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THE ASSISTANT-SECRETARY OF THE GEOLOGICAL SOCIETY.

Quod si cui mortalium cordi et curæ sit non tantum inventis hærere, 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.*

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MDCCCLXXVI.

5. *On a new* Fossil Crab *from the* Tertiary *of* New Zealand, *collected by* Dr. Hector, F.R.S., F.G.S., Director of the Geological Survey of New Zealand. By Henry Woodward, Esq., F.R.S., F.G.S., of the British Museum. *With a Note by* Dr. Hector. (Read November 3, 1875.)

[Plate VII.]

The fine fossil Crab which I have now the pleasure to describe was obtained by my friend Dr. Hector, F.R.S., F.G.S., from the "passage-beds," Ototara series, Woodpecker Bay, Brighton, north-west coast of the South Island, New Zealand, considered by him to be probably equivalent in position to the very lowest Eocene, or the uppermost Cretaceous of Europe.

I have compared it with the various genera of fossil Crabs with which I am acquainted, and am of opinion that its nearest alliance is with the genus *Harpactocarcinus* of Alphonse Milne-Edwards*, from the Nummulitic series of France, Spain, and Italy. Of this genus Alphonse Milne-Edwards has described the following six species, namely :—

Harpactocarcinus, Alph. Milne-Edw.

1. *punctulatus*, Desm.	M. Eocene,	Barcelona and N. Italy.	
2. *macrodactylus*, A. M.-Edw.	,,	,,	,,
3. *rotundatus*, A. M.-Edw.	,,	,,	,,
4. *ovalis*, A. M.-Edw.	,,	,,	,,
5. *Souverbiei*, A. M.-Edw.	,,	Dax, S.W. of France.	
6. *quadrilobatus*, Desm.	,,	Dax; Perpignan; and Vicentin, N. Italy.	

Of the above species the specimen from New Zealand most nearly approaches to *H. quadrilobatus*, Desm., in general proportions; but the carapace of the New-Zealand crab is much more tumid, and the relative proportions between the depth of the anterior and posterior halves of the carapace differ considerably. Thus, if an imaginary line be drawn transversely across each carapace from the epibranchial spine on the lateral border of each, we shall find the proportions to be as under :—

	Depth of anterior half.	Depth of posterior half.
Harpactocarcinus quadrilobatus	29	46
,, new species	35	40

The carapace of the New-Zealand crab is 83 millims. broad and 73 millims. in depth from the rostrum to the posterior border. If measured along the *curve* of the carapace, the depth is 83 millims.; but, owing to the curvature of the carapace this is less apparent.

The carapace is remarkably tumid, especially on the branchial

* Alph. Milne-Edwards, Hist. Crust. Podophth. fossiles, 1861–65. Family of Canceridæ, pp. 196–207.

and gastric regions; the surface of the posterior half of the carapace is very finely granulated; but the anterior half is nearly smooth. The rostrum is short and bicuspid, as in other *Harpactocarcini*; the orbits are shallow and rounded; the space between the orbits measures 15 millims.

The hepatic margin, at first partially obscured by matrix, now presents a nearly smoothly rounded border, a blunt and rounded denticle marking the lateral angles of the epibranchial border, as in *H. quadrilobatus*.

The divisions between the branchial, cardiac, and gastric regions are faintly indicated by a shallow undulation of the surface of the carapace, and a slightly roughened and incised line of short oblique markings on the sides of the gastric intumescence.

The external jaw-feet, or maxillipeds, are well preserved*. The endopodite is broad and 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 take their rise from a common basal joint.

The chelæ, or first pair of true limbs, are robust and, as is commonly the case among the Canceridæ, very unequal in size, the right being considerably larger than the left hand.

The ischium measures 8 millims. in length, the arm 31 millims.; these, with the short basal joint, are concealed beneath the carapace; the carpus is a short strong joint 26 millims. long, and having its distal end broadest (measuring 30 millims.) and armed at each angle with a stout short spine. Its proximal end contracts greatly at its articulation with the arm, giving it a triangular form. The length of the larger hand is 65 millims., breadth 30; length of the smaller hand 53 millims., breadth 21. The chelate ends of the limbs are considerably recurved, as in other Canceridæ.

The abdomen has nearly all flaked off; but a sufficient portion remains attached to the plastrosternum to show that the fossil crab was a female. In general form the plates of the plastrosternum agree with those of *Harpactocarcinus*. The four pairs of simple monodactylous feet are broken off short, but they present no characters dissimilar to those of other Cancerines.

I propose to name this interesting fossil *Harpactocarcinus tumidus*.

The presence of this Crab alone would sufficiently attest the near-shore character of this deposit at Woodpecker Bay; but, besides another specimen of *Harpactocarcinus tumidus* obtained from this deposit, a number of portions of chelæ of other Cancerine claws, with remains of an extinct gigantic Penguin, attest the correctness of this opinion.

For the present, however, I will refrain from generalizing on the exact horizon of this fossil from New Zealand as compared with the beds containing *Harpactocarcini* in Europe; but Dr. Hector has added a few remarks to my paper; and as he has visited the locality

* The entire underside has been carefully worked out by Mr. Barlow, the intelligent and able mason attached to the geological department of the British Museum.

and also obtained this and many other fossils therefrom, and worked out the geology of the district, I leave him to notice the geological facts of the case.

Note by Dr. Hector.

The locality where both the specimens of this fossil were obtained is a small bay on the exposed west coast of the South Island, where the shelter of the Seal-rocks affords a precarious landing-place for supplying stores to the gold-miners around Brighton. Northwards the coast is formed of granite for many miles; but the crystalline rocks at this place disappear under Upper Mesozoic and Lower Tertiary formations, which form the coast range, and expand southwards to a width of 15 miles, covering the important area of the Grey-River Coal-field.

The Seal-rocks belong to the upper part of the formations referred to, representing on the west coast the Ototara group of the north-east of Otago Province, a formation which is widely distributed throughout New Zealand, and nowhere, so far as I have seen, passes into the Tertiary strata of later date.

The Ototara group was referred to by Profs. E. Forbes and Rupert Jones*, who from fossils collected by Mr. Walter Mantell, considered it to possess mixed characters of the Upper Cretaceous and Eocene periods of Europe.

In the same formation Prof. Huxley, from a single bone brought also by Mr. Mantell, determined the former existence of a gigantic Penguin (*Palæeudyptes antarcticus*†); and it is worthy of remark that not only have further remains of the skeleton of that bird been obtained in the Calcareous Sandstone at Ototara, but that a large part of a skeleton was extracted from the same stratum in the Seal-rocks with the first-found specimen of the Crustacean under notice, thus satisfactorily correlating the formations on the opposite sides of the island‡. Concerning the palæontological value of these Penguin remains Prof. Huxley makes the following important observations :—

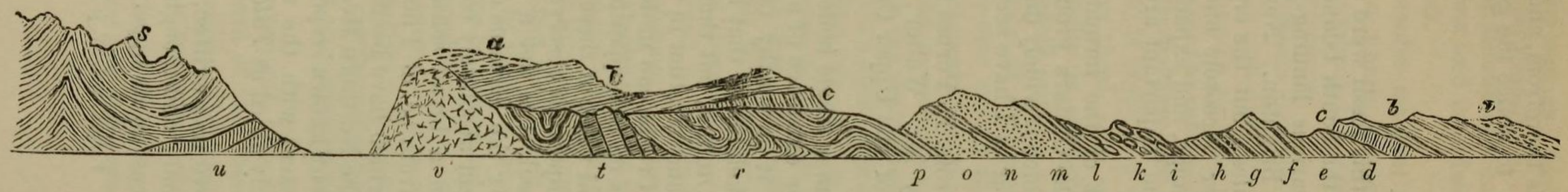
"Whatever be the precise age of the fossil, it is not a little remarkable to find in strata of such antiquity the remains of a bird the whole of whose congeners are at present absolutely confined to the southern hemisphere, and therefore, in a broad sense, to the same great distributional area. If the strata be of Pliocene age, the fact is in accordance with the relations which have been observed between the recent and Pliocene faunæ of the Northern Hemisphere. On the other hand, the little that is at present known respecting the distribution of Birds in time is not inconsistent with the ascription of a far higher antiquity to a genus as closely allied as *Palæeudyptes* to those which now exist" (*l. c.* p. 675).

The Ototara formation has, since the above was written, been examined in most distant parts of New Zealand; and though it varies in mineral aspect, it always maintains, at least in its upper part, the

* Quart. Journ. Geol. Soc. vol. vi. p. 329, 1850. † *Ibid.* vol. xv. p. 672, 1859.
‡ Hector, Trans. New-Zeal. Inst. vol. iv. p. 341.

Section from the Alps to Brighton, New Zealand.

E. W.



Details of Section.

Formations.		
IV. V. VI. ...	*a.*	Gravel sandstone.
	b.	Tough blue clay marls.
	c.	Calcareous and nummulitic.
VII.	*d.*	Calcareous sandstone—Ototara group.
	e.	Glauconitic sandstone.
	f.	Chalk marls under Fucoidal limestone.
	g.	Leda marls—*Pecten pleuronectes.*
VIII.	*h.*	Greensand grits.
	i.	Dark tough clays.
	k.	Limonite sandstone and greensands, Saurian bones, Ammonites, &c.
	l.	Brown pitch coal.

Formations.		
IX.	*m.*	Upper conglomerates.
	n.	Bituminous coal (Dicotyledonous leaves).
	o.	Lower conglomerate.
X.....	*p.*	Green sandstone and marlstone with *Tæniopteris* and the same fossils as at Rajamahal, India.
XI.	*r.*	Auriferous rocks of Reefton, green tufaceous sandstones and slates.
XII. XIII.*...	*s.*	Upper palæozoic sandstones of the Alps.
XIV.*	*t.*	Madrepore limestones and quartzites with Trilobites &c.
	u.	Schistose rocks along the west base of the Alps.
	v.	Granite in massive but generally isolated mountains.

* XIII. and XIV. are probably Carboniferous and Devonian.

character of a littoral or shallow-water calcareo-arenaceous deposit, rich in distinctive fossils associated with other forms that are common in the underlying formations. The stratigraphical position of the Ototara group, as the upper part of what for convenience of mapping, I have termed the Cretaceo-Tertiary formation, is shown in the following general schedule, in which the local names and subdivisions used in surveying have been suppressed, and a comparison attempted with European formations:—

	Formation.	*Physical Character.*	
Tertiary.	I. Recent and Postpliocene.	*a.* Fluviatile and littoral.	Moa period.
	II. Upper Pliocene.	Fluviatile, extended glaciers.	Moa period.
		Fluviatile, oldest gold-drift.	Moa period.
	III. Older Pliocene.	*b.* Marine, craglike and conglomerates.	
	IV. Upper Miocene.	*a.* Marine, argillaceous, concretionary.	
	V. Lower Miocene.	Marine, arenaceous, concretionary.	
	VI. Upper Eocene.	Marine calcareous.	
		b. Estuarine lignitiferous.	
	VII. Cretaceo-Tertiary.	*a.* Ototara group—calcareous sandstone.	
	VIII. Middle Cretaceous.	*b.* Chalk and marl.	
		a. Marine, ferruginous clays and greensands.	
		b. Estuarine, gravels and *hydrous brown coal*; chief Saurian beds.	
Mesozoic.	IX. Lower Cretaceous.	*a.* Fluviatile grits and conglomerates; *anhydrous brown coal.*	Saurians.
		b. Marine, grits, green and grey sandstone.	Saurians.
	X. Jurassic.	Green sandstone and shales, with thin coal, *Pecopteris*, *Tæniopteris*, &c.	Saurians.
	XI. Liassic.	Red and blue marlstones.	Saurians.
	XII. Trias.	Conglomerates and shales, plant-beds.	Saurians.

About 320 specimens of fossil Mollusca and Echinodermata have been described from the first seven of the foregoing divisions, the collections having been made from 90 different localities*; and I have prepared the following Table to show the actual number of recent and extinct species, comparing the recent fauna with the Upper, Middle, and Lower Tertiary and Cretaceo-Tertiary formations, omitting those which are of doubtful specific identity or stratigraphical position.

	Univalves.		Bivalves.		Brachiopods.		Echinoderms.		Totals.	
Formations.	R.	Ex.	R.	Ex.	R.	Ex.	R.	Ex.	R.	Ex.
Recent	285	...	134	...	9	...	26	...	454	...
II. III.	67	14	45	9	6	0	3	0	120	23
IV. V.	30	60	22	33	2	3	1	3	55	109
VI.	7	28	4	46	2	8	1	7	14	89
VII.	0	13	0	28	...	9	0	20	...	70
Extinct species, II.–VII.	...	87	...	71	...	10	...	26	...	194

* Catalogue of Tertiary Fossils in the Col. Museum, by F. W. Hutton, Assist. Geologist. New Zealand, 1873.

From the comparison which this Table affords with the recent fauna of the same area, the Otatara formation would seem to have no claim to a place among Eocene formations. This is confirmed by the occurrence of a few fossils of decidedly Cretaceous type, such as Saurian forms and fragments of the shell of *Inoceramus*, and the presence of many forms that are associated with decided Mesozoic fossils in the underlying strata. On the other hand, the occurrence of decidedly Tertiary fossils (among which is *Nautilus ziczac*, or a closely allied form), the gigantic Penguin bones, and the recent discovery of the bones of a Turtle, also from the Seal-rocks, indicate a fauna not dissimilar to that at present existing in adjoining areas to the north and south; so that any additional evidence bearing on this matter, such as is afforded by Mr. Woodward's determination of the affinities of this Crustacean, is an important contribution to New-Zealand palæontology.

The accompanying section (p. 54) explains the general sequence of the formations referred to in the foregoing paper on the west coast of the South Island, from Brighton to the Alps.

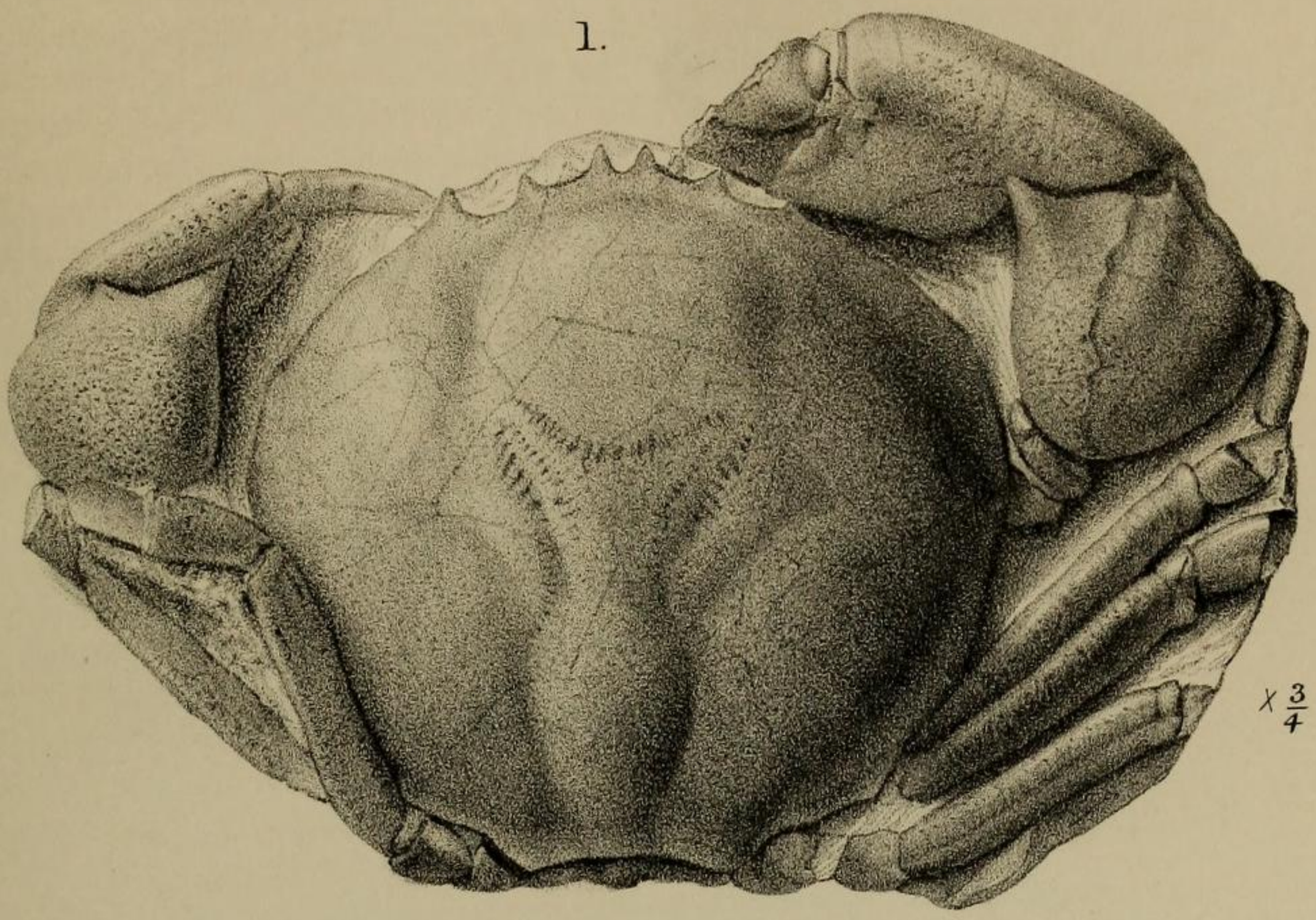
EXPLANATION OF PLATE VII.

Harpactocarcinus tumidus, H. Woodw. Three fourths nat. size.

Fig. 1. Upperside of carapace.
2. Underside of carapace.

The specimen is preserved in the British Museum.

1.



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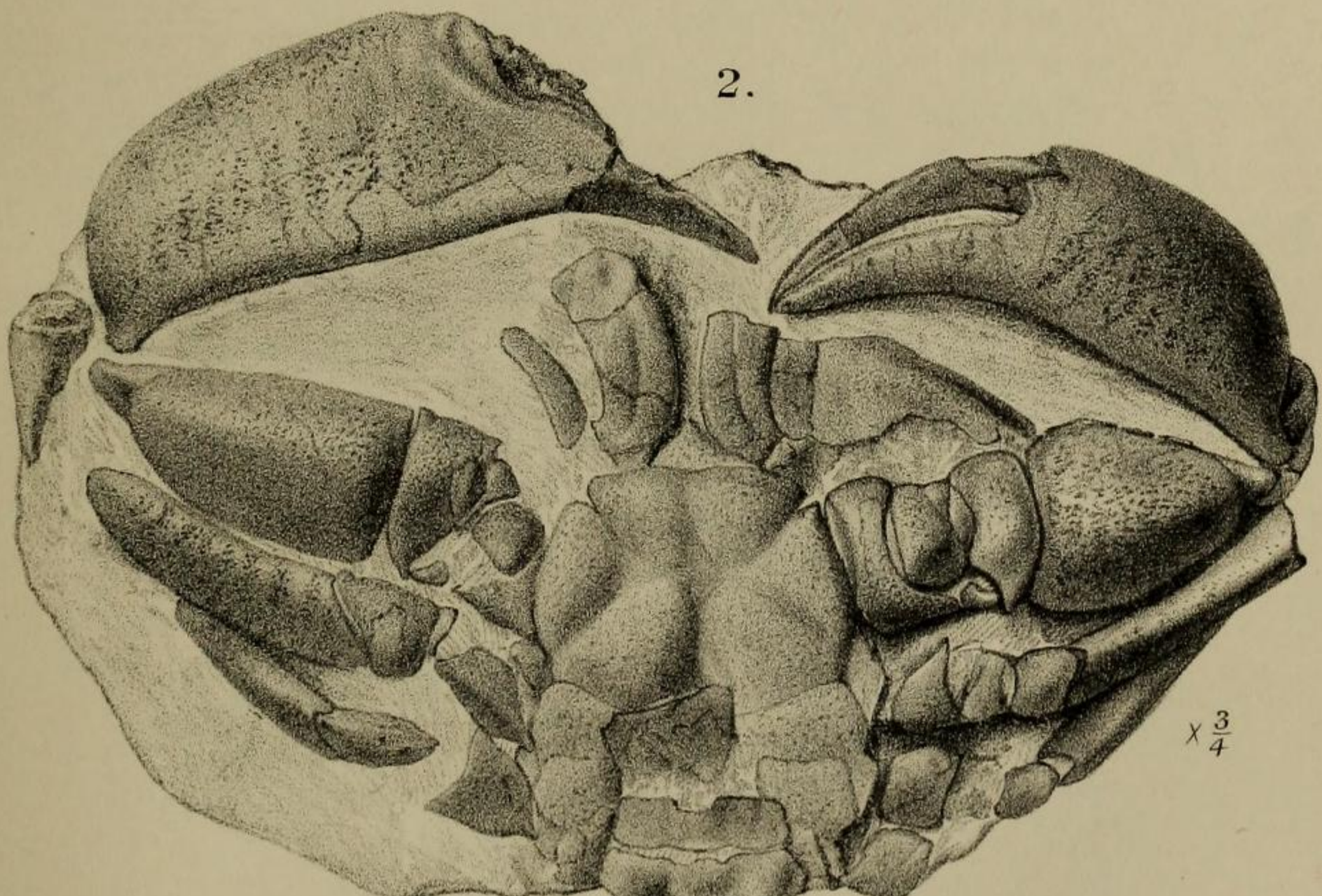

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G.H.Ford & C.L.Griesbach.

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HARPACTOCARCINUS TUMIDUS.