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SUB-FOSSIL CRUSTACEANS FROM THE COASTS
OF AUSTRALIA.

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AND

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(Plates i-vii. ; Fig. 1.)

I.—INTRODUCTION.

At various beaches on the south, south-east, north, and north-west coasts of Australia, remains of Decapoda more or less encased in clay-nodules, are every now and then brought to light, but very few facts appear to have been gathered as to their mode of occurrence when *in situ*. Again, similar animal remains have been met with in excavating canals in delta deposits, only in such instances they are less markedly nodular, and have undergone a lesser degree of fossilisation. A third occurrence is that of river, or perhaps estuarine, deposits brought to light through dredging operations.

As an instance of the first mode of occurrence we cite Anson Bay, North-west Australia; of the second the Coode Canal, Yarra River Delta; and of the third dredging operations carried on at the mouth of the Brisbane River, Moreton Bay. All of these occurrences will be referred to later.

II.—HISTORY.

The first to describe one of these semi-fossil Decapoda from Australia was Prof. Thomas Bell, of King's College, London. It appears he received from Mr. W. Sharp Macleay, a macruran which he referred to the genus *Thalassina* as *T. emerii*, naming it after a "Mr. Emery" who apparently was the collector, but unfortunately neither locality nor geological information accompanied the specimen; it was simply said to have been derived from "New Holland." The first description of the *Thalassina* appeared in the "Proceedings

of the Geological Society," for 1844,¹ followed in the next year (1845) by republication in the "Quarterly Journal."² A notice of the reading of Prof. Bell's paper, however, appeared in "Annals of Natural History"³ for 1844, and in this brief notice the fossil is termed *Thalassina antiqua*. In compiling his "Index Palæontologicus," Dr. H. G. Bronn, evidently unaware of Bell's papers proper, adopted the unauthorised name *antiqua*⁴ for the Australian sub-fossil. In his papers Prof. Bell frankly confessed his inability to distinguish but little difference between his *T. emerii* and the recent *T. anomala*, Herbst.

The collector spoken of as "Mr. Emery," was no doubt Lieut. James B. Emery, R.N., an officer of H.M.S. "Beagle," during her exploration of the north and west coasts of Australia between 1837-1843, under Commander J. Lort Stokes.⁵ Now, as the "Beagle" visited Shoal Bay, contiguous to Anson Bay from where most of our examples come, it is quite possible the type specimen was obtained from one or another of the rich deposits in the extreme north-west.

From 1845 onwards nothing more appears to have been written on Australian sub-fossil Crustacea until 1866, when Mr. S. H. Wintle described two crabs from an estuarine deposit at the mouth of the Yarra River, Hobson's Bay; one he called *Phlyxia lævis* and the other *Utica*, sp.,⁶ and associated with them were the remains of the Freshwater Crayfish (*Astacopsis franklini*, McCoy). These were "found in nodules of a highly calcareous cement occurring in great abundance in the old estuarine bed of the river Yarra Yarra, which has been exposed in excavating for docks, and also in the cutting for the Coode Canal at Fisherman's Bend." In the same year Mr. Wintle read⁷ a paper before the Royal Society of Tasmania of a similar nature, wherein he named two forms—*Utica yarraensis* and *U. haswelli*.

¹ Bell—Proc. Geol. Soc., iv., 1844, p. 360, fig.

² Bell—Quart Jour. Geol. Soc., i., 1845, p. 93, fig.

³ Ann. Nat. Hist., xiv., 1844, p. 455.

⁴ Bronn—Index Pal., i., 2, 1848, p. 1265.

⁵ Stokes—Discoveries in Australia, ii., 1846, p. 93.

⁶ Wintle—Vict. Nat., iii., 1886, p. 110.

⁷ Wintle—Proc. R. Soc. Tasm. for 1886 (1887), p. 233.

The *Phlyxia laevis* is probably intended for *Philyra laevis*, Bell, which is a very common species in Victorian waters, more particularly as there is no species *laevis* in the genus *Phlyxia*, so far as we know. Of *Utica*, the only recent Australian species were described by Prof. W. A. Haswell from Port Denison, Queensland, and it is most unlikely the crabs so referred by Wintle were correctly named. As to the *Astacopsis*, *A. franklini*, Gray (non McCoy) is not a Victorian but a Tasmanian species.

It appears crabs, in a similar condition to our *Thalassina* from the north, are also found on the New Caledonian coast, for Prof. A. Milne Edwards refers⁸ to the occurrence of *Macrophthalmus latreillei*, Desmarest. Even here the crabs were in a bluish-grey very hard calcareous clay, in fact, very much like the matrix from different spots on our north-west coast.

One other reference only is known beyond Wintle's brief notices—about 1880 Dr. R. L. Jack forwarded to one of us a rolled limestone nodule found on the beach at Townsville, but he was unable to throw any further light on it. The nodule contained the abdominal somites and portion of the appendages of a *Thalassina*, seemingly *T. emerii*, Bell.⁹ In a footnote to the description Dr. Jack said:—"A number of specimens, apparently of this same species were collected by the late Mr. James Smith (Collector to the Geological Survey of Queensland) shortly before his death, at Casuarina Island, Keppel Bay."

III.—MODES OF OCCURRENCE.

We possess information on this point only from the three localities mentioned in the introductory remarks, and also from Derby.

1. *Anson Bay*, embouchure of the Daly River, North Australia.—Examples of *Thalassina emerii* from this locality were first sent to one of us by Mr. H. Y. L. Brown, late Government Geologist of South Australia, in 1908, with the following information:—The calcareo-argillaceous nodules are found on the beach at the foot of a low cliff (Pl. vii.) composed of sand, clay, and grit topped by red loam, as water-worn fragments. They are also found embedded in a blue clay below high-water mark, and here probably the nodules are in place.

⁸ A. Milne-Edwards—Nouv. Ann. Mus. Hist. Nat., ix., 1873, p. 278.

⁹ Etheridge—Geol. Pal. Q'land, &c., 1892, p. 639, pl. 36, fig. 6.

A valued correspondent of this museum, Mr. W. T. Watkin Brown, obtained a number of these fossiliferous nodules from Anson Bay; these are now here. Besides confirming Mr. H. Y. L. Brown's information, his collector informed him that the nodules are plentiful on the beaches after south-east winds, when they are washed out of the mud (= blue clay of H. Y. L. B.) below high-water mark, or by the action of the waves on a low mud bank above tidal influence; this last is probably a gradual reformation of the blue clay in question.

With the view of ascertaining how far fossilisation had been carried, portions were submitted to our colleague, Dr. C. Anderson, for qualitative analysis. He reports as follows:—"These remains have suffered a considerable degree of replacement and petrification. I could find no undoubted evidence of the presence of chitin and the exoskeleton is (partly at least) dolomitized. The interior is filled with a hard magnesian limestone showing vughs lined with secondary crystals.

2. *Derby*.—From information supplied to us by Mr. W. D. Campbell, late of the Geological Survey of Western Australia, the occurrence of these Crustacea at Derby is much the same. He says:—"The nodules are found at low-water spring-tides near Derby Wharf, in the hollows of runs of water formed in the river banks, and appear to have been washed out of the grey clay of the river bed and banks which appears to form the valley flat."

3. *Coode Canal and Yarra River Delta, Melbourne*.—In 1878 seven bores were driven through the Estuarine deposits of the delta preparatory to excavating a water-way, now known as the New Channel, to deflect the course of the river Yarra round the great bend enclosing Coode Island, and opposite Footscray. We are indebted to Mr. R. Rudd, Secretary to the Melbourne Harbour Trust Commission, for a map showing the positions of these bores, and journals of the same. From the latter we gather no rock was encountered, but the rods invariably passed through sand or silt, or both, in most instances followed by soft blue or black clay, and this again by hard, tough blue and yellow clay, the latter the lower of the two. The position of the soft yellow clay varied from fourteen to twenty-one feet from the surface, that of the tough clays from eighteen to thirty-seven feet. The thickness of the soft blue clay varied from two feet six inches

to eighteen feet, and of the tough clays combined from eight to twenty-five feet. The appearance of the few sub-fossil Crustacea seen from this deposit leads us to believe they came from the bottom tough yellow clay; we have not seen any remains in calcareous cement nodules as described by Mr. Wintle.

4. *Entrance Brisbane River, Moreton Bay.*—Mr. J. H. Stevens, Inspector of Fisheries, Brisbane, informs us that the sub-fossil Crustacea from this locality were obtained from the New Channel Cutting at the entrance to the Brisbane River, now forming the main waterway.

The cutting was dredged through a large bank about half a mile wide, a continuation of Fisherman Island. Previous to the dredging operations the bank was covered with about two feet of water at ordinary low-water spring tides, but at very low tides parts of the bank were quite exposed; the depth of the channel is now twenty-eight feet. The specimens collected came from a depth of about sixteen feet from the surface in sand and mud. Mr. Stevens considers the bank had evidently accumulated through the deposition of sediment from the flood-waters of the Brisbane River.

The aspect of these Crustacea is quite different from those obtained further north and north-west. The matrix is a hard ochre-coloured, slightly calcareous mud. Dr. Anderson also submitted portions of these to a qualitative analysis, and informs us that:—"Portions of the exoskeleton, cleaned as completely as possible from adhering matrix, were treated with hot dilute hydrochloric acid. A fragment of a chelipede became converted into a white, soft, amorphous substance, which readily carbonised on heating. Portion of the carapace was attacked less readily and left some inorganic residue, but the presence of organic matter was proved as before. These experiments indicate that there is little or no petrification; there is some infiltration of mud or clay, particularly in the case of the less dense carapace, and it is apparent that, as we should expect, the proportion of organic matter is lower than in a recent specimen (tested for comparison), but a considerable amount of chitin still persists in the skeleton."

IV.—LOCALITIES.

The following is a complete list of the localities yielding these sub-fossil remains of one kind or another :—

A.—*Littoral Deposits*—

1. Derby, Fitzroy River, Kimberley, North-west Australia (Collection of the Geological Survey of Western Australia—W. D. Campbell).
2. Anson Bay, North Australia, (Australian Museum—Messrs. H. Y. L. Brown and W. T. Watkin Brown).
3. Daly River, North Australia (Queensland Museum).
4. Coast west of Darwin (or Palmerston), North Australia (Australian Museum—Messrs. H. W. Christie and F. L. Godfrey).
5. Darwin (or Palmerston), North Australia (Queensland Museum).
6. Beach at Normanton, Gulf of Carpentaria, North Queensland (Australian Museum—P. G. Black).
7. Beach at Townsville, North-east Queensland (Collection of the Geological Survey of Queensland—R. L. Jack).
8. Casuarina Island, Fitzroy River, East Central Queensland (*Ibid.* and J. Smith).
9. Golden Shore, Curtis Island, Port Curtis, East Central Queensland (Australian Museum—A. J. Vogan).
10. Ocean Beach, near Jumping Pin, Stradbroke Island, Moreton Bay, South-east Queensland (Australian Museum—A. R. McCulloch).

B.—*Estuarine Deposits*—

11. New Channel, mouth of Brisbane River, Moreton Bay, South-east Queensland (Queensland and Australian Museums—J. H. Stevens).
12. Newcastle Harbour, New South Wales (Australian Museum—W. Cantrill).
13. Coode Canal Works, Yarra Delta, Hobson's Bay, Victoria (Australian Museum—S. H. Wintle).

V.—DESCRIPTION OF THE SPECIES.

Family THALASSINIDÆ.

Genus THALASSINA, Latreille.

THALASSINA ANOMALA, Herbst.

(Plate i., figs. 1-3).

Thalassina anomala (Herbst), Ortmann, Zool. Jahrb., vi., 1892, p. 52 (synonymy).

Thalassina emerii, Bell, Quart. Journ. Geol. Soc., i., 1845, p. 93, figure. *Id.*, Etheridge, Geol. Pal. Q'land., etc., 1892, p. 639, pl. 36, fig. 6.

Thalassina antiqua, Bell, Ann. Nat. Hist., xiv., 1844, p. 455 (*nomen nudum*).

Thalassina maxima, Hess, Arch. Nat., xxxi., 1865, p. 37, pl. 7, fig. 18.

A large number of fragments, in a more or less perfect state of preservation, agree in detail with recent specimens of *T. anomala*, and indicate that *T. emerii*, which was described from a fossil similar to ours, is synonymous with that species. Bell noted that his specimen scarcely differed from a recent example, but relied upon the development of the epimeral portions of the abdominal segments, and of the terminal joint to distinguish *T. emerii*. These characters are variable in a series of *T. anomala*, however, they being proportionately larger in the adult than in the young. The development of the tubercles and spines on the carapace also increases with age.

This Crustacean is a tropical species, living in large burrows in the mud of mangrove swamps. According to Hess, the specimen on which his *T. maxima* was based, came from Sydney, but the species is not known to occur south of Queensland.

Locs.—Golden Shore, Curtis Island, and Casuarina Island, Fitzroy River, Queensland (Austr. Mus.—*R. L. Jack*); Beach deposit at Townsville, North-east Queensland (Austr. Mus.—*R. L. Jack*); Darwin, North Australia (Q'land Mus.); Coast west of Darwin (Austr. Mus.—*H. W. Christie* and *F. L. Godfrey*); Anson Bay, North Australia (Austr. Mus.—*H. Y. L. Brown* and *W. T. Watkin Brown*); Daly River, Anson Bay (Q'land Mus.); Derby, Fitzroy River, Kimberley, North-west Australia (Geol. Survey W. Austr.—*W. D. Campbell*).

Family CALAPPIDÆ.

Genus PARACYCLOIS, *Miers.*PARACYCLOIS GRANDISPINIS, *sp. nov.*

(Plate ii, fig. 3; Fig. 1).

Carapace convex, broadest at a point a little in advance of the middle of the length. Its dorsal surface is everywhere finely granular, and rendered uneven by the presence of numerous smooth and low tubercles, which are largest in the middle, and decrease in size as they approach the margins; they are smallest on the hinder part of the branchial regions. The grooves defining the cardiac and intestinal regions are broad and deeply impressed. Front divided into three parts, the median one being pyramidal and turned slightly upward; the two outer lobes are on a higher plane, and separated from the orbital margin by a furrow. Orbits directed obliquely upwards, their margins a little sinuous, finely granular, and each has a very indefinite indication of a median suture above. Eye-peduncles short, thick, and granular.

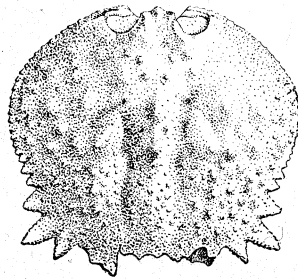


Fig. 1.

Lateral margins evenly curved, extending forward to below the centres of the orbits; they are studded with a row of small tubercles, which gradually enlarge on the postero-lateral portions, and merge into the five large teeth with which these parts are armed; of these the penultimate one is much bigger than the others, and the last is about the same size as the second. Posterior margin wanting. Sub-hepatic region granular like the carapace, defined below by a row of tubercles similar to those of the antero-lateral margins. Pterygostomian regions smooth.

The orbits, epistome, and antennal parts appear to have been very similar to those of *P. milne-edwardsii*, Miers, though several of the more important portions are lost. The carapace also resembles the figure of that species in most of its details, the most important difference lying in the great development of the postero-lateral spines in the fossil.

The occurrence of this genus in Australian waters is interesting as the above-mentioned species from the Admiralty Islands appears to be the only one previously known.

Loc.—Estuarine deposit, Yarra Delta, Melbourne, Victoria (Australian Museum).

Family PODOPHTHALMIDÆ.

Genus PODOPHTHALMUS, *Lamarck*.

PODOPHTHALMUS VIGIL, *Fabricius*.

(Plate iv., fig. 3; Plate v., fig. 3).

Podophthalmus vigil (Fabricius), Leach, Zool. Miscell., ii., 1815, p. 149, pl. cxviii. *Id.*, Miers, "Challenger" Rept., Zool., xvii., 1886, p. 207 (references).

Two incomplete carapaces and abdominal parts, with the basal joints of the legs attached, agree in detail with a specimen in the Australian Museum from Mauritius. The species has not hitherto been recognised from Australia, though it occurs throughout the Indo-Pacific region.

Loc.—New Channel, mouth of Brisbane River, Moreton Bay (Anstr. and Q'land Mus.—*J. H. Stevens*).

Family PORTUNIDÆ.

Genus SCYLLA, *de Haan*.

SCYLLA SERRATA, *Forsk.*

(Plate ii., figs. 1-2).

Scylla serrata (Forsk.), Alcock, Journ. Asiat. Soc. Bengal, lxxviii. (n. ser.), 1899, p. 27.

The collection received from the Queensland Museum includes the ventral surface and abdomen of a large female example, to which the meropodites of all the legs, and portion of the left hand are attached. We have also two well preserved lower right-hand fingers. They do not differ from those parts of the common, and widely distributed Mangrove Crab, *Scylla serrata*.

Locs.—Wharf at Derby, Fitzroy River, Kimberley, North-west Australia (Geol. Survey, W. Austr.—*W. D. Campbell*). New Channel, Mouth of Brisbane River, Moreton Bay (Austr. & Q'land Mus.—*J. H. Stevens*).

Genus PORTUNUS, *Fabricius*.

PORTUNUS PELAGICUS, *Linnaeus*.

Neptunus pelagicus (Linnaeus), Alcock, Journ. Asiat. Soc. Bengal, lxxviii. (n. ser.), 1899, p. 34.

A much damaged carapace and portion of a right chela agree with recent specimens of this common, and widely distributed swimming-crab.

Loc.—New Channel, Mouth of Brisbane River. Moreton Bay, Queensland (Austr. Mus.—*J. H. Stevens*.)

Family XANTHIDÆ.

Sub-family GALENINÆ.

Genus GALENE, *de Haan*.

GALENE BISPINOSA, *Herbst*.

(Plate iii., figs. 3-4).

Cancer (Galene) bispinosus (Herbst), *de Haan*, Faun. Japon. Crust., 1835, p. 49, pl. v., fig. 2.

Galene bispinosa, Alcock, Journ. Asiat. Soc. Bengal, lxxvii. (n. ser.), 1898, p. 136.

A fine series of one hundred and two specimens, 30-74 mm. across the carapace, includes both sexes, and exhibits considerable growth variation. In the smaller specimens the granules

on the carapace and chelipeds are much more numerous and more prominent than in the larger ones. On the hand they are very large and arranged in rows which extend almost across the outer face of the palm, whereas in the oldest examples they are confined to its posterior portion, the greater part of the outer surface being smooth. Similar variation has been noted by Alcock.

Locs.—Though this species has not been previously recorded from Australia, there are recent specimens in the Australian Museum which were taken by the F.I.S. "Endeavour," seven miles N.N.E. of Bowen, Queensland, in 16 fathoms.

New Channel, Mouth of Brisbane River, Moreton Bay Queensland (Austr. and Q'land Mus.—*J. H. Stevens*).

Family GRAPSIDÆ.

Sub-family SESARMINÆ.

Genus SESARMA, *Say*.

SESARMA SMITHII, *Milne Edwards*.

(Plate iii., figs. 1-2).

Sesarma smithii (Milne Edwards), McCulloch, Rec. Austr. Mus., ix., pt. 3, 1913, p. 322 (references).

A damaged carapace and several fragments of legs, together with a complete hand and fingers, are in the Australian Museum collection. They agree perfectly with the specimens recently recorded by the junior author from Queensland.

Loc.—Casuarina Island, Fitzroy River, Keppel Bay, Queensland (Geol. Survey Q'land.—*J. Smith*).

Family MACROPHTHALMIDÆ.

Genus MACROPHTHALMUS, *Latreille*.

MACROPHTHALMUS SERRATUS, *Adams & White*.

(Plate iv., figs. 1-2).

Macrophthalmus serratus (Adams & White), Miers, "Challenger" Rept., Zool., xvii., 1886, p. 250, pl. xx., fig. 1.

? *Macrophthalmus latreillei* (Desmarest), A. Milne Edwards, Nouv. Arch. Mus. Paris, ix., 1873, p. 278, pl. xiii., fig. 3 (*vide* Ortmann, Zool. Jahrb., vii., 1897, p. 747).

A very fine specimen, having the carapace and one cheliped almost complete, together with the meropodites and basal joints of all the legs, is well represented by Miers' excellent figure of *M. serratus*. It differs from A. Milne Edwards' figure of *M. latreillei* only in having four instead of three lateral teeth, but as the last is small, and, according to Miers, subject to variation in development, this is probably an unimportant character.

M. latreillei was originally described from fossilised specimens from the East Indies and Luzon, and some interesting details and conclusions are given by A. Milne Edwards, who had both fossil and recent specimens from New Caledonia.

Loc.—Ocean Beach, near Jumping Pin, Stradbroke Island, South-east Queensland (Austr. Mus.—*A. R. McCulloch*).

MACROPHTHALMUS SETOSUS, *Milne Edwards*.

(Plate v., figs. 4-5; Plate vi., fig. 1).

Macrophthalmus setosus (Milne Edwards), Ortmann, Zool. Jahrb., x., 1897, p. 343 (references).

Two specimens lying one upon the other, are identical with this common New South Wales species.

The recent specimen figured is an adult male collected at Ryde, on the Parramatta River.

Loc.—Estuarine deposit, forty feet below the surface at Newcastle, New South Wales (Austr. Mus.—*W. Cantrill*).

MACROPHTHALMUS DEPRESSUS, Rüppell.

(Plate v., figs. 1-2; Plate vi., fig. 2).

Macrophthalmus depressus, Rüppell, 24 Krab. Roth. Meer., 1830, p. 17, pl. iv., fig. 6. *Id.*, Ortmann, Zool. Jahrb., x., 1897, p. 342. *Id.*, Alcock, Journ. Asiat. Soc. Bengal, lxi. (n. ser.), 1900, p. 380. *Id.*, Grant & McCulloch, Proc. Linn. Soc. N.S. Wales, xxxi., 1906, p. 21.

Macrophthalmus affinis, Guérin, Mag. Zool., viii., 1838, p. 7, pl. xxiv., fig. 2. *Id.*, Haswell, Cat. Austr. Crust., 1882, p. 88.

Four fossil specimens do not differ from the recent ones recorded from Queensland by Haswell as *M. affinis*, and Grant and McCulloch as *M. depressus*. They all differ from the original figure of *M. affinis* however, in having the carapace narrower at the outer orbital angles than at the third lateral tooth. For their identification as *M. depressus* we have relied upon the descriptions of Ortmann and Alcock, Rüppell's original description and figure not being available to us.

The accompanying figure of a recent example represents a typical Australian specimen from near Fremantle, Western Australia.

Loc.—Beach deposit at Townsville, North-east Queensland (Geol. Survey Q'land.—*R. L. Jack*).

Genus HEMIPLAX, Heller.

HEMIPLAX LATIFRONS, Haswell.

(Plate iv., figs. 4-5; Plate vi., figs. 3-4).

Macrophthalmus latifrons, Haswell, Proc. Linn. Soc. N.S. Wales, vi., 1881, p. 549, and Cat. Austr. Crust., 1882, p. 90.

The form of the front excludes this species from the genus *Macrophthalmus* in which it was placed by Haswell. It agrees in all its generic characters with *Hemiplax hirtipes*, Heller, from which it is separated specifically by its longer eye-stalks, narrower front, and more slender legs, etc.

The specimen figured on Pl. vi., fig. 3, is a young male from Victoria, which measures 17 mm. across the carapace. It differs from the type, and another larger example from Tasmania, only in having the hands and wrists proportionately broader and shorter; we have figured these joints of the Tasmanian specimen in fig. 4.

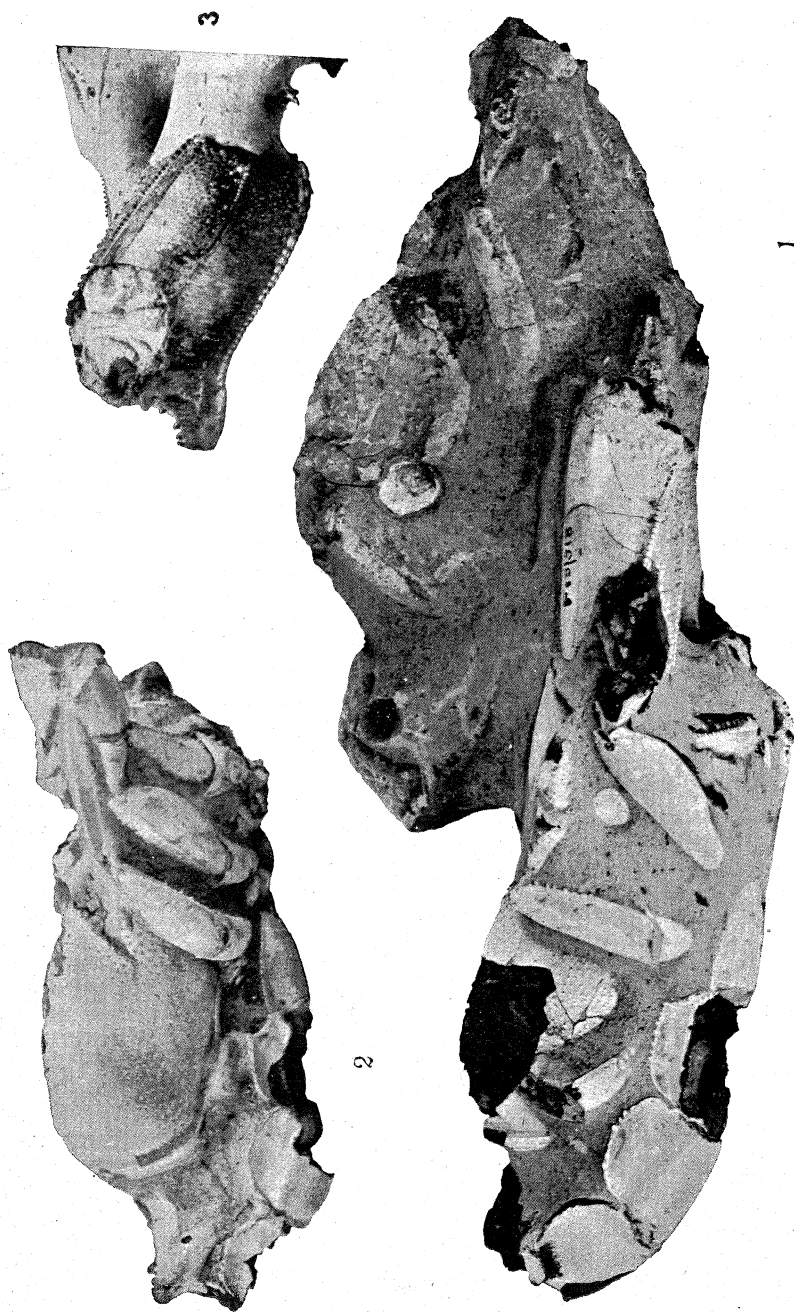
H. latifrons is represented in the collection of sub-fossils by three carapaces, one of which is sufficiently perfect to leave no doubt of its correct identification.

Loc.—Estuarine deposit, Yarra Delta, Melbourne (Austr. Mus.—S. H. Wintle).

EXPLANATION OF PLATE I.

Sub-fossil Crustaceans.

- Fig. 1. *Thalassina anomala*, Herbst. Side-view of two incomplete specimens. Natural size. Darwin, North Australia.
- Fig. 2. *Thalassina anomala*, Herbst. Side-view of an incomplete specimen. Natural size. Darwin, North Australia.
- Fig. 3. *Thalassina anomala*, Herbst. Side-view of hand, slightly enlarged. Darwin, North Australia.



A. R. McCULLOCH, photo.,
Austr. Mus.

EXPLANATION OF PLATE II.

Sub-fossil Crustaceans.

- Fig. 1. *Scylla serrata*, Forskal. Lower surface of carapace and bases of legs. About two-thirds natural size. New Channel, mouth of Brisbane River, Queensland.
- Fig. 2. *Scylla serrata*, Forskal. Lower finger of right hand. Natural size. Derby, Fitzroy River, Western Australia.
- Fig. 3. *Paracyclois grandispinis*, sp. nov. Upper view of carapace. Natural size. Coode Canal, Yarra River delta, Victoria.

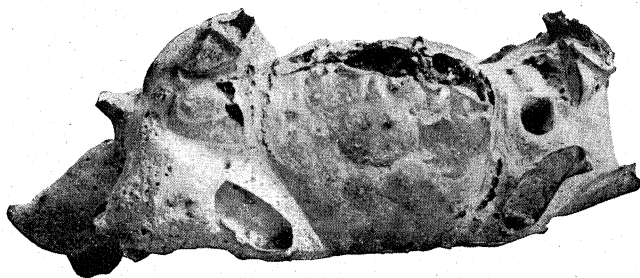


A. R. McCulloch, photo.,
Austr. Mus.

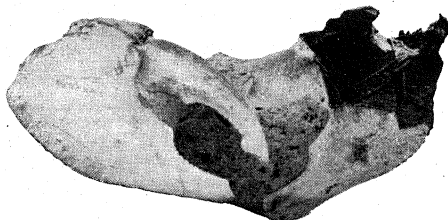
EXPLANATION OF PLATE III.

Sub-fossil Crustaceans.

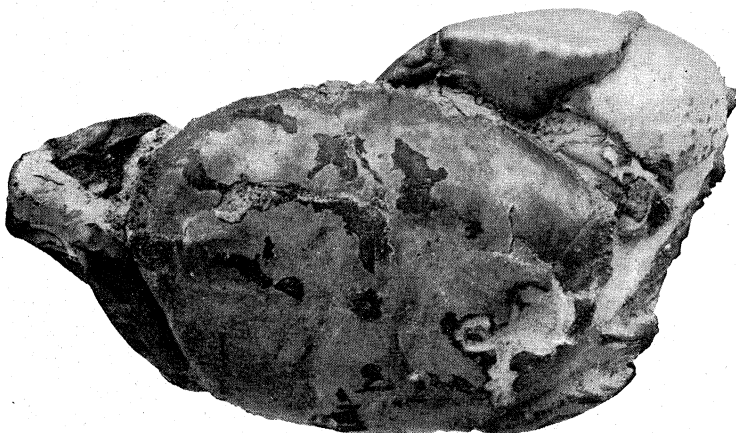
- Fig. 1. *Sesarma smithii*, Milne Edwards. Carapace and basal joints of legs. Slightly reduced. Casuarina Island, Fitzroy River, Queensland.
- Fig. 2. *Sesarma smithii*, Milne Edwards. Right chela. Natural size. Casuarina Island, Fitzroy River, Queensland.
- Fig. 3. *Galene bispinosa*, Herbst. Upper view of carapace and cheliped. Slightly reduced. New Channel, mouth of Brisbane River, Queensland.
- Fig. 4. *Galene bispinosa*, Herbst. Lower view of carapace and cheliped. Slightly reduced. New Channel, mouth of Brisbane River, Queensland.



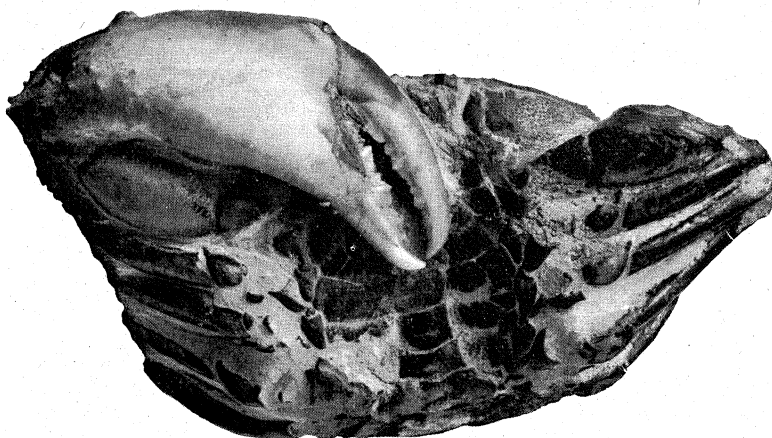
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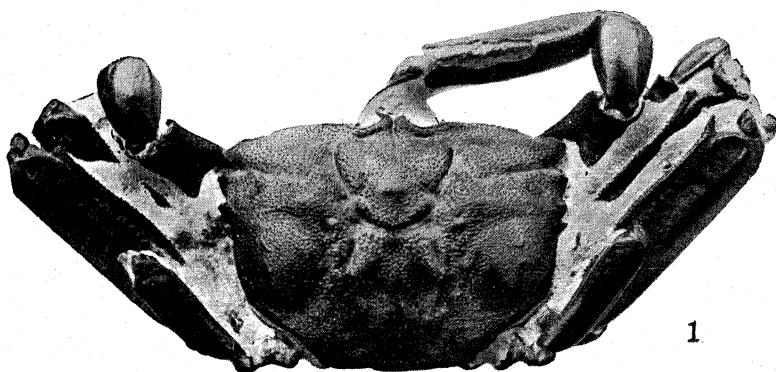


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EXPLANATION OF PLATE IV.

Sub-fossil Crustaceans.

- Fig. 1. *Macrophthalmus serratus*, Adams & White. Upper view. Slightly reduced. Stradbroke Island, Southern Queensland.
- Fig. 2. *Macrophthalmus serratus*, Adams & White. Lower view. Slightly reduced. Stradbroke Island, Southern Queensland.
- Fig. 3. *Podophthalmus vigil*, Fabricius. Upper view. Slightly enlarged. New Channel, mouth of Brisbane River, Queensland.
- Fig. 4. *Hemiplax latifrons*, Haswell. Upper view. Natural size. Coode Canal, Yarra River delta, Victoria.
- Fig. 5. *Hemiplax latifrons*, Haswell. Lower view. Slightly enlarged. Coode Canal, Yarra River delta, Victoria.



1



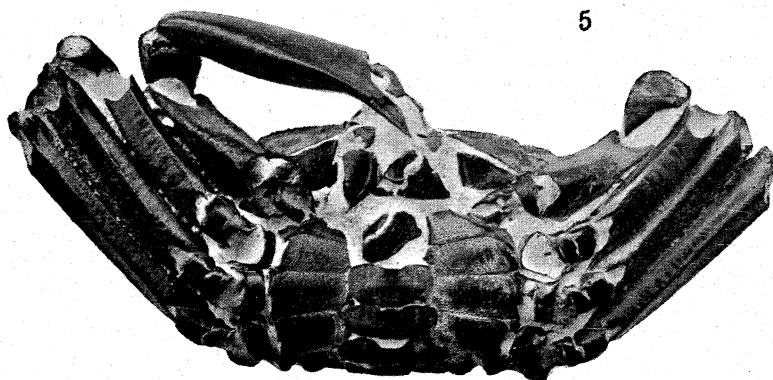
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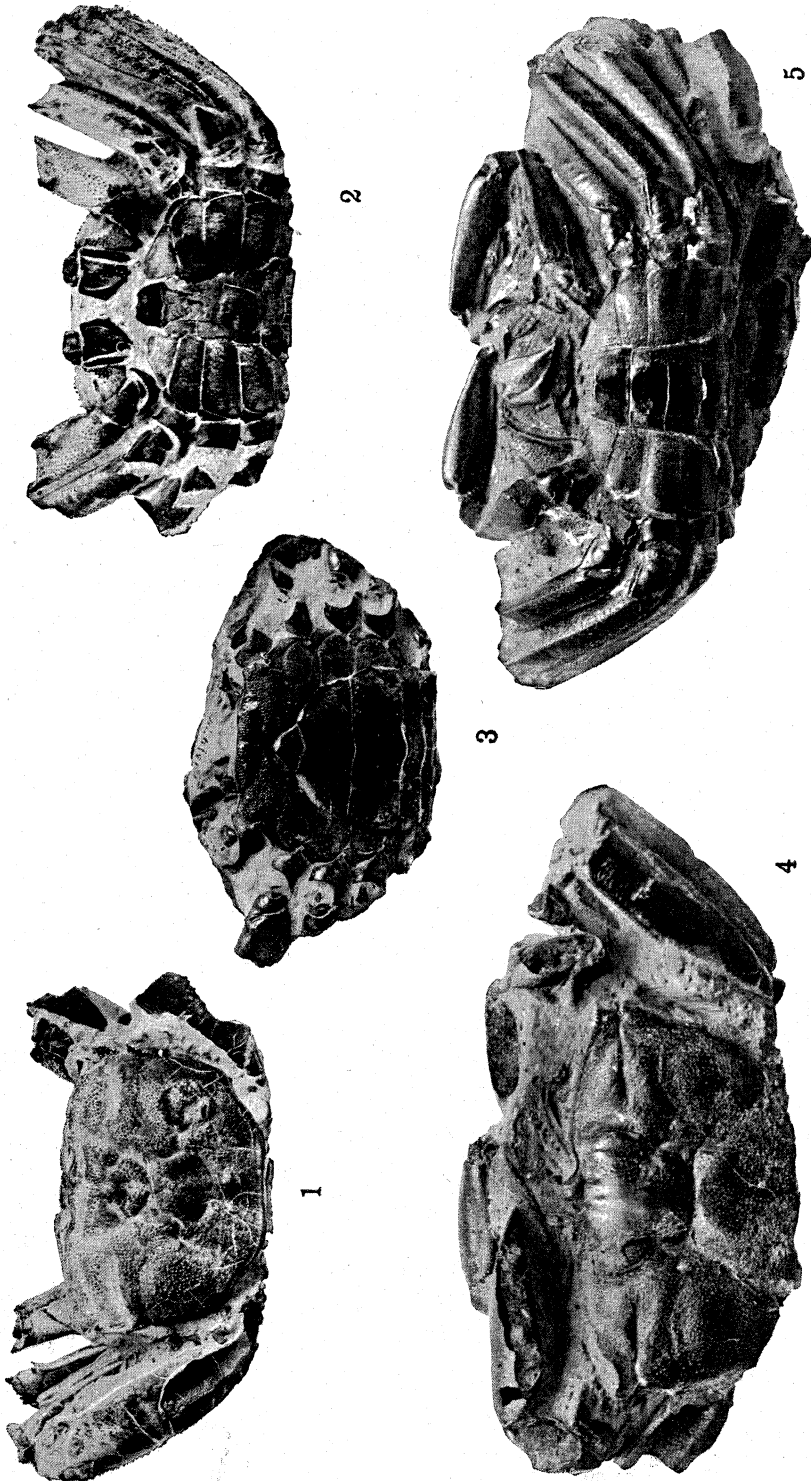


2

EXPLANATION OF PLATE V.

Sub-fossil Crustaceans.

- Fig. 1. *Macrophthalmus depressus*, Rüppell. Upper view.
Natural size. Townsville, Queensland.
- Fig. 2. *Macrophthalmus depressus*, Rüppell. Lower view.
Natural size. Townsville, Queensland.
- Fig. 3. *Podophthalmus vigil*, Fabricius. Lower view. About
three-fourths natural size. New Channel, mouth of
Brisbane River, Queensland.
- Fig. 4. *Macrophthalmus setosus*, Milne Edwards. Upper view.
About one and two-thirds natural size. Newcastle,
New South Wales.
- Fig. 5. *Macrophthalmus setosus*, Milne Edwards. Lower view.
About one and two-thirds natural size. Newcastle,
New South Wales.

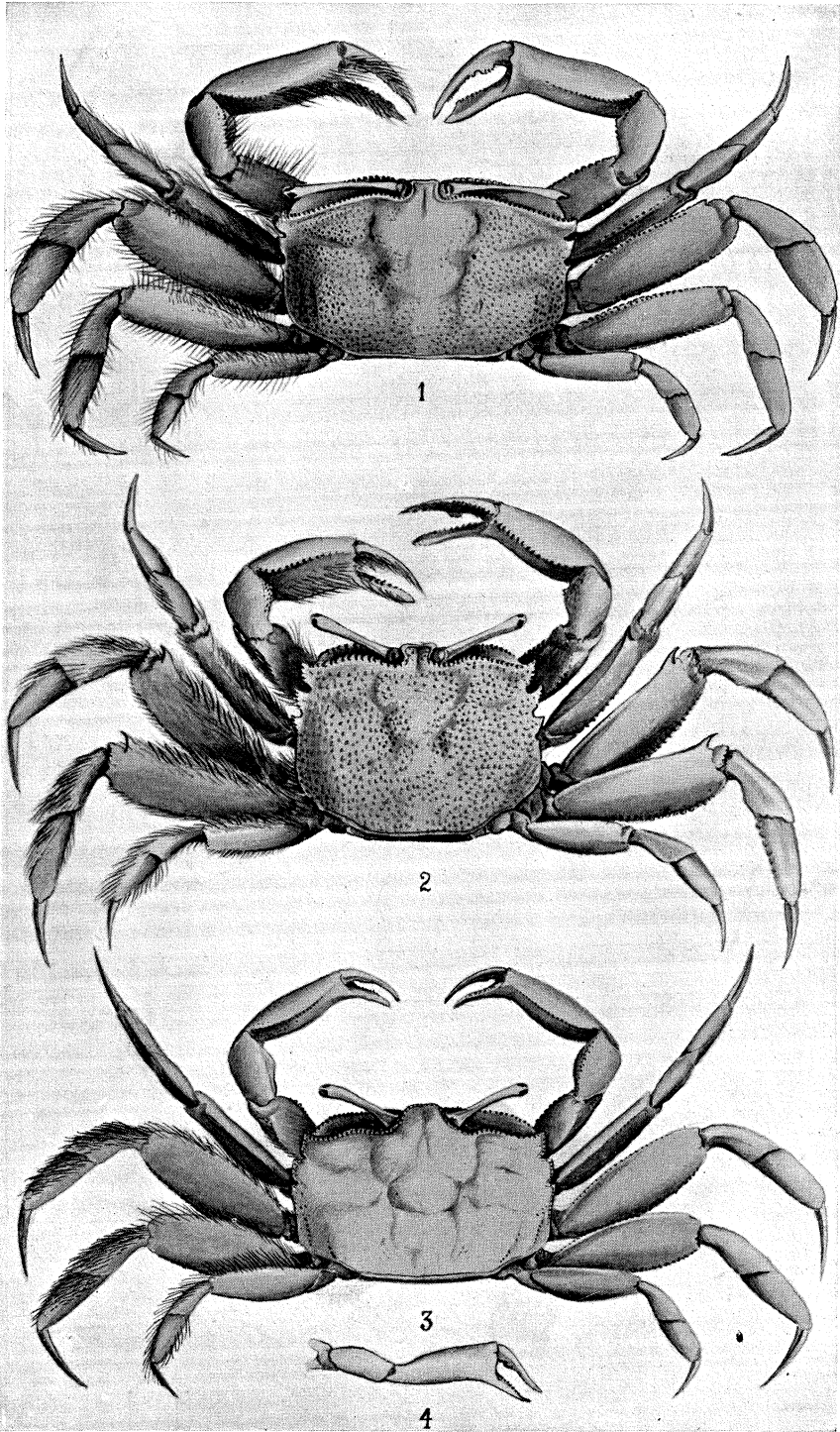


A. R. McCULLOCH, photo.,
Austr. Mus.

EXPLANATION OF PLATE VI.

Recent Crustaceans.

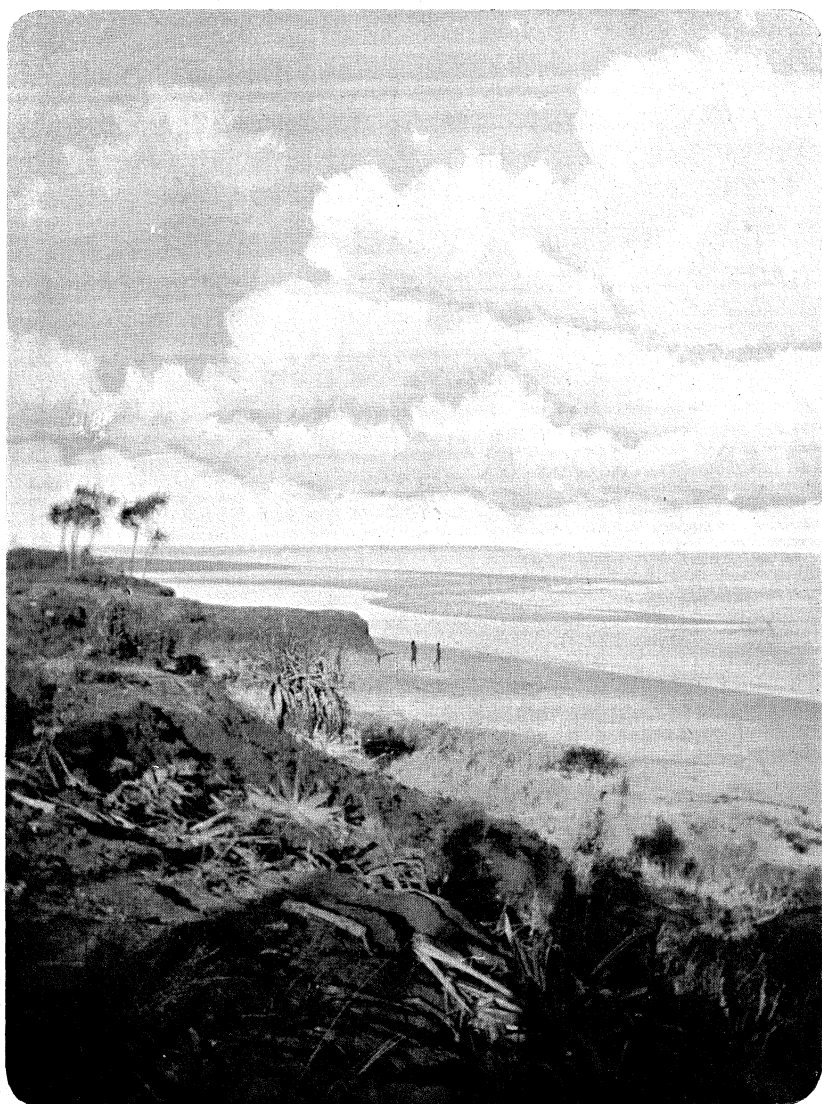
- Fig. 1. *Macrophthalmus setosus*, Milne Edwards. Male. Natural size. Parramatta River, New South Wales.
- Fig. 2. *Macrophthalmus depressus*, Rüppell. Male. Natural size. Fremantle, Western Australia.
- Fig. 3. *Hemiplax latifrons*, Haswell. Male. Twice natural size. Victoria.
- Fig. 4. *Hemiplax latifrons*, Haswell. Hand of adult male. Natural size. Tasmania.



A. R. McCulloch, del.,
Austr. Mus.

EXPLANATION OF PLATE VII.

View of Anson Bay, North Australia. The fossiliferous bed is at the base of the low cliff in the centre of the illustration.



H. Y. L. BROWN, photo.

CATALOGUE SLIP.

Etheridge, R., Junr. and A. R. McCulloch—

Sub-fossil Crustaceans from the Coasts of Australia.

McCulloch, A. R.—

Sub-fossil Crustaceans from the Coasts of Australia.

(See Etheridge and McCulloch).

Rec. Austr. Mus., vi., 1, 1916.