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margin of the articular ends of the centra. The costoids in the middle of the tail are rod-like elements, decreasing rapidly in size backwards. There is a great resemblance to the middle caudal vertebræ in *St. unguatus*.

The distal caudals in *St. priscus*, as shown in Figs. 3c, d, are still more elongate than the middle ones. The centrum is laterally compressed, as Fig. 3c shows, and exhibits a pentagonal section, with the point of the pentagon turned downwards. The articular surface for the chevron bone on these vertebræ is only developed at the posterior end. The concavity of the articular surface is also more marked at this end than at the other. The neural arch in these vertebræ, as in all the anterior ones, covers nearly the whole of the neural canal; the elongate rod-like prezygapophyses are comparatively feeble, their articular facets are directed as in the middle dorsals. The narrow neural spine (Fig. 3d) rises in a remarkable manner straight upwards; it is blade-like, tapering towards its summit, and, like the rest of this vertebra, it is characterized by the complete want of rugosities, thus indicating clearly that on this bone no great mass of firmly adhering tissue was present during life. This latter observation will prove to be of the utmost importance when we discuss the dermal armour of *St. priscus*.

The distal caudal in *St. priscus* differs from that of *St. unguatus* and *Diracodon* by the feeble development of the neural spine, and still more by the development of elongate post-zygapophyses, for these are quite short and nearly sessile on the blade of the neural spine in *St. unguatus*, *Diracodon*, and many other Dinosaurs, though not in *Polacanthus*. The development of the neural spine and the post-zygapophyses in *St. priscus* are features so strange for a posterior caudal that if the shape of the centra did not prove beyond all doubt the contrary, one might hesitate to refer this vertebra to an *Omosaurus*. The biconcave nature of all the caudals of our *Stegosaurus*, and the neural spines overlapping each other, do not imply great flexibility of this organ.

(To be concluded in our next Number.)

III.—SEDGWICK MUSEUM NOTES.

NEW CRUSTACEA FROM THE LOWER GREENSAND OF THE ISLE OF WIGHT.

By F. R. COWPER REED, M.A., F.G.S.

(PLATE VII.)

AMONGST the large series of specimens of *Meyeria* recently obtained by the Sedgwick Museum, Cambridge, from the Lower Greensand of Atherfield, Isle of Wight, two new and strange forms, obviously referable to another genus, were detected by me in looking over the material. Their interest consists not only in belonging to new species but in representing the genus *Thenops*, of which the best known and only British species, so far described, is *Th. scyllariformis*, Bell, from the London Clay. There is one imperfect specimen in the British Museum from the Speeton Clay attributed (with a query) to *Thenops*, but no other British representative from the Cretaceous appears to have been found.

THENOPS CARTERI, sp. nov. (Pl. VII, Figs. 2, 2a.)

Description. Carapace elongated, narrowing anteriorly, divided at about half its length by cervical groove; median dorsal portion of carapace flattened, especially in thorax, with lateral portions bent down steeply on each side along tuberculated longitudinal lateral carinæ.

Cervical groove deep, strongly marked, divisible into (1) a short middle transverse portion slightly arched forwards and about one-fourth the width of the carapace at this level, and (2) a pair of lateral portions bent sharply forwards on each side and running out so as to meet the lateral carinæ at about 45° , outside which they bend down almost at right angles to inferior edge of carapace but turn forwards close to margin to meet it at an acute angle.

Posterior end of carapace concave in outline, and furnished with a narrow rounded ring with pitted surface marked off by a strong smooth furrow.

Cephalic portion of carapace with upper surface very gently convex, and defined on each side by slightly curved, fine lateral carinæ diverging backwards from rostral teeth to cervical groove, and marked by row of small sharply pointed tubercles increasing in size posteriorly.

Anterior end of cephalic portion abruptly truncate, furnished with median pair of short triangular rostral teeth somewhat flattened with their faces inclined inwards and their points about one-third the anterior width of the carapace apart. Median notch between rostral teeth rounded. Anterior edge of carapace outside rostral teeth simple, nearly straight, not excavated nor dentate, meeting lateral edges nearly at right angles. Median portion of cephalic region forming a slightly elevated sub-lanceolate pre-gastric area, ill-defined at the sides and behind where at about half the length of the cephalon it touches two sub-parallel, gently curved longitudinal rows of 6–7 spinose tubercles, bounding laterally the narrow, elongated, somewhat flattened gastric region reaching back to the cervical groove and having a width equal to about one-fifth that of the base of the cephalon.

A pair of low indefinite longitudinal ridges run back from the bases of the rostral teeth with a slight divergence to the level of the anterior end of the gastric region, where they end in somewhat marked depressions, prolonged outwards as weak grooves curving back to the lateral carinæ and marking off indistinctly on each side of the gastric region a sub-triangular area in front of the cervical groove. Outside the lateral carinæ of the cephalon the carapace is bent down, very slightly at the anterior end, but with increasing steepness posteriorly. Inferior edge of carapace thickened and armed with large closely set spinose tubercles.

Thoracic portion of carapace with upper part horizontally flattened, but medially somewhat elevated into cardiac region and bearing a longitudinal carina of large pointed tubercles. Cardiac region with slight independent swelling, about two-thirds the length of thorax and one-third its width, sub-lanceolate in shape and marked out on each side by weak furrows gently curved, but not defined behind. On each side of cardiac region thorax is flattened and horizontally

extended to the strong lateral carinæ, which are gently arched outwards and formed by a row of large sharply pointed tubercles directed forwards and increasing in size from the posterior margin of the carapace to the cervical groove. Outside these carinæ the sides of the thorax are bent down almost at right angles.

Surface of carapace ornamented with small, widely separated, sharply pointed tubercles. On the cephalon the tubercles are not numerous, and are irregularly distributed, or obscurely in longitudinal series; on the thorax the tubercles are larger and arranged on the upper flattened portion at equal distances apart in fairly distinct longitudinal lines parallel to the lateral carinæ, but on the steeply inclined sides they are less regularly placed and are more closely aggregated immediately behind the cervical groove.

The large tubercles of the median and lateral carinæ are conical and sharp with the points directed forwards.

Second antennæ composed of large flattened and ridged joints (only part of one joint on the left side is preserved).

Abdomen gently convex, broad; surface of terga flat, but bearing a thin elevated longitudinal median carina; lateral edges of terga slightly thickened; surface of shell densely but finely pitted. Epimeres becoming successively longer and sub-falcate; epimere of second segment sub-quadrate in shape, wider than long, with straight lower edge and swollen band on anterior margin, ending above in articulating peg to fit into socket of preceding segment. Epimeres of third and fourth segments longer than wide, sub-falcate, anterior and lower margins forming a continuous curve, and posterior edge serrated; upper anterior corner swollen and cut off by oblique furrow and projecting as articulating peg; surface of shell finely pitted, but less densely than rings. Peræopods compressed, slender, with surface smooth and sparsely pitted.

Dimensions.

	mm.
Length of carapace along median line to rostral notch	33·5
Length of thorax along median line	17·0
Width of thorax between lateral carinæ at posterior end	17·0
Width of thorax at point of section of lateral carinæ by cervical groove	13·5
Width of head at anterior end between outer lateral angles	16·0
Width of abdomen	16·0

Holotype. Carapace with portion of one of the right peræopods, one joint of left second antennæ, and with four segments of abdomen attached. From the Lower Greensand, Atherfield, Isle of Wight.

Affinities. This species is undoubtedly allied to the London Clay form *Thenops scyllariformis*, Bell.¹ The peculiar flattening of the upper part of the carapace, the sharply bent down lateral portions, the lateral and median carinæ, the general development of the gastric and other regions, the pair of rostral teeth, and the simple straight anterior edge of the carapace are features in common. There are, however, certain obvious differences which a comparison with the large series of splendidly preserved examples of *Th. scyllariformis* from Portsmouth

¹ Bell, Mon. Foss. Malac. Crust. (Palæont. Soc.), 1857, p. 33, pl. vii, figs. 1-8.

in the Sedgwick Museum clearly brings out. In the first place the thorax of the London Clay form has its sides nearly parallel; the lateral carinæ are less marked; the cephalic part of the carapace is shorter and broader; the anterior lateral angles are produced forwards into stout spinose processes; the cervical groove is not divisible into three parts, but forms a continuous gentle curve meeting the lateral carinæ less acutely; the hepatic depressions are deeper and larger; the gastric region is lyre-shaped, and there is a prominent large median tubercle just in front of it; the abdomen is less convex and the surface of the segments is much more coarsely and closely pitted, and the median ridge rises into a stout tubercle; and, finally, the tubercles on the general surface of the carapace are low and rounded or transverse.

Our new species may be appropriately dedicated to the late Dr. Carter.

The Lower Senonian species known as *Podocrates dülmensis* (Becks MS.)¹ is closely related in many respects to *Th. Carteri*, but differs by having the orbits excavated and the anterior margin of the carapace toothed; the tubercles around and in front of the gastric region are differently disposed; the lateral carinæ of the thorax are not regularly arched outwards; the cervical groove is more gently and regularly curved; there are fine oblique furrows on the steep sides of the carapace; the tubercles on the carinæ and carapace generally are rounded and not sharply pointed; the abdomen has a median tubercle and a pair of lateral ones instead of a longitudinal keel, and the rings are not pitted.

In spite of Schlüter's² contention that *Podocrates*, Becks MS., 1850,³ is synonymous with *Thenops*, Bell, 1857 (op. cit.), there seems reason to doubt it, on account of the orbits in the former being excavated and the anterior margin toothed, whereas in *Thenops* the anterior edge of the carapace on each side of the rostral teeth is straight, simple, and not indented or toothed. For this reason it appears desirable to place our new species from Atherfield in the genus *Thenops*, which has *Th. scyllariformis* as its type.

THENOPS TUBERCULATUS, sp. nov. (Pl. VII, Figs. 1, 1a, 1b.)

Description. Carapace elongated, narrowing anteriorly, divided transversely into two unequal parts by cervical groove; median dorsal portion of carapace flattened; lateral portions sharply bent down on each side along obscure lateral carinæ curving down somewhat posteriorly.

Cervical groove strong, smooth, consisting of three parts—(1) a short transverse median portion about one-fourth the width of the carapace at this level, and (2) a pair of lateral portions bending forward sharply and running in a slightly sigmoidal course to meet the lateral carinæ at about 45°, outside which they bend down and cross the sides at right angles.

Posterior end of carapace strongly concave in outline, with lateral

¹ Schlüter, Zeitschr. deut. geol. Gesell., Bd. xiv, p. 713, t. xii, figs. 1-3, 1862.

² Ibid., p. 710; id. op. cit., Bd. li, pp. 409-30, 1899.

³ Geinitz, *Die Quadersandstein*, 1850, t. ii, fig. 6 (no description).

angles somewhat produced backwards and pointed, and with a narrow rounded tuberculate ring marked off by a smooth furrow.

Cephalic portion of carapace gently convex between lateral carinae, which converge anteriorly and end just outside base of rostral teeth. Lateral carinae marked by specially large tubercles posteriorly, decreasing in size anteriorly. Median portion of cephalon gently swollen into obscurely defined sub-lanceolate pre-gastric area passing back imperceptibly into gastric region, which is marked in front by a pair of specially large tubercles situated rather behind the middle of the cephalon. Gastric region narrow, somewhat depressed, oblong defined on each side by irregular row of rather large tubercles running back to cervical furrow. A weak depression lies on each side of the anterior pair of gastric tubercles and is prolonged outwards into a weak furrow curving slightly back to the point where the cervical furrow crosses the lateral carinae. Rostral teeth triangular (imperfectly preserved), separated by sharply rounded notch, with their faces flattened and inclined inwards. A narrow indistinct post-rostral ridge, marked by a few large tubercles, decreasing in size posteriorly, runs back from the base of each rostral tooth to the depressions (hepatic) on each side of the gastric region. Anterior edge of lateral portions of carapace not preserved. Sides of cephalon posteriorly bent down at right angles to upper surface along lateral carinae.

Surface of cephalon ornamented with sharply pointed, conical tubercles smaller and fewer than on thorax and less closely placed, but tending to be arranged in longitudinal lines especially towards the lateral carinae.

Thorax horizontally extended and flattened dorsally between lateral carinae, with median portion somewhat elevated and provided with median longitudinal keel bearing a row of specially large, sharply conical tubercles. Lateral portions of thorax bent down at right angles to upper portion without the formation of definite lateral carinae posteriorly, but anteriorly towards cervical groove the angular line of bending is marked by definite line of large conical tubercles. Sides of thorax decrease in height posteriorly owing to lateral line of bending curving down behind. Cardiac region gently elevated and defined by pair of weak smooth furrows, gently curved outwards and reaching two-thirds the length of the thorax; width of cardiac region across middle about one-third that of thorax. Anterior margins of thorax swollen slightly on each side behind and along cervical groove into a low rounded ridge, widening a little laterally to the lateral carinae against which it ends.

Surface of thorax covered with large, sharply pointed, conical tubercles, mostly of equal size and closely placed, but not in any determinable order; on the sides these bases are nearly or quite contiguous. Both the large tubercles on the carinae and those on the general surface of the carapace have their sharp points slightly arched and directed forwards.

Abdomen strongly arched from side to side (five segments preserved); tergum with general surface flat, and with a thin median longitudinal keel; shell covered with small equal-sized numerous pits. Inferior lateral edges of terga somewhat thickened. Epimeres of

second to fifth segments sub-triangular to sub-falcate, with anterior and inferior margins forming a continuous curve and posterior margin dentate. Small triangular area cut off by short furrow from anterior upper corner and swollen into peg for articulation.

Peræopods slender, laterally compressed, with smooth surface sparsely dotted with pits.

Dimensions.

	mm.
Length of carapace along median line to rostral notch . . .	29·0
Length of carapace along median line to level of posterior lateral angles	33·5
Length of thorax along median line	14·0
Width of thorax posteriorly between lateral carinæ . . .	18·0
Width of carapace at point of section of lateral carinæ by cervical groove	13·0
Distance between outer edges of bases of rostral teeth . . .	6·5
Width of abdomen	14·5

Holotype. Carapace with five segments of abdomen attached and portions of three peræopods on right side. From the Lower Greensand, Atherfield, Isle of Wight.

Affinities. This species differs from *Th. Carteri* in the more elongated carapace, the smaller development of the lateral keels and their downward curvature posteriorly, the much closer and coarser tuberculation of the surface, the different kind of demarcation of the gastric region, the stronger ridges running back from the bases of the rostral teeth, and in the more convex abdomen. But the most striking differences amongst those above-mentioned are the general shape and tuberculation.

With *Th. scyllariformis* it agrees more closely than does *Th. Carteri* in the development of the post-rostral ridges and in the smaller prominence of the lateral carinæ. But otherwise it has fewer points of resemblance. With *P. dülmensis* the development of the large gastric tubercles is a feature in common, but it is less closely allied to this Senonian species in general characters than is *Th. Carteri*.

From the possession of a coarsely tuberculate surface it may be approximately designated by the specific name *tuberculatus*.

EXPLANATION OF PLATE VII.

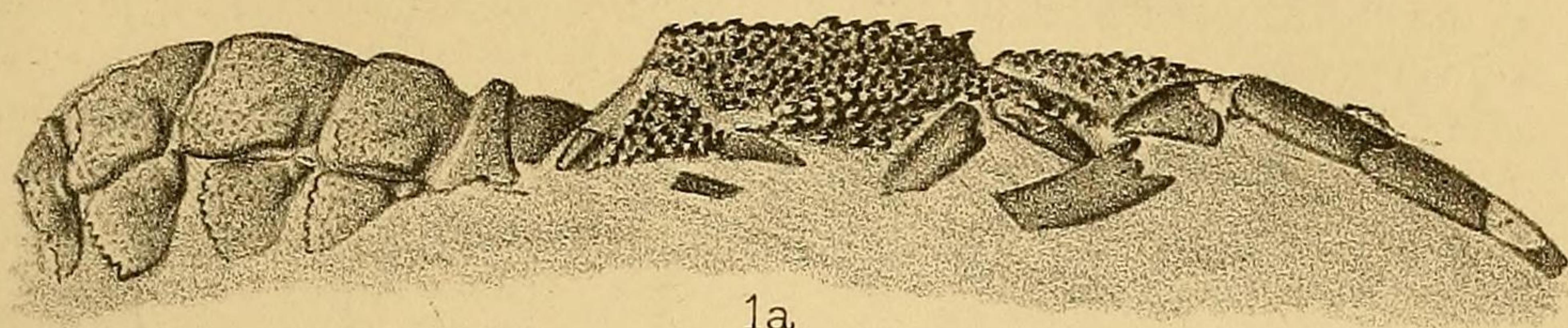
- FIG. 1. *Thenops tuberculatus*, sp. nov. $\times \frac{3}{2}$. Viewed from above.
 ,, 1a. Ditto. $\times \frac{3}{2}$. Viewed from right side.
 ,, 1b. Ditto. $\times \frac{3}{2}$. Viewed from left side.
 ,, 2. *Thenops Carteri*, sp. nov. $\times \frac{3}{2}$. Viewed from above.
 ,, 2a. Ditto. $\times \frac{3}{2}$. Viewed from right side.

(Both specimens are from the Lower Greensand, Atherfield, Isle of Wight.)

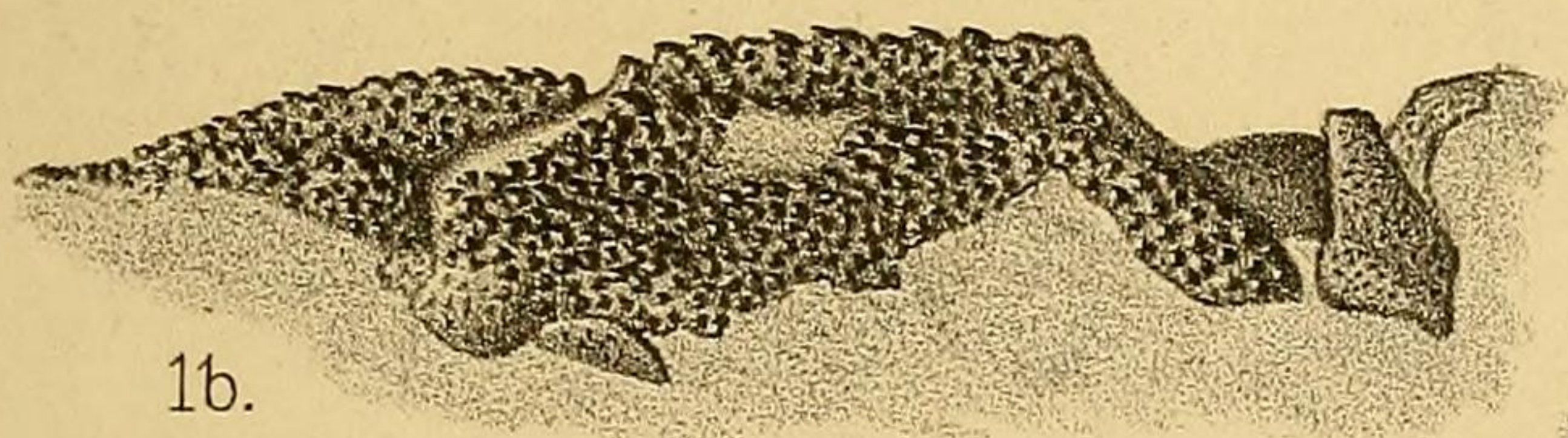
IV.—ON THE FORMATION OF A LATERITE FROM A PRACTICALLY QUARTZ-FREE DIABASE.

By Professor J. B. HARRISON, C.M.G., M.A., F.G.S., F.I.C.

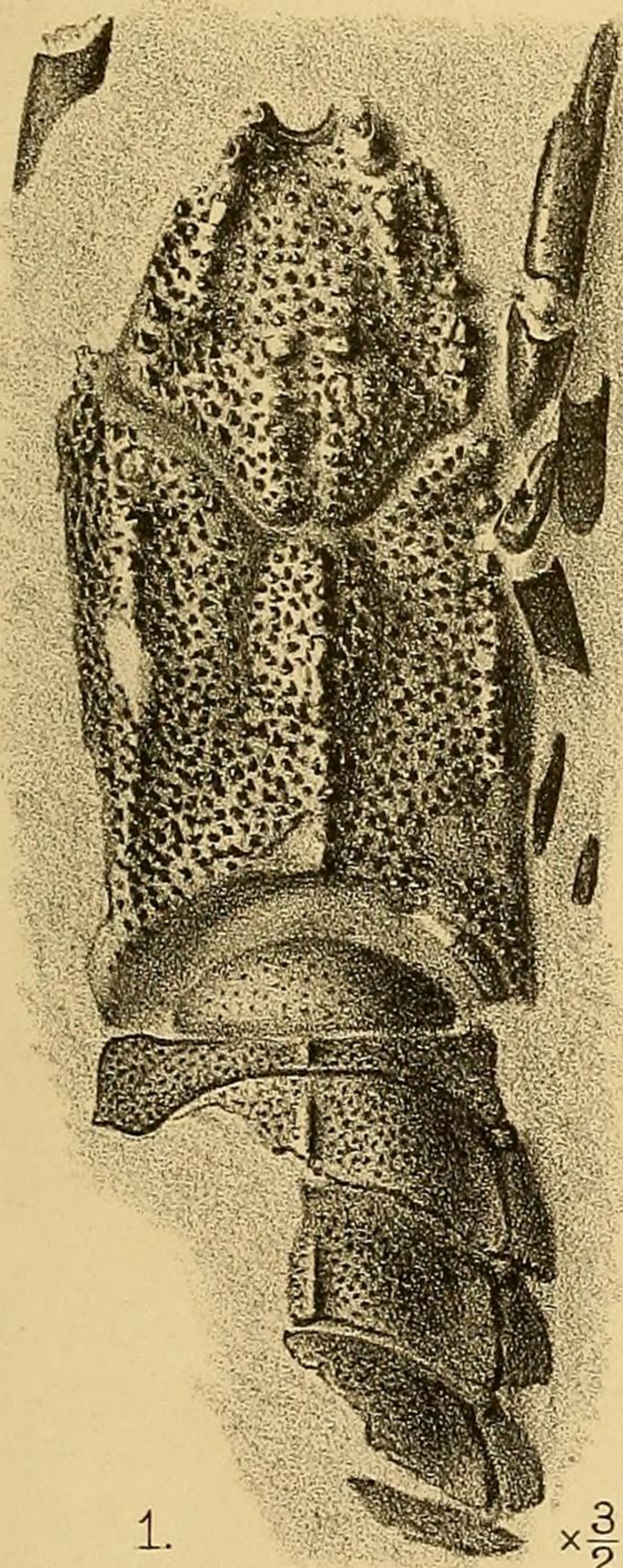
AFTER I had forwarded the paper on "The Residual Earths of British Guiana commonly termed 'Laterite'", published on pp. 439-52, 488-95, and 553-62 of the GEOLOGICAL MAGAZINE for October, November, and December, 1910, I visited the neighbourhood of Christianburgh and Akyma on the Demerara River in British Guiana and examined a small long-deserted quarry in a very fine-grained



1a

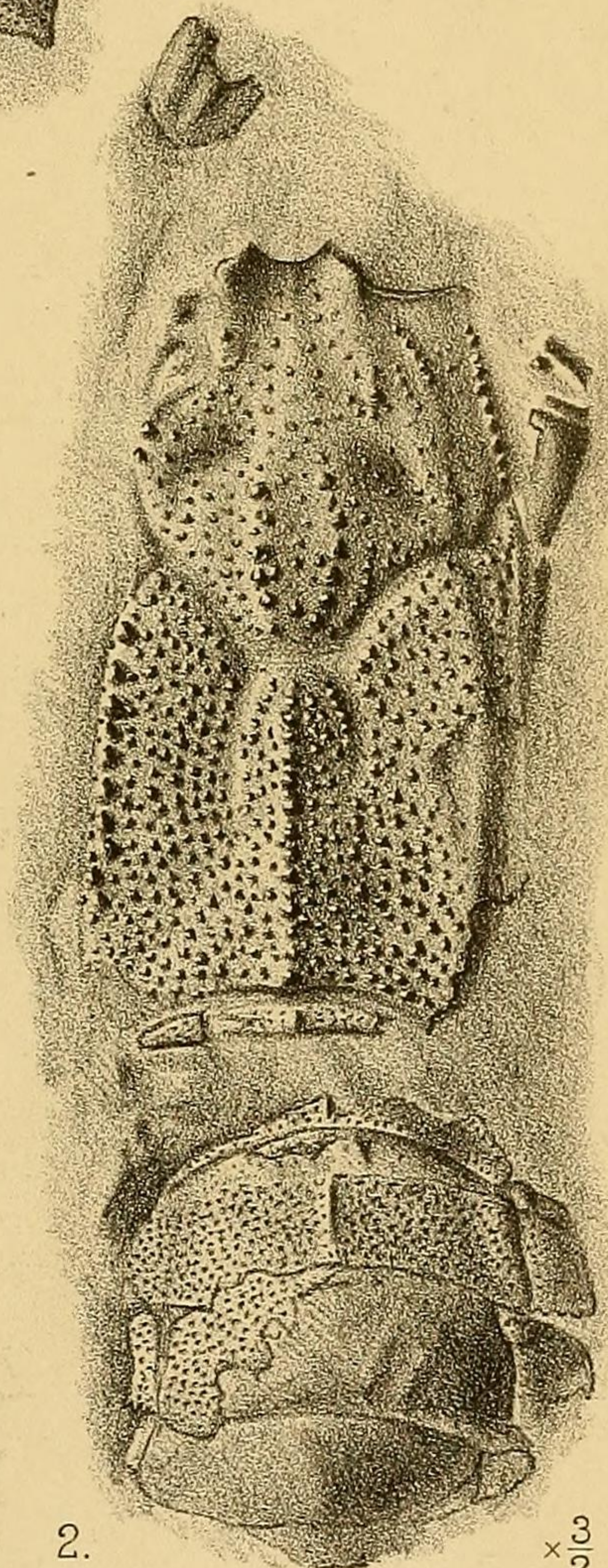


1b.



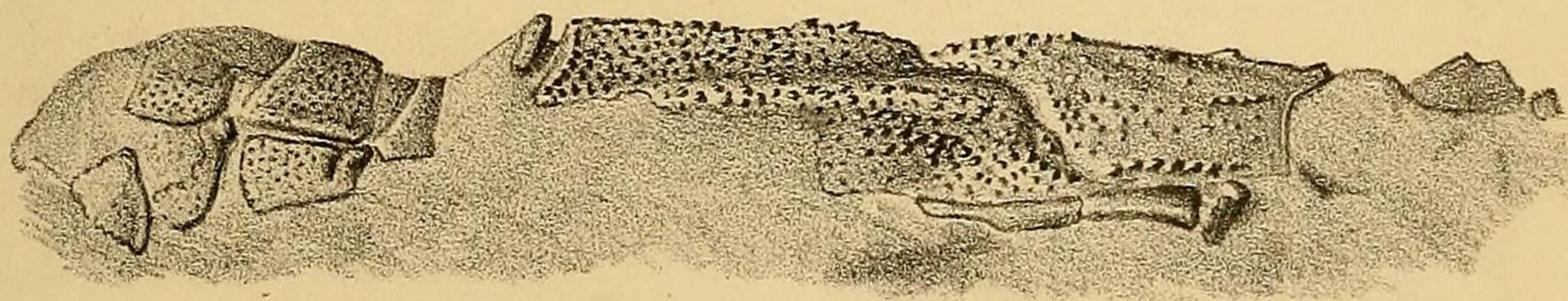
1.

$\times \frac{3}{2}$



2.

$\times \frac{3}{2}$



2a

A.H.Searle del. et lith.

West, Newman imp.

New Species of *Thenops*.

