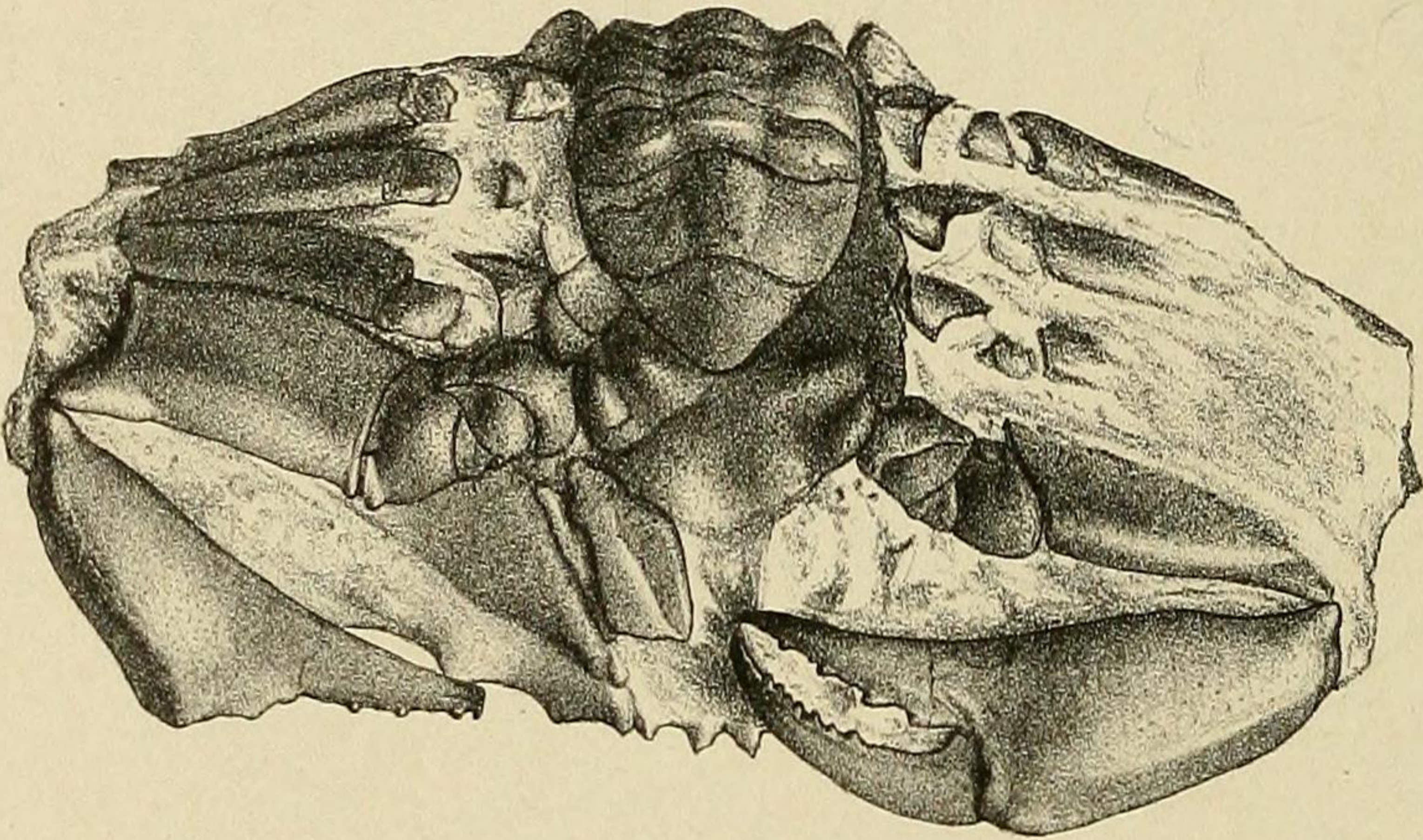
C.L. Griesbach. del et lith.

RHACHIOSOMA

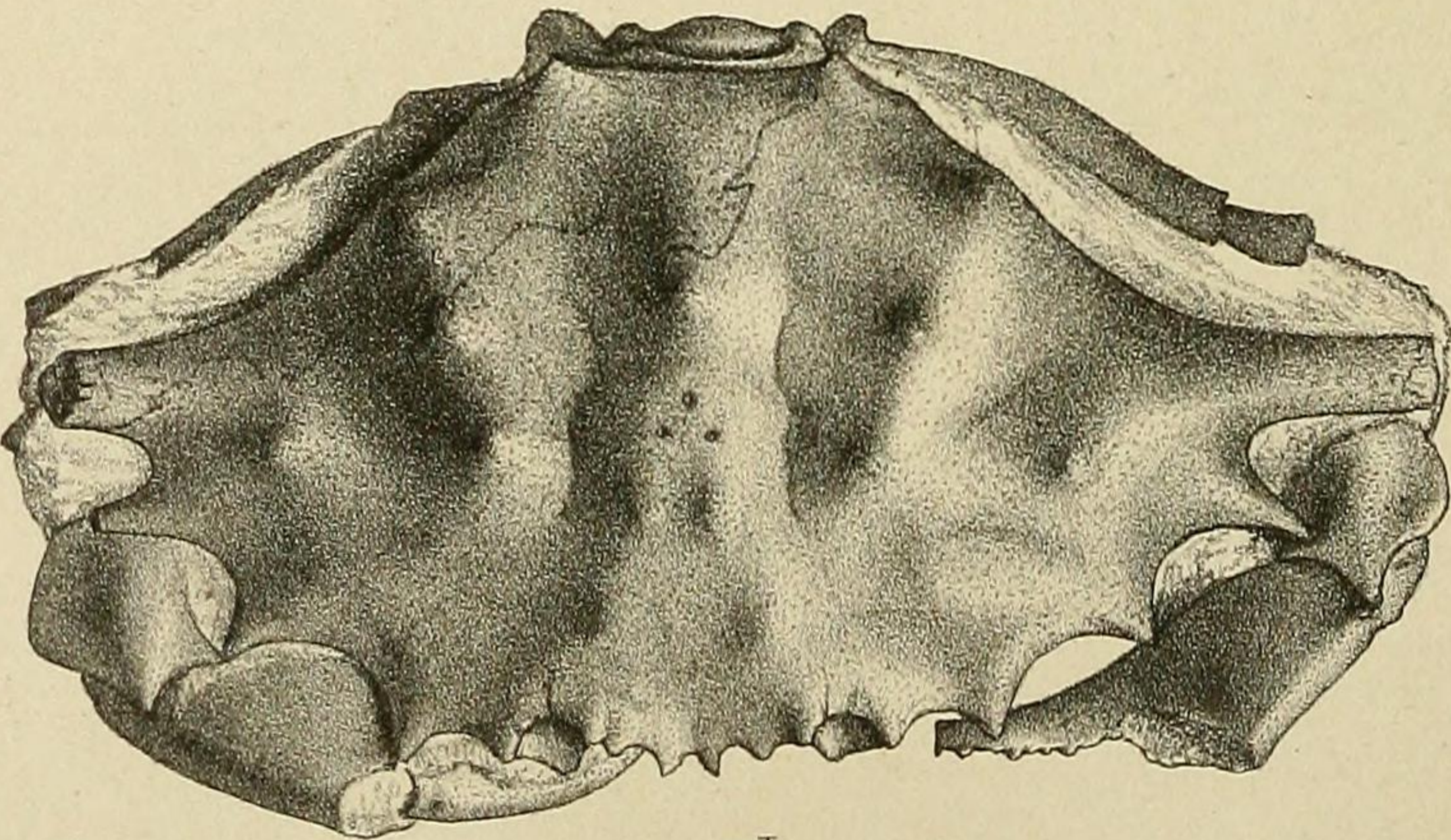
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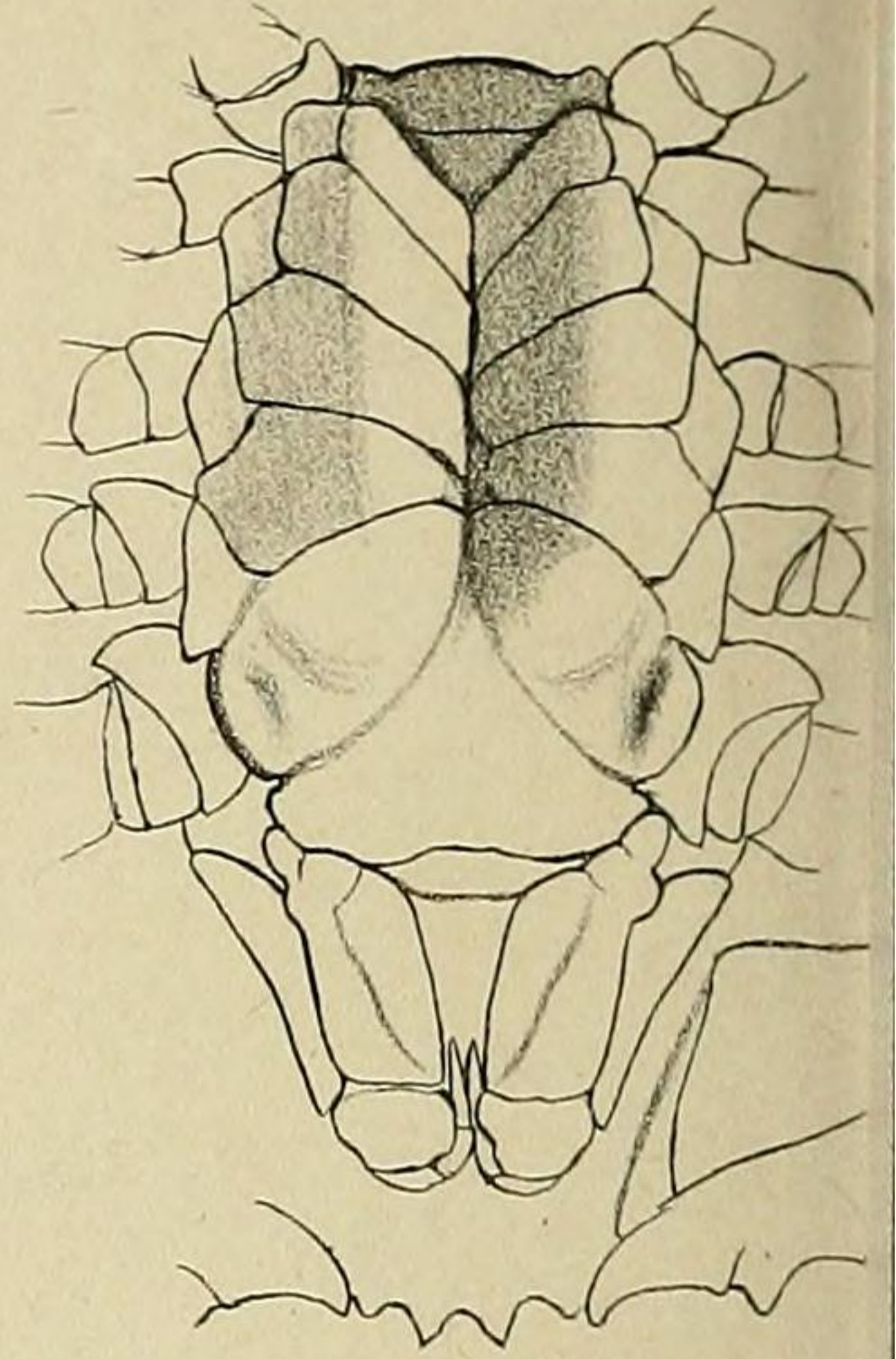
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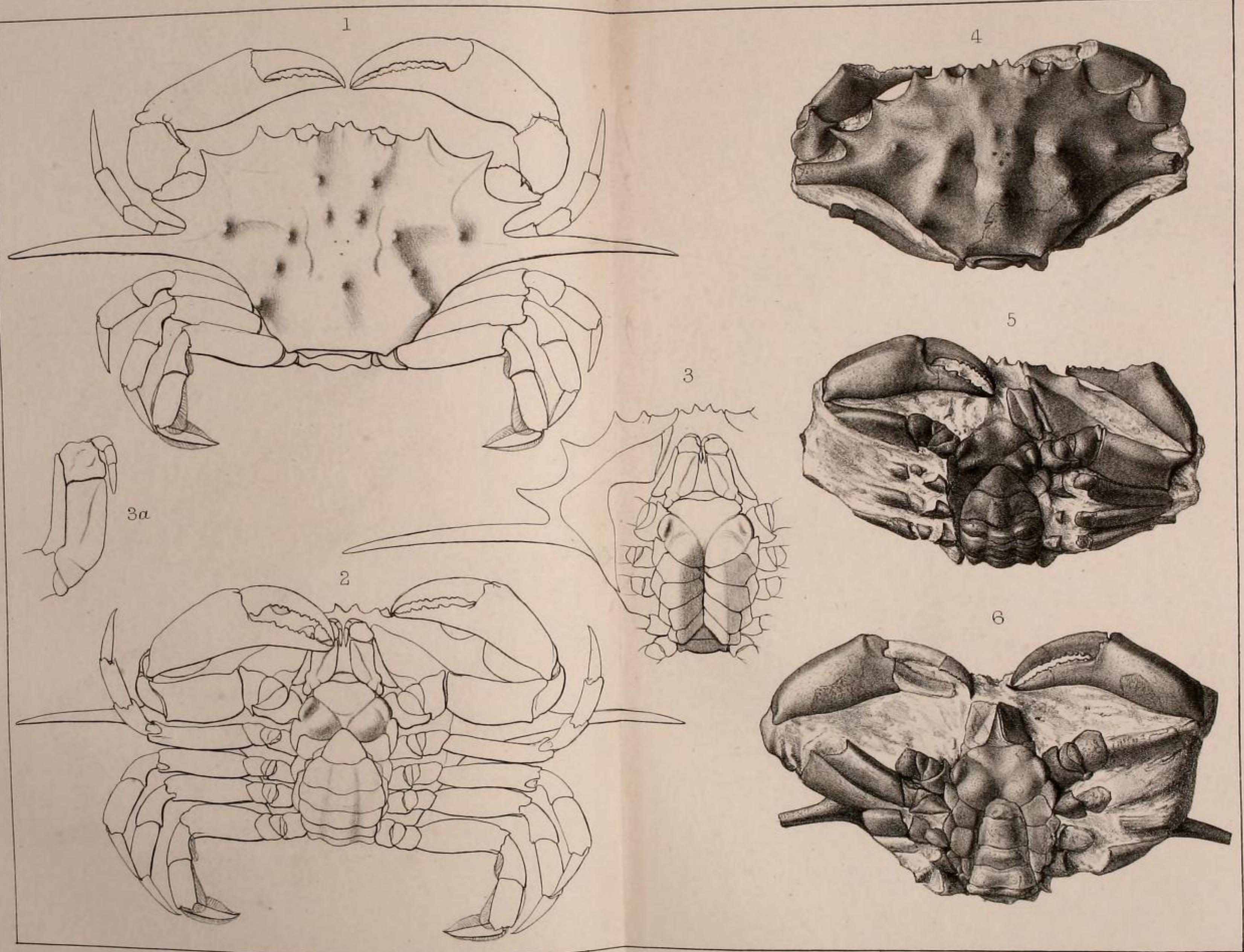
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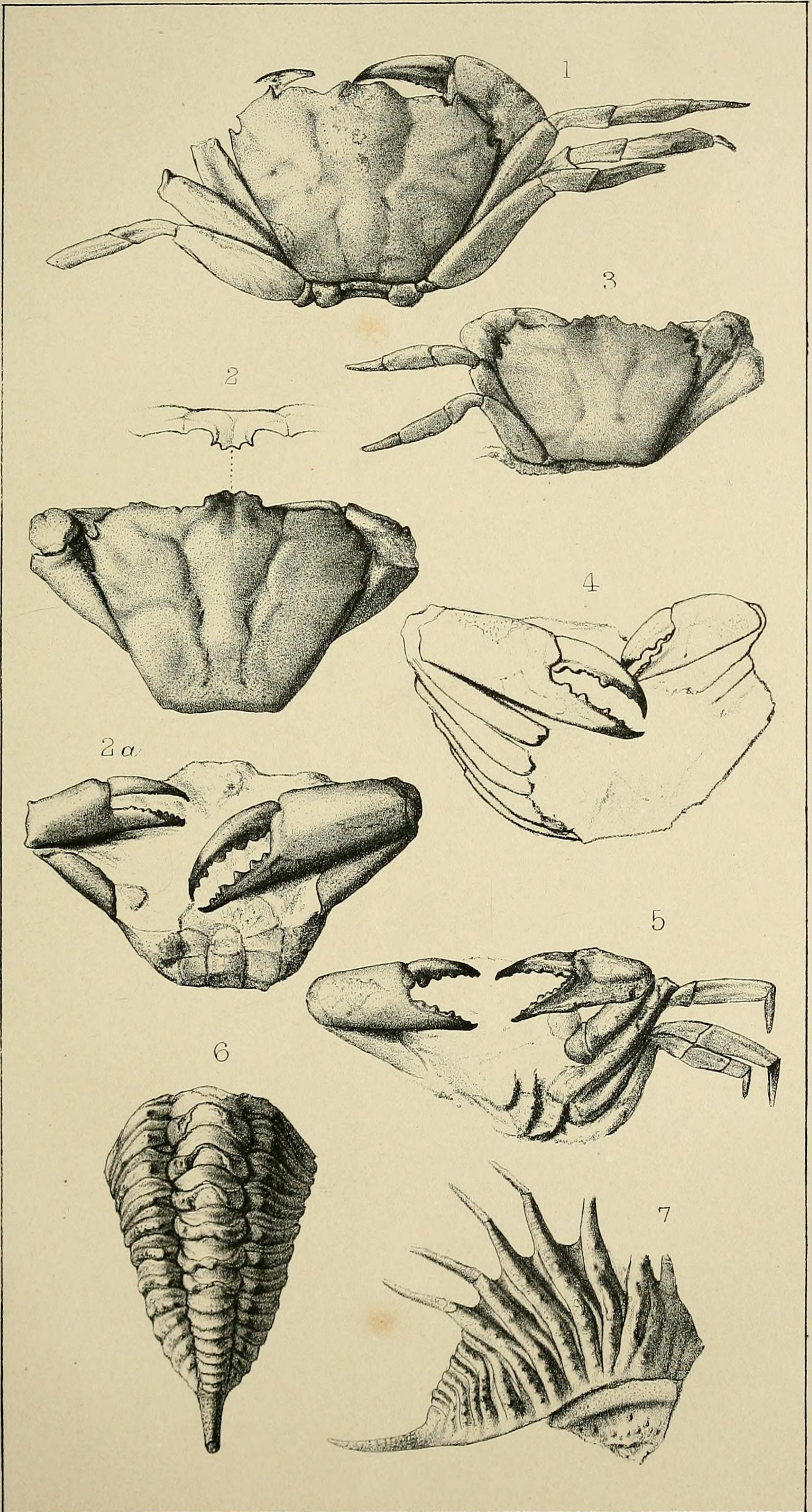
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C.L. Griesbach. del et lith.

RHACHIOSOMA BISPINOSA.

Mintern Bros. imp.



CL Griesbach del et lith.

Mintern Bros. imp.

LITORICOLA AND ENCRINURUS.

- Fig. 2. Outline figure of underside (♀), restored on the same scale as fig. 1.
 3. Outline figure of part of underside (♂), on the same scale as fig. 1.
 Fig. 3*a*. One of the maxillipeds, enlarged.
 4. Dorsal aspect of a smaller example (♀).
 5. Ventral aspect of the same, showing the broad abdomen and the maxillipeds.
 6. Ventral aspect of another specimen (♂), showing the narrow abdomen and the maxillipeds.

All the specimens are drawn of the *natural size*.

Figs. 4, 5, and 6 are not in any way restored.

The above are all from the collection of C. J. A. Meyer, Esq., F.G.S., and obtained from the Lower Eocene of Portsmouth.

PLATE II. figs. 1–5.

- Fig. 1. *Litoricola glabra*, H. Woodw. Dorsal aspect (the only specimen at present obtained).
 2. ——— *dentata*, H. Woodw. Dorsal aspect. Fig. 2*a*. The same. Ventral aspect.
 3. ——— ———. Dorsal aspect of a much smaller individual, in which the legs are preserved.
 4. ——— ———. Ventral aspect of another specimen, showing the disparity in the size of the chelæ on the opposite side to that in fig. 2*a*.
 5. ——— ———? Another specimen, perhaps belonging to a *third* species (?), in which the hands are of nearly equal size (? ♀).

All drawn of the natural size; and all from the Lower Eocene of Portsmouth.

Fig. 1 from the Collection of Caleb Evans, Esq., F.G.S.

Figs. 2–5 from the Collection of C. J. A. Meyer, Esq., F.G.S.

DISCUSSION.

Mr. MEYER gave some particulars as to the horizon from which these fossils were derived. They all came from the argillaceous sands with *Dentalium*, mentioned in his former paper. These beds are much mottled, probably owing to the burrowing of the crabs.

Mr. WOODWARD, in answer to inquiries, pointed out that these crustaceans were of purely littoral, and not of pelagic forms, and their feet were in a condition better adapted for walking than for swimming. The long epibranchial spines formed weapons of offence, and were of much service to the pelagic forms, though their retention in the littoral forms was not of easy explanation. The *Litoricolæ* were essentially adapted for running on land and burrowing. As an instance of the disparity in the hands of Crabs, he instanced the common Calling Crab, which had always one hand greatly larger than the other.

4. *On a NEW TRILOBITE from the CAPE of GOOD HOPE.*
 By HENRY WOODWARD, Esq., F.G.S.

[PLATE II. figs. 6–7.]

SINCE the contributions to the 'Transactions' of this Society, by the late Mr. J. W. Salter, in 1852*, I do not remember that any Trilobites have been described from the Cape of Good Hope.

* Read November 17, 1852, see Trans. Geol. Soc. vol. vii. second series, p. 175.