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H. C. Dannevig,
Commonwealth Director of Fisheries

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Report on the Spider Crabs obtained by the F.I.S. "Endeavour" on the Coasts of Queensland, New South Wales, Victoria, South Australia and Tasmania.

BY

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Plates I.-XV.; Figures 1-3.

REPORT ON THE SPIDER CRABS.

The Spider Crabs form a small but interesting part of the Decapod Crustaceans collected by the "Endeavour." They number twenty-seven species, nine of them new, and one representing a new genus. The most notable are the new species of the deep-water genus *Cyrtomaia*, with its formidable armature of sharp spines; the long-necked *Ephippias*, having an exaggerated first ambulatory leg, and combining the characters of two subdivisions of the family Inachidæ; and five species of *Leptomithrax*, including one distinguished by a smooth round boss on the merus of the outer maxilliped.

Mr. Allan R. McCulloch had begun a report on the crustaceans, and later kindly sent me the drawings which he had prepared. The originals of Pl. xv. and Fig. 2 were drawn by Mr. J. R. Kinghorn, of the Australian Museum, and of Pl. xiv. by Mr. McCulloch. The remaining drawings were made by Mrs. R. E. Gamble, and the photographs by Mr. J. H. Paine.

Order DECAPODA.

Suborder REPTANTIA.

Tribe BRACHYURA.

Subtribe OXYRHYNCHA.

Family HYMENOSOMIDÆ.

Genus Halicarcinus, *White*.

Halicarcinus ovatus, *Stimpson*.

Halicarcinus ovatus, Stimpson, Proc. Acad. Nat. Sci. Philadelphia, x., 1858, p. 109 [55]; Smithsonian Misc. Coll., xlix., 1907, p. 146. Stebbing, Proc. Zool. Soc. London, 1900, p. 523, pl. xxxvi. A.

One male was taken at Oyster Bay, Tasmania, and four were without a definite locality label.

These specimens agree with Stebbing's description and figures of the species as compared with *H. planatus* (Fabricius).

Family INACHIDÆ.

Subfamily INACHINÆ.

Genus ACHAEUS, *Leach.*

ACHAEUS TENUICOLLIS, *Miers.*

Achaeus tenuicollis, Miers, Challenger Rept., Zool., xvii., 1886, p. 9, pl. i., figs. 3-3c. Whitelegge, Mem. Austral. Mus., iv., 1900, p. 140.

An ovigerous female was taken on the eastern slope of Bass Strait in 70-80 fathoms.

This specimen has been compared with a male from Port Jackson, in the United States National Museum, and received from the Australian Museum. The female has a shorter neck than the male but agrees in other respects. The eggs are numerous and of large size, about 7 mm. in diameter, the carapace of the mother measuring 8.7 mm. long and 6.7 mm. wide.

Genus ACHAEOPSIS, *Stimpson.*

ACHAEOPSIS THOMSONI, *Norman.*

Dorynchus thomsoni, Norman, in Wyville-Thomson's Depths of the Sea, 1873, p. 175, text-fig. 34.

Lispognathus (*Dorynchus*) *Thomsoni*, A. Milne Edwards, Comptes Rendus Acad. Sci. Paris, xciii., 1881, p. 878 (translation in Ann. Mag. Nat. Hist. (5), ix., 1882, p. 38).

Three males were taken in the Great Australian Bight, sixty to eighty miles west of Eucla, in 80-120 fathoms.

This widely distributed species was also obtained by the "Challenger" in Australian waters, near Sydney, in 410 fathoms.[1]

Genus CYRTOMAIA, *Miers.*

CYRTOMAIA MACCULLOCHI,[2] *sp. nov.*

(Plates i. and ii. and Figs. 1 and 2.)

Type-locality.—Great Australian Bight, south of Eucla, Long. 129° 28′ E., 250-450 fathoms; male (E6263). This specimen is taken as type, because, although not the largest in the collection, it has the pair of gastric spines and the rostral spines perfect, and the chelipeds well developed.

1. Miers—Challenger Rept., Zool., xvii., 1886, p. 29.
2. Named for Mr. Allan R. McCulloch, Zoologist of the Australian Museum.

Measurements.—Male holotype, length of carapace to tip of horns 48, length to base of rostral sinus 40.5, width of carapace exclusive of spines, 44, length of lateral gastric spines 18.3 mm.

Diagnosis.—No spine on upper margin of orbit. No spine between largest gastric spine and largest branchial spine. Palm of male three times as wide at distal as at proximal end.

Description.—Carapace very finely roughened with sharp granules. Three gastric spines, the lateral spines being very long, slender, sub-parallel, and in a plane almost at right angles to that of the cardiac spines; median gastric spine further back than the lateral pair and very much smaller. Two cardiac spines side by side, shorter than the median gastric spine. Two dorsal branchial spines (paired) the posterior and smaller almost in line with the cardiac spines, the anterior spine lower down and almost in line with the median gastric spine. Besides there is a marginal line of small spines which is continued on the pterygostomian region, and a short, parallel, submarginal row of similar spines at the widest part of the carapace. Two marginal hepatic spines (paired), the anterior of good length, the posterior small. Rostral horns slender, moderately divergent, about twice as long as the interantennular spine.

A large tubercle on the upper surface of the eyestalk at its extremity.

Basal antennal segment armed with four spines; the stoutest is at the antero-external angle, points forward and has a spinule near its posterior base; the others point downward and outward, the second spine on the ventral surface near the inner margin, the other two on the outer margin.

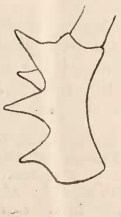


Fig. 1.—*Cyrtomaia maccullochi*, Rathbun, basal segment of left antenna of male (E 3683), outer view, five and one-third times natural size.

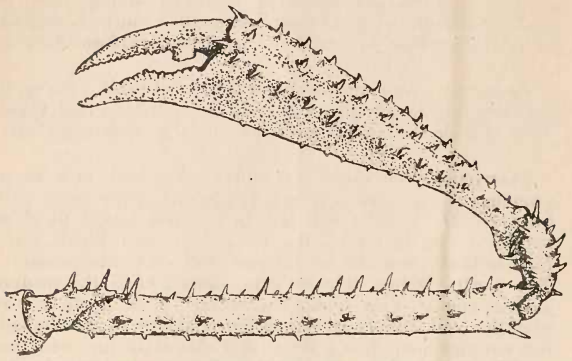


Fig. 2.—*Cyrtomaia maccullochi*. Rathbun, right cheliped of male (E 6263), natural size.

The chelipeds, besides rows of spines customary in the genus, are sparingly covered with granules and spinules. The palm of the adult male is not only very thick but is three times as wide at its distal as at its proximal end.

A fine series of nine specimens was taken in the Great Australian Bight, as follows :—

South-east of Eucla, Long. 130° 50′ E., 250-300 fathoms ; one immature female.

South of Eucla, Long. 129° 6.5′ E., 200-300 fathoms ; one small male.

South of Eucla, Long. 129° 28′ E., 250-450 fathoms ; three males (one holotype) with *Lepas* attached, three ovigerous females, two of which bear specimens of *Lepas*.

South by west of Eucla, Long. 126° 45.25′ E., 190-320 fathoms ; one male, with *Lepas* attached.

Relationships.—This species resembles *C. suhmii*,[3] *C. platyceros*[4] and *C. goodridgei*[5] in lacking a supraorbital spine, and in having the two movable segments of the antennal peduncle cylindrical, not lamellate. It differs from the first two mentioned in not having a branchial spine half way

3. Miers—Challenger Rept., Zool., xvii., 1886, p. 16, pl. iii., fig. 2.

4. *C. suhmi platyceros*, Doflein—Brachyura Valdivia, vi., 1904, p. 55, pl. xix., fig. 3 ; pl. xl., figs 1-7 ; pl. xliii., fig. 4 ; pl. xlv., figs. 1-5.

5. McArdle—Ann. Mag. Nat. Hist. (7), vi., 1900, p. 472 ; Alcock and McArdle—Illus. Zool. Investigator, Crust., pt. x., 1902, pl. lix., figs. 1, 1*a*, 1*b*, 1*c* ; pt. xii., 1907, pl. lxxviii., figs. 2, 2*a*.

between, and in line with, the lateral gastric spine and the anterior of the dorsal, branchial spines. It differs from *C. goodridgei* in the longer spines of rostrum and gastric region (anterior pair), and in the direction of the latter, which point forward instead of outward.

Genus Platymaia, *Miers.*

Platymaia wyvillethomsoni, *Miers.*

(Plates iii., iv. and xiv.)

Platymaia wyville-thomsoni, Miers, Challenger Rept., Zool., xvii., 1886, p. 13, pl. ii.

(Not *P. wyville-thomsoni*, Doflein, Brachyura Valdivia, 1904, p. 59, text-figs. 2-5, pls. ii., xx., xxi., xxii., xxiii., xxxix., xliii., figs. 5 and 6, pl. l., figs. 2, 5 and 6 or synonymical references to Wood-Mason, Alcock, Chun or Stebbing.)

The " Endeavour " specimens were all taken in the Great Australian Bight, off Eucla, as follows :—

South by east of Eucla, Long. 131° E., 200-250 fathoms ; one male, two females.

About one hundred miles south of Eucla, 120-160 fathoms ; two ovigerous females.

South by west of Eucla, Long. 126½° E., 130-190 fathoms ; one male.

Sixty to eighty miles west of Eucla, 80-120 fathoms ; one ovigerous female.

Remarks on the type-specimen.—In order to comprehend this species I examined the unique type female at the British Museum in August, 1914. Several discrepancies between the specimen and the figure in the "Challenger" volume above cited were noted. The length of the carapace on the median line is 37.3 mm., the width 35.2 mm., that is the carapace of the figure is somewhat too long. The narrowest part of the rostrum at the constriction, just behind the lateral spine, is 4.3 mm., while below that point the width between the downward-pointing teeth is 5.8 mm. The figure does not represent the inferior width. The propodus of the second ambulatory leg shows in reality an inner margin slightly concave and more spinous than in the figure, while the outer margin measures 41 mm. and is densely and finely spinulous. The merus joints of all the legs are slightly concave on the inner margin. The merus of the third leg is rough to the touch.

A special feature of this species is the presence of an outward-pointing, transversely-placed spine on the inner margin of the upper sinus of the orbit, or at the posterior end of the preorbital lobe. This spine is not present in the species figured as *P. wyville-thomsoni* by Alcock[6] or by Doflein.[7]

In the type-specimen, the carapace is covered by numerous granules, a few of which are enlarged into tubercles; the only spines are around the anterior border or on the anterior part of the branchial regions. The two branchial regions are well separated from each other.

Notes on the Australian specimens.—The chief difference between the specimens taken by the "Endeavour" and the type-specimen is the enlargement of the more elevated tubercles into small spines, as follows: 4 on the gastric region, of which 2 are median and 2 in a transverse line a little in advance of the anterior of the median spines; 2 cardiac, arranged transversely; 1 branchial (paired) in line with the gastro-cardiac suture; besides there are a few smaller spines or spinules, *e.g.*, 1 branchial (paired) in front of the above-mentioned, 1 or 2 gastric (paired) not far behind the orbit.

The ambulatory legs of the male are considerably longer than those of the female.

	♂	♀
MEASUREMENTS.	E3675	E6260
Length of carapace on median line	30.2	31.5
Width of carapace, excluding spines	31	32
Length of merus of first ambulatory leg	59	37.7
" " " " second " "	61.3	46
" " " " third " "	55	44
" " " " fourth " "	50.8	41.2
" " propodus of fourth " "	39	31

Allied species.—*P. wyvillethomsoni* of Wood-Mason and Alcock. Chun[8] and Doflein may be known as *P. alcocki*, nom. nov. A small specimen received from the Indian Museum is in the United States National Museum and another in the British Museum. In all its stages this species

6. Alcock—Illus. Zool. Investigator, Crust., part iv., pl. xvi.
7. Doflein—Brachyura Valdivia, vi., 1904, pls. ii., xx.-xxiii.
8. Chun—Aus den Tiefen des Weltmeeres, ii., Jena, 1903, text-fig. on p. 400.

differs from the true *P. wyvillethomsoni* in having the two branchial regions approximating the median line, and in being devoid of a spine at the hinder end of the inner orbital lobe.

The name *P. turbynei* Stebbing[9] cannot be applied to the above form because it is differentiated by the characters set forth by Stebbing; *e.g.*, the propodus of the penultimate leg of *turbynei* is about twice as long as the same article in the young male of similar (larger) size of *P. alcocki*. Compare Stebbing's pl. v. with Doflein's pl. xxii., fig. 1.

Genus EPHIPPIAS,[10] *gen. nov.*

Carapace elongate-pyriform, with a long neck; inflated behind; a large, posterior, median, saddle-like prolongation. Rostrum of two long horns. Eyes not retractile in the orbits. No preocular or supraocular spines. A postorbital spine remote from orbit. Basal antennal joint rather narrow; free joints visible in dorsal view. Epistome elongate. The external maxillipeds close the buccal cavity, the merus is as wide as the ischium. Chelipeds not much enlarged. First ambulatory leg extremely long and stout. Abdomen seven segmented in both sexes.

Related by its maxillipeds to the Alliance Inachoida of Alcock, but in the elongate form of the anterior part of the carapace, it suggests many of the members of the Alliance Macropodioida or Leptopodioida of Alcock, such as *Macropodia*[11] and *Stenorynchus*[12].

Type and only species, *Ephippias endeavouri*.

EPHIPPIAS ENDEAVOURI, *sp. nov.*

(Plate xv.)

Type-locality.—South of Kangaroo Island, Investigator Strait, S. Australia; male holotype (E3129). At the same place was taken an ovigerous female (E3128), much smaller than the male.

Measurements.—Male holotype, length of carapace on median line, including posterior hump 82.7, length to end of rostrum and posterior hump 111.7, width of carapace, exclusive of spines, 55 mm.

9. Stebbing—South Afric. Crust., pt. ii., 1902, p. 3, pl. v.

10. Ἐφίππιον, a saddle, in allusion to the saddle-like posterior projection of the carapace.

11. Leach—Edin. Encyc., vii., 1814, pp. 385, 395.

12. Lamarck—Hist. Anim. sans Vert., v., 1818, p. 236.

Female, length of carapace on median line, including posterior hump 47.3, width of carapace, exclusive of spines, 32.1 mm.

Male holotype.—Carapace with the regions well delimited, the branchial regions approaching each other, the cardiac region small, the hepatic regions prominent, the intestinal region prolonged backward in a stout, blunt process. The more elevated portions are tuberculate: The principal tubercles are, a pair in a transverse line on the anterior gastric region; two, median, mesogastric; a number on the cardiac region chiefly grouped on two conical elevations side by side; a band of tubercles on the branchial region extending from the inner angle obliquely backward to the lateral margin; those on the surface of the intestinal region which include five or six of the largest tubercles of all. These are deeply pitted, as is also the broad, blunt end of the intestinal prominence. Hepatic region trispinose; the upper, marginal spine projects directly outward, the submarginal, anterior spine projects forward, while a subhepatic spine points obliquely forward and is visible in dorsal view between the other two spines. The anterolateral margin of the branchial region is armed with short blunt spines and tubercles arranged mostly in a double row. The postorbital spine is triangular, acute, and is a little nearer the eye than it is to the hepatic region.

Rostrum cut nearly to its base into two long flat, gradually tapering, acute, and slightly divergent spines; the upper surface is longitudinally concave in the middle, the outer edges of the two horns are subparallel or slightly convergent, inner edges fringed with long straight hair, lines of curled hair above which are continued backward on the carapace.

Eyes rather long, stout, enlarged at both ends, curved, much as in *Camposcia retusa* Latreille.[13] Eye sockets circular, margin smooth except for a small tubercle below, on the basal antennal joint. This joint is longer than wide, longitudinally furrowed in the middle except at the distal end, where it is armed with a strong spine pointing downward, forward and slightly outward, and partially visible from above.

The anterior angles of the buccal cavity are produced in a blunt tooth; above and in front of these angles there is a short spine. Merus of outer maxilliped at its widest point as wide as the ischium; palpus coarse, articulated at the inner angle of the merus.

13. See Milne Edwards—Hist. Nat. Crust., Atlas, pl. 15, figs. 15 and 16.

Chelipeds as long as carapace ; ischium subspherical, viewed from below ; merus armed with three spines above, the terminal spine not in line with the other two ; carpus elongate ; smooth; manus longer than merus, compressed, distally tapering, fingers slender, gaping, distal half of prehensile edges crenulate, a lowtooth on proximal half of dactylus.

First ambulatory leg of enormous size, over twice as long as carapace and correspondingly stout ; a short, blunt spine at lower, distal end of ischium ; next three articles rough with low tubercles or nodules ; dactylus longer than propodus, compressed.

The legs diminish in length and stoutness from the first to the fourth ; the last three pairs are nearly smooth ; the dactylus is distinctly shorter than the propodus ; the second leg is much stouter than the third and fourth.

Female.—The carapace is wider anteriorly in proportion to the length than in the male, the "neck" being shorter and less conspicuous ; the antennal spine is slenderer and more outstanding, the postorbital spine is slenderer and is directed obliquely forward a little, the anterior of the hepatic spines is longer, slenderer and hooked inward a little at tip. The rostral horns are broken off near the base and are missing, but the stumps appear narrower and less flat than in the male. The posterior hump is slightly developed and overhangs the posterior margin of the carapace but little. Chelipeds slender, especially the chelae ; arm with various tubercles above in addition to the three spines of the male ; chelae almost filiform, the horizontal fingers less than half as long as palm, and narrowly gaping in basal third only. The first ambulatory leg is estimated at no more than twice as long as the carapace ; dactylus a trifle longer than propodus, both measured along the dorsal line. The second ambulatory leg is not so much stouter than the third as in the male ; in the second, third and fourth legs there is more difference in the length of dactylus and propodus than in the corresponding articles of the male.

Genus NAXIA, *Leach.*

NAXIA ARIES, *Guérin.*

Halimus aries, Latreille, in Guérin, Icon. Règne Anim., ii., Crust, pl. ix., figs. 2, 2*a-c*. Milne Edwards, Hist. Nat. Crust., i., 1834, p. 341 ; Cuvier's Règne Anim., Crust., Atlas, 1849 (*fide* McCulloch), pl. xxviii., figs. 2, 2*a-c*.

Halimus gracilis, Baker, Trans. Roy. Soc. S. Australia, xxix., 1905, p. 124, pl. xxiii., figs., 4, 4*a*.

Naxia aries, McCulloch, Rec. Austral. Mus., ix., 1913, p. 327.

A single male was taken on the east coast of Flinder's Island, Bass Strait. It is a larger specimen than that measured by Baker.

Measurements.—Length of carapace measured on median line to posterior margin 37, greatest width of carapace, without spines 26, length of rostral horn 9.2 mm.

Subgenus MICROHALIMUS, *Haswell.*

NAXIA (MICROHALIMUS) DEFLEXIFRONS, *Haswell.*

Microhalimus deflexifrons, Haswell, Proc. Linn. Soc. N. S. Wales, iv., 1880, p. 435, pl. xxv., fig. 2.

Naxia (*Microhalimus*) *deflexifrons*, McCulloch, Rec. Austral. Mus., ix., No. 3, 1913, p. 330, pl. x., figs. 1-4, and synonymy.

One ovigerous female from south by east of Flinders Island, Bass Strait, 37 fathoms.

Subfamily ACANTHONYCHINÆ.

Genus ANTILIBINIA, *MacLeay.*

ANTILIBINIA LAPPACEA,[14] *sp. nov.*

(Plate vii., fig. 3 and Fig. 3.)

Type-locality.—Great Australian Bight, south of Eucla, Long. 129° 6½′ E., 200-300 fathoms. One ovigerous female, holotype.

Measurements.—Length of carapace on median line 12.8, length to tip of horns 16.5, width of carapace, 9 mm.

Description.—Carapace pyriform, high in the middle, curving rapidly down to the front and sides. Surface smooth and sparingly clothed with long, fine, soft hairs. Cardiac region faintly limited; otherwise the dorsal aspect is without inequalities. Rostrum about half as long as postrostral portion of carapace, bifurcate about three-fourths of its length, the horns slender, divergent, and probably acute, although the tips are broken off. The preorbital spines are about half as long as, but more divergent than, the rostral spines. Postorbital lobes externally flattened in an oval face, curved a little inward, tip blunt. Hepatic spines (one on each side) directed forward, upward and a little outward, laterally compressed, curved, acute, and reaching forward to the level of the corneae. No branchial spine, but on the sub-branchial region two single tubercles followed anteriorly

14. *Lappa*, a burr, in allusion to the appearance of the carapace.

by a cluster of three tubercles, forming a line which is continued on the pterygostomian region by three or four tubercles. The antero-lateral angle of the buccal cavity is produced downward in a rounded lobe.

The narrow basal joint of the antenna has a shallow furrow through the middle, and a small forward-pointing tooth at the outer angle; the first movable joint is very short, the next two are long, the remainder of the flagellum does not reach the tip of the rostral horn.

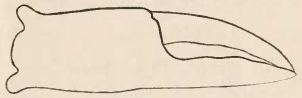


Fig. 3.—*Antilibinia lappacea*, Rathbun, right chela of female holotype, six and two-thirds times natural size.

The cheliped of the female is shorter and stouter than the first ambulatory leg; the arm has a stout terminal spine above and a few tubercles near the proximal end. The wrist has an upper crest which is produced in a squarish lobe near the proximal end. Legs rather slender, diminishing in size from the first to the fourth pair, the merus joints each terminating in a superior tooth.

Fifth and sixth segments of female abdomen fused, although a suture line is faintly visible.

Relationships.—The genus *Antilibinia* already contains two species, viz., the type, *A. smithii* MacLeay[15] from Natal, and *A. gilloloensis* Rathbun[16] from the Molucca Islands. *A. smithii* has an uneven, somewhat lumpy surface, two lateral teeth or spines, one hepatic, one branchial, a rostrum cut only half way to its base, a moderate preocular and postocular spine and rounded joints of chelipeds and legs. *A. gilloloensis* has also an uneven surface, but less lumpy than *smithii*, no tooth or spine on the margin of the branchial region, but a small one on the hepatic region, a rostrum and preocular and postocular spines similar to those of *A. smithii*, but a carinated wrist and arm. *A. lappacea*, while having the antennal and orbital characters possessed by the other species, has a more smoothly rounded carapace, the cardiac region alone appearing as a separate area; the branchial spine or tooth is missing, as in *A. gilloloensis*, but the hepatic spine is elongated and conspicuous; the rostral horns are

15. In Smith—Illus. Zool. S. Africa, Annulosa, 1838, p. 57, pl. ii.
16. Rathbun—Proc. U.S. Nat. Mus., l., 1916, p. 537.

also long, much exceeding the base of the rostrum; the preocular spine is longer than in the other two species; the wrist and arm are more strikingly carinate than in the intermediate species, and the merus of the legs ends in a flat spine.

Subfamily PISINÆ.

Genus SCYRAMATHIA, *A. Milne Edwards.*

SCYRAMATHIA FULTONI, *Grant.*

(Plate v.)

Hyastemus fultoni, Grant, Proc. Linn. Soc. N. S. Wales, xxx., 1905, p. 313, pl. xi., fig. 1.

The shape of the orbit indicates the genus *Scyramathia* rather than *Hyastenus*.

Numerous specimens were taken at various stations in Bass Strait and vicinity.

Off Gabo Island, Victoria, 80-100 fathoms; one female.

East of Flinders Island, 200-300 fathoms; one male.

From Babel Islands to Flinders Island, 60 fathoms; two ovigerous females.

Off Babel Islands, eastern slopes of Bass Strait, 50-80 fathoms: three males.

East of Babel Islands, eastern slopes, 65-70 fathoms; nine males, ten females (six ovigerous). One male of this lot is the original of the photographs on Plate v.

East of Babel Islands, eastern slopes, about 70 fathoms; thirty-one males, sixty-six females. Twenty-two of the females are ovigerous and one female bears a rhizocephalid parasite under the abdomen.

Twenty miles east of Babel Islands, eastern slopes, 65-70 fathoms; seven males, four females, one of which is ovigerous, and one very young specimen.

Fifteen miles east-north-east of Cape Barren, Cape Barren Island, 53 fathoms; one male.

Eastern slope of Bass Strait, 70-80 fathoms; three young females.

Off Tasman Head, Bruni Island, 80-100 fathoms; one ovigerous female.

Genus HYASTENUS, *White*.

HYASTENUS DIACANTHUS, *de Haan*.

Pisa (*Naxia*) *diacantha*, de Haan, Fauna Japon., Crust., 1838, pl. xxiv., fig. 1 ; 1839, pl. xcvi., and pl. G.

Hyastenus diacanthus, Grant and McCulloch, Proc. Linn. Soc. N. S. Wales, xxxi , 1906, p. 32.

Twenty-five miles south by east of Double Island Point, Queensland, 33 fathoms ; one male, small and immature.

HYASTENUS CONVEXUS, *Miers*.

Hyastenus (*Chorilia*) *convexus*, Miers, Crust. Alert, 1884, p. 196, pl. xviii., figs. *B.* & *b*.

Hyastenus convexus, Grant and McCulloch, Proc. Linn. Soc. N. S. Wales, xxxi., 1906, p. 32.

Twenty miles north-north-east of Double Island Point, Queensland, 30 fathoms ; one ovigerous female.

Genus PHALANGIPUS, *Latreille*.

PHALANGIPUS AUSTRALIENSIS, *sp. nov.*

(Plate vi.)

Type-locality.—Platypus Bay, Queensland, 7-9 fathoms. One male holotype.

Additional material.—A female also was taken in Platypus Bay, 7-9 fathoms, on July 28, 1910 (No. 1, haul 2).

Measurements.—Male holotype, length of carapace on median line 16.7, length of horns 1.5, width of carapace 13.6, length of cheliped 29, length of first ambulatory leg about 87 mm.

Diagnosis.—Rostral horns without accessory spinule. Sinus of infraorbital margin U-shaped. A broad, arcuate lobe on first abdominal segment in both sexes.

Description.—The spines and tubercles of the carapace are arranged as in *P. herbstii* (Milne Edwards)[17] and *P. arachnoides* (Latreille),[18] the carapace is about the same shape as in *herbstii* and the rostrum and its horns of similar length. The principal differences are set forth in the table below. For a statement in regard to the older species of this genus, see my forthcoming report on Philippine Oxyrhyncha in the Bulletin of the U.S. National Museum.

17. *Egeria herbstii*, Milne Edwards—Hist. Nat. Crust., i., 1834, p. 292. *Leptopus longipes*, Guérin, Icon. Règne Anim., pl. x., fig. 3.

18. *Egeria arachnoïdes*, Latreille—Tabl. Encyc. Méth., pt. xxiv., 1818, pl. cclxxxi., fig. 1.

	P. australiensis.	*P. herbstii.*
Tips of rostral horns . .	Obtuse.	Acute.
Preorbital lobe.....	Without a lobe at posterior end of outer margin.	With a little lobe at posterior end of outer margin.
Median supraorbital tooth	Bounded on each side by a broad U-sinus.	Bounded by a V-sinus outside and by a narrow slit inside.
Median suborbital tooth	Much deflexed and bounded by a broad U-sinus on each side.	Bounded by a V-sinus on each side.
Palm of adult male...	Slender, a little enlarged at distal end.	Stout, inflated.
Merus of last leg.....	Without a small terminal spine on the anterior side.	With a small terminal spine on the anterior side.
Lobe on first abdominal segment.....	Arcuate and occupying nearly whole width of segment.	Smaller, more pointed, not occupying nearly whole width of segment.
Appendages of first segment of male abdomen.....	Pointing forward.	Curving outward toward tips.
Tubercle on sternum at base of cheliped....	Very wide, occupying almost whole width of segment on each side of abdomen.	Narrow, occupying less than half of segment on each side of abdomen.

Genus DOCLEA, *Leach.*

DOCLEA PROFUNDA, *sp. nov.*

(Plate vii., figs. 1 and 2.)

Type-locality.—Great Australian Bight, south of Eucla, Long. 129° 28′ E., 250-450 fathoms. An egg-bearing female, holotype.

Measurements.—Length of carapace on median line exclusive of spines 9.3, length from tip of rostrum to tip of posterior spine 11.2, width without spines 11.7, width with spines 8.3 mm.

Diagnosis.—Two lateral spines. Spines of rostrum longer than basal portion of same. Six spines on postfrontal portion of carapace.

Description.—Surface covered with a close pubescence. Of the spines on the carapace the longest is one pointing obliquely upward at the widest part of the carapace, on each side. Nearly as long is the suberect cardiac spine in the same line; while the median spine directed slightly backward just above the posterior margin is shorter and slenderer; the marginal hepatic spine is similar and points outward. Tubercles are few: Three in a triangle on the after half of the gastric region, the median one slightly behind the lateral pair; three in a group at the inner angle of each branchial region; one further back, on each side, in a line just behind the line of long spines. Besides there are a few small granules, especially toward the lateral margins.

Rostrum longer than wide, divided more than half its length; horns flat, directed forward, spine-tipped. Preorbital spines slender, directed upward, outward, and forward; postorbital lobes, viewed laterally, oval, flattened.

Basal antennal joint longitudinally grooved through the middle, a small tooth at distal outer angle. Angle of buccal cavity produced in a thin lamina.

Cheliped of female weak; merus with a sharp upper margin; wrist with an outer ridge; fingers about as long as palm. Legs of moderate length, both pubescent and long-hairy.

The mature abdomen is longer than wide and covers the sternum. Eggs few (twenty are visible when the abdomen is laid back) and large (about .7 in diameter).

Relationship.—The species is related to *D. expansa* (A. Milne Edwards).=*D. orientalis*, Miers.[19] Both are little ornamented and have only two lateral spines on each side, one hepatic, one branchial; but *D. expansa* has no median spines, but numerous scattered tubercles, and its rostral horns are short.

Remark.—This is the first *Doclea* noted in Australian waters or at any great depth, the latter fact one to which the specific name calls attention.

Subfamily MAJINÆ.

Genus PARAMITHRAX, *Milne Edwards.*

Hist. Nat. Crust., i., 1834, p. 324. Type, *P. peronii*, Milne Edwards, 1834, specified by Miers, Journ. Linn. Soc. London, xiv., 1879, p. 656.

19. See Miers—Proc. Zool. Soc. London, 1879, p. 28, pl. II, figs. 1, 1a.

Orbit incomplete below, the postorbital spine conical, not cupped, and usually remote from orbit.

Milne Edwards in making this genus divided it into two sections according to the character of the orbit. Later (1876) Miers divided *Paramithrax* into two subgenera according to the shape and ornamentation of the chelipeds, calling one division *Leptomithrax*, type *P.* (*L.*) *longimanus* Miers, 1876. Milne Edwards's basis of division seems more reasonable than that of Miers. The only species, *P. gaimardii*, which Milne Edwards put in his second section, is congeneric with *longimanus*, therefore the name *Leptomithrax* is available for that section.

PARAMITHRAX MINOR, *Filhol.*

(Plate viii.)

Paramithrax minor, Filhol, Bull. Soc. Philom. (7), ix., 1885, p. 27 (Cook Straits, especially Massacre Bay, 15-20 meters); Mission de l'Ile Campbell (Passage de Vénus, 1874), iii., part 2, p. 356, atlas, pl. xl., figs. 4, 5 and 7 (hardly fig. 6, which is apparently *Acanthophrys filholi*).

Between Port Stephens and Newcastle, New South Wales, 22-60 fathoms. Three males, two of them large, and one female.

Oyster Bay, Tasmania, 26 fathoms. One ovigerous female.

Oyster Bay (depth not given). Fifteen males, ten females (nine ovigerous). Dorsal aspect concealed by a dense coating of algae, hydroids, etc., attached by the hairs of the carapace; chelae, wrists and under part of arms bare.

Entrance to Storm Bay, Tasmania. Two males, three females.

There is a short spine on the preorbital lobe; the postorbital spine may reach farther forward than the tip of the preorbital spine, or not so far forward. Of the two hepatic spines, the anterior is much the larger. There is a curve of seven spines on the branchial region, the last two of which are above the margin. The rostral spines are broad and flat, their outer margins are nearly parallel to each other. The tubercles of the dorsal surface are not crowded, a few of them are spiniform; all have a tuft of curled hairs. There are longer hooked hairs on the inner margin of the rostral horns, also on the dorsal surface whence they are continued backward on the gastric region.

The basal segment of the antenna has a short, forward-pointing spine at each of the anterior angles, the outer spine more advanced than the inner. Flagellum fringed with long straight hairs.

The upper margin of the arm is unarmed, the only elevation being a tubercle at the articulation with the wrist. The latter has a strong outer crest, which is entire, and a superior crest which is broken into tubercles ; the two crests converge but do not meet proximally. The movable finger bears a very shallow tooth at its basal third in the gape. The ambulatory legs are covered with hooked hairs and besides there is on each side a fringe of longer, plumose hairs.

Measurements.—Male (P 2134), length of carapace 40.8, width 34 mm.

Genus LEPTOMITHRAX, *Miers.*

Ann. Mag. Nat. Hist. (4), xvii., 1876, p. 20 (type, *P.* (*L.*) *longimanus*, Miers, 1876, specified by Miers, 1879).

Orbit fairly complete, the postorbital spine hollowed out to receive the extremity of the eye.

Key to species in the collection.

a. Postorbital lobe or cup truncate and bifid at tip, the two terminal teeth or spines being equally prominent.

b. Two spines at tip of postorbital lobe. Carapace with many long spines. Four long marginal or submarginal spines in a semicircle on the branchial region. Outer maxillipeds swollen at union of merus and ischium. Outer spine of basal segment of antenna less than twice as long as inner spine. Sternal segments not deeply excavate :— *waitei.*

bb. Two teeth at tip of postorbital lobe. Carapace covered mostly with tubercles. Three long marginal or submarginal spines in a semicircle on the branchial region. Outer maxillipeds not swollen at union of merus and ischium. Outer spine of basal segment of antenna more than twice as long as inner spine. Sternal segments deeply excavate :— *sternocostulatus.*

aa. Postorbital lobe or cup acute, not truncate. There may be a spinule on the outer margin not far behind the tip.

b. A spinule on outer margin of postorbital lobe not far behind the tip. Sternum not deeply excavate. A spine at posterior end of preorbital lobe.

c. Carapace suboblong. A smooth, hemispherical swelling on merus of outer maxilliped. Rostral horns slender. Legs long and slender, the first leg about twice as long as carapace :— *globifer*.

cc. Carapace subovate. Outer maxillipeds swollen at union of merus and ischium, but not conspicuously so. Rostral horns short and stout. Legs of moderate size, first leg about one and a half times as long as carapace :— *spinulosus*.

bb. No spinule on outer margin of postorbital lobe. Sternum deeply excavate. Chelipeds stout, legs slender. A triangular tooth at posterior end of preorbital lobe :— *tuberculatus*.

LEPTOMITHRAX SPINULOSUS, *Haswell*.

(Plate ix.)

Leptomithrax spinulosus, Haswell, Proc. Linn. Soc. N.S. Wales, iv., 1879 (1880), p. 441, pl. xxv., fig. 3 ; Cat. Austral. Crust., 1882, p. 16.

Taken at numerous stations from New South Wales to Eucla, including Tasmania.

Shoalhaven Bight, New South Wales, 15-45 fathoms ; one ovigerous female.

Off Tathra Head, near Moruya, New South Wales, 100-250 fathoms ; one ovigerous female, concealed under a coating of compound ascidian, while a slender finger sponge as long as the carapace projects from between the rostral horns.

Off Gabo Island, Victoria, 80 fathoms ; one ovigerous female encrusted with sponge.

Bass Strait ; two ovigerous females, one of which bears encrusting serpulid tubes and bryozoans.

Fifteen miles east-north-east of Cape Barren, Cape Barren Island, 53 fathoms ; one young female.

Oyster Bay, Tasmania, 26 fathoms ; two young.

Forty miles east of Kingston, South Australia, 30 fathoms ; one male, with encrusting serpulid tubes and bryozoans.

Forty miles west of Kingston, South Australia, 30 fathoms ; three males, soft shell, and covered with hydroids, branching bryozoans, etc.

Cape Marsden, Kangaroo Island, South Australia, 17 fathoms ; one immature female.

Off Marsden Point, Kangaroo Island, 17 fathoms ; one male and one ovigerous female, the latter very old and encrusted with mollusks (*Anomia* ?) serpulid tubes, and one stalked barnacle.

Great Australian Bight, south of Eucla, Long. 129° 28′ E., 250-450 fathoms ; one young, very small.

The specimens agree very well with Haswell's description and figure. The spinules of the dorsal surface are numerous, unequal, but none of them much enlarged. As to the border spines, the spine projecting from the preorbital lobe is transverse and its tip turns slightly upward ; middle spine of orbit spinulous ; outer spine directed forward, acute, and armed on the outer edge with two smaller spines ; two hepatic spines, nearly transverse and subequal, the anterior usually a little the larger ; a semicircle of four spines on the branchial region, the last one standing well in on the carapace ; in the intervals between these spines there is a smaller spine or spinule, any of which may be suppressed ; two small submedian spines on the intestinal region. The marginal spines are proportionally larger in the young than in the adult.

The ventral surface is especially setose in the females and young, but a transverse band at the articulation of ischium and merus of outer maxilliped is always naked and smoothly rounded. The externo-distal angle of the ischium projects laterally in a small spine. While the different segments of the male sternum bear concavities, they are not deeply guttered.

A small orange-red spot on the outside of the chela at articulation of propodus and dactylus persists in the preserved specimens.

Measurements.—The largest specimen, an egg-bearing ♀ (E 809) is almost entirely concealed by a mass of shells and worm tubes. It measures, roughly, 136 mm. long and 118 wide.

This species may be the *L. gaimardii* of Milne Edwards[20] of which a full description and figure are lacking. Filhol[21] says that the posterior of the marginal hepatic spines of *L. gaimardii* is bifurcate, and the series of large branchial spines numbers five.

20. Milne Edwards—Hist. Nat. Crust., i., 1834, p. 325, New Zealand.
21. Filhol—Mission de l'Ile Campbell (Passage de Venus, 1874), iii., part 2, 1885, p. 356.

LEPTOMITHRAX STERNOCOSTULATUS, *Milne Edwards.*

Paramithrax gaimardii, Miers, Cat. Crust. New Zealand, 1876, p. 6 (not *P. gaimardii*, Milne Edwards, 1834).

Paramithrax sternocostulatus, Milne Edwards, Ann. Sci. Nat. (3), xvi., 1851, p. 291 [71], pl. x., figs. 3, 3*a*, 3*m*, 4. Miers, Ann. Mag. Nat. Hist. (5), iv., 1879, p. 9. Grant and McCulloch, Proc. Linn. Soc. N.S. Wales, xxxi., 1906, p. 28, pl. iii., figs 2 and 2*a*.

Four miles west of Kingston, South Australia, 30 fathoms; one ovigerous female.

Cape Marsden, Kangaroo Island, South Australia, 17 fathoms; one female.

North of Cape Borda, Kangaroo Island, 40 fathoms; one male, three females, all small.

South Australia; one female. A large specimen 41.3 by 30.8 mm., including spines, decorated with numbers of a flabellate bryozoan and one elongated sponge. The preorbital and postorbital lobes overlap in this specimen.

The male of this species is easily recognised by the peculiar cavities in the sternum, which are more numerous on the anterior part than in *L. tuberculatus*, but both sexes are distinguished by the postorbital lobe in the form of a flat, truncate spine with bidentate extremity, two spines arranged transversely on the posterior margin, two shorter ones on the cardiac region, and three long, submarginal spines on the branchial region.

LEPTOMITHRAX TUBERCULATUS (*Whitelegge*).

Paramithrax tuberculatus, Whitelegge, Mem. Austral. Mus., iv., 1900, p. 146, pl. xxxiv., figs. 1 and 2.

Only two specimens were taken by the "Endeavour."

Twenty-five miles south by east of Double Island Point, Queensland, 33 fathoms; one male. Carapace overgrown with sponge.

Shoalhaven Bight, New South Wales, 15-45 fathoms; one male, partly overgrown with compound ascidian.

The only previous record is New South Wales, from Broken Head to Wata Mooli, 20-78 fathoms (Whitelegge).

LEPTOMITHRAX WAITEI (*Whitelegge*).

Chlorinoides waitei, Whitelegge, Mem. Austral. Mus., iv., 1900, p. 143, pl. xxxiii.

Between Port Stephens and Newcastle, New South Wales, 22-60 fathoms; one female.

Off Babel Islands, eastern slopes, 70 fathoms; one female. Total length of carapace 130, total width 109.2 mm.; length of first ambulatory leg 162, of last leg 126 mm.

The carapace of these large females is longer in proportion to its width than in the large male measured by Whitelegge. The submedian series of spines includes two pairs on the protogastric regions, those of the hinder pair being the smaller and further apart.

LEPTOMITHRAX GLOBIFER,[22] *sp. nov.*

(Plates x. and xi.)

Type-locality.—Southern Australia[23]; one male, holotype.

Measurements.—Male holotype, length of carapace, including spines, 86.6, length on the median line 71, width without spines 56 mm.

Diagnosis.—A round excrescence on merus of outer maxilliped. Four marginal spines on branchial region.

Description.—Carapace ovate-oblong; covered, but not crowded, with acute tubercles and a few spines; four large spines forming a semicircle on the margin of the branchial region, the posterior of these spines being subdorsal; hepatic region outwardly produced, margin armed with two spines, of which the anterior is the larger; four small median spines, two mesogastric, one urogastric and one intestinal; ten pairs of submedian spines and tubercles (three frontal, or between the orbits, two protogastric, two mesogastric, one cardiac and two intestinal), the last pair being stout spines which project horizontally backward.

Rostral spines gradually tapering, slightly divergent and one-fifth as long as the remainder of the carapace. Surface of preorbital lobe covered with sharp granules, spine long and projecting transversely, separated by a narrow gap from the middle supraorbital spine. This last is narrow-triangular, bears one or two erect spines or spinules at its base, and is in contact at its middle with the postorbital cup; between the

22. In allusion to the rounded excrescence on the mouth.

23. The details of the locality and date associated with this specimen are incongruous. It was almost certainly secured in southern Australian waters.

bases of the two there is a narrow buttonhole slit. The postorbital cup has an acuminate tip, and not far behind the tip a spinule on the outer margin.

Interantennular spine of good size. Basal segment of antenna bearing two spinulous ridges, the inner terminating in a downward and forward-pointing spine at the inner angle, and the outer ridge terminating in a upward and forward-pointing spine at the outer angle. Ventral surface of carapace furnished sparingly with acute tubercles and granules, while a single pterygostomian spine points obliquely outward. The maxillipeds are distinguished by a smooth, round, whitish excrescence on the merus, at its posterior end, but nearer the outer than the inner angle.

Sternum moderately excavate, and showing a few granules near the abdomen. Abdomen pubescent.

The chelipeds are a little longer than the carapace, and when extended reach to the middle of the propodus of the first ambulatory leg; the arm and wrist are dorsally tuberculate, and the former has a short, subterminal spine above. The legs are slender and diminish rapidly in length, but the last one is still longer than the cheliped. The distal half or two-thirds of each dactylus above the horny tip is covered with a short pile.

The species inhabits the Great Australian Bight, and was taken at the following localities:—

Southern Australia. Two males, one being the holotype.

Great Australian Bight, south-west of Eucla, about Long. 127° E., 80-120 fathoms; two males, one of them young.

Great Australian Bight, sixty to eighty miles west of Eucla, 80-120 fathoms; four males, two females, all young.

Genus CHLORINOIDES, *Haswell.*

CHLORINOIDES SPATULIFER, *Haswell.*

Paramithrax spatulifer, Haswell, Proc. Linn. Soc. N. S. Wales, vi., 1882, p. 540; Cat. Austral. Crust., 1882, p. 14.

Chlorinoides coppingeri, Miers, Challenger Rept., Zool., xvii., 1886, p. 53, pl. vii., figs. 3, 3*a*, 3*b* (not *C. coppingeri*, Haswell, 1881).

Shoalhaven Bight, New South Wales, 15-45 fathoms; two ovigerous females.

Forty miles south of Cape Wilson, South Australia, 100 fathoms ; one female.

East coast of Flinders Island, Bass Strait ; one male.

Twenty miles east of Babel Islands, eastern slopes, 65-70 fathoms ; one male.

Great Australian Bight, south of Eucla, Long. 129° 28′ E., 250-450 fathoms ; one young female.

Great Australian Bight, sixty to eighty miles west of Eucla, 80-120 fathoms ; two males, one ovigerous female.

The spatula on the intestinal region, though usually entire except for some fine spinules, is in one specimen a male from east of Babel Islands, bifid at the top, forming two flat, truncate spines or teeth.

Genus SCHIZOPHRYS, *White*.

SCHIZOPHRYS ASPERA, *Milne Edwards*.

Mithrax asper, Milne Edwards, Hist. Nat. Crust., i., 1834, p. 320.

Schizophrys aspera, Alcock, Journ. Asiat. Soc. Bengal, lxiv., 1895, p. 243.

Southern Queensland ; one male.

Spencer's Gulf, South Australia, 26 fathoms ; one male, one female.

Spencer's Gulf, South Australia, 20 fathoms ; one male.

The specimens are all large, and represent a form with short rostrum, short marginal spines, and a rather even carapace, few of the granules being enlarged and elevated. The bend on the lower margin of the propodus of the cheliped is almost rectangular.

Family PARTHENOPIDÆ.

Subfamily PARTHENOPINÆ.

Genus PARTHENOPE, *Weber*.

Subgenus RHINOLAMBRUS, *A. Milne Edwards*.

Cancer contrarius, Herbst, Naturg. d. Krabben u. Krebse, iii., part 4, p. 8, pl. lx., fig. 3.

Lambrus (*Rhinolambrus*) *contrarius*, Alcock, Journ. Asiat. Soc. Bengal, lxiv., 1895, p. 266, and synonymy.

Thirteen miles north by west of Double Island Point, Queensland, 25-26 fathoms ; one ovigerous female. Reg. No. E2030.

Length 63.8, width 62 mm. Chelipeds partly, and carapace almost entirely (up to the postorbital constriction), covered with *Balanus*. Not only are the merus joints of the ambulatory legs tuberculate, but the carpus and propodus of the last pair.

Genus CRYPTOPODIA, *Milne Edwards.*

CRYPTOPODIA QUEENSLANDI, *sp. nov.*

(Plate xii.)

Type-locality.—20 miles north-east of Cape Gloucester, Queensland, 35 fathoms ; adult male, holotype.

Measurements.—Length of carapace 27.4, width of carapace 49.3, width between orbits 5.6, length of front measured from the line of the anterior orbital angles 3 mm.

Description.—Carapace extremely broad ; lateral angle strongly marked ; antero-lateral margin cut into shallow irregular lobes, the re-entering angle at the beginning of the lateral wings well defined ; posterior margin slightly concave in its middle two-fifths. Triangular depression deep, a large granulated tubercle at its lateral angles. Surface smooth except on the boundary of the triangular depression, from which a line of low granulated tubercles stretches part way across the branchial regions. Rostrum short, broad, sides arcuate, tip blunt ; edge finely crenulate, granulate and pitted.

Chelipeds twice as long as carapace, massive, with smooth surfaces ; and thin, cristiform edges. The upper edge of the manus has five more prominent, flat, triangular teeth, the outer edge has three enlarged teeth.

Edges of merus, carpus and propodus of ambulatory legs laminate, those of the merus finely serrulate.

Relationships.—The shape of the carapace approaches that of *C. dorsalis*, Adams and White[24] and *C. spatulifrons*, Miers,[25] both of which have the posterior margin concave in the middle, but our species is intermediate, the slope from the lateral angle backward being less longitudinal than in *C. spatulifrons*, and yet more gradual than in *C. dorsalis*. The character of the

24. Adams and White—Zool. Samarang, Crust., 1848, p. 30, pl. vi., figs. 5, 5*a*.

25. Miers—Ann. Mag. Nat. Hist. (5), iv., 1879, p. 26, pl. v., fig. 10.

edges is more as in *C. spatulifrons*, but without the tendency to form spinous processes. Our species is much wider than any other.

Subfamily EUMEDONINÆ.

Genus EUMEDONUS, *Milne Edwards.*

EUMEDONUS VILLOSUS, *sp. nov.*

(Plate xiii., fig. 1.)

Type-locality.—Twenty-five miles south by east of Double Island Point, Queensland, 33 fathoms ; one male, holotype.

Additional locality.—Twenty miles north-north-east of Double Island Point, Queensland, 30 fathoms ; one male.

Measurements.—Male holotype, length of carapace to end of rostrum 10.7, length on median line 10, width 10.8 mm.

Description.—Carapace covered for the most part with crowded, forward-pointing granules ; they are absent in the anterior middle portion, which is clothed with long hair. Hind part of carapace depressed, especially in the line of the gastro-cardiac suture. Longitudinal impressions limiting the meso-gastric and anterior cardiac region deep. Rostrum short and broad, ending in two broad, arcuate lobes separated by a narrow emargination.

Chelipeds rough like the carapace, the right one the larger ; they are lobed and spined as follows : a broad lobe on the inner margin of the ischium and another on the inner margin of the merus in its proximal half ; merus proximally carinate above, carina high and faintly bilobed ; a short, stumpy, erect spine at distal end of merus ; a large, curved spine at inner angle of wrist ; two large serrations occupy the upper margin of the manus. A reddish-brown colour covers the immovable finger and the distal half of the dactylus, except the tips.

Legs cristate along upper margin of merus, and feebly so on upper margin of carpus and propodus of last two pairs. The crests have an uneven edge, ending in the merus of the first three pairs, in a short distal tooth above, and having a tendency to form a shallow tooth at the middle of the same crest. Legs sparingly long-hairy.

Ventral surface of body granulate ; abdomen nearly smooth

Relationships.—Resembles *E. granulosus* McGilchrist,[26] but differs as follows : the carapace is shorter ; granules present in

26. McGilchrist—Ann. Mag. Nat. Hist. (7), xv., 1905, p. 253 ; Illus. Investigator, Crust., part xii., 1907, pl. 57, figs. 2, 2*a*.

the depressions as well as on the elevations, except that the anterior median region is smooth and long-hairy; lateral spines directed outward and not at all forward; rostrum more deeply cut; hands provided with strong teeth above; merus joints of legs carinate.

It is singular that the same locality should produce two closely-allied species. The one described below presents the same configuration of carapace as *E. villosus* but many differences in other details.

Eumedonus vicinus, *sp. nov.*

(Plate xiii., fig. 2.)

Type-locality.—Twenty-five miles south by east of Double Island Point, Queensland, 33 fathoms; one male holotype.

Measurements.—Male holotype, length of carapace to end of rostrum 13.5, length on median line 12.4, width 14.5 mm.

Description.—Carapace shaped as in *E. villosus*, except that the rostrum is longer and is divided at tip into two narrow horns directed forward; the granules are flatter and squamiform and have a tendency to disappear from the more elevated parts of the posterior half. Carina on upper margin of merus of cheliped bilobed; lobe on inner margin longer, narrower, and more triangular than in *E. villosus*; spine at inner angle of carpus longer, stronger and flatter; the two spines on the upper margin of the palm are larger and more upstanding. No colour on fingers. There is a thin crest on the upper margin of the carpus and propodus, as well as on the merus, of the ambulatory legs. Surface of abdomen and most of the sternum coarsely punctate; anterior sternum granulate and eroded. Abdomen wider than in *E. villosus* and fringed with hair, having somewhat the appearance of the abdomen of an immature female; the male appendages are well developed.

Relationship.—The rostrum of this species suggests that of *E. zebra*,[27] but the branches are not at all divergent, as they are in that species; the carapace is longer and rougher; the chelipeds are covered with granules and the spines or teeth surmounting the palm are more important; the legs are similarly carinated, but the terminal and the middle tooth above the merus joints are weaker in our species.

27. Alcock—Journ. Asiat. Soc. Bengal, lxiv., 1895, p. 288 Illus. Investigator, Crust., part iv. pl. xxiii., fig. 5.

Genus CERATOCARCINUS, *Adams* and *White*.

CERATOCARCINUS DILATATUS, *A. Milne Edwards*.

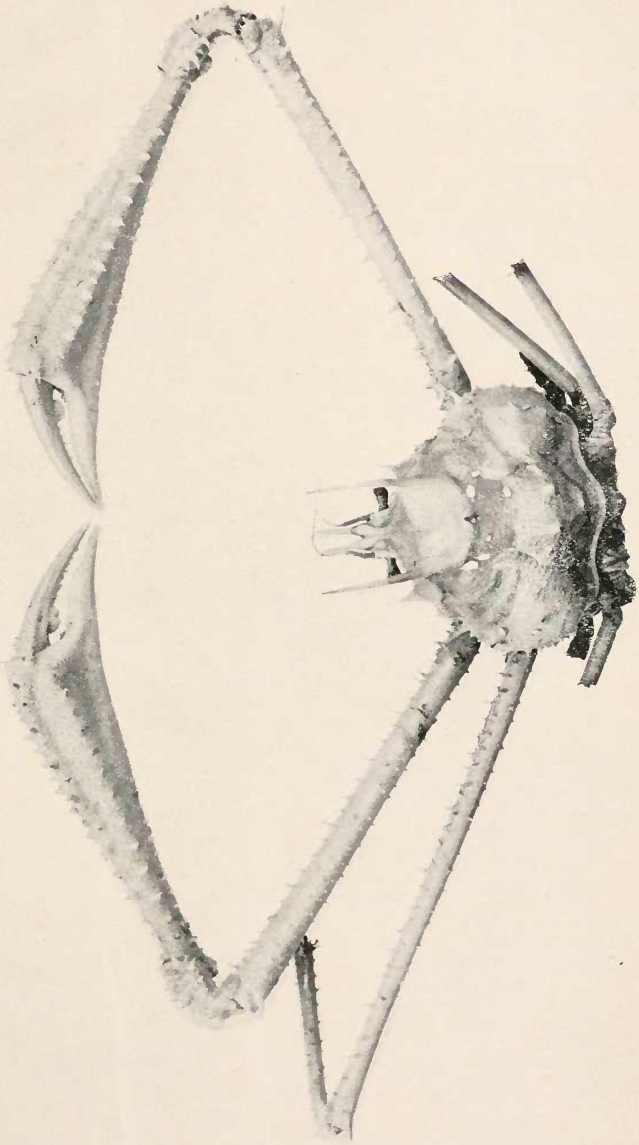
Ceratocarcinus dilatatus, A. Milne Edwards, Nouv. Arch. Mus. Paris, viii., 1872, p. 256, pl. xiv., figs. 2-2*c*. McCulloch, Rec. Austral. Mus., ix., 1913, p. 338.

Twenty miles north-north-east of Double Island Point, Queensland ; 29-30 fathoms ; one female.

The specimen is about half as big as the male figured by A. Milne Edwards and differs from his illustrations in some minor particulars. The carapace is narrower (length 6.6, width 7.6 mm., horns included) and is densely pilose, save on the rostral and lateral spines, the protogastric and branchial bosses and the antero-lateral margin ; the rostral horns are more oblique, the outer margins of the two horns being obviously divergent ; they and the lateral horns are truncate at tip ; the pair of mesogastric and of cardiac tubercles are inconspicuous, hidden as they are under the heavy pile. Milne Edwards describes and figures the basal joint of the antenna as wide (see his fig. 2*a*), but it is no more than half as wide as represented in the figure cited, the outer half there shown being the thickened portion of the lower wall of the orbit.

EXPLANATION OF PLATE I.

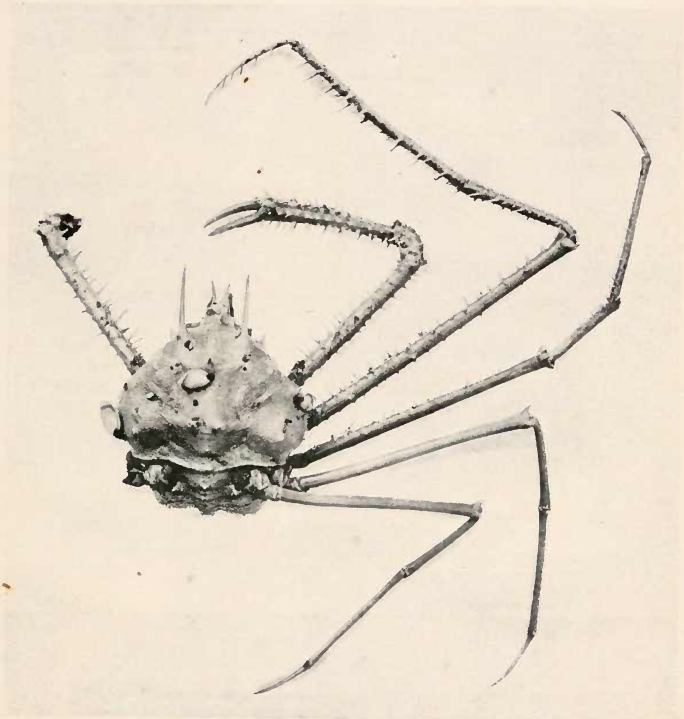
Cyrtomaia maccullochi, sp. nov. Male holotype, dorsal view. Nine-tenths natural size.



J. H. PAINE, photo.

EXPLANATION OF PLATE II.

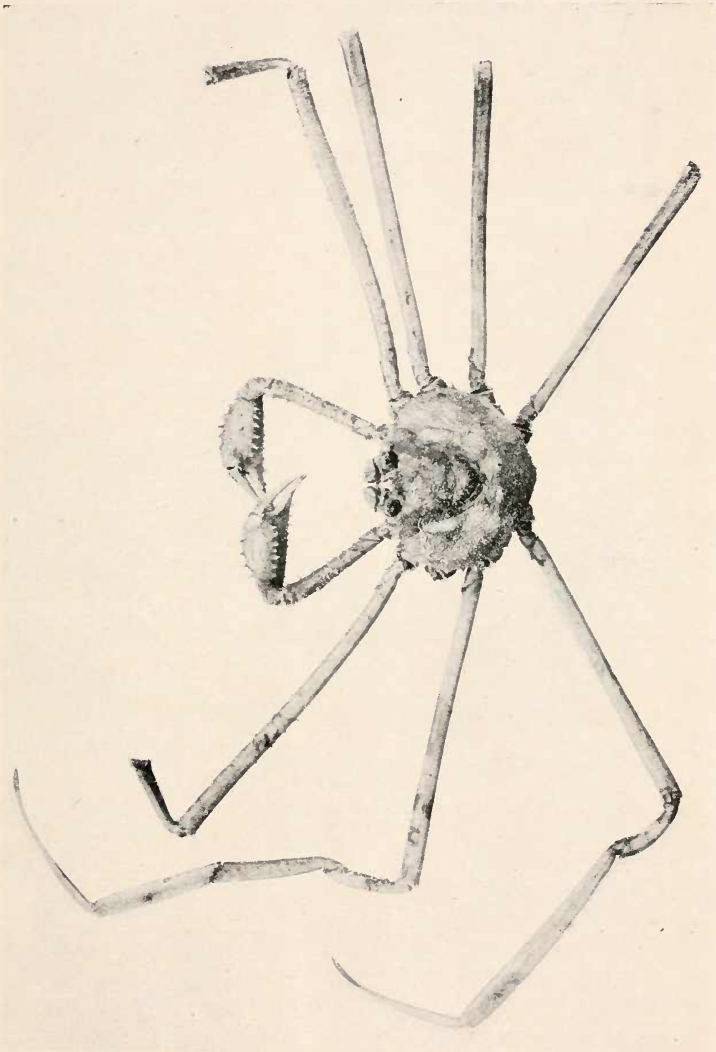
Cyrtomaia maccullochi, sp. nov. Female (E6262), dorsal view. Two-thirds natural size.



J. H. PAINE, photo.

EXPLANATION OF PLATE III.

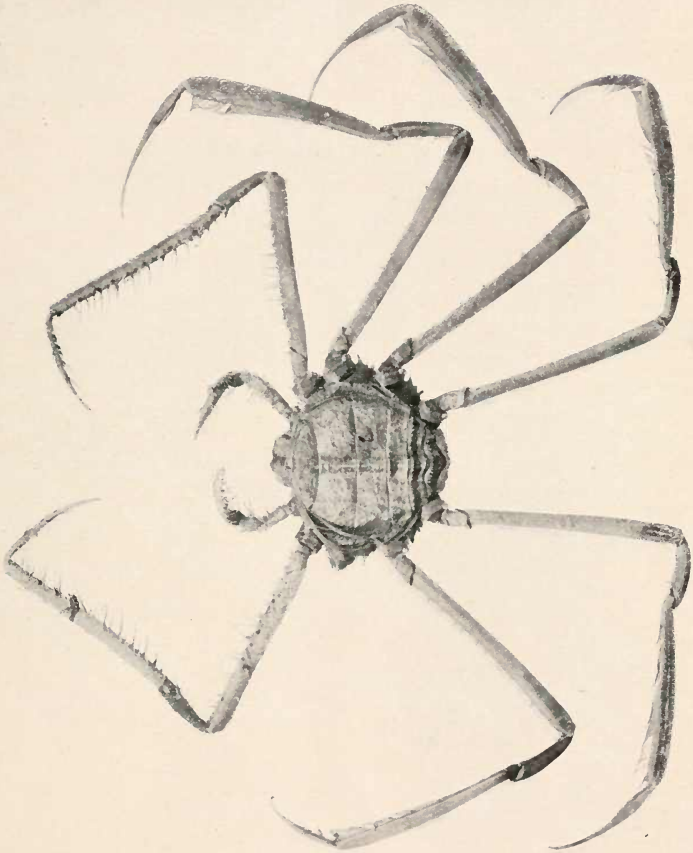
Platymaia wyvillethomsoni. Miers. Male (E3675), dorsal view. Nine-tenths natural size.



J. H. PAINE, photo.

EXPLANATION OF PLATE IV.

Platymaia wyvillethomsoni, Miers. Female (E6260), ventral view. Nine-tenths natural size.



J. H. PAINE, photo.

EXPLANATION OF PLATE V.

Scyramathia fultoni, Grant. Male (E5157). Once and one-half natural size.

Fig. 1.—Dorsal view.

Fig 2—Ventral view.

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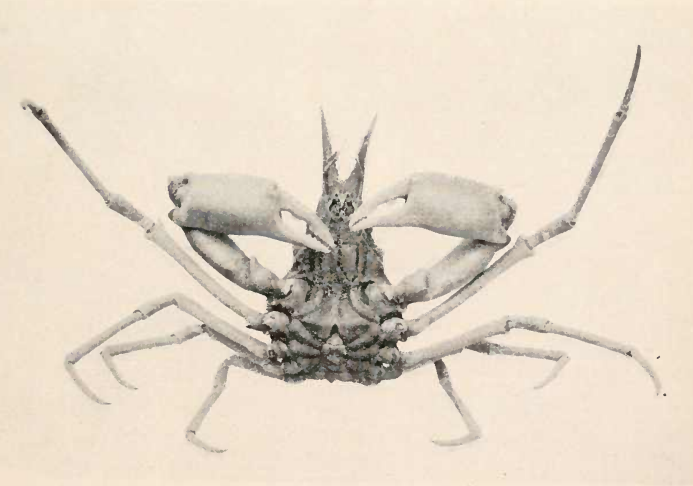

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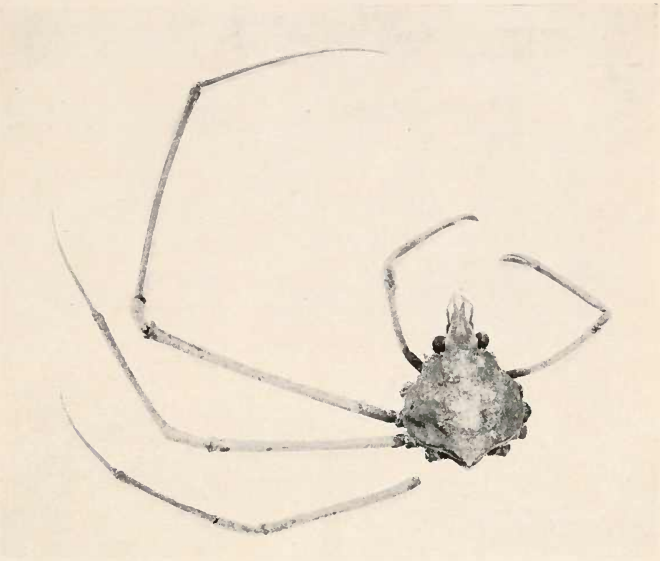
J. H. PAINE, photo.

EXPLANATION OF PLATE VI.

Phalangipus australiensis, sp. nov. Male holotype. Once and one-half natural size.

Fig. 1.—Dorsal view.

Fig. 2.—Ventral view.



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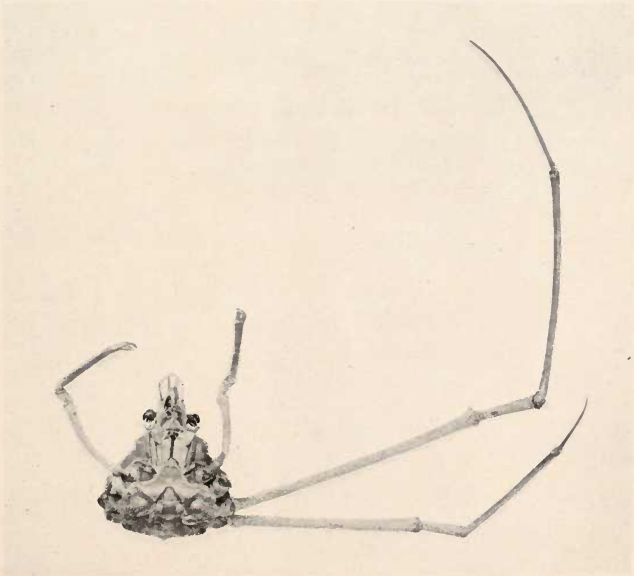

J. H. PAINE, photo. 2

EXPLANATION OF PLATE VII.

Fig. 1.—*Doclea profunda*, sp. nov. Female holotype, dorsal view. Three times natural size.

Fig. 2.—Same. Ventral view.

Fig. 3.—*Antilibinia lappacea*, sp. nov. Female holotype, dorsal view. Three times natural size.

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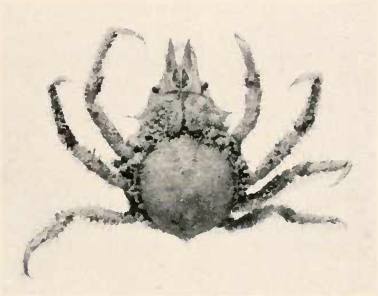

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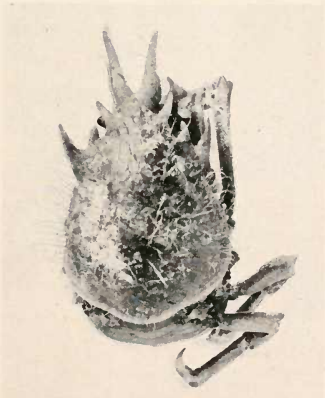

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J. H. PAINE, photo.

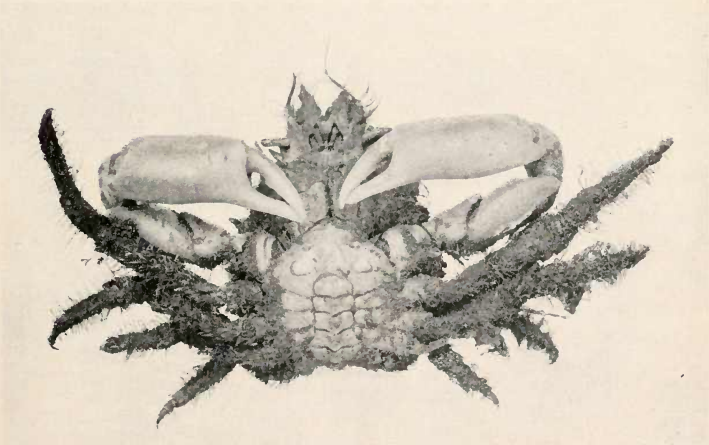
EXPLANATION OF PLATE VIII.

Paramithrax minor, Filhol. Male (E1351). About once and one-third natural size.

Fig. 1.—Dorsal view, right half of carapace denuded.

Fig. 2.—Ventral view.

1



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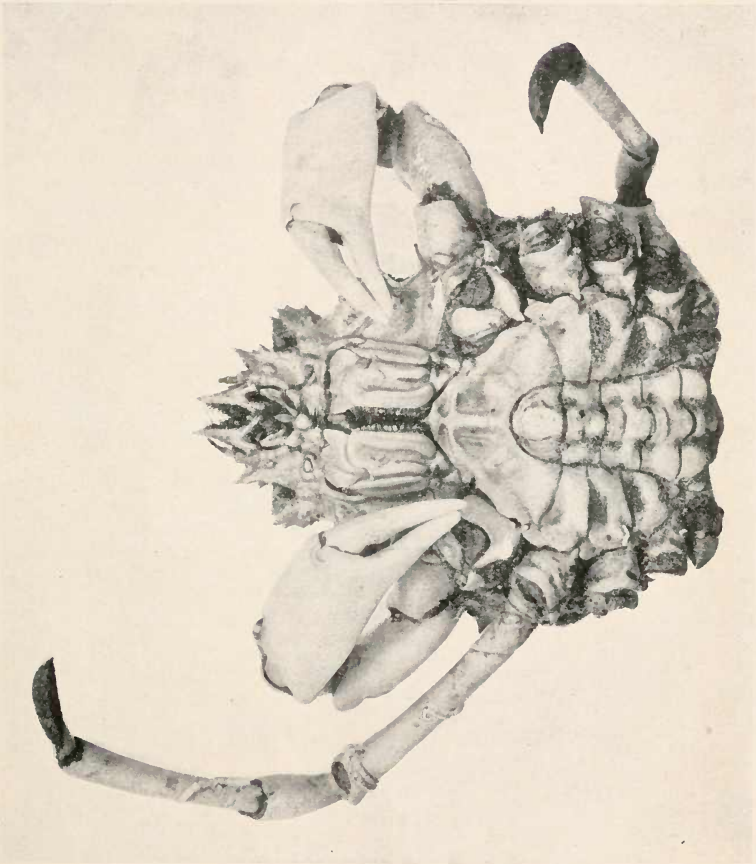
J. H. PAINE, photo.

EXPLANATION OF PLATE IX.

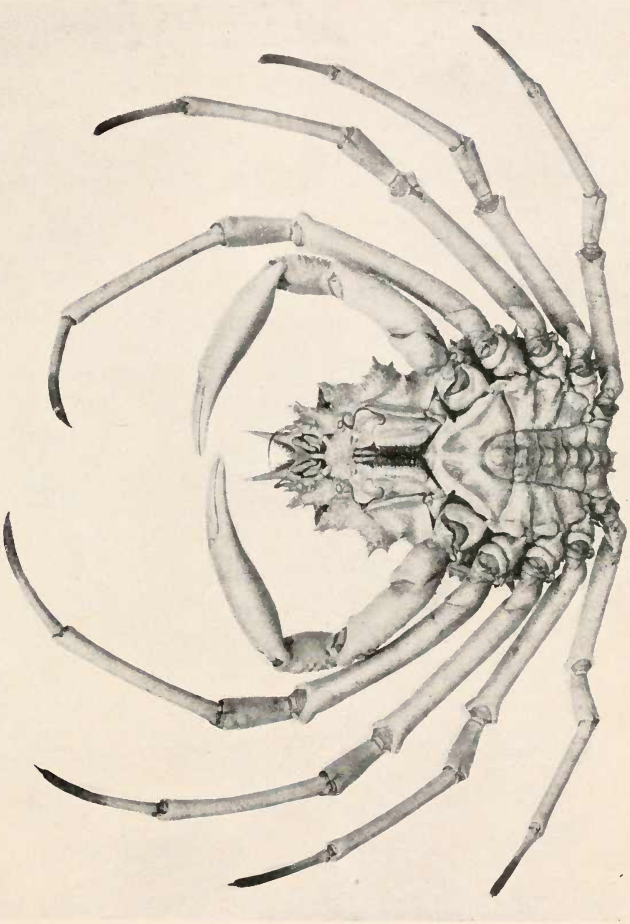
Leptomithrax spinulosus, Haswell. Male (E811), ventral view. About natural size.



J. H. PAINE, photo.

EXPLANATION OF PLATE XI.

Leptomithrax globifer, sp. nov. Male holotype, ventral view. About two-thirds natural size.



J. H. PAINE, photo.

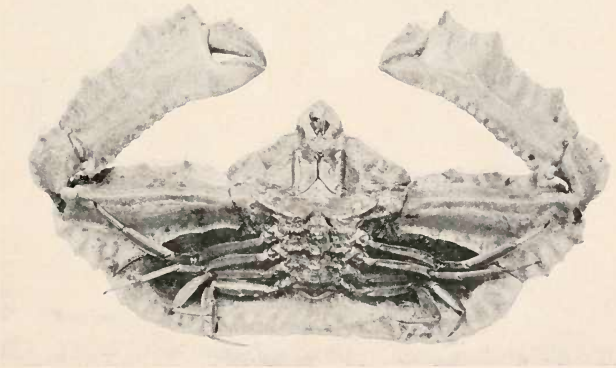
EXPLANATION OF PLATE XII.

Cryptopodia queenslandi, sp. nov. Male holotype. Once and one-half natural size.

Fig. 1.—Dorsal view.

Fig. 2.—Ventral view.

1



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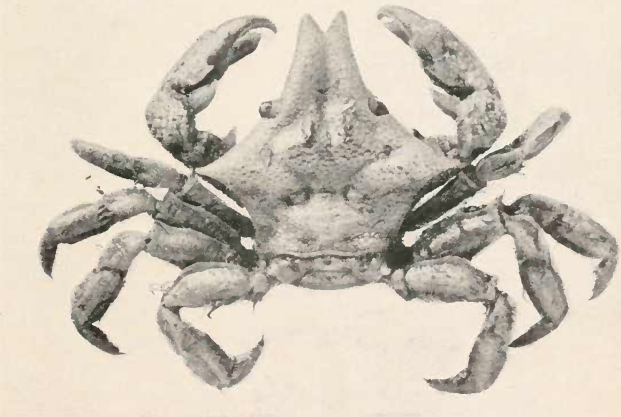
J. H. PAINE, photo.

EXPLANATION OF PLATE XIII.

Fig. 1.—*Eumedonus villosus*, sp. nov. Male holotype, dorsal view. Three times natural size. Hair removed to show rostral emargination.

Fig. 2.—*Eumedonus vicinus*, sp. nov. Male holotype, dorsal view. Three times natural size.

1



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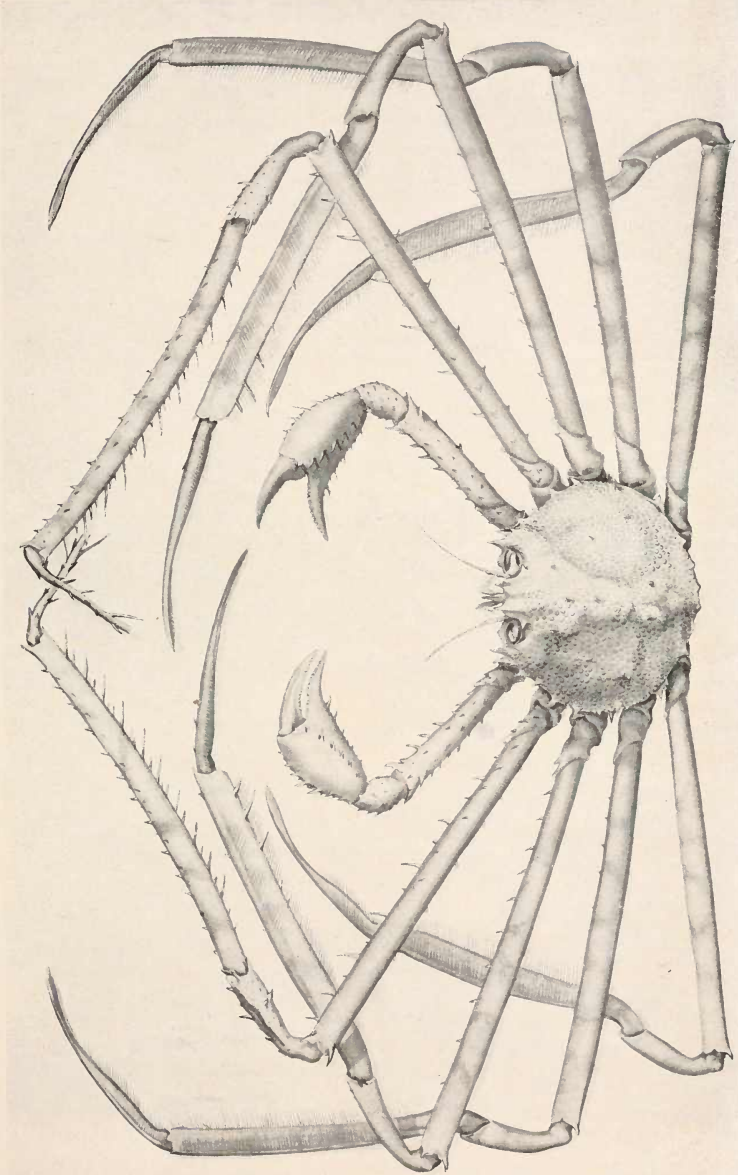
J. H. PAINE, photo.

EXPLANATION OF PLATE XIV.

Platymaia wyvillethomsoni, Miers. Male (E3694), dorsal view. Once and one-third natural size.



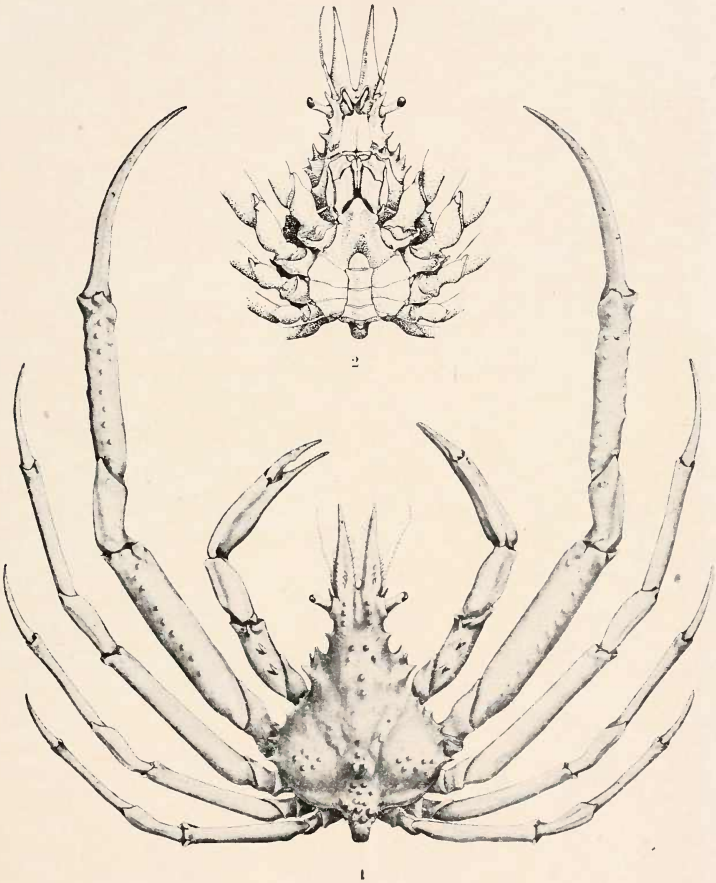
A. R. McCULLOCH, Austr. Mus., del.

EXPLANATION OF PLATE XV.

Ephippias endeavouri, Rathbun. Male holotype. One-half natural size.

Fig. 1.—Dorsal view.

Fig. 2.—Ventral view of body.



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R. J. Kinghorn, Austr. Mus., del.

Report on the Amphipoda obtained by the F.I.S. "Endeavour" in Australian Seas.

BY

CHARLES CHILTON, M.A., D.Sc., M.B., C.M., LL.D., F.L.S., C.M.Z.S., F.N.Z.Inst., Hon. Mem. Roy. Soc. N.S.W., Professor of Biology, Canterbury College, New Zealand.

Figures 1-16.

REPORT ON THE AMPHIPODA.

Introduction.

The collection of Amphipoda made by the F.I.S. "Endeavour" contains thirty-four species, and although there are only two of these that I have described as new, the collection is of very considerable value, affording additional information on species already known and particularly on their distribution. The most interesting is *Endevoura mirabilis*, nov. gen. et sp., which, in the greatly enlarged propod of the first peræopod, appears to differ from other members of the Lysianassidæ. The re-discovery of *Ephippiphora kröyeri*, White, from the type locality enables this fine species to be fully described and restored to its proper place in the group. It will be seen that an increasing number of the forms have been identified with species previously known only from European seas and the North Atlantic.

I am greatly indebted to Miss E. M. Herriott, M.A., assistant at the Biological Laboratory, Canterbury College, for preparing the drawings to illustrate this paper and for much other valuable assistance.

List of Species and their Distribution.

1. *Ephippiphora kröyeri*, White. Bass Strait and Coast of Tasmania.
2. *Waldeckia chevreuxi*, Stebbing. Australian seas.
3. *Nannonyx kidderi*, (S. I. Smith). Australia; New Zealand and Subantarctic seas.
4. *Tryphosa sarsi*, (Bonnier). Arctic Ocean; North Atlantic and Southern Australia.
5. *Endevoura mirabilis*, nov. gen. et sp. Bass Strait.
6. *Euonyx normani*, Stebbing. Bass Strait; Kermadec Islands.
7. *Amaryllis macrophthalma*, Haswell. Australia; New Zealand; South Africa.

8. *Andaniotes corpulentus*, (G. M. Thomson). Australia; New Zealand; Antarctic seas.

9. *Seba typica*, (Chilton). Bass Strait; New Zealand.

10. *Leucothoe spinicarpa*, (Abildg.). In all seas.

11. *Colomastix brazieri*, Haswell. Australia; New Zealand; South Orkneys.

12. *Liljeborgia brevicornis*, (Bruz.). Arctic Ocean; North Atlantic; Southern Australia.

13. *Liljeborgia dubia*, (Haswell). Australia; New Zealand.

14. *Oediceroides ornatus*, (Stebbing). Bass Strait.

15. *Bovallia Monoculoides*, (Haswell). Subantarctic seas; South Africa; Indian Ocean.

16. *Paramoera austrina*, (Bate) var. *megalophthalma*, Haswell. Australian seas.

17. *Melita fresnelii*, (Aud.). Atlantic and Indian Oceans; Australian seas; South Africa.

18. *Ceradocus rubromaculatus*, (Stimpson). Australia; New Zealand; Gambier Archipelago.

19. *Maera inaequipes*, A. Costa. Northern and Southern seas.

20. *Maera marstersii*, (Haswell). Australia; New Zealand; Kermadecs; Gambier Archipelago.

21. *Maera hamigera*, (Haswell). Australia; Indian Ocean; South Africa.

22. *Maera viridis*, Haswell. Australia; New Zealand; Gambier Archipelago.

23. *Elasmopus diemenensis*, (Haswell). Bass Strait.

24. *Elasmopus subcarinatus*, (Haswell). Australia; New Zealand; Indian Ocean; Fiji.

25. *Polycheria antarctica*, (Stebbing). Australia; New Zealand; Subantarctic and Antarctic seas.

26. *Lembos philacanthus*, (Stebbing). Australia; New Zealand; Chatham Islands.

27. *Photis dolichommata*, Stebbing. Southern Australia.

28. *Eurystheus maculatus*, Johnston. Arctic Ocean; North Atlantic; Southern Australia.

29. *Eurystheus atlanticus*, Stebbing. Australia; South Africa.

30. *Eurystheus thomsoni*, (Stebbing). Australia.

31. *Eurystheus persetosus*, sp. nov. South Australia.

32. *Ampithoe flindersi*, Stebbing. Australia; Torres Strait.

33. *Icilius australis*, Haswell. Australian seas.

34. *Pseudoprotella phasma*, (Mont.). European seas; Mediterranean; North Atlantic; Southern Australia.

Ephippiphora kroyeri, *White*.

(Figs. 1 *a*—*i*.)

Ephippiphora kroyeri, White, 1847*, p. 221.

? *Ephippiphora kroyeri*, Miers, 1884, p. 312.

Ephippiphora kroyeri, Stebbing, 1888, p. 224, and 1910, p. 571.

Socarnes kroyeri, Stebbing, 1906, p. 57.

Lysianassa kroyeri, Spence Bate, 1862, p. 65.

Localities.—East Coast of Flinders Island, Bass Strait. One specimen, 25 mm. long. (Reg. No. E. 4851.) Sixty to eighty miles west of Eucla, 80-120 fathoms. One specimen, 17 mm. long.

These specimens agree in size and in the general characters with the description given of this species by White in 1847. The species has, however, remained so long uncertain that Stebbing (1910, p. 571) speaks of it as "the enigmatical *Ephippiphora kroyeri*, White." The specimens come from the same locality as the original type, and I feel confident must be the same. White established the genus *Ephippiphora* in 1847, and as the description is quite suffi-

* The references are made by the year of publication to the list on p. 90.

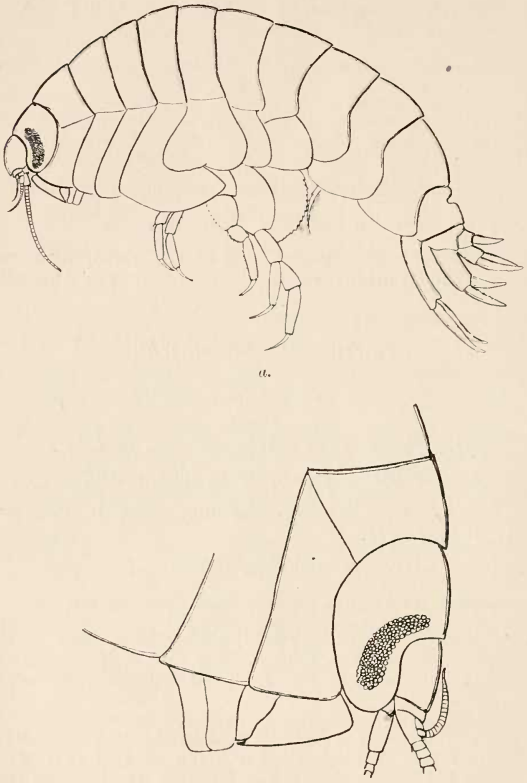


Fig. 1 *a*—*b*. *Ephippiphora kröyeri* White.
a. Side view of whole animal. *b*. Head and anterior segments of peraeon showing side view of projecting mouth parts.

cient for identification I think it right that his name should be re-established. His description is as follows:—

"Head rather large; antennae distant from each other, the upper pair with the basal joints very thick

and corneous, inserted in a deep notch in front of head; two setae at the end of each, the outer the thicker. Lower pair of the antennae with the basal joint somewhat elongated and furnished with hairs.

"Body much compressed, the lateral appendages on the first eight joints very large, and nearly concealing the legs; the appendage of the fourth joint much dilated behind at the end; eighth to eleventh joints slightly keeled on the back; appendages of the three last joints of abdomen longish, with short spines on the edge behind."

For the description of the species, *Ephippiphora kröyeri*, he merely says:—

"The body is very highly polished, the edges of the segments behind somewhat tinged with yellow; the legs and caudal appendages slightly brownish.

"*Hab.* Van Diemen's Land."

In 1862 the species was re-described and figured by Spence Bate from White's typical specimen in the British Museum, which is, he says, an inch in length. His description corresponds well with the two "Endeavour" specimens. Some further information as to White's type was given by Miers (1884, p. 312), who referred to this species small specimens obtained by the "Alert" at Dundas Straits, Prince of Wales Channel and Port Denison. These may, however, really belong to *Waldeckia chevreuxi*, Stebbing. The species *Ephippiphora kröyeri* and allied species were discussed by Stebbing in 1910 (p. 571).

From the figures which I give it will be seen that *E. kröyeri* is closely similar to the animals for which the genus *Waldeckia* has since been established, and it will be unnecessary to give a detailed description of all its appendages.

The mouth parts form a compact mass protruding below the anterior portion of the body and are shown in side view in Fig. 1 *b*, and as seen from below in Fig. 1 *c*. The separate mouth parts are very similar to those of *Waldeckia chevreuxi* if we make allowance for the greater size of the animal. The mandible (Fig. 1 *d*) has the same general shape with fairly narrowed cutting edge without separate teeth, and the process on the inner side (molar tubercle) is narrow and beset with many short setae; the palp is very

slender, and in the natural position lies closely against the outer surface of the mandible between it and the side plates; its first joint is short, the second the longest with

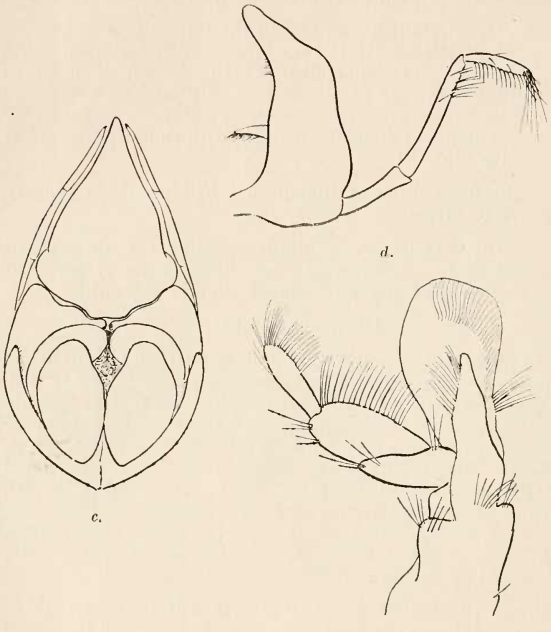


Fig. 1 *c—e*. *Ephippiphora kröyeri* White.
c. Mouth parts seen from below. *d*. Mandible, seen from outer side. *e*. Maxilliped, anterior aspect.

seven or eight long setae near the distal end, the third joint has a fringe of setae along one side with longer ones at the apex. The lower lip has the apex somewhat irregular, thickly fringed with spinules, the mandibular process well developed. The first maxilla has the inner lobe narrow, with two setae at its apex, outer lobe with a number of very stout dentate setules, some of them very broad, as in *Waldeckia chevreuxi*, and all of them yellowish brown in colour; the palp is two-jointed, first joint very short, the

second broad with rounded apex, concave on the inner side so as to fit against the other mouth appendages. The maxillipeds have the inner plate short with three or four stout teeth at the end and many spinules, the outer plate

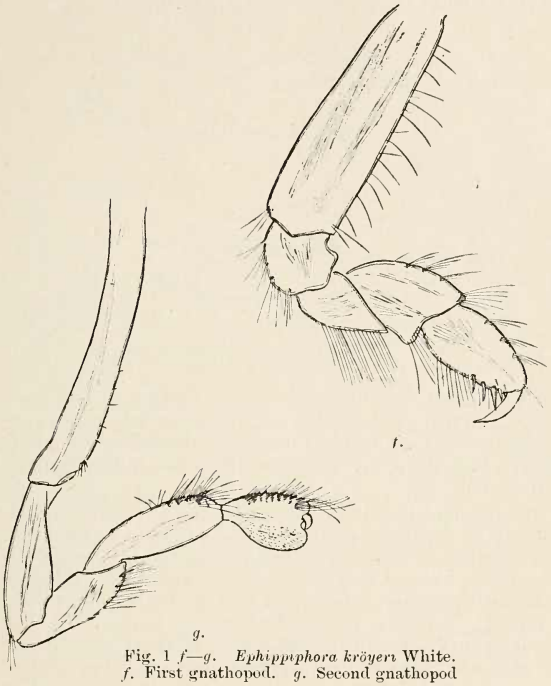
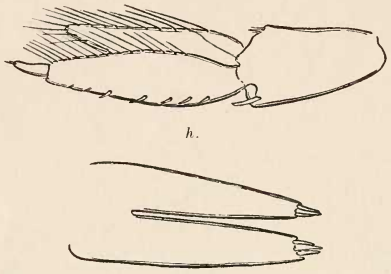


Fig. 1 *f*—*g*. *Ephippiphora kröyeri* White.
f. First gnathopod. *g*. Second gnathopod

large and broad, its margin entire, without spinules; palp well developed, reaching beyond the end of the outer plate: inner surface with joints well fringed with setae as shown in the figure. In Fig. 1 *e* the inner lobe of the maxilliped is seen in profile as it lies in the natural position projecting inwards almost at right angles to the rest of the appendage which closes in the other mouth parts posteriorly.

The gnathopoda (Figs. 1*f* and *g*) are very like those of *Waldeckia obesa*, Chevreux.

The peraeopoda are normal, the basal joints widely expanded, the posterior margin in the fifth distinctly serrate. The uropoda and telson show a close general resemblance to those of *Waldeckia obesa*, Chevreux. (See Figs. 1 *h* and *i*.)



h.

i.

Fig. 1 *h*—*i*. *Ephippiphora kröyeri* White.
h. Third uropod. *i*. Telson.

The branchiae are large and bear a number of transverse folds on the upper portion like those in *Anonyx nugax*, Phipps. I did not find any "accessory branchiae," but was unable to make a full examination in the single specimen I dissected.

It is evident that the genus *Ephippiphora* is very nearly related to *Socarnes*, as Boeck stated when he established that genus in 1870. The resemblance of *E. kröyeri* to *Waldeckia obesa*, Chevreux, a species which I consider the same as *W. zschaui* (Pfeffer), is so close that the two should, I think, be placed in the same genus, but at present I leave them as they are and the discussion of these genera must be held over for some future occasion.

Waldeckia chevreuxi, *Stebbing*.

(Fig. 2.)

Waldeckia chevreuxi, Stebbing, 1910, p. 572, pl. 47 *b*.

Localities.—Schouten Island, Tasmania, 5 fathoms. Many specimens, the largest about 8 mm. in length. (Reg. No. E 5351.)

Entrance to Oyster Bay, Tasmania. Two specimens. (Reg. No. E 4764.)

Sanders Bank, Kangaroo Island, South Australia. 28 fathoms. One male. (Reg. No. E 4855.)

Bay of Fires, Tasmania, 10 fathoms. Two specimens, one male, one female. (Reg. No. E 5350.)

Eastern Slope, Bass Strait. Two specimens. (Reg. No. E 5356.)

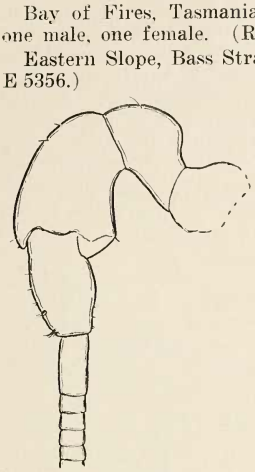


Fig. 2. *Waldeckia chevreuxi.* Second antenna of male.

These specimens agree well with Stebbing's description and figures which apply however only to the female. In the male the second antenna (Fig. 2) has the flagellum greatly elongated and is fully half as long as the animal, the penultimate joint of the peduncle is longer and broader than the ultimate and widens a little distally, the ultimate joint narrowing distally; there are only a few fine setae on the peduncle and the flagellum appears to be without calceoli. In both sexes the proximal joints of the flagellum of the upper antennae bear transverse rows of sensory setae which appear to be as numerous in the female as in the male.

In 1912 (p. 473) I stated that this species occurs in New Zealand. Comparison of specimens shows that the New Zealand form differs a little in the characters of the third uropoda and should, perhaps, be kept separate. *Ephippiphora kröyeri*, White, and *Waldeckia obesa*, Chevreux, have the third uropoda nearly alike, but differing from both the Australian and the New Zealand forms mentioned.

Nannonyx kidderi, (*S. I. Smith*).

(Figs. 3 *a* and *b*.)

Nannonyx kidderi, Chilton, 1909, p. 615.

Parawaldeckia thomsoni, Stebbing, 1910, p. 571.

Locality.—Tasmanian Coast. One male. (Reg. No. E 5352.)

A full discussion of the forms which I grouped under this name in 1909 will be found in the reference quoted.

Stebbing has since suggested the establishment of a new genus, *Parawaldeckia*, for its inclusion.

The present specimen, which is a male with greatly elongated flagellum to the second antenna, appears to be quite the same as the type specimen of *Lysiannax stebbingi*, G. M. Thomson, which was obtained at Pirates Bay, Tasmania, and with which I have compared it. In the "Endeavour" specimen the telson (Fig. 3 *b*) has the posterior margin transverse with two setules at each posterior angle. Mr. Thomson's type is mounted permanently so that the telson is seen in side view and the posterior border cannot be made out, but it shows the two setules at the

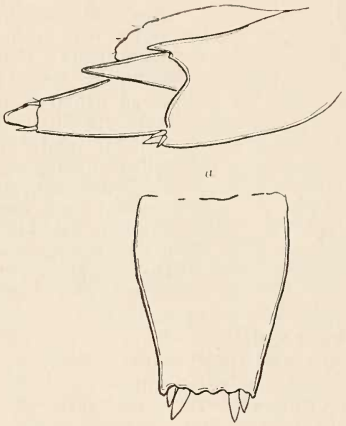


Fig. 3 *a*—*b*. *Nannonyx kidderi* (S. I. Smith), male.
a. Third uropod. *b*. Telson.

angles as in the "Endeavour" specimens. In *Socarnoides kergueleni*, Stebbing, which I have considered to be the same as the present species, the angles of the telson bear setules but the margin between is rather deeply indented or cleft. I give also a drawing of the third uropod (Fig. 3 *a*).

If all the forms I have grouped under the name *N. kidderi* are rightly included, the species is widely distributed in Australian and New Zealand seas and in Subantarctic regions.

TRYPHOSA SARSI, (*Bonnier*).

Tryphosa sarsi, Stebbing, 1906, p. 70.

Tryphosa camelus, Stebbing, 1910, p. 574, pl. xlvii. *a*.

Tryphosa nana, Sars, 1891, p. 76, pl. 27, Fig. 1.

Locality.—Bay of Fires, Tasmania, 10 fathoms. Many specimens, 3 mm. long; deep salmon coloured; eyes reddish.

I think these specimens must be referred to Stebbing's species, the type of which was obtained by H.M.C.S. "Thetis" off the coast of New South Wales, 54 to 59 fathoms. In some respects, however, they differ from Stebbing's description and approach still more nearly to *T. sarsi*, Bonnier, as described and figured by Sars under the name *T. nana* (1891, p. 76, pl. 27, fig. 1), and in my opinion Stebbing's name must be considered a synonym. The depression on the fourth segment of the pleon is not quite so narrow and deep as that shown in Stebbing's figure, but in some specimens at least it is well marked, while the posterior part of the segment is distinctly keeled. The variation in this character is sufficient to make one doubt its importance as a specific distinction. Stebbing states that in the second antenna the antepenultimate joint of the peduncle is, "contrary to custom, longer than the penultimate." This, however, is not the case in the "Endeavour" specimens, in which it is either shorter than, or equal to, the penultimate joint. The second gnathopod has the hinder angle of the hand not so acutely produced as shown in Stebbing's figure, but more like that figured by Sars for *T. sarsi;* the finger again is hardly "small and weak" as described by Stebbing, but agrees with the figure and description given by Sars, who speaks of it as being "rather strong." The peraeopods agree with Stebbing's description in having the basal joint large in comparison with the rest of the limb and the merus ("fourth joint") more expanded than is shown in Sars' figures. Stebbing describes the lobes of the telson as bearing three lateral spines instead of two as in *T. sarsi*. In some of my specimens, however, there are certainly only two lateral spines and, as stated below, there may be three lateral spines in *T. sarsi*.

I have compared the "Endeavour" specimens with specimens sent to me years ago by M. Chevreux from Le Croisic,

France, named "Tryphosa nana," and I cannot find any reliable character by which the two sets of specimens can be distinguished. These specimens from Le Croisie agree on the whole with the description and figures given by Sars, but have the fourth segment of the pleon in some cases at any rate distinctly keeled, while Sars describes his species as being easily known "by the absolute want of any dorsal projection" on the fourth segment of the pleon. The Le Croisie specimens, however, seem to show, just as do the "Endeavour" ones, that this character is by no means constant, but is subject to considerable variation in specimens collected at the same place and time. In the peraeopods again the Le Croisie specimens agree in the expanded meral joints with the "Endeavour" specimens, though the basal joint is perhaps a little shorter in proportion to the rest of the limb. In one of the Le Croisie specimens again the telson has three lateral spinules as in *T. camelus* instead of the two mentioned by Stebbing for *T. sarsi*.

The two species described by Sars under the names of *T. nana* and *T. Höringii* are united by Della Valle, and in this I am very much inclined to agree with him. He, however, considers them to be the same as *Anonyx nana*, Kröyer, which is considered by Stebbing to be a different species and is included in "Das Tierreich" Amphipoda under the name *Orchomenella nanus* (Kröyer).

It should be added that Walker in 1904 (p. 244) described, on a single male specimen from Ceylon, a new species, *Tryphosa cucullata*, which, he says, "is distinguished by the peculiar hooded character of the peduncular joints of the upper antennae." At the same time he recorded the occurrence in the seas of Ceylon of *Orchomenella nanus* (Kröyer) which had been collected in a different locality at a different time.

ENDEVOURA* MIRABILIS, *nov. gen. et sp.*

(Fig. 4 *a-q.*)

Locality.—East Coast of Flinders Island, Bass Strait. Numerous specimens. (Reg. No. E.4845.)

* The generic name has been formed by a slight alteration from the word "Endeavour," the name of the vessel by which the specimens were collected.

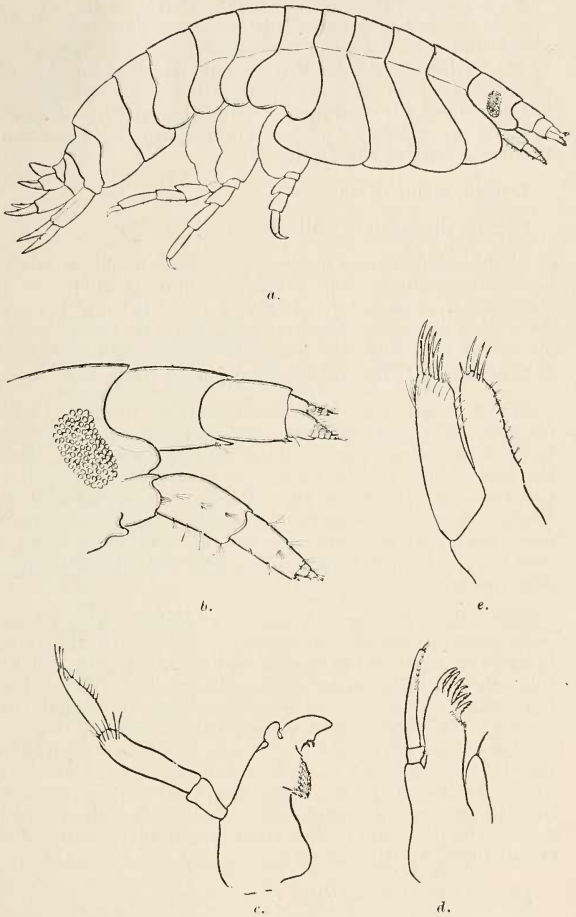


Fig. 4 *a—e*. *Endevoura mirabilis*, nov. gen. et sp. *a*. Side view of whole animal. *b*. Anterior portion of head with antennae. *c*. Mandible. *d*. First maxilla. *e*. Second maxilla.

Diagnosis. Antennae subequal, short, with reduced flagella; upper antennae with accessory flagellum. First gnathopod large, simple; second gnathopod of usual type in the Lysianassidae. First peraeopod developed into a subchelate grasping organ with greatly broadened propod. Telson entire with extremity rounded. In general shape, side plates, remaining peraeopoda and uropoda resembling the usual type of the family.

Length, about 6 mm.

Colour (in spirit), whitish.

The development of the first peraeopod in this species is most extraordinary, and I know nothing at all like it in the other Lysianassidae. At first I suspected that it might be a male character, but it is present in all the numerous specimens that I have been able to examine, although there is none among them that I am perfectly certain is a female.

The first gnathopod is also somewhat peculiar, being large in proportion to the second and somewhat ungainly in form, the distal portion lying in a different plane from the basal joints and being so curved that it is difficult to get a satisfactory view of the appendage. The very reduced flagella of both antennae are noteworthy, but in the remaining characters the animal presents the usual type found in the family Lysianassidae. The following is a detailed description:—

Both antennae (Fig. 4 *b*) are short and stout, the flagella being greatly reduced. In the upper antenna the first joint is much larger than the second, and the third joint is indistinguishable, being apparently sunk in the hollow end of the second. The primary flagellum is about one-half the length of the second joint of peduncle, composed of about five very short joints. The accessory flagellum is about half the size of the primary. The second antenna is of about the same length as the first, the antepenultimate joint slightly longer and considerably broader than the penultimate. The flagellum is very short, apparently composed of two or three small joints.

The eyes are large, oval.

In the mandibles (Fig. 4 *c*) the palp is well developed and arises at some distance from the base, it is considerably longer than the mandible itself, its second joint the longest

with several setae at the distal end, the third joint shorter and slightly narrower, with setae at the apex and some along one margin. The molar tubercle is fairly well developed and is situated distally to the base of the palp, and there are two small curved setules between it and the smooth cutting edge. On the outer side of the mandible, nearly opposite the molar tubercle, is a small rounded prominence similar to that figured by Sars in *Orchomenella ciliata*, Sars, and in other species.

The lower lip has the mandibular process well developed, each lobe rounded distally and fringed with setae, apparently small inner lobes more delicate than the outer lobes are present.

The first maxilla (Fig. 4 *d*) has the palp of two joints, the first very short, the second appears narrow as shown in Fig. 4 *d*, being seen in profile; when seen full-face it is broad, with rounded end bearing numerous short setules. The inner lobe is small and bears a single long seta at its rounded apex, the outer lobe is straight and bears seven or eight stout dentate setae.

The second maxilla (Fig. 4 *e*) has the two lobes subequal, the inner one bearing three long spinules at the apex and fine setæ along the inner margin, the outer has five or six long dentate setules at the apex and finer ones near their base.

The maxillipeds (Fig. 4 *f*) have both lobes well developed, the inner one with the inner margin straight and bearing fine setules, and one stouter spinule at some distance from the apex. The extremity is obliquely truncate and serrate, the appearance being similar to that caused by a number of short setae placed closely side by side. The outer lobe is much larger, reaching fully as far as the end of the carpus, its inner margin is finely crenulate or uneven, with curved lines reaching up to each crenulation; the surface bears three small spinules at some distance from the margin. In the palp the proportions of the joints are shown in Fig. 4 *f*. The terminal joint is not finger-like, but forms a broad oval.

The first gnathopod (Fig. 4 *g* and *h*) is very large and is peculiarly bent and curved so that it is difficult to get a view of the whole of it at the one time, the side plate is large, rounded anteriorly, the basal joint is very long and bears

on its anterior margin three or four short dentations. The ischium is very long and slightly narrowed proximally as usual; the remaining joints of the appendage are twisted so as to lie in a line almost at right angles to that of the basal joints. In Fig. 4 *g* they are shown in this position more or

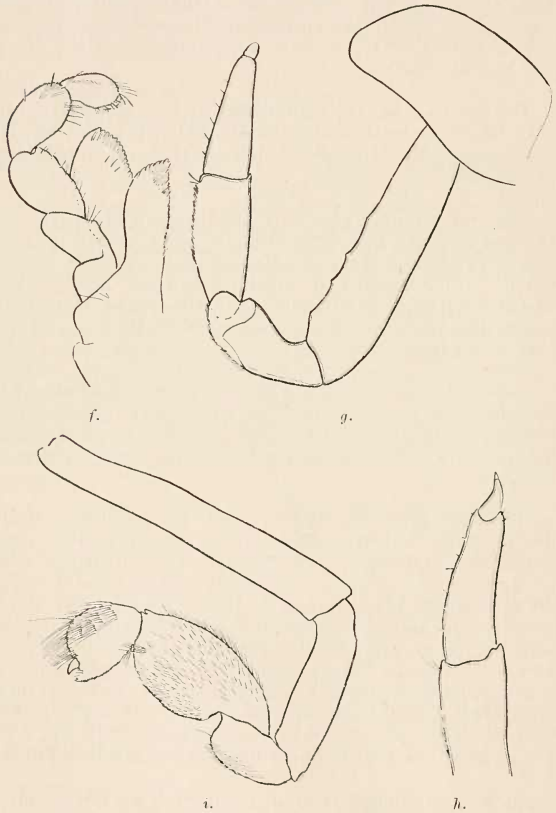
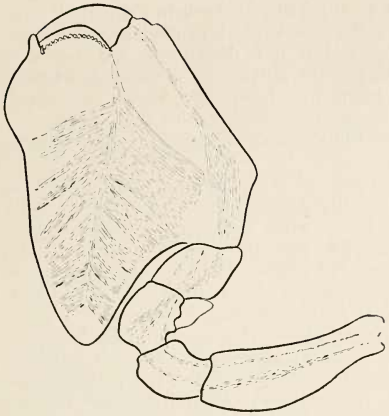
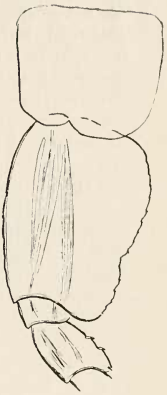


Fig. 4 *f*–*i*. *Endevoura mirabilis*, nov. gen. et. sp. *f*. Maxilliped. *g*. First gnathopod. *h*. Extremity of same seen full face. *i*. Second gnathopod.





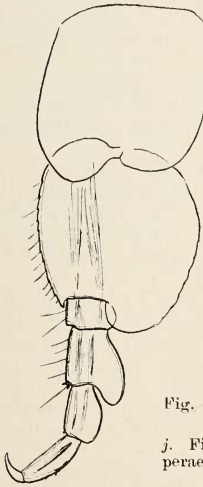


Fig. 4 *j*—*m*. *Endevoura mirabilis*, nov. gen. et sp.

j. First peraeopod. *k*. Second peraeopod. *l*. Third peraeopod. *m*. Fourth peraeopod.

less in profile, the apex of the finger being directed away from the observer; the carpus and propod are somewhat flattened, but are curved so it is difficult to get them in a position to show their full width, but a full-face view as given in Fig. 4 *h* shows that the propod, which is about as long as the carpus, narrows distally, and that there is no trace of a palm, the limb ending simply in the short, stout curved finger.

The second gnathopod (Fig. 4 *i*) is long and delicate and has the characters usually found in the Lysianassidae. The carpus is broadly oval, with its whole surface densely covered with fine short setules, the propod is much smaller than the carpus, oval in shape, with transverse rows of setules on its anterior margin. It projects slightly so as to form a minute chelate joint with the short finger.

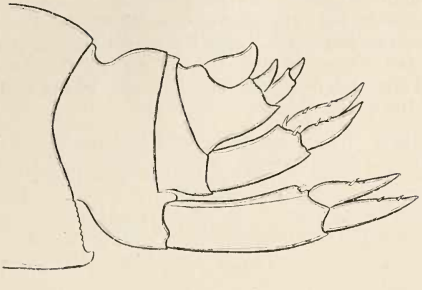
The first peraeopod (Fig. 4 *j*) is large and of extremely peculiar appearance, forming a powerful subchelate organ. The propod is immensely enlarged and is irregularly quadrate in shape, the postero-distal portion being produced backwards into a lobe reaching nearly to the proximal end of the merus, it narrows somewhat distally, the palm being only half the distal width of the joint, defined by a stout tooth, regularly convex and fringed with a row of very short, stout teeth; the finger is short and stout, fitting closely on to the palm.*

The second peraeopod (Fig. 4 *k*) is normal, and has the side plate produced backwards, along the lower margin of the fifth side plate, into a moderately large lobe about as broad as deep.

The third peraeopod (Fig. 4 *l*) has the side plate very large, deeper than broad, lobed below, the posterior portion widely expanded, oval, anterior margin fringed with setules arising from slight serrations, posterior margin with minute crenulations. The merus is produced postero-distally into a rounded lobe.

The fourth (Fig. 4 *m*) and fifth (Fig. 4 *n*) peraeopods are of similar shape, the fifth slightly larger than the fourth, the basal joint narrower than in the third, and with the posterior margin somewhat irregular in outline, slightly concave towards the distal end and with minute crenulations. The third pleon segment has the infero-posterior angle quadrate, the angle itself being produced into a short point.

* In another specimen, subsequently examined, the palm projects much more and the limb might be described as chelate.



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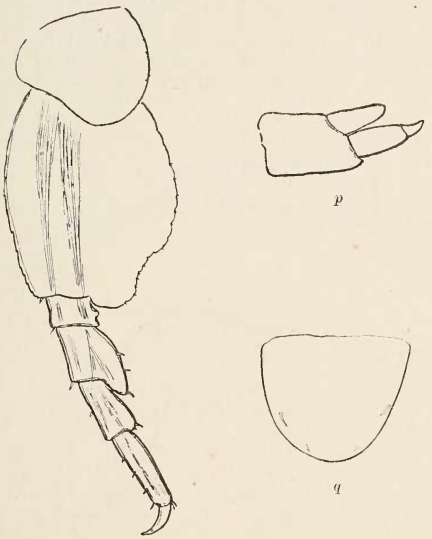


p

q

n

Fig. 4 *n*—*q*. *Endevoura mirabilis*, nov. gen. et sp. *n*. Fifth peraeopod. *o*. Terminal portion of pleon with side view of uropods and telson. *p*. Third uropod. *q*. Telson.

The first uropod with the branches subequal, shorter than the peduncle; the second uropod similar but shorter and the branches rather broader in proportion, the third uropod (Fig. 4 *p*) very short, two-branched, outer branch of two joints, inner branch one-jointed, as long as the first joint of the outer.

The telson (Fig. 4 *q*) short, entire, forming a half oval, and bears two minute spinules on each side near the margin.

EUONYX NORMANI, *Stebbing.*

(Figs. 5 *a-d.*)

Euonyx normani, Stebbing, 1906, p. 19.

Locality.—East Coast of Flinders Island, Bass Strait. One male, length about 18 mm. (Reg. No. E. 4851.)

I think this specimen must be referred to Stebbing's species although there are one or two points of difference. In the general shape, the small first side plate, large second

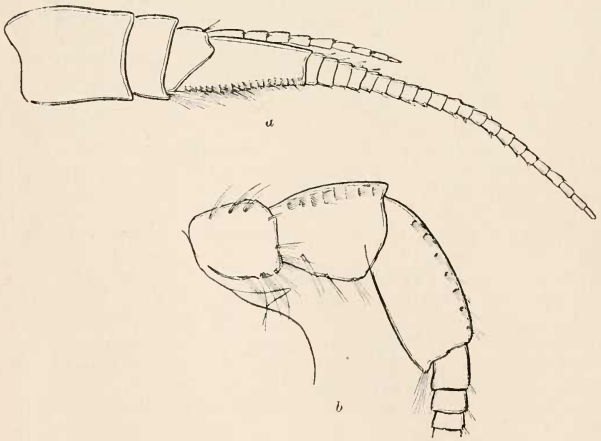


Fig. 5 *a—b*. *Euonyx normani*, Stebbing, male.
a. First antenna. *b*. Second antenna.

plate produced into a rounded anterior lobe and in the peraeopoda, etc., it agrees well with his figures, but the first antennae seem shorter in proportion to the second. In the "Endeavour" specimen these (Fig. 5 *b*) have the general characters found in males of similar genera and have the flagellum elongated to about one-half the length of the body. The eye is large and oval. The first gnathopod is similar to the figure given by Stebbing, but is considerably longer and more slender; the second gnathopod is also long and slender, agreeing well with Stebbing's figure and description. Stebbing's specimen, which was a female, was obtained in the South Pacific near the Kermadec Islands at a depth of 1,140 metres.

In the first antenna (Fig. 5 *a*) the first joint of the flagellum is very long and bears on the under side numerous short transverse rows of fine setae, the joints of the flagellum bear calceoli and are twenty-three in number, while the accessory flagellum contains nine, of which the first is the longest. The last joint of the second antenna is longer than

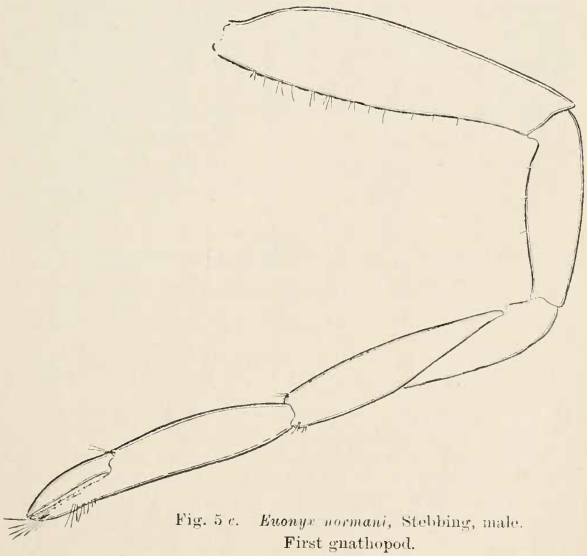


Fig. 5 *c*. *Euonyx normani*, Stebbing, male. First gnathopod.

the preceding, both bear transverse tufts of setae on the upper surface, the flagellum contains seventy-nine joints, many of the proximal ones bearing calceoli.

The gnathopoda are shown in Fig. 5 *c* and *d* and do not call for detailed description; the first bears very few setules and the second has the structure commonly found in the Lysianassidae; in both the ischial joint is considerably elongated.

The type specimen, which was a female, was taken off the Kermadec Islands, and the species is now for the first time recorded from the Australian coast.

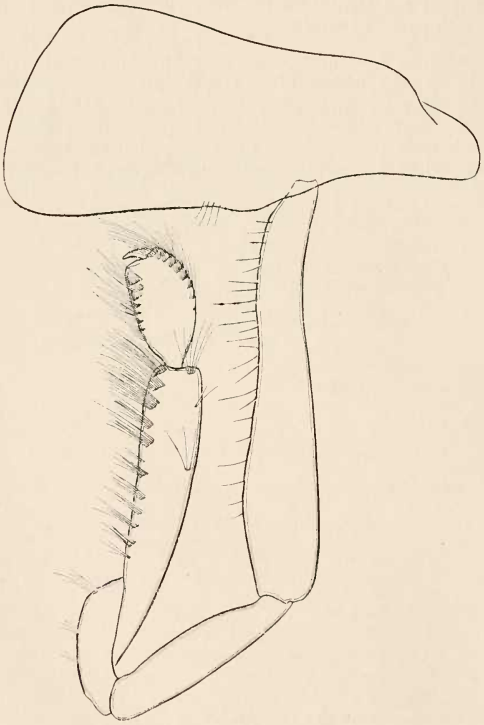


Fig. 5 *d*. *Euonyx normani*, Stebbing, male. Second gnathopod.

AMARYLLIS MACROPHTHALMA, *Haswell.*

Amaryllis macrophthalma, Haswell, 1880*a*, p. 253, pl. viii., fig. 3.

Amaryllis macrophthalma, Stebbing, 1910, p. 569.

Amaryllis macrophthalma, Barnard, 1916, p. 114.

Localities.—10 miles north of Circular Head, Tasmania. Several specimens.

Eastern Slope, Bass Strait; several specimens.

Tasmanian Coast; several.

60-80 miles west from Eucla, 80-120 fathoms; one specimen.

Off Cape Jervis, South Australia; one.

East Coast of Flinders Islands, Bass Strait; one.

These specimens vary very much in size, the largest being 20 mm. in length. They seem all referable to this species.

Barnard has recently given a fuller account of the species, based on the examination of specimens from South Africa, and his description appears to agree well with the "Endeavour" specimens. He points out that some forms have pale eyes, while others from the same locality have dark eyes. All the "Endeavour" specimens have dark eyes.

Distribution.—Australia, New Zealand, South Africa, and the Straits of Magellan.

ANDANIOTES CORPULENTUS, (*G. M. Thomson*).

Andaniotes corpulentus, Stebbing, 1910, p. 575.

Locality.—Eastern Slope, Bass Strait.

One small specimen, about 3 mm. long. (Reg. No. E. 5356.)

This agrees well with the description given by Stebbing. The species was originally recorded from New Zealand waters, but was taken in Australian seas by the "Thetis" and Chevreux has recorded it from Port Charcot in Antarctic regions. Stebbing (1910, p. 575) also recorded that it was taken by the "Scotia" Expedition in Lat. 66° 40′ S., Long. 40° 35′ W.

SEBA TYPICA, (*Chilton*).

(Fig. 6 *a-d.*)

Teraticum typicum, *Chilton*, 1884, p. 257, pl. 18, figs. 1*a—f*.

Seba typica, Chilton, 1906, p. 572, (with synonymy).

Locality.—East Coast of Flinders Island, Bass Strait, about 10 specimens, all small, the largest with body 4.5 mm. long.

These specimens were found along with numerous other Amphipoda collected at the same time. After examining them and comparing them with New Zealand specimens, I have no hesitation in referring them to this species, *S. typica*, which has hitherto been known only from a very few small-sized specimens from New Zealand.

There are altogether five species described of the genus *Seba*, all of them somewhat imperfectly known. In two of the species the male differs from the female in the shape of the first gnathopod. In the male the propod of the first gnathopod is expanded and the palm shows various projections or teeth with concave depressions between them. In the female the propod is much smaller and has the palm produced so that the limb is distinctly chelate, the inner margin of the fixed finger—*i.e.*, the palm—being straight or almost so.

In his account of *S. antarctica* Walker (1907, p. 37) pointed out that the male of that species differs from the female in the posterior peraeopoda, which had the meral joint very much broadened and expanded posteriorly. Walker speaks of his species as having dimorphic males, some being similar to the female and distinguished from it only by the absence of incubatory lamellae, the others larger and differing in the expansion of the meral joint of the last three pairs of peraeopoda; though, according to Walker's account and figures, these large males have the first gnathopod similar to that of the female. In *S. saundersii* Stebbing the female only is known, but in the two species, *S. armata* (Chevreux) and *S. typica* (Chilton) there is a form which has been described as the male differing, as already mentioned, from the female in the configuration of the palm of the first gnathopod; in these two species the difference in the meral joint of the last peraeopods has not previously been noticed.

The largest of the "Endeavour" specimens, which measure 4.5 mm. in length of body, differ from the figure

of the male that I had previously given of New Zealand specimens in having the meral joints of the posterior peraeopoda as greatly expanded as in *S. antarctica* and in having the palm of the first gnathopod very distinctly

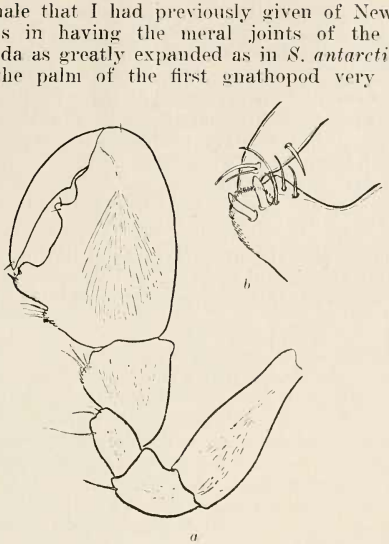


Fig. 6 *a*—*b*. *Seba typica*, Chilton, male.
a. First gnathopod. *b*. End of palm with tip of finger (more highly magnified).

oblique instead of being transverse, though the armature of the palm itself is closely similar (Fig. 6 *a* and *b*). I find, however, that the small specimens collected by the "Endeavour," measuring only about 2 mm. in length of body, have the palm transverse as in the New Zealand specimens, which are of about the same size, and, as in them, the meral joint of the posterior peraeopoda is only slightly broadened. Transitional forms are also found, and it appears evident that the expansion of the meral joints of the peraeopods is greatest in fully developed males and is gradually attained, and that in young males the palm of the first gnathopod is transverse or even projecting, while in the larger or older males it becomes gradually more and more oblique. The expansion of the merus of the fifth peraeopoda increases in proportion to the greater obliqueness of the palm of the first gnathopod. Probably in quite young males the first gnathopod is similar to that of the

female; I have one small specimen that I presume is a young male which has the first gnathopod almost the same as in the female, but with the palm more nearly transverse and slightly irregular. Among the "Endeavour" specimens there is no female bearing eggs, but there is one specimen which has the first gnathopod similar to that described by Stebbing for *S. saundersii* or to the female of *S. armata* as described and figured by Chevreux. It has the first gnathopod distinctly chelate and the distal portion bent inwards in a different plane from that of the basal half, so that it is difficult to get the whole gnathopod in view at one time.

Individuals with the first gnathopoda having this same chelate form were found by Walker in *S. antarctica* bearing eggs, and we may therefore presume that this "Endeavour"

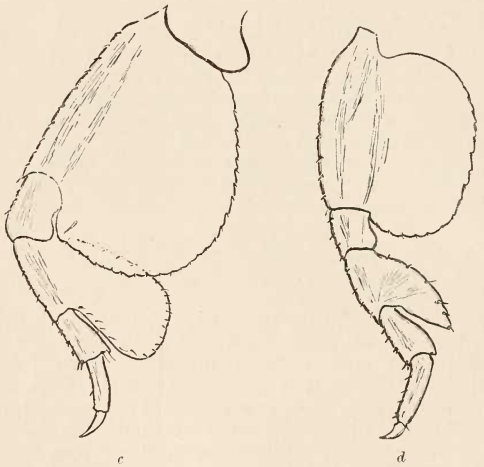


Fig. 6 *c—d*. *Seba typica*, Chilton, male.
c. Fifth peraeopod. *d*. Fourth peraeopod.

specimen is also a female. In *S. antarctica* Walker speaks of dimorphic males, but as the two forms he describes differ only in the amount of expansion of the meral joints of the posterior peraeopoda they are probably rather to be considered as different stages of development. In *S. antarctica*, therefore, the males appear to differ from the females only in the great expansion of the meral joints of the posterior

peraeopoda. In his figure of the whole animal Walker (1907, pl. 13, fig. 22) shows the meral joints of the third, fourth and fifth peraeopoda all equally expanded. In the "Endeavour" specimens of *S. typica* it is only the fifth peraeopod that has the very marked expansion and in some specimens the joint is produced posteriorly more than is shown in Walker's figures (sèe Fig. 6 *c*); in the fourth peraeopod (Fig. 6 *d*) there is considerably less expansion, and in the third still less, the meral joint showing the same amount of dilatation as in the female.

In *S. armata*, as in *S. typica*, the male differs from the female in the armature of the palm, the projections and teeth being similar to those of the latter species, but the propod is markedly produced so that the gnathopod is distinctly chelate. Chevreux gives the size of the males examined by him as scarcely 3 mm., and it is possible that they were not fully mature, and that older specimens would have the palm more transverse or even obliquely subchelate. The male figured by Chevreux shows no expansion of the meral joint of the last peraeopod; either it is not yet developed or the species differs in this point from *S. typica*.

As Walker has already pointed out, the females of all the species described are practically indistinguishable.

*Seba typica** is known from New Zealand and from Bass Strait between Australia and New Zealand. *S. saundersii* Stebbing, with which *S. typica* was at one time united, and with which it may ultimately prove to be identical, is known from Cape Virgins, Patagonia, and, with some doubt, from Algoa Bay, S. Africa. *S. antarctica* Walker is known from South Victoria Land in the Antarctic; *S. armata* Chevreux from the Gulf of Gascony and the Azores. The remaining species, *S. innominata* Bate was recorded from the Gulf of Naples, but is still imperfectly known.

LEUCOTHOE SPINICARPA, (*Abildg.*).

Leucothoe spinicarpa, Stebbing, 1906, p. 165.
Leucothoe spinicarpa, Chilton, 1912, p. 478.
Leucothoe spinicarpa, Barnard, 1916, p. 148
Leucothoe miersi, Stebbing, 1906, p. 165.
Leucothoe commensalis, Stebbing, 1910, p. 580.

* Stebbing (1906, p. 163) gives *S. typica* and *S. armata* as synonyms of *S. saundersii*. In view of the facts mentioned by Walker in his description of *S. antarctica*, I have spoken of all these forms as separate species pending further investigation.

Localities.—Tasmanian Coast and Eastern Slope, Bass Strait. Three specimens. (Reg. Nos. E. 5352 and E. 5356.)

Forty miles west of Kingston, South Australia, 30 fathoms. Several specimens. (Reg. No. E. 4862.)

I am referring these specimens to the species mentioned above, which is of world-wide distribution. To the synonyms previously given Barnard has definitely added *L. commensalis* Haswell and *L. miersi* Stebbing, which I had also done in my MS. notes before I received Mr. Barnard's paper.

COLOMASTIX BRAZIERI, *Haswell.*

(Fig. 7 *a-h.*)

Colomastix brazieri, Haswell, 1880*b*, p. 341, pl. 22, fig. 4.

Colomastix brazieri, Stebbing, 1906, p. 206.

Colomastix brazieri, Chilton, 1912, p. 484.

One specimen, male, about 6 mm. long, exact locality not recorded.

Distribution.—Australia, New Zealand, South Orkneys.

As this species is as yet only imperfectly known and belongs to a peculiar genus, the following description of the single specimen obtained by the "Endeavour" may be acceptable.

The general shape of the body agrees with Haswell's description, and is shown in Fig. 7 *a*; the back is smooth; the side plates are all shallow and present no peculiarity.

The antennae (Fig. 7 *b*) are stout, pediform, the flagellum being vestigial in both. The first antenna has the first joint about the same length as the second, both end in subacute teeth and sharp spines above and below, and bear a row of spinules on the under surface, in the first segment the under surface being concave with spines along both margins; the third joint is considerably shorter than the second, but ends similarly with spines. The flagellum is represented only by one or two minute joints, the first one being produced to an acute point reaching to the end of the

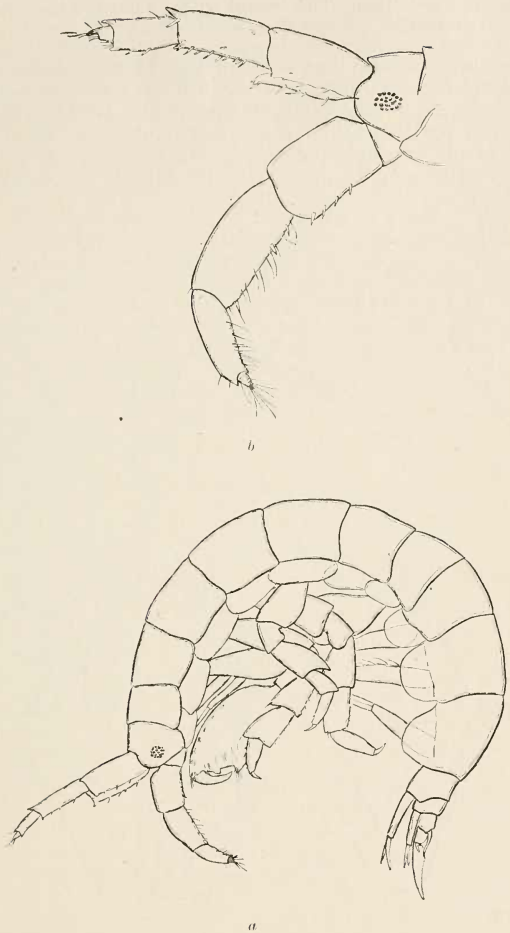


Fig. 7 *a*–*b*. *Colomastix brazieri*, Haswell, male.
a. Side view of animal. *b*. Head and antennae.

vestigial flagellum. The second antenna has the third joint of the peduncle stouter than the fourth or fifth and bearing stout spinules on its lower margin; the fourth joint is longer and stouter than the fifth, both bear slender setules on the lower margin, and the fifth is produced at the extremity into subacute teeth above and below; the flagellum is vestigial, being composed of four or five segments fused into a single piece and bearing numerous slender setules towards the apex. The maxillipeds are shown in Fig. 7 *c*.

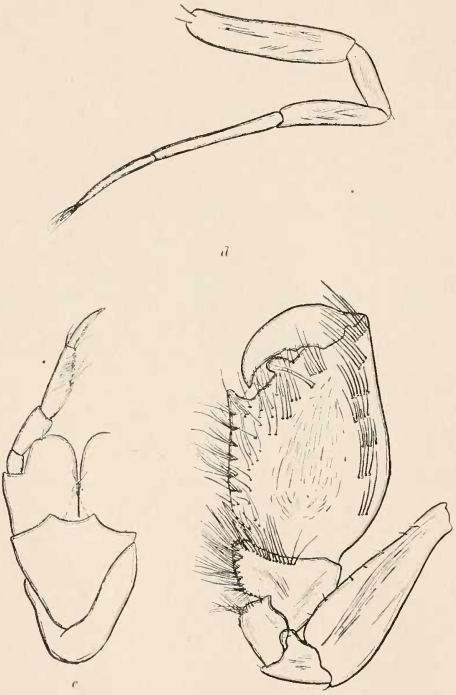


Fig. 7 *c—e*. *Colomastix brazieri*, Haswell, male.
c. Maxillipeds. *d*. First gnathopod. *e*. Second gnathopod.

The first gnathopod (Fig. 7 *d*) is very small, long, slender and delicate, and ends without dactyl in a small tuft of setae as in *C. pusilla* (Grube).

The second gnathopoda (Fig. 7 *e*) are large and powerful, the right and left equal in size. The basal and ischial joints are produced into a flange on the inner side against which the large propod rests when reflexed. The carpus is short and subtriangular and bears on the posterior margin several transverse rows of long setules, a similar row extending along the distal margin on the inner side. The propod is greatly dilated, being fully two-thirds as broad as long; it bears numerous transverse rows of setae near the anterior margin, others along the posterior margin and numerous single setae scattered at various places on the inner surface; the palm is defined by a stout subacute tooth, is broad, and shows two or more rounded prominences; the finger is short, stout, strongly curved, and fits into a depression near the defining tooth.

The peraeopoda call for no special remark, the third, fourth and fifth have the basal joint only slightly dilated. (See Figs. 7 *f* and *g*.)

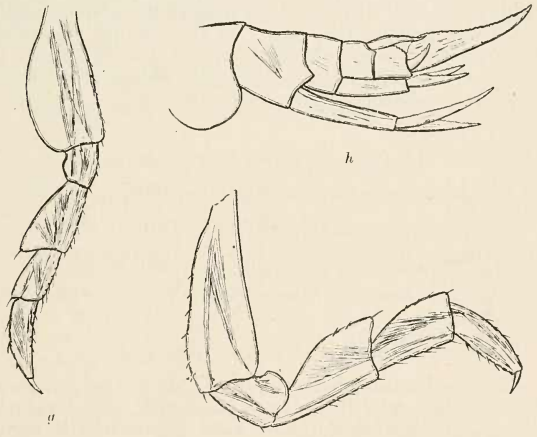


Fig. 7 *f*—*h*. *Colomastix brazieri*, Haswell, male.
f. First peraeopod. *g*. Fifth peraeopod.
h. Pleon, with uropoda and telson.

The first and second uropoda are small and have the rami small, styliform and subequal, both finely serrate on the upper margin. In the third uropod the outer ramus is small, slender and shorter than the peduncle; the inner ramus is much longer, three times as long as the peduncle, flattened vertically, the upper margin serrate or irregularly dentate. (Fig. 7 *h*).

The telson reaches beyond the end of the peduncle of the third uropod.

Colour.—In spirit, dull white, eye red, green according to Stebbing.

The single New Zealand specimen that I have is much smaller, and is probably immature. It was obtained by surface net in Port Chalmers in 1904; it is still greenish in colour (mounted in glycerine jelly) and when alive the eye was a bright red. The second gnathopod is small and appears like that of *C. pusilla* as figured by Bonnier (1893, pl. 8), who says his figure is that of an adult male, though judging from the "Endeavour" specimen it seems possible that his were not fully developed. In the third uropod the outer ramus is much shorter than the inner. In the "Scotia" specimens from South Orkneys the outer ramus was two-thirds the length of the inner. Probably as the animal develops the inner ramus becomes longer in proportion.

Liljeborgia brevicornis, (*Bruz.*).

Liljeborgia brevicornis, Stebbing, 1906, p. 231.

Liljeborgia aequabilis, Stebbing, 1910, p. 588.

Liljeborgia pallida, Sars, 1894, p. 530, pl. 187.

Locality.—Eastern Slope, Bass Strait. (Reg. No. E. 5356.)

Three specimens, the largest 12 mm. long.

These specimens are certainly similar to those described by Stebbing under the name *L. aequabilis*, agreeing in the absence of dorsal dentation, but the species is, I think, too close to *L. brevicornis* Bruz. to be retained as a separate species. Stebbing mentions several small points of difference, and of these the first one, namely, the absence of a projecting tooth at the lower hind corner of the first and

second side plates holds good in the specimen I have specially examined, but these teeth are so small in *L. brevicornis* that their absence is not a very important character. The third pleon segment has the lateral margin straight and shows no emargination above the postero-lateral tooth; the slender finger of the fifth pair of peraeopods is not more than one-third the length of the propod, and is thus similar to the figure given by Sars; the length of this finger appears to vary, being longer in smaller specimens; the telson has only a single seta in the notch at the end of each lobe, thus agreeing with Sars' figure and differing from Stebbing's description. The slight differences mentioned by Stebbing in the gnathopods appear of little importance, those of my specimen agreeing quite closely with the figures given by Sars, the palm of the second having a small concave depression near the base of the finger.

L. brevicornis Bruz. is known from the Arctic Ocean and the North Atlantic. If *L. aequabilis* is really the same its range is extended to Australian seas.

The species *L. proxima* Chevreux from the Gambier Archipelago should, in Mr. Barnard's opinion, become a synonym of *L. aequabilis*. He records it from False Bay, South Africa.

Liljeborgia dubia, (*Haswell*).

Liljeborgia dubia, Stebbing, 1906, p. 233, and 1910, p. 638.

Liljeborgia dubia, Chilton, 1912, p. 485.

Locality.—Tasmanian Coast. Two specimens, the largest 15 mm. long. (Reg. No. E. 5352.)

These specimens agree on the whole with the description of this species given by Stebbing in 1906. The sixth and seventh segments of the peraeon are produced into a sharp dorsal tooth and there is a minute tooth on the fifth segment also; the teeth and carinations on the pleon are as described by Stebbing.

L. dubia is known from Australia, New Zealand, South Africa, the South Orkneys, and South Victoria Land. The closely allied species *L. consanguinea* has been recorded by Stebbing from Kerguelen and Heard Islands and by Chevreux from Marguerite Bay in the Antarctic. The two species present many points in common which are also found in the European species *L. fissicornis* (Sars.)

OEDICEROIDES ORNATUS, (*Stebbing*).

Oediceroides ornatus, Stebbing, 1906, p. 270, and 1910, p. 589.

Locality.—Eastern Slope, Bass Strait. One specimen, about 12 mm. long. (Reg. No. E. 5356.)

This specimen agrees with *O. ornatus* in the shape of the eyes, which extend to the acute tip of the frontal process, and in the little process to which the ventral carina of the rostrum is produced. It was obtained in Bass Strait near where the typical species was collected. The segments of the body bear rounded corrugations, but there is an absence of the small tubercles which appear to be so marked in Stebbing's figure, the species in this respect being more similar to *O. cinderella* from the Falkland Islands. However, the resemblance in the eyes and in the appendages is, I think, sufficient to warrant its being assigned to *O. ornatus*.

The species was taken by the "Thetis" off Port Hacking and also from Botany Bay, New South Wales.

BOVALLIA MONOCULOIDES, (*Haswell*).

Bovallia monoculoides, Chilton, 1909, p. 622, and 1912, p. 494.

Eusiroides monoculoides, Stebbing, 1910, p. 595.

Eusiroides monoculoides, Barnard, 1916, p. 174.

Eusiroides crassi, Stebbing, 1910, p. 594.

Localities.—Tasmanian Coast. Four specimens, the longest about 20 mm. in length. (Reg. No. E. 5352.)

Forty miles west of Kingston, South Australia, 30 fathoms. Two specimens, each about 15 mm. long. (Reg. No. E. 4862.)

Under the name *Bovallia monoculoides* or *Eusiroides monoculoides* a number of forms have been grouped, the relations of which are rather puzzling. In the "Challenger" Report, Stebbing described three species under the new genus *Eusiroides*, namely, *E. caesaris*, *E. pompeii*, and *E. crassi*. In "Das Tierreich" Amphipoda he united the first two as synonyms of the previously described species

Atylus monoculoides Haswell, but left *E. crassi* as a distinct species. In 1909 I identified specimens from the Auckland Islands with *E. crassi* and gave various reasons for the opinion that it could hardly be kept as a species distinct from *E. monoculoides* (i.e., *E. caesaris* and *E. pompeii*). I also pointed out that my specimens appeared to be nearly identical with *Bovallia gigantea* as described by Pfeffer and Chevreux. In 1912, after comparing specimens gathered by the "Scotia" with co-types of *Bovallia gigantea*, I remained still of the same opinion. In 1913, p. 168, Chevreux advanced several reasons for considering *Bovallia gigantea* distinct from *B. monoculoides*. In drawing up these differences he has, I think, based some of them on the published descriptions of *E. caesaris*. It has been pointed out by Walker, Stebbing and myself that in *B. monoculoides* there are very considerable variations in the presence and acuteness of the dorsal teeth and in the amount of serration of the posterior margin of the third pleon segment. Certainly extreme forms of *E. monoculoides* (i.e., *E. caesaris*) and *B. gigantea* look considerably different, but if we are to unite under one species *E. caesaris*, *E. pompeii* and *E. monoculoides*, then the differences between these forms and *Bovallia gigantea* do not seem to me to be sufficient to warrant us in keeping them distinct from that species. Whether the different forms are to be distinguished by different names or not is a point of comparatively little importance, the main point is to ascertain the characters of the forms under consideration and the amount of variation they show. This will be illustrated by the following brief description of the specimens gathered by the "Endeavour."

Off the Tasmanian Coast, four specimens (Reg. No. E. 5352) were collected. One of these is a female fully 20 mm. long with recently hatched young in the brood pouch. Both upper and lower antennae agree well with the figures given by Stebbing for *E. caesaris* and also with those given by Chevreux for *Bovallia gigantea*, except that the calceoli are not so numerous on the peduncular joints. The third pleon segment has the posterior margin convex and without serrations, the angle being very slightly produced, in this respect agreeing with both *E. crassi* and *B. gigantea*. None of the segments are produced dorsally into teeth; the fourth pleon segment shows a depression, more distinctly marked than in Stebbing's figure; the fifth segment is produced posteriorly into a short median triangular tooth, which in side view appears as a narrow

curved tooth. In the absence of dorsal teeth and of serrations on the third pleon segment this specimen agrees with *E. crassi*. A second specimen, about 15 mm. long, a female bearing eggs, is similar in general appearance and in the appendages, but has the posterior margin of the third pleon segment with numerous dentations as drawn by Stebbing for *E. pompeii*, there is a very slight indication of pleon segments one and two being produced into dorsal teeth, but no sign of a tooth on pleon segment four, the presence of which in the previous specimen seems to be exceptional. The third specimen, also a female with eggs, about 13 mm. long, has the first and second pleon segments very slightly produced, and is similar to the second in practically all other characters, but the third pleon segment has more numerous serrations, these being nearly as numerous as shown by Stebbing for *E. caesaris*. The fourth specimen, about 12 mm. long, also a female, is similar to the second and third but has only about six or seven serrations on the third pleon segment, the rest of the margin being slightly uneven.

Off Kingston, South Australia, two specimens (Reg. No. E. 4862) were collected, each about 15 mm. long, and having the serrations on the third pleon segment intermediate in character between those shown for *E. caesaris* and *E. pompeii* by Stebbing. One of them also showed very slight dorsal production of pleon segments one and two.

Certainly all the "species" mentioned above must, in my opinion, be placed in one genus, and the name *Bovallia* appears to have priority over *Eusiroides*.

PARAMOERA AUSTRINA, (*Bate*) var. MEGALOPHTHALMA, (*Haswell*).

(Fig. 8 *a-c*.)

Paramoera australina, (part), Stebbing, 1906, p. 363.

Paramoera australina, (part), Chilton, 1909, p. 625, and 1912, p. 498.

Paramoera australina, (part), Stebbing, 1910, p. 456.

Localities.—Entrance to Oyster Bay, Tasmania. Many specimens. (Reg. No. E. 4764.)

Port Arthur, Tasmania. Many specimens. (Reg. No. E. 4765.)

Tasmanian Coast. Seven specimens. (Reg. No. E. 5352.)

Under the name, *Paramoera austrina*, Stebbing has grouped a large number of forms to which I have added others. He included the species originally described by Haswell as *Atylus megalophthalmus*. I have since pointed

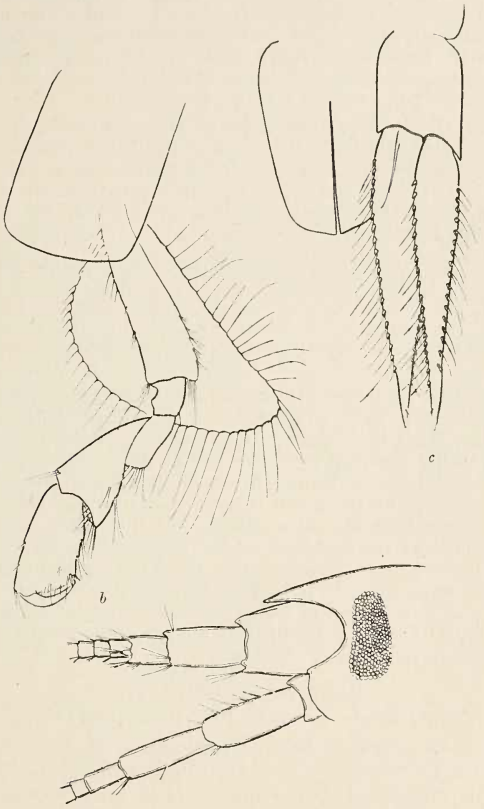


Fig. 8 *a*—*c*. *Paramoera austrina* Bate, var. *megalophthalma* Stebbing. *a*. Head and bases of antennae; showing rostrum. *b*. Second gnathopod of female. *c*. Third uropod and telson.

out that this form differs from the others in sufficient points to warrant its being considered a separate variety, if not a species. Similarly the form from South Africa, with several teeth on each lobe of the telson, which I described in 1912, has been considered by Barnard to be sufficiently distinct to be recognised as a separate species under the name *P. capensis* (Dana). Further discussion of the various forms is given by Barnard (1916, p. 183), who includes *Atyloides magellanica* Stebbing (1888, p. 925, pl. 79) as a synonym of *P. capensis* (Dana).

The "Endeavour" specimens all appear to belong to the variety *megalophthalma*, which may be distinguished by the very large eyes, the presence of a distinct rostrum (Fig. 8 *a*), the shorter and more triangular carpal joints of the gnathopoda (Fig. 8 *b*), the broader rami of the third uropods and the absence of setae from the telson (Fig. 8 *c*).

The accessory flagellum seems to vary, as might be expected. In the specimens from Port Jackson that I have examined it is almost indistinguishable and apparently fused to the last joint of the peduncle; in the "Endeavour" specimens it is fairly distinct as in typical specimens of the species.

Stebbing considers *Atylus microdeuteropus* Haswell from Port Jackson to be a synonym of *Amphitoe* (*Iphimedia*) *simplex* Dana from Hermit Island, and says that the species is probably identical with *P. austrina* Bate. There is very considerable resemblance between the descriptions and figures given by Dana and Haswell, and it is probable they were describing the same species, but the enlargement of the joints of the flagellum of the first antenna mentioned and figured by each seems to me to be too marked and too widely separated—"every third or fourth" (Haswell)—to apply to *P. austrina*, in which every second joint is dilated but only to a slight extent, and the species more probably belongs to the genus *Pontogeneia*.

Melita fresnelii (*Aud*).

Melita fresnelii, Stebbing, 1906, p. 423, and 1910, p. 596.

Locality.—Sanders Bank, Kangaroo Island, 28 fathoms. Several specimens (male and female). (Reg. No. E. 4855.)

This widespread species appears to be fairly common in Australian seas. The specimens examined agree well with the description given by Stebbing in 1906, though the numbers of teeth on the posterior margins of the pleon segments do not appear to be constant.

CERADOCUS RUBROMACULATUS (*Stimpson*).

(Fig. 9 *a-c*).

Ceradocus rubromaculatus, Stebbing, 1910, p. 598 (with synonymy).

Ceradocus rubromaculatus, Chilton, 1916, p. 369.

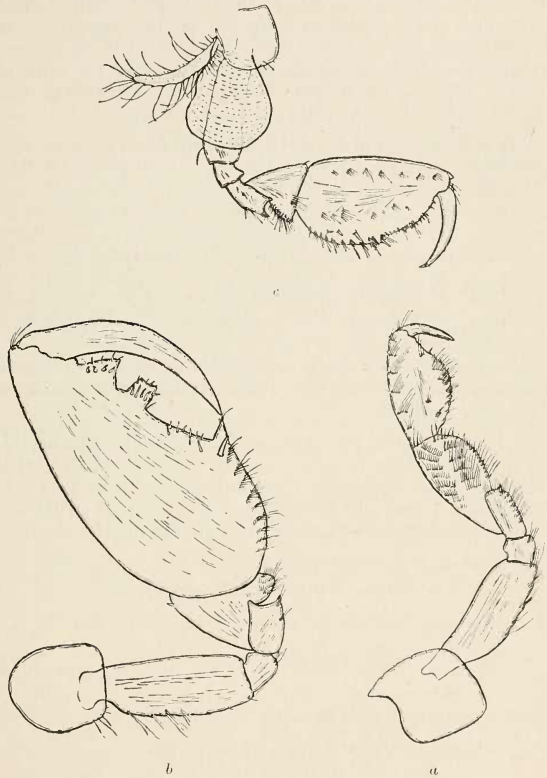


Fig. 9 *a—c*. *Ceradocus rubromaculatus* (Stimpson).
a. First gnathopod of male. *b*. Second gnathopod of male.
c. Second gnathopod of female.

Localities.—Tasmanian Coast. (Reg. No. E. 5352.)

Ten miles North of Circular Head, Tasmania.

Eastern Slope, Bass Strait. (Reg. No. E. 5356.)

Of this species there are several specimens, males and females, from the localities mentioned. I give figures of the first and second gnathopods of the male and of the second gnathopod of the female, which will readily indicate their structure and the arrangement of the setae without further description. In the male the palm is very oblique, while in a form from the Gambier Archipelago referred to this species by M. Chevreux, the palm is transverse.

The species is widely distributed in New Zealand and Australian seas. I have discussed its occurrence in New Zealand in the paper quoted above.

Maera inaequipes, (*A. Costa*).

Maera inaequipes, Stebbing, 1910, p. 599.

Maera inaequipes, Chilton, 1916, p. 365, figs. 5 and 6, and 1917, p. 19.

Locality.—Fifteen miles N.W. of Cape Jervis, South Australia, 17 fathoms. One ovigerous female, 6 mm. long. (Reg. No. E. 4842.)

In this specimen the right and left second gnathopods are equal, the palm regularly convex. The third uropod is missing. I have recorded the occurrence of this species in New Zealand seas and have made some remarks on its distribution and variations in the two papers quoted above.

Maera mastersii, (*Haswell*).

Megamoera mastersii, Haswell, 1880*a*, p. 265, pl. 11, fig. 1.

Maera mastersii, Stebbing, 1906, p. 439, and 1910, p. 642.

Maera mastersii, Chevreux, 1908, p. 481.

Maera mastersii, Chilton, 1916, p. 367.

Maera mastersii, Barnard, 1916, p. 195.

Locality.—Forty miles West of Kingston, South Australia, 30 fathoms. One specimen, 6 mm. long.

I have described this species in detail in the paper mentioned above. It is known from Australian and New Zealand seas, from the Kermadec Islands, South Africa, and the Gambier Archipelago.

MAERA HAMIGERA, (*Haswell*).

Maera hamigera, Stebbing, 1910, p. 600.

Maera hamigera, Barnard, 1916, p. 196.

Locality.—Eastern Slope, Bass Strait. Four specimens, length about 12 mm. (Reg. No. E. 5356.)

These specimens undoubtedly belong to this species, agreeing well with specimens received from Port Jackson, New South Wales. They also correspond on the whole with the description of the species given by Barnard of South African specimens, except that the large right second gnathopod of the male differs in having the palm distinctly transverse and in a slightly different armature; the finger is stout but not scimitar-shaped as in his specimen. Apparently there is considerable difference in the second gnathopod of this species as I have another specimen from Port Jackson which I think must be referred to the species, though it differs both from the typical form and from that described by Mr. Barnard.

The species is known from Australia, South Africa and from the Indian Ocean.

MAERA VIRIDIS, *Haswell*.

Maera viridis, Haswell, 1880*b*, p. 333, pl. 21, fig. 1.

Elasmopus viridis, Stebbing, 1906, p. 445, and 1910, p. 643.

Maera viridis, Chilton, 1916, p. 362.

Locality.—Eastern Slope, Bass Strait. One specimen, about 6 mm. long.

In this specimen gnathopod two has the palm slightly projecting and even—*i.e.*, without notches—except for the deep narrow notch next to the sharp defining tooth.

I have discussed this species in the paper quoted above. It is widely distributed in Australian and New Zealand seas.

ELASMOPUS DIEMENENSIS, (*Haswell*).

(Fig. 10 *a-c.*)

Megamoera diemenensis, Haswell, 1880*a*, p. 266, pl. xi., Fig. 3.

Elasmopus diemenensis, Stebbing, 1906, p. 442, and 1910, p. 643.

Locality.—Eastern Slope, Bass Strait. One male, 11 mm. long.

This species is very similar in general appearance to *E. subcarinatus*, but can be readily distinguished from it by the pair of strong dorsal teeth on the posterior margin of the first four segments of the pleon.

In the first gnathopod (Fig. 10 *a*) the side-plate is produced a little anteriorly and bears on the lower margin a

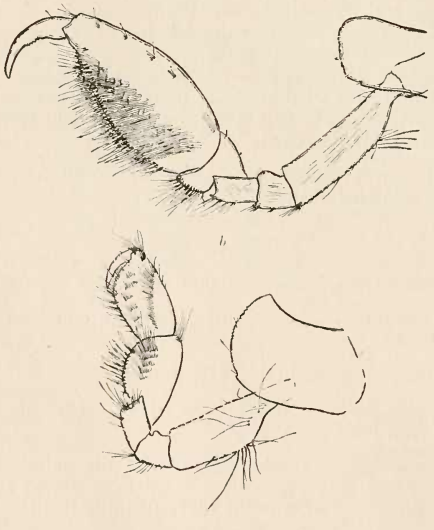
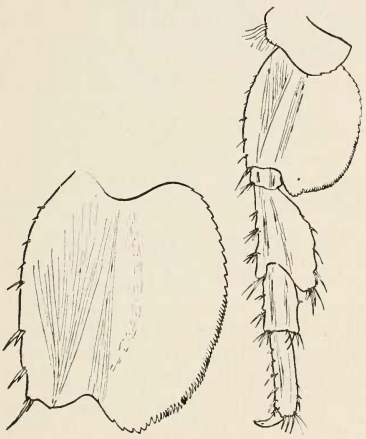


Fig. 10 *a—b*. *Elasmopus diemenensis* (Haswell), male.
a. First gnathopod. *b*. Second gnathopod.

few spinules; the rest of the appendage is closely similar to that of *E. subcarintus* and shows the same characteristic arrangement of setae on the inner surface. The second gnathopod (Fig. 10 *b*) is much larger than the first, but the propod is only moderately expanded, being narrow pyriform, the greatest width being at about one-third of the length from the base; the palm is long and ill-defined, and bears a few irregular teeth towards the base of the dactyl; the whole length of the palm and the posterior half of the inner surface is thickly covered with fine long hairs mostly arranged in short transverse rows; there are five or six small tufts of spinules along the anterior margin; the dactyl is more than one-third the length of the propod and has the inner concave margin with a few irregularities near the middle.



d *c*

Fig. 10 *c—d*. *Elasmopus diemenensis* (Haswell), male.
c. Fifth paraeopod. *d*. Basal joint of same, more highly magnified.

The fifth peraeopod (Fig. 10 *c—d*) is broad, especially in the meral joint; the posterior margin of the basal joint is moderately convex and simply serrate on the proximal portion, while on the distal portion the serrations are much closer and deeper, forming a regular pectinate margin, similar to that in *E. neglectus*, Chilton, and *E. serrula*, Walker.

In the telson each half has the lateral margins produced into long acute teeth so that the posterior margin is deeply concave; from it arises two stout spinules. (See Fig. 10 *e*.)

In the structure of the second gnathopods and of the peraeopoda, this species appears to approach *E. serrula*,

Walker, a species which Barnard has recently combined with *E. pectenicrus*, Bate, but in that species there are no dorsal teeth on the segments of the pleon.

Elasmopus diemenensis is at present known only from Bass Strait and Tasmania.

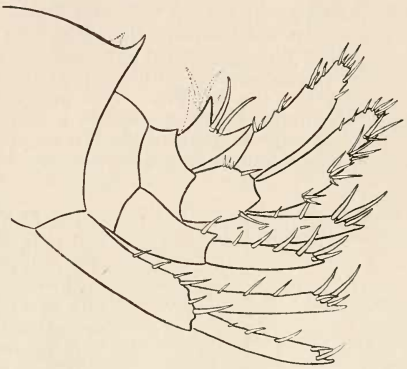


Fig. 10 *e*. *Elasmopus diemenensis* (Haswell). male. Terminal portion of pleon with uropoda and telson.

ELASMOPUS SUBCARINATUS (*Haswell*).

Megamoera subcarinatus, Haswell, 1880*b*, p. 335, pl. xxi., fig. 4.

Elasmopus subcarinatus, Stebbing, 1910, p. 602.

Elasmopus subcarinatus, Chilton, 1915, p. 321.

Locality.—Eastern Slope, Bass Strait. Four males, one female. (Reg. No. E. 5356.) Tasmanian Coast. One female. (Reg. No. E. 5352.)

The second gnathopods of the males vary a little in shape and have probably not all attained their fully developed form. They belong to what I have called the "form 1" (1915, p. 325).

In all the specimens the body bears a few long hairs scattered on the dorsal surface.

The species is common on the Australian and New Zealand coasts and is also known from several localities in the Indian Ocean.

POLYCHERIA ANTARCTICA (*Stebbing*).

Polycheria antarctica, Chilton, 1912, p. 502 (with synonymy).

Locality.—Sanders Bank, Kangaroo Island, 28 fathoms, one specimen (Reg. No. E. 4855).

This specimen is about 4 mm. long; it has the antennae subequal and not longer than the head and first three segments of the peraeon; in the third uropod the rami are only slightly unequal. In these points it resembles the description of *P. brevicornis*, Haswell, but on the other hand the eye is large and red, fully as large as in *P. tenuipes*, and I have no doubt the "Endeavour" specimen is immature and that Haswell's two species are only stages in the life-history of one, as already suggested by Stebbing.

I have fully discussed the described species of *Polycheria* elsewhere and come to the conclusion that they are only forms of the one species, *P. antarctica* (Stebbing), which is very widely distributed in southern seas and extends north of the equator in one or two localities.

LEMBOS PHILACANTHUS (*Stebbing*).

(Fig. 11 *a*—*c*.)

Lembos philacanthus, Stebbing, 1888, p. 1082, pl. 110.

Lembos philacanthus, Stebbing, 1910, p. 605.

Localities.—Tasmanian Coast, two specimens (Reg. No. E. 5352); Eastern Slope, Bass Strait, several specimens (Reg. No. E. 5356).

These specimens vary considerably in size and in the structure of the gnathopoda, but they present such a general resemblance that I think they all belong to one species and that they must be referred to *L. philacanthus*, Stebbing, the type specimen of which was obtained from the same locality. Some of the differences observed are doubtless due to stages of development and to sexual characters.

My specimens differ from Stebbing's description in having the eye round and the lateral lobe of the head narrowly rounded, while he described the eye as reniform and the lateral lobe acute. The appendages are long and slender as in the specimens examined by him; they evidently increase in length with the development of the animal. The antennae and peraeopoda agree with his description, the peraeopoda having the basal joints rather narrow and not dilated.

In one specimen which I imagine to be a mature male, the first gnathopod (Fig. 11 *a*) is long and slender and bears dense tufts of long slender setae on the ischium, merus and carpus; the second gnathopod (Fig. 11 *b*) is practically as drawn by Stebbing, propod only very slightly expanded distally, basis not expanded.

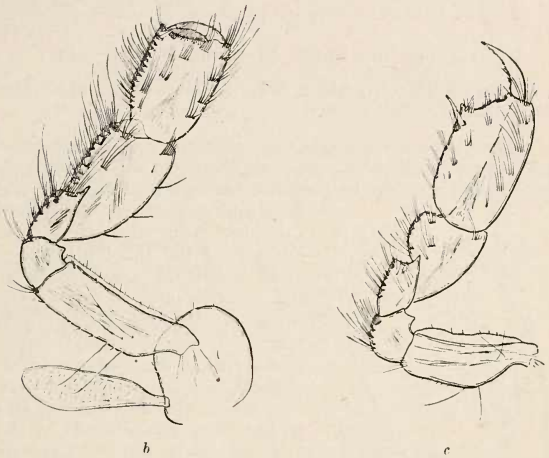
Fig. 11 *a*. *Lembos philacanthus* (Stebbing). First gnathopod of male.

In the female (Fig. 11 *c*) and in the immature males the appendages are not so elongated and correspond more nearly to the figures given by Stebbing of the "Challenger" specimens (1888, pl. 110).

It will be seen from the figure of the adult male (Fig. 11 *a*) that in this character *L. philacanthus* presents very considerable resemblance to *L. longipes* (Liljeborg) and *L. websteri* (Spence Bate) from the Northern Hemisphere. In these species, however, the arrangement of the long slender setae on the first gnathopod is slightly different.

In 1914 Stebbing redescribed *L. fuegiensis* (Dana) from specimens obtained from the Falkland Islands and identified with that species the form from the Indian Ocean described under the name of *L. kergueleni* by Walker in 1909. From the description and figures given by Stebbing it is evident that *L. fuegiensis* approaches very closely to *L. philacanthus*, but as yet the fully developed male does not appear to have been described.

L. philacanthus, Stebbing, occurs in New Zealand and Chatham Islands, as I have specimens from these localities which I feel certain must be referred to that species. The relation of the species mentioned to *L. kergueleni*, Stebbing, and to the form from the Subantarctic Islands of New Zealand which I described under that name in 1909 will require further investigation when additional material is available.



b *c*

Fig. 11 *b*—*c*. *Lembos philacanthus* (Stebbing).
b. Second gnathopod of male. *c*. First gnathopod of female.

PHOTIS DOLICHOMMATA, *Stebbing*.

Photis dolichommata, Stebbing, 1910, p. 609, pl. 55*.

Locality.—Eastern Slope, Bass Strait (Reg. No. E. 5356). Two specimens. Length of body about 6 mm.

In the prolonged and apically rounded eye-lobes and in other characters generally these specimens closely resemble Stebbing's description and figures. The species seems to be very close to *P. longicaudata* (Bate), a form of which has been recorded from Ceylon by Walker (1904, p. 286, pl. 6, fig. 43), and from South Africa by Barnard (1916, p. 243).

The specimen I have dissected agrees with Stebbing's in lacking the decurrent lobe of the basis in the second gnathopod and in having the palm less oblique; the decurrent lobe is, however, not figured by Walker in the Ceylon specimens he refers to *P. longicaudata*.

EURYSTHEUS MACULATUS (*Johnston*)

(Fig. 12.)

Eurystheus maculatus, Stebbing, 1906, p. 617.

Locality.—Eastern Slope, Bass Strait. One male (Reg. No. E. 5356).

This single specimen lacks the antennae and is imperfect in one or two other respects, but it agrees with Stebbing's description in:—the two minute medio-dorsal teeth on the fourth pleon segment, the second side-plate being the largest, the bulging of the third pleon segment above the small tooth at the postero-lateral angle, the shape of the second gnathopod which has the basal and carpal joints robust, the palm oblique, slightly concave and provided with two teeth or tubercles, and in the spine at each side of the apex of the telson. I have no hesitation therefore in identifying it with the above-named species. It agrees closely with the figures given by Sars of *E. erythrophthalma* except that the posterior margin of the third pleon segment is more bulging and resembles that of *G. melanops*, both of these species being considered synonyms of *E. maculatus*, Johnston, by Stebbing. I have been able to compare it with a female specimen of *E. maculatus* from England with which it closely corresponds.

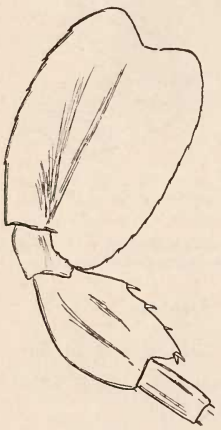


Fig. 12. *Eurystheus maculatus* (Johnston), male. Proximal joints of fifth paraeopod showing the widened merus.

The merus of one of the peraepoda, I think the fifth, is considerably broadened, as in the male specimen from Gough Island, collected by the "Scotia," which I referred with much doubt to *E. afer* (Stebbing) in 1912; I have since pointed out (1920, p. 7) that this should rather be *E. dentatus* (Chevreux).

Stebbing gives the distribution of *E. maculatus* as "Arctic Ocean and North Atlantic." Its occurrence in Bass Strait at the south of Australia greatly extends its range.

Eurystheus atlanticus (*Stebbing*).

Eurystheus atlanticus, Stebbing, 1906, p. 611.

Locality.—Sanders Bank, Kangaroo Island, S. Australia, 28 fathoms, one specimen, female, about 8 mm. long (Reg. No. E. 4855); Shoalhaven Bight, N.S.W., one, probably male (mounted) (Reg. No. E. 4852).

These specimens agree closely with Stebbing's description and figures in the shape of the lateral lobe of the head and of the eye, except that the eye is almost confined to the lateral lobe, its narrow neck being nearly obsolete. The eye is still red in the spirit specimen.

The second antenna has the upper margin of the first joint of the peduncle concave to accommodate the lateral lobe as described by Stebbing. The gnathopods agree closely and so do the peraeopoda, except that the basal joint of the fifth has the posterior margin more distinctly serrate than is shown in the figure of the "Challenger" specimen.

E. atlanticus was originally described from the Atlantic Ocean. It has been taken with *E. afer* in South Africa, and Stebbing thinks it is perhaps a variety of that species. The Australian specimens agree so well with the figures given in the "Challenger" Report of *E. atlanticus* that I prefer to leave them in the meantime under that name.

Eurystheus thomsoni (*Stebbing*).

(Fig. 13 *a*—*c*.)

Eurystheus thomsoni, Stebbing, 1910, p. 614.

Locality.—40 miles W. of Kingston, South Australia, 30 fathoms. Two specimens, male and female (Reg. No. E. 4862).

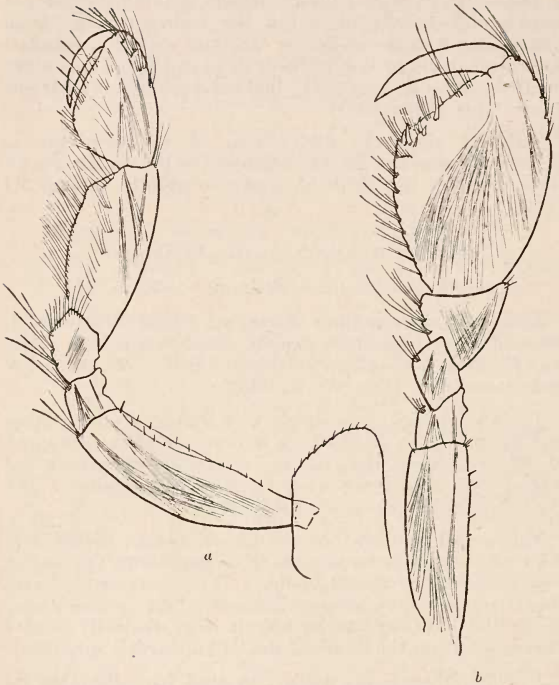


Fig. 13 *a—b*. *Eurystheus thomsoni* (Stebbing), male.
a. First gnathopod. *b*. Second gnathopod of one side.

The male differs from the female in the second gnathopod which agrees with the description given by Stebbing. In this specimen, as in the "Thetis" specimen examined by Stebbing, the second gnathopods were unequal, one of them resembling the female form. In a recent paper (1920, p. 8) I suggested that *Eurystheus thomsoni* (Stebbing) was somewhat similar to *E. dentatus*, Chevreux, which I had recorded from New Zealand waters, and the females are certainly somewhat difficult to distinguish; but the male of *E. thomsoni*, which I have now for the first time been

able to examine, differs considerably and is not very dissimilar in the second gnathopod from *E. crassipes* (Haswell), though the fourth peraeopod does not appear to be greatly broadened as in that species.

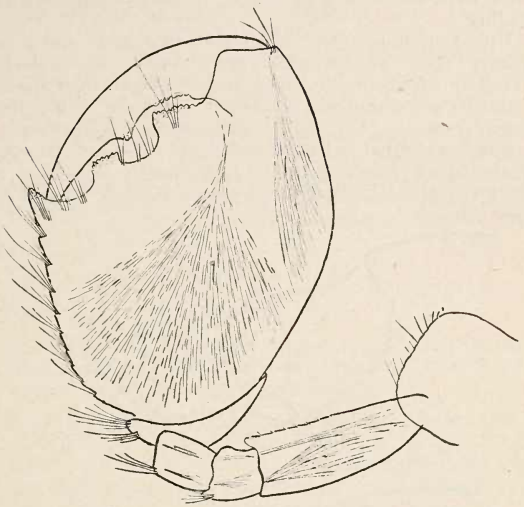


Fig. 13 *c*. *Eurystheus thomsoni* (Stebbing), male. Second gnathopod of opposite side.

I give figures of the first gnathopod (Fig. 13 *a*) and of the right (Fig. 13 *b*) and left (Fig. 13 *c*) second gnathopoda of the male specimen.

The "Thetis" specimens were taken off Botany Bay and Wata Mooli, the type specimens having been collected by the "Challenger" off New Zealand.

Eurystheus persetosus, *sp. nov.*

(Fig. 14 *a*—*b*.)

Locality.—40 miles west of Kingston, South Australia, 30 fathoms. Four specimens, about 12 mm. (Reg. No. E. 4862).

Eyes large, reddish, oval, in horizontal direction, situated on the narrow rounded lateral lobe of the head below the insertion of the upper antenna. All the appendages very hirsute, a pair of tufts of setae on the dorsal surface of the fourth and fifth segments of pleon. Side plates small, shallow.

Upper antennae (Fig. 13 *a*) with first joint shorter and stouter than second and third, which are subequal, flagellum of about 20 joints, rather longer than the last segment of peduncle; accessory flagellum 5-6 jointed. Lower antenna (Fig. 13 *a*) with last two segments of peduncle subequal in length and about as long as the second of the upper; flagellum of 16 joints nearly as long as last joint of peduncle. Both antennae are densely fringed with long setules.

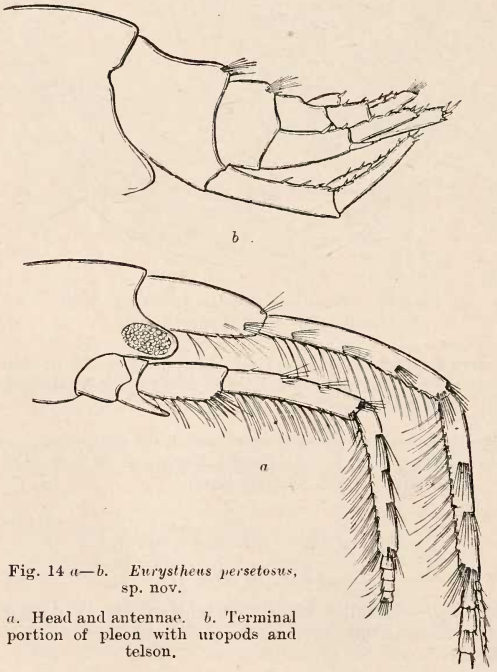


Fig. 14 *a*—*b*. *Eurystheus persetosus*, sp. nov.

a. Head and antennae. *b*. Terminal portion of pleon with uropods and telson.

The first gnathopod with merus ending acutely at the distal angle; carpus slightly shorter than the propod, posterior margin somewhat lobed and bearing 6 or 7 tufts of long setules; anterior margin with a row of six short, stout setules; propod oval, narrowing distally, palm very oblique, slightly concave, defined by a blunt tooth and having an acute tooth about the centre; finger with inner margin serrate. The second gnathopod similar to the first but with carpus shorter, propod rather longer and palm more distinctly concave, with the central tooth small.

Basal joints of the third to fifth peraeopoda rather narrow, posterior margin in the fifth straight. Third uropoda with rami subequal. Telson with dorsal surface depressed in the median line, raised on each side into narrow rounded lobe, tipped posteriorly with a stout setule (Fig. 13 *b*).

Length.—About 12 mm.

Colour.—Brownish.

The mouth parts are normal and agree well with those of the genus, the inner lobe of the first maxilla well developed and bearing numerous long setules.

I am very uncertain about the position of this species, of which I have seen females only. In the hirsute character of the appendages, the gnathopods and some other points, it agrees with the description given by Stebbing (1906, p. 615) of *Eurystheus hirsutus* (Giles), but that species is considered by Walker to be the female of *Cheiriphotis megacheles* (Giles) which differs in the very small size of the inner ramus of the third uropod and in other respects.

AMPITHOE FLINDERSI, *Stebbing.*

(Fig. 15 *a-d.*)

Ampithoe flindersi, Stebbing, 1906, p. 635, and 1910, p. 616.

Locality.—40 miles west of Kingston, South Australia, 30 fathoms. One female (Reg. No. E. 4862).

I think this must be referred to Stebbing's species, although in the absence of male specimens the determination of the species of this genus is very uncertain. Stebbing's description was based on a single specimen

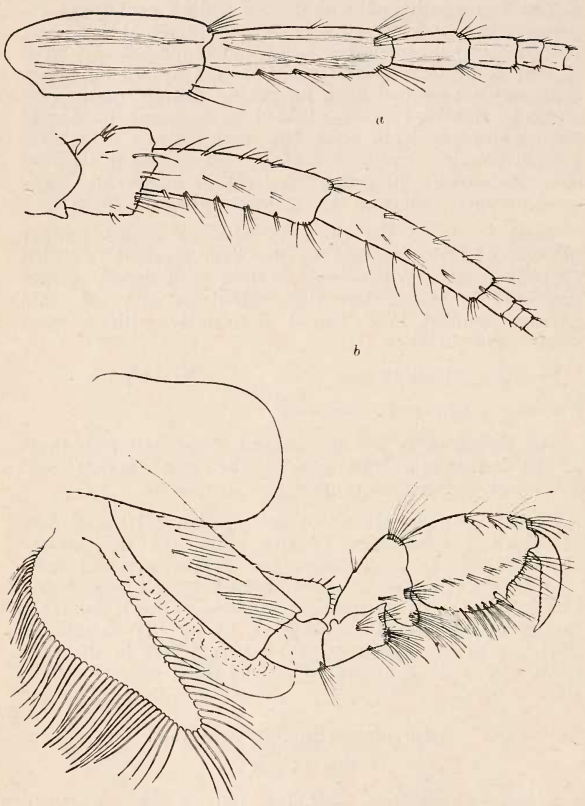


Fig. 15 *a*, *b* and *d*. *Ampithoe flindersi*, Stebbing, female.
a. First antenna. *b*. Second antenna. *d*. Second gnathopod.

about 4 mm. long, in which the antennae were wanting and which, as he suggests, was probably an immature specimen. The further specimens from the "Thetis" Expedition examined by him also lacked the antennae. Of these specimens he described the second gnathopods as having "an

excavation of the palm at right angles to the hind margin of the sixth joint,'' and as this seems to agree with the ''Endeavour'' specimens I venture to make the identification. In order to complete the description I give figures of the peduncles of the antennae (Fig. 15 *a* and *b*) and of the gnathopods (Fig. 15 *c* and *d*) from which the structure can be learnt without further detailed description.

I have some specimens of an *Ampithoe* from Norfolk Island which I had previously thought probably belonged to *A. flindersi*, but in them the carpus of the first gnathopod is very much longer than in the present specimen, being longer than the propod, and possibly the Norfolk Island specimens should be placed in a separate species. The ''Challenger'' specimens were from Flinders Passage in Torres Strait, and those of the ''Thetis'' from off Wata Mooli, N.S.W.

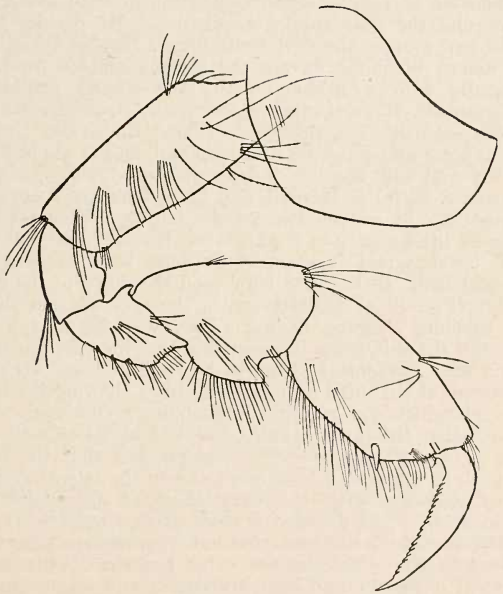


Fig. 15 *c*. *Ampithoe flindersi*, Stebbing, female. First gnathopod.

ICILIUS AUSTRALIS, *Haswell.*

(Fig. 16 *a-c.*)

Icilius ovalis (part), Stebbing, 1906, p. 706.

Icilius australis, Stebbing, 1910, p. 628.

Localities.—40 miles west of Kingston, South Australia, 30 fathoms, several specimens; Sanders Bank, Kangaroo Island, South Australia, 28 fathoms, two specimens; Shoalhaven Bight, New South Wales, several specimens, 15 miles N.W. Cape Jervis, South Australia, 17 fathoms, one specimen.

I think all these specimens must be referred to *Icilius australis,* Haswell, as defined by Stebbing in 1910. He had previously considered all the species of *Icilius* to be synonyms of *Icilius ovalis,* Dana, but in 1910 prefers to recognise the four species as distinct. He divides them into two groups, the first containing *I. ovalis,* Dana, and *I. danae,* Stebbing, having the pleon segments produced dorsally into a median tooth; the second containing *I. australis,* Haswell, and *I. punctatus,* Haswell, with the pleon segments not produced. The "Endeavour" specimens come under the second group and, on the whole, agree fairly well with Stebbing's description and with specimens named *I. australis,* Haswell, sent to me from the Australian Museum. In one or two points, however, they seem to come a little nearer to *I. punctatus,* Haswell, and I should not be surprised if these two species have to be again recombined. In the fifth peraeopod the shape of the basal joint (Fig. 16 *a*) is pretty much the same as that shown in Stebbing's figure, having a narrow bulge at the top, though the difference between this and the corresponding part of *I. punctatus* seems to be slight. I am giving a drawing of the third uropod (Fig. 16 *c*) showing the inner branch which was wanting in Stebbing's specimen. This shows that the inner branch is almost identical with that drawn for *I. punctatus* by Stebbing, but that the outer branch is longer and has more setae on the lateral margin, thus agreeing with the description of this joint for *I. australis.* The drawing is made from a specimen taken off Kingston, South Australia, but in specimens sent from the Australian Museum the outer branch of the third uropod is shorter and has only one or two setules on the outer margin, being thus intermediate in character and approaching that of *I. punctatus* as drawn by Stebbing.

The telson is narrowed posteriorly as in *I. australis*, but in place of having two spinules only, there are five or six small spinules on each side of the apex. Further back nearer the base, there are three large spinules on the

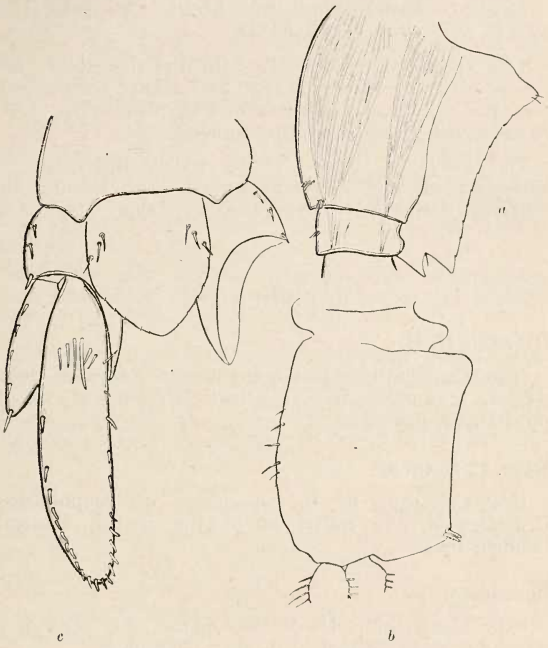


Fig. 16 *a*—*c*. *Icilius australis*, Haswell.
a. Basal joints of fifth peraeopod. *b*. Basal joint of third pleopod. *c*. Third uropod and telson.

surface of the telson on each side near each lateral margin. The pleopods (Fig. 16 *b*) do not quite agree with the figure given for either species. They are not quite so broad as drawn by Stebbing for *I. australis* and have the inner margin straight with only a slight indication of the lobe near the base and the spinules on the outer margin are fewer than shown in Stebbing's figure.

PSEUDOPROTELLA PHASMA (*Mont*).

Protella phasma, Mayer, 1882, p. 29.

Pseudoprotella phasma, Mayer, 1903, p. 37.

Locality.—Eastern Slope, Bass Strait. One male, about 17 mm. long (Reg. No. E. 5356).

This species agrees closely with the description and figures given by Mayer in 1882 and I have been able to compare it with specimens from Banyuls-sur-mer, South France, with which it appears to agree.

The species is known to be widely distributed in European seas, the Mediterranean and North Atlantic, and four varieties have been recognised by Mayer.

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Report on the Crabs obtained by the F.I.S. "Endeavour" on the Coasts of Queensland, New South Wales, Victoria, South Australia and Tasmania.

BY

MARY J. RATHBUN,

Associate in Zoology, United States National Museum, Washington.

Plates xvi.-xlii., and Figures 1-3.

REPORT ON THE BRACHYRHYNCHA, OXYSTOMATA AND DROMIACEA.

This report includes all the brachyuran crabs of the "Endeavour" collection other than the Oxyrhyncha or spider crabs, which were enumerated in Vol. V., part 1, 1918, with one exception here noted. There are sixty-one species listed below, and fourteen of these are new. There are also, among the species previously known, several which are additional to the Australian fauna: *Pinnotheres novæzelandiæ, Pilumnoplax heterochir, Liagore rubromaculata, Chlorodopsis pilumnoides, Pilumnus spongiosus, Acanthodes armatus, Charybdis natator, C. truncata, Myra fugax, Calappa lophos* and *Dromidiopsis edwardsi.* The most noteworthy is *Acanthodes armatus,* which, although described by de Haan in 1835, has been found rarely, and then only in Japanese waters.

I am indebted to Mr. Allan R. McCulloch for allowing me to introduce some of his notes, made several years ago, and for making it possible to examine several Australian *Pilumnus* not in the "Endeavour" collection.

Order DECAPODA.

Suborder REPTANTIA.

Tribe BRACHYURA.

Subtribe BRACHYGNATHA.

Superfamily OXYRHYNCHA.

Family INACHIDÆ.

Subfamily INACHINÆ.

Paratymolus latipes quadridentata, *Baker.*

Paratymolus latipes var. *quadridentata,* Baker, Trans. Roy. Soc. S. Australia, xxx., 1906, p. 107, pl. i., fig. 2.

Spencer's Gulf, South Australia, 20 fathoms; E.4442; one female with carapace 6.5 mm. long to tips of frontal teeth, and 6.3 mm. wide including spines.

Chelipeds of female shorter than of male, as figured by Baker, the merus scarcely reaching beyond the lateral angle of the carapace. The merus has a spine instead of a tubercle on its upper margin. The major chela, in this case on the right side, has an enlarged tooth at the base of the dactylus, which is absent from the slightly smaller, minor chela. The first three pairs of ambulatory legs are longer than the chelipeds.

This species was accidentally omitted from the report on spider crabs, vol. v., part 1, of this series, on account of its strong resemblance to *Telmessus*, save for the arrangement of the basal antennal segment.

Superfamily BRACHYRHYNCHA.

Family GRAPSIDÆ.

PLAGUSIA CAPENSIS, *de Haan.*

Grapsus (*Plagusia*) *capensis*, de Haan, Fauna Japon., Crust, 1835, pp. 31 and 58.

Plagusia capensis, Stebbing, South African Crust., Part iii., 1905, p. 47 and synonymy.

Plagusia chabrus, Rathbun (perhaps not Linnæus), Bull. U.S. Nat. Mus., xcvii., 1918, p. 336, pl. civ.

Bass Strait?; E.444; one female of medium size. The front is bordered by conical spines and tubercles, two or three being pointed, and the rest rounded at tip.

Family PINNOTHERIDÆ.

PINNOTHERES SUBGLOBOSA, *Baker.*

(Plate xvi., fig. 1, and Fig. 1.)

Pinnoteres subglobosa, Baker, Trans. Roy. Soc. S. Australia, xxxi., 1907, p. 179; 17 fathoms, South Australian coast.

Off Marsden Point, Kangaroo Island, South Australia; 17 fathoms; E.4519; one female.

Length of carapace 7.6, width at middle 7.8, postero-lateral width above the first ambulatory leg 9.6, length of carapace and the part of the abdomen visible in dorsal view 9.2, fronto-orbital distance 2.4, front 1.3 mm.

Carapace thin and yielding, high, the upper surface transversely oblong-globose, the sides spreading outward posteriorly. Posterior margin, between legs of last pair, transverse. Two broad shallow furrows lead backward from the orbits but do not meet. Eyes colourless, fitting in the orbits.

Palp of maxilliped two-segmented, lacking a dactylus.

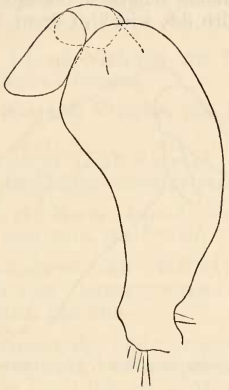

Fig. 1.—Left outer maxilliped, *Pinnotheres subglobosa*.

The slender palm is more than twice as long on its upper margin as its greatest width. The whole propodus has a slightly sinuous lower margin, and a fringe of hair on the inner surface just above the margin; the finger embraces less than one-third of that margin.

Legs similar, dactyli curved; second pair longest, its dactylus also longest; the first and third legs are subequal, the fourth shortest. The left leg of the second pair is longer than the right; whether this is individual or a specific character as in certain American species, only an examination of further material can determine.

The abdomen is very capacious, wider than the widest part of the carapace and envelops the sternum and bases of the legs. The sternal cavity has a dense fringe of hair.

PINNOTHERES NOVÆZELANDIÆ, *Filhol.*

(Plate xvi., fig. 2, and Fig. 2.)

Pinnotheres novæ zelandiæ, Filhol, Miss. l'Ile Campbell, Crust., 1885, p. 395, pl. xlvi. in atlas, figs. 1-6.

Pinnotheres novæ-zelandiæ, Lenz, Zool. Jahrb., Syst., xiv., 1901, p. 467, pl. xxxii., figs. 11-14.

East coast of Flinders Island, Bass Strait; E.5676; one female. Approximate length of carapace 8.4, width 8.5, fronto-orbital width 3.8, width of front 1.6 mm.

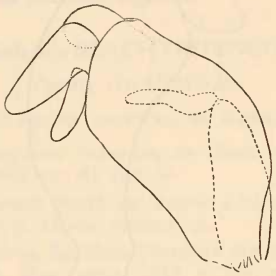

Fig. 2.—Left outer maxilliped, *Pinnotheres novæzelandiæ*.

Carapace soft and much wrinkled, nearly circular; front invisible in dorsal view, and covered by the abdomen, which reaches in all directions beyond the carapace. In front view the margin of the front is straight; the eyes are faintly pigmented, the orbits extend laterally beyond the eyes to a distance as long as the eyes, gradually tapering but not to a point; the margin of the orbit is bluntly rounded, not an acute rim.

Chelipeds rather small, chelæ shaped as represented by Lenz in his fig. 11, *op. cit.* Ambulatory legs slender, similar, dactyli curved; second pair a little the longest; second, third and fourth pairs regularly diminishing, first pair subequal to third. In dorsal view, the upper margin of the merus and the lower margin of the dactylus are conspicuously haired; there are also some hairs on the distal end of the propodus and on the inner surface above the lower margin.

Family GONEPLACIDÆ.

Pilumnoplax heterochir (*Studer*).

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

Pilumnus heterochir, Studer, Abhandl. k. Akad. Wiss. Berlin, ii., 1882 (1883), p. 11, pl. i., fig. 3 *a-d*.

Pseudorhombila (*Pilumnoplax*) *normani*, Miers, in Narr. Challenger Exp., i., part ii., 1885, p. 587.

Pilumnoplax heterochir, Miers, Challenger Rept., Zool., xvii., 1886, p. 227, pl. xix., figs. 1-1*d*.

South of Gabo Island, Victoria, 200 fathoms; E.6211; one male, two ovigerous females.

South of Cape Everard, Victoria, 200 fathoms; E.6152; one young male.

Forty miles South of Cape Everard, Victoria, 200-270 fathoms; E.6155; two males, three ovigerous females.

East-north-east of Maria Island, Tasmania, 127-180 fathoms; E.5168; one male, one female.

Measurements.—Largest male (E.6211), length of carapace 8.2, width 11 mm. Largest female (E.6211), length of carapace 9.3, width 12.8 mm.

In all the specimens the right cheliped is the larger except in the largest male. In comparing this male with one 8.6 mm. wide or about the size of Miers's figured specimen, the dark colour runs a little further back on the palm in the larger one; in all the males the colour margin is oblique to the lower margin, not at right angles to it as in Miers's figure 1*b*, and as in the female specimens. In the young male (E.6152), 4.8 mm. wide, the granulation of the major palm is much coarser than in larger specimens.

Carcinoplax meridionalis, *sp. nov.*

(Plate xviii.)

Type-locality.—Seventeen and a half miles south-east of Rame Head, Victoria, 76 fathoms; May 10, 1911; E.2233; one male, holotype.

Additional localities.—South-east of Cape Everard to South of Gabo Island, Victoria, 70-80 fathoms; E.6487; three females.

South of Mt. Cann, Victoria, 55-70 fathoms; E.6079; one male.

South and south-west of Mt. Cann, Victoria, 70-100 fathoms; E.6116; two males, two females. E.6117; one female, with encrusting Serpulid.

South-south-west of Mt. Cann, Victoria, forty miles, 70 fathoms; E.6276; two females, one immature, one ovigerous, both very small.

East of Bass Strait, 70-80 fathoms; E.4820; two males, two females.

Twenty miles east of Babel Islands, Bass Strait, 65-70 fathoms; E.5159; one young male.

Off Babel Islands, Bass Strait, 50-300 fathoms; E.4785; one male.

South-west of Eucla, about long. 127° E., Great Australian Bight, 80-120 fathoms; E. 3661 and 3662; two males, two females.

Sixty to eighty miles west from Eucla, Great Australian Bight, 80-120 fathoms; E.3167; one male, one female. P.3552; one female.

South Australia; E.4438; one male.

Measurements.—Male holotype, length of carapace 21.7, width (approximate) between tips of lateral spines 30.2, width just in front of lateral spines 27, fronto-orbital width 17.8, front 8.3 mm. Largest female (E.6117), length of carapace 22.3, width between tips of lateral spines 30.4, width just in front of lateral spines 28.2, fronto-orbital width 18.4, front 8.6 mm. One of the two smallest females (E.6276) is ovigerous, carapace 5.8 mm. long.

Description.—Carapace very convex fore and aft. A short, obliquely transverse branchial ridge near lateral tooth; postero-lateral angle of dorsum also marked by a smooth ridge. Two transverse depressions, one in front of, the other behind, the cardiac region. Three antero-lateral projections; the first or orbital tooth is blunt, produced little in advance of orbital angle, its inner slope short and continuing the supraorbital margin, outer slope convex; second tooth longer and with a sharp tip, directed forward; third projection a stout, acuminate spine, directed obliquely outward. Front transverse, or nearly so, double-edged, upper edge less advanced than lower. Antennal sinus well defined. Supraorbital fissure obscure. Suborbital margin crenulate; inner angle nearly as advanced as the front.

The major cheliped is considerably heavier than the minor one; of the 25 specimens possessing chelipeds, all but four have the major cheliped on the right side. On the upper border of the arm distad of the middle there is a rounded lobe; dorsal aspect of wrist an elongated rhomb, with a spine at the inner angle, and a smaller one at the outer angle. In the male the dark brown colour of the immovable finger embraces a small part of the palm except in its upper part where it does not quite cover the prehensile edge; on the dactylus the colour does not quite cover the proximal end but seems to cover the prehensile edges when the fingers are closed. In the female the brown is much more restricted, extending on the outside edges less than half the length from the tip in the full-grown, or quite half the length of the dactylus in the half-grown; on the prehensile edges the colour runs much further, half or more than halfway on the immovable finger, and nearly the whole length on the minor dactylus and quite the whole length on the major dactylus.

Ambulatory legs long and slender; last three articles sparsely fringed with long, fine hair; the dactyli have also two marginal stripes of dense pubescence.

The male abdomen is nearly triangular from the third segment to the tip, posterior margin of terminal segment arcuate. The sternal furrow just in front of the bases of the chelipeds forms a slightly obtuse angle at the median line.

Carcinoplax victoriensis, *sp. nov.*

(Plate xix.)

Type-locality.—South of Gabo Island, Victoria, 120-275 fathoms; E.4395; one male, holotype.

Additional localities.—South of Gabo Island, Victoria, 180-150 fathoms; E.4394; one female.

Off Gabo Island, Victoria, 80-100 fathoms; E.4779; one male with Serpulid shell on the merus of the left maxilliped.

Off Gabo Island, Victoria, about 200 fathoms; E.5196; four very young.

South-east of Cape Everard to south of Gabo Island, Victoria, 70-80 fathoms; E.6091; one young female.

Measurements.—Male holotype, length of carapace 24.4, width (approximate) between tips of lateral spines 34, width just in front of lateral spines 31.3, fronto-orbital width 20, front 9.3 mm. Largest specimen, male (E.4779), length of carapace 27.3, width between tips of lateral spines 37.4 mm. Length of carapace of a very young crab (E.5196) 3.6, total width of same 4.4 mm.

Description.—Of similar appearance to the preceding and at a glance might be mistaken for it.

The chief differences are:—

The antero-lateral angle of the carapace is coincident with the outer angle of the orbit, instead of being advanced beyond the orbital angle to form a tooth.

The first of the marginal teeth is less dentiform, its sides at an oblique angle to each other, meeting in a short, acute tip.

The spine at the lateral angle of the carapace is directed more outward.

The supra-orbital fissure is more deeply marked.

The wrist is squarer, less elongate.

The proximal end of the palm, opposite the carpal spine is produced in a tubercle.

The fingers are longer, slenderer and bent downward beyond the lower border of the palm. In preserved specimens they are almost colourless; only on the teeth of the distal third to half is there trace of a violet brown.

The dactyli of the ambulatory legs are almost covered with dense pubescence; a thinner coating of similar hairs runs along the greater part of the upper margin of the propodal segments and a short way on the lower margin.

Variations.—The chelipeds become very massive with age; the largest male (E.4779) lacks the major cheliped but the minor one is much larger than in the type specimen which has a somewhat smaller body.

The fingers of the females (there are none of large size in the collection) are little deflexed.

A young female (E.6091), 8.7 mm. long, has the first antero-lateral projection spiniform or tipped with a slender spine so that it has a strong resemblance to the spine at the lateral angle; the granulation of the hands is more pronounced than in the old.

The four young crabs registered E.5196, probably represent one of the earliest stages of the crab-form. The carapace is very narrow, as may be seen from the measurements, and subquadrate, the sides being parallel except just behind the orbit; the two lateral spines are nearly the same size and shape. The granules of the palm are arranged partly in longitudinal rows and mixed with fine hair.

Family XANTHIDÆ.

Subfamily XANTHINÆ.

Xantho bowenensis, *sp. nov.*

(Plate xx.)

Type-locality.—Seven miles north-north-east of Bowen, Queensland, 16 fathoms; E.3097; one male, holotype.

Measurements.—Male holotype, total length of carapace 31, greatest width, at last pair of lobes, 46.3, fronto-orbital width 17.6, front 10 mm.

Description.—Carapace very convex fore and aft, closely covered with uneven granules, which are smaller in the depressions; anterior two-thirds well areolated, areoles 1 L and 2 L fused,[1] and with 3 L and 4 L high and *Actæa*-like; 5 L and 6 L lower and partially fused; a small, transverse, oval areole on the posterior cardiac region; anterior mesogastrium very narrow; protogastric regions unevenly and incompletely divided; epigastric lobes distinct. Of the four lateral lobes, E is very low, N and T are obtuse-angled, S is rounded. Front not visible in dorsal view; median fissure closed, its sides overlapping; on each side a truncate lobe occupies less than half the front; a broad, shallow sinus separates it from the pointed outer tooth; no supra-orbital angle. Suborbital region, reaching to a line from the buccal angle to lateral tooth N, roughly granulous like the dorsum. The fissures either side of N are continued on the lower surface where they almost meet in a small, circular depression.

Chelipeds equal in male, closely granulous, the granules smaller and smoother on the merus than on the carpus and propodus; carpus slightly furrowed; chelæ short, stout, tapering distally; fingers black, fluted, with blunt tips, and meeting when closed.

[1] See Dana—Crust. U.S. Expl. Exped., part i., 1852, p. 29.

Legs granulous, the three principal segments short and broad; dactyli hairy between the granules.

Remarks.—This is not a typical *Xantho* in all respects, it is too convex at its middle, and the front too deflexed, and uncommonly narrow. On the other hand, the orbits and antennæ are typical, the flagellum not excluded from the orbit.

PSEUDOCARCINUS GIGAS (*Lamarck*).

Cancer gigas, Lamarck, Hist. Anim. sans Vert. v., 1818, p. 272.

Pseudocarcinus gigas, Milne Edwards, i., 1834, p. 409. McCoy, Prodr. Zool. Victoria, ii., Dec. xviii., 1889, p. 293, pls. 179 and 180. McNeill, Rec. Austr. Mus., xiii. 3, 1920, p. 180.

East of Bass Strait; E.6094; one male, with *Lepas* attached.

East-north-east of Maria Island, Tasmania, 127-180 fathoms; E.5169; one young female.

East of Maria Island, Tasmania, 50-100 fathoms; E.6241; one young male.

North-east of Cape Pillar, Tasmania, 50-60 fathoms; E.6174; one young.

Thirty-five miles south-east of Bruni Island, Tasmania, 150-230 fathoms; E.5155; one young female.

South of Eucla, Great Australian Bight, long. 129° 28′ E., 250-450 fathoms; E.3701; one male, with *Lepas.*

Great Australian Bight, 80-120 fathoms; E.3698; one female, with *Lepas.*

Southern Australia; one immature female.

A series of eight specimens, the three largest of which are 140 mm. wide or a little smaller, and the remainder graduated down to one 12.3 mm. wide. In small specimens the carapace is roughly granular except in the furrows; the granules on the inner and outer surfaces of the hand tend to form more or less distinct rows. All the spines on the carapace and legs are much more acute than in larger examples; in carapaces under 40 mm. wide, four of the lateral spines are much more developed than the intermediate ones, and the third and fourth large spines, or those near the widest part of the carapace are longest. The teeth on both fingers are proportionately larger. The chelipeds are subequal in size though the right is the larger.

As the specimens increase in size, all these characters become less marked except the size of the hand, the right becoming gradually larger than the left.

The red colour of the back may be uniform, as described by McCoy, or divided up into different patterns in different specimens. It may form vermiculating lines on the yellow ground colour or the latter may break through it as irregularly shaped spots. The chelipeds are all marked with vermicular red lines, and the fingers are uniformly scarlet at their junction with the hand.[2]

Liagore rubromaculata, *de Haan.*

Liagore rubromaculata, Alcock, Journ. Asiat. Soc. Bengal, lxvii., 1898, p. 93 [328] and synonymy.

Twenty miles north-east of Cape Gloucester, Queensland, 35 fathoms; E.3120; one small female.

New to the Australian fauna.

Galene bispinosa (*Herbst*).

Cancer bispinosus, Herbst, Naturg. d. Krabben u. Krebse, i., No. 2, 1783, p. 144, pl. vi., fig. 45; and iii., No. 2, 1801, p. 11, pl. liv., fig. 1 (female).

Galene bispinosa, Alcock, Journ. Asiat. Soc. Bengal, lxvii., part 2, 1898, p. 136 [371], and synonymy; Etheridge and McCulloch, Rec. Austr. Mus. xi. 1, 1916, p. 10, pl. iii., figs. 3-4.

Seven miles north-north-east of Bowen, Queensland, 16 fathoms; E.3096; one male. P.3517; one female.

Twenty miles north-east of Cape Gloucester, Queensland, 35 fathoms; E.3121; one female.

Two of Herbst's specimens were extant in the Berlin Museum in 1896; one is a male, labelled "type," and may be the original of pl. vi., fig. 45, the other is a female and is figured on pl. liv., fig. 1.

[2] Taken almost wholly from Mr. McCulloch's notes.

Subfamily ACTÆINÆ.

ACTÆA INSKIPENSIS, *sp. nov.*

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

Type-locality.—Off Point Inskip, Great Sandy Strait, Queensland, 10 fathoms; E.3186; one young male, holotype.

Measurements.—Male holotype, length of carapace 5.1, width of same 7.7, fronto-orbital width 4 mm.

Description.—Carapace, chelipeds and legs furnished with scanty hairs which do not conceal the surface and are scarcely to be noticed. Carapace covered everywhere except on the cardiac and intestinal regions with fine, subequal granules; well, but not deeply areolated; areolations but not granulations visible to the unaided eye. Each protogastric region is divided by a shallow, longitudinal sulcus which fades out posteriorly, into two unequal parts, the inner part half as wide as the outer; epigastric and antero-external protogastric lobes swollen. In the language of Dana,[3] lobes 1 L and 2 L are scarcely separate, 3 L and 4 L are well marked, 5 L shows a tendency to subdivide, 6 L is faintly outlined behind, 1 R, 2 R and 3 R are continuous. Of the marginal lobes, N, T and S are prominent and somewhat angled, E is nearly flat. Postero-lateral margin concave; above the posterior margin there is a narrow, raised, bilobed and crenulated ridge. Frontal lobes in front view with sinuous margins separated by a median fissure; at the outer ends an independent, triangular tooth bent downward.

Chelipeds of immature male small; carpus granulous like the carapace, and with a few shallow furrows. Granules of palm arranged largely in longitudinal rows especially on the lower half of the outer surface; immovable fingers with two outer furrows, the lower one leading from the palm and tapering to a point, the upper one reaching only to middle of finger, a tooth on prehensile edge near its base; dactylus with a deep groove below the upper margin, a small tooth near the base of that margin, a large basal tooth or tubercle on the prehensile margin and a shallow tooth further out and distad to that on the immovable finger.

Legs granulous, except on the posterior surface of the merus joints, the granules more pointed than on carapace.

[3] Dana—Crust. U.S. Expl. Exped., part i., 1852, p. 29.

Relationship.—Closely related to *A. obesa*,[4] A. Milne Edwards, which also has a broad-oval carapace with numerous granules, similar areolations, and chelæ of the same form. In *obesa* the lateral lobes are rounded, not at all angular, and are not separated from the neighbouring areoles, the granulation is very coarse especially on the lateral thirds, and the posterior part is finely granulate, not smooth as in *inskipensis*; the posterior surface of the merus of the last leg is granulous, not smooth; the dactylus of the cheliped has a row of spinules on the upper margin instead of a single denticle.

ACTÆA PERONII, (*Milne Edwards*).

(Plate xxi., figs. 4-5.)

Xantho peronii, Milne Edwards, Hist. Nat. Crust., i., 1834, p. 392.

Xantho spinosus, Hess, Arch. f. Naturg., xxxi., 1865, pp. 132 and 171, pl. vi., fig. 3.

Actæa peronii, Haswell, Cat. Austral. Crust., 1882, p. 46.

From sixty miles south of Diana's Peak to about forty miles south of Mt. Cann, Victoria, 70-80 fathoms; E.6086; two males, one female.

South of Mt. Cann, Victoria, 55-70 fathoms; E.6080; one young female.

East coast of Flinders Island, Bass Strait; E.5672; one male, six females.

Forty miles west of Kingston, South Australia, 30 fathoms; E.4464; one young.

Marsden Point, Kangaroo Island, South Australia, 17 fathoms; E.4465; one young.

North of Cape Borda, Kangaroo Island, 40 fathoms; E.4463; one female.

Sander's Bank, Kangaroo Island, 28 fathoms; E.4462; one young.

Spencer Gulf, South Australia, 20 fathoms; E.4461; one female.

South Australia; E.4460; one female.

[4] Rathbun—Trans. Linn. Soc. London, ser. 2, xiv., 1911, pl. xvi., figs. 4 and 5.

ACTÆA CALCULOSA (*Milne Edwards*).

Cancer calculosus, Milne Edwards, Hist. Nat. Crust., i., 1834, p. 378.

Actæa calculosa, Grant and McCulloch, Proc. Linn. Soc. New South Wales, xxxi., 1906, p. 11, and synonymy.

Fifteen miles north-west of Cape Jervis, South Australia, 17 fathoms; E.4457; two females. E.4459; one young female.

Marsden Point, Kangaroo Island, South Australia, 17 fathoms; E.6485; five males, ten females.

Spencer Gulf, South Australia, 16 fathoms; E.4456; four males, one female.

Subfamily CHLORODIELLINÆ.

CHLORODIELLA NIGER (*Forskål*).

Chlorodius niger, Alcock, Journ. Asiat. Soc. Bengal, lxvii., 1898, p. 160 [395], and synonymy.

North-west Island, off Rockhampton, Queensland; E.4455; one male, one female.

CHLORODOPSIS PILUMNOIDES (*White*).

Chlorodius pilumnoides, Adams and White, Voy. Samarang, Crust., 1848, p. 41, pl. ix., figs. 3 and 3*a*.

Chlorodopsis pilumnoides, Alcock, Journ. Asiat. Soc., Bengal, lxvii., 1898, p. 167 [402], and synonymy.

Thirteen miles south-east of Cape Capricorn, Queensland, 13 fathoms; E.3146; one young specimen, carapace 5.3 mm. wide.

New to the Australian fauna.

Subfamily PILUMNINÆ.

Genus PILUMNUS, *Leach*.

Key to the Australian species of Pilumnus.

a. Abnormal species. Carapace covered with symmetrically disposed, raised, curved or sinuate ridges:— *labyrinthicus*.†

aa. Normal species in which the carapace is covered wholly or partially with a more or less thick coat of hair and is without raised ridges.

b. Carapace covered with a short, close pubescence, unmixed with long hairs.

c. Antero-lateral teeth each capped by a cluster of granules:— *monilifer.*

cc. Antero-lateral teeth not capped by a cluster of granules.

d. Carapace transversely suboval.

e. Carapace with small, red, bead granules showing in the pubescence:— *rufopunctatus.**

ee. Carapace without bead granules showing in the pubescence:— *humilis.*†[5]

dd. Carapace narrow, subhexagonal, interregional furrows deep, not concealed by the pubescence.

e. Merus of ambulatory legs sharply cristate above:— *cristipes.*†

ee. Merus of ambulatory legs not cristate above:— *spongiosus.**

bb. Carapace more or less hairy; when covered with a short, close pubescence, it is mixed with long hairs.

c. Larger palm more than half smooth and bare, at least in male.

d. Infero-distal portion of outer surface of smaller palm bare and, in male, smooth:— *flssifrons.**

dd. Outer surface of smaller palm rough all over and more or less hairy.

e. Last three antero-lateral teeth armed with long, slender spines. A similar but larger projection at inner angle of wrist:— *spinicarpus.**

ee. Antero-lateral projections dentiform, the last three armed with short spinules. Larger wrist with an acute, conical tubercle at inner angle:— *tantalus.**

cc. Larger palm either partially smooth and bare on not more than half its outer surface, or rough all over.

d. Antero-lateral projections dentiform or lobiform, not spine-tipped.

e. Palms and fingers finely granulate except on the short, light brown, finger-tips. Chelipeds, legs and anterior carapace ornamented with fringes of long and very fine soft hair:— *digitalis.**

ee. Palms tuberculate. Fingers not granulate beyond their basal portions, and nearly all brown. Hairs coarser than in:— *digitalis.*

f. Carapace half smooth and bare. Fringes of long hair on anterior and lateral portions. Whole outer surface of larger palm tuberculate:— *semilanatus.**

ff. Carapace covered with hair or pubescence.

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[5] The name *humilis* was suggested as an alternative by Miers (Crust. "Alert," 1884, p. 221, pl. xxi., fig. B) for specimens which he doubtfully labels *P. lanatus* Latreille. Latreille, however, in concluding his brief description (Encyc. Méth., Entom., x., 1825, p. 125) compares *lanatus* with *vespertilio*, as follows: "*Un peu plus grand que le précédent, avec les serres épaisses et graveleuses; d'ailleurs presque semblable. Variété peut-être du male de cette espèce.*" This indicates a much closer resemblance of *lanatus* to *vespertilio* than one would ascribe to the trim looking species figured by Miers, *loc. cit.* I have, therefore, used the name *humilis* for his species.

g. Two notches in upper margin of orbit. A subhepatic tooth present. Carapace rough with small, granulate areoles and covered with distinctly separated bunches of hair.

h. Fingers whitish or lightish:— *vespertilio.*

hh. Fingers blackish:— *lanatus.*†

gg. One notch in upper margin of orbit. No subhepatic tooth. Carapace finely, and in the centre, sparingly granulate; hairs soft, without definite arrangement:— *contrarius.**

dd. Antero-lateral projections (some or all) either spines or spine-pointed teeth.

e. Antero-lateral projections simple, not bifid nor with spinules on their slopes.

f. Large hand ornamented with rounded granules. Outer orbital angle a small tooth, not spine-tipped.

g. Granules of palm arranged in longitudinal series and almost concealed in pubescence or hairs.

h. Carapace wide, one and a third times as wide as long. Anterior carapace, wrist and palm clothed with short pubescence:— *seminudus.*†

hh. Carapace narrow, less than one and a fourth times as wide as long. Carapace, wrist and palm clothed with long hairs:— *pulcher.*

gg. Granules of palm not arranged in rows or concealed by pubescence:— *terrae-reginae.*†

ff. Large hand ornamented with spines or pointed tubercles or granules. Outer orbital angle a spine or tooth with sharp tip.

g. Large hand ornamented chiefly with spines, less than half smooth and bare. Three antero-lateral spines long, slender, horny, set in cylindrical bases from which spring a few long hairs.

h. No subhepatic nor outer orbital spine:— *australis.*†

hh. A long, slender, subhepatic spine. A similar spine at outer angle of orbit:— *acer.**

gg. Large hand ornamented with conical, pointed tubercles. Antero-lateral spines slender, set in triangular or conical bases. A small, subhepatic spinule.

h. Larger palm half smooth and bare:— *hirsutus.**

hh. Larger palm nearly all rough, tubercles largely seriate:— *vestitus.*

ee. Antero-lateral projections either bifid or with spinules on their slopes.

f. Antero-lateral teeth bispinous, the anterior spine the larger. Both palms smooth just above lower margin:— *etheridgei.**

ff. Antero-lateral teeth spine-pointed and with several much smaller spinules on their slopes. Larger palm only is smooth just above lower margin:— *tomentosus.**

* In the "Endeavour" collection. † Not seen by the writer.

SPECIES OF PILUMNUS REMOVED TO OTHER GENERA.

P. glaberrimus, Haswell, 1881. Now *Ceratoplax glaberrimus* (Haswell) = *C. punctata,* Baker, 1907. Haswell's type examined.

P. inermis, Haswell, 1881. Now *Ceratoplax inermis* (Haswell). Type not found; specimen from Saddleback Island, Queensland, examined.

P. integer, Haswell, 1881. Photographs of type (dorsal views) examined. Should be referred to *Chasmocarcinus* or a kindred genus.

P. pilosus, Fulton and Grant, 1906. Now *Heteropilumnus fimbriatus* (Milne Edwards, 1834). Not *P. fimbriatus,* Haswell, 1882 = *Cryptocæloma fimbriatum,* Miers, 1884. See de Man (who examined Milne Edwards's types), Zool. Jahrb., Syst., viii., 1895, p. 533.

P. fimbriatus, Haswell, 1882. Now *Cryptocæloma haswelli,* nom. nov. = *C. fimbriatum,* Miers, 1884, not *P. fimbiatus,* Milne Edwards, 1834. Male specimen from Port Denison, Queensland, examined.

PILUMNUS SPONGIOSUS, *Nobili.*

Pilumnus spongiosus, Nobili, Bull. Mus. Hist. Nat., Paris, 1905, No. 6, p. 406; Ann. Sci. Nat., Zool. (9), iv., 1906, p. 280, pl. x., fig. 6.

South of Gabo Island, Victoria, 200 fathoms; E.6212; one male. Carapace length 5.6 mm., width 7.1 mm.

This specimen is much smaller than those described by Nobili; the carapace is proportionally narrower than that of the female measured by him, the distance being shorter from the orbit to the second of the five lateral teeth. In nearly every respect the "Endeavour" specimen agrees with the descriptions cited; there is, however, indication of a transverse fringe of hair on the front, though it is incomplete; the pubescence in front of the fringe is shorter than behind it; only one row of granules is discernible on the margin. It may be added that both fingers of both chelæ are deeply grooved, and the granulation extends half the length of the dactyls and almost to the tips of the immovable fingers.

PILUMNUS DIGITALIS, *sp. nov.*[6]

(Plate xxii.)

Type-locality.—South 29° east of Pine Peak, Queensland; E.6486; one male, holotype. Length of carapace 9, width 12, width of front 4.8, distance between outer angles of orbits 9, length of penultimate leg 16.8 mm.

Additional locality.—Eleven to fourteen miles northwest of Pine Peak, Queensland, 24-26 fathoms; E.3188; one male.

This species belongs to the group of *P. trichophorus* [7] de Man, *P. trichophoroides*[8] de Man and *P. borradailei*[9] Rathbun. Like them it has the posterior half of the carapace flat, the surface of body and legs almost entirely covered with a coat of short hair, while fringes of long hair ornament the anterior third of the carapace, and also the chelipeds and legs. The new species has a narrower carapace, its length just three-fourths of its width; the frontoorbital distance is greater in proportion to width of carapace; the regions are mostly well defined, the mesogastric, protogastric, frontal, cardiac, anterior branchial and posterior branchial; while a furrow sets off the narrow marginal rim of the front, the wider, inner margin of the orbit, the posterior margin, and partially circumscribes an inner branchial areole. The outer of the two emarginations of the upper orbital margin is much the larger and helps to define the dentiform outer angle, which is more acute than the three succeeding blunt teeth of the anterolateral margin of the carapace. The transversely oblique ridge leading inward and forward from near the hinder part of the posterior tooth is pronounced and granulate. A similar ridge is subparallel to the antero-lateral margin, and runs from the gastric region to a point opposite the third tooth.

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[6] It should be noted that, in drawing the different species of *Pilumnus*, the carapace has been inclined so as to represent the true edge of the front, even though that edge is invisible in a strictly dorsal view.

[7] de Man—Zool. Jahrb., Syst., viii., 1895, p. 544; ix., 1896, pl. xiii., figs. 7-7*e*.

[8] de Man—*Op. cit.*, p. 549, pl. xiii., figs. 8*a*-8*e*.

[9] Rathbun—Proc. Biol. Soc. Washington, xxii., 1909, p. 113.

Chelæ somewhat unequal, covered with a fine but dense granulation reaching nearly to the tips. The horny tips, to which the long hair extends, are in the case of the movable finger only one-fifth of the length of the whole finger. The specific name draws attention to this peculiarity.

Ambulatory legs shorter than in *trichophorus* and *trichophoroides*, the penultimate leg being less than twice as long as the fronto-orbital distance.

Pilumnus contrarius, *sp. nov.*

(Plate xxiii.)

Type-locality.—Twelve miles north-north-east of Bowen, Queensland, 19-25 fathoms; E.3155; one male, holotype.

Measurements.—Male holotype, total length of carapace 11.6, total width 13.5, fronto-orbital width 9.4, width of front 5 mm.

Description.—A narrow species without spines, clothed with uneven, ragged-looking hairs. Carapace covered with short and rather fine hair, also long, coarse hair disposed in a line behind the front, a bunch on each protogastric region and a larger patch near the margin at the widest part of the carapace. When the hair is removed, the hepatic region is seen to be marked off by a wide furrow, the epigastric regions are isolated, the protogastric regions are continuous with the broad part of the mesogastric region, the median furrow, including the narrow part of the mesogastric region, is deep, the epibranchial lobe is raised, the lateral teeth are separated off in a sort of rim. All the most elevated parts of the carapace including the frontal, epigastric, middle part of protogastric, hepatic and epibranchial lobes, also the antero-lateral teeth and the postero-lateral regions are granulate.

The large lobes of the front are broadly rounded, median notch of good size, lateral notches larger, the outer teeth slightly acute. Inner upper angle of orbit almost obsolete. Margins of front and orbit granulate, one well-marked superior orbital notch, a shallow notch below outer angle, a thick, triangular tooth at lower, inner angle. Suborbital and subhepatic regions very finely granulate; no subhepatic tooth nor spine. Four antero-lateral teeth, the first low, second largest, carapace equally wide at the third and the fourth tooth.

Chelipeds and legs clothed with long hair, through which the surface is imperfectly seen; arm with a large, subterminal tooth above, lower and inner margins tuberculated; carpus finely and sparingly granulate, a small tooth at inner angle; larger palm unevenly tuberculate, the tubercles largest on upper surface and on lower, distal portion of outer surface; proximal half of lower margin tuberculate; fingers smooth except upper, proximal end of dactylus; two grooves on outer surface of fixed finger, which is slightly deflexed. Minor palm considerably smaller, tuberculation continued so as to embrace the whole lower surface, and part of the fingers, each finger with three deep grooves on the exposed surfaces. Legs almost entire, the upper margin of the merus finely and obscurely roughened.

Remarks.—In shape this resembles some species of *Heteropanope* Stimpson.[10] Of the species of Pilumnus, it has much in common with *P. marginatus* Stimpson[11] from Loo Choo, but the carapace of the latter is wider with more convergent postero-lateral borders and the hands are more finely roughened.

In *P. contrarius* the tubercles of the major palm, contrary to the customary rule, increase, instead of diminish, in size toward the distal, lower portion, a fact to which the name draws attention.

Pilumnus semilanatus, *Miers.*

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

Pilumnus semilanatus, Miers, Zool. Alert, Crust., 1884, p. 222, pl. xxii., figs. B and b. McCulloch, Rec. Austral. Mus., ix., 1913, p. 325, fig. 43, and synonymy.

Seven miles north-north-east of Bowen, Queensland, 16 fathoms; E.3099; two females (one ovigerous). P.3519; one male, one female.

Eighteen miles south by west of Lady Elliot Island, Queensland, 18 fathoms; E.4441; two females.

Great Sandy Strait, Queensland; P.3569; one young female.

Off Point Inskip, Great Sandy Strait, Queensland, 10 fathoms; E.3150; one female. E.3183; one young.

[10] Stimpson—Proc. Acad. Nat. Sci. Philadelphia, x., 1858, p. 35.
[11] Stimpson—Smithson. Misc. Coll., xlix., 1907, p. 70, pl. ix., fig. 2.

The specimens vary in size from the male (P.3519) 23 mm. long by 29 wide, to the young female (P.3569) 6.5 mm. long by 7.7 wide.

The species may be recognised by its ragged appearance, the carapace more than half smooth and naked, the long, coarse, tubular hairs disposed in tufts on the anterior and antero-lateral portions; besides there is a small tuft above each posterior corner, and a still smaller tuft at each end of the gastro-cardiac suture. The granules and tubercles on the hepatic region are partially exposed. The upper part of wrist and hand is almost bare and armed with large tubercles; the distal half of the larger palm is also bare and the tubercles well spaced. The ambulatory legs are thickly clothed with hair on the upper margin, and in the last pair on the lower margin, while the posterior surface of the last two segments in all the legs is hairy.

Pilumnus rufopunctatus, *Stimpson.*

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

Pilumnus rufopunctatus, Stimpson, Proc. Acad. Nat. Sci. Philadelphia, x., 1858, p. 36 [33]; Smithson. Misc. Coll., xlix., 1907, p. 66, pl. viii., fig. 3. Haswell, Cat. Austral. Crust., 1882, p. 66.

Spencer Gulf, South Australia, 16 fathoms; E.4444; four males, four females. The largest male is 9 mm. long, 13 wide; the other specimens are considerably smaller.

The species may be recognised by its short, thick, rather smooth, furry coat in which are embedded the few red granules, which to a certain degree retain their colour in alcohol; the large hand is half granulate, half smooth.

Pilumnus fissifrons, *Stimpson.*

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

Pilumnus fissifrons, Stimpson, Proc. Acad. Nat. Sci., Philadelphia, x., 1858, p. 36 [33]; Smithson. Misc. Coll., xlix., 1907, p. 67, pl. viii., fig. 4. Haswell, Cat. Austral. Crust., 1882, p. 68, pl. i., fig. 6.

Off Point Inskip, Great Sandy Strait, Queensland, 10 fathoms; E.3184; two males, one female.

Great Sandy Strait, Queensland; P.3570; one male, one female.

The largest specimen is the male, P.3570, measuring 6.4 mm. long by 8 mm. wide, or 1:1.25. Both females are smaller than the males, the smallest female (P.3570) measuring 4.8 by 6.9 mm. A lot of four specimens from Port Jackson, sent to the U.S. National Museum (Cat. No. 17025) by the Australian Museum, run much larger, one male being 9.6 by 14.4 mm. or 1:1.5. The width of the carapace, it will be seen, increases rapidly with age.

In the "Endeavour" specimens the main pubescence is very short and close, but the tufts scattered about, especially on the elevations are formed of long, coarse but soft, tubular hairs, which are much longer than on the larger specimens; of a different sort are the long, slender hairs on the ambulatory legs and on the granulated portion of the chelipeds.

Pilumnus tantulus, *sp. nov.*

(Plate xxv.)

Type-locality.—Platypus Bay, Queensland, 5-9 fathoms; E.3113; one male, holotype.

Additional localities.—Eleven to fourteen miles northwest of Pine Peak, Queensland, 24-26 fathoms; E.3189; four males, two females (one ovigerous).

South 29° east of Pine Peak, Queensland; P.3573; four males, two females.

Measurements.—Male holotype, total length of carapace 7.3, width including teeth 10.2, fronto-orbital width 7.4, width of front 3.7 mm.

Description.—A small species. Carapace covered with short, dense pubescence and some longer, fine hairs. When the carapace is cleaned, it is seen to be well areolated; antero-lateral regions rough with four elevations, one hepatic, one extending inward and forward from the last tooth, two behind the orbit; postero-lateral regions finely granulate. Frontal lobes almost free of pubescence, margins slightly oblique and granulate, median cut triangular; outer teeth independent, tuberculiform; preorbital angle very obtuse and inconspicuous. Two well-marked emarginations in the upper, granulate border of the orbit; a large, slightly acute tooth at outer angle, beneath which there is a narrow notch followed by a

denticulated margin which gradually advances to the acute inner angle. Three thick lateral teeth, more produced than the orbital tooth and each tipped with a small spine. No subhepatic projection, only a few granules. Posterior margin broad.

Chelipeds very unequal, less hairy than carapace, pubescence not concealing roughness, large chela totally bare. Outer surface of merus granulate; upper edge denticulate, a large subterminal tooth, a smaller terminal one; inner edge tuberculate, lower edge partly so. Carpus covered with pointed tubercles, sharper and more spinelike on the smaller carpus, which also has a spine instead of a tubercle at the inner angle. Larger palm bare and smooth except for a band of tubercles or large granules along the proximal end of the outer surface and a patch of the same at the proximal end of the upper surface. Two or three granules at base of dactylus. Fingers light brown, the colour covering the distal two-thirds of the fixed finger and almost the whole of the dactylus. The outer surface of the smaller palm is covered with pointed tubercles arranged in approximately seven rows, and a patch of the same is at the proximal end of the dactylus above. Ambulatory legs hairy, the merus roughened above by fine, unequal spinules.

Relationships.—The very unequal chelæ suggest those of *P. spinicarpus*[12] but in that species the rough area on the larger palm is much greater, also the carapace and legs are longer. The carapace of *tantulus* resembles in shape that of *P. quadridentatus*[13] de Man, which also has a striking inequality in chelæ, but differs from *tantulus* in having five (instead of four) antero-lateral teeth, counting the post-orbital tooth, and in the larger palm being finely granulate outside.

Pilumnus etheridgei,[14] *sp. nov.*

(Plate xxvi.)

Pilumnus lanatus, Fulton and Grant, Proc. Roy. Soc. Victoria, xix., 1906, p. 18, not *P. lanatus* Latreille.

Type-locality.—Ten miles north of Circular Head, Tasmania; E.6490; two males (one is holotype).

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[12] See page 123

[13] de Man—Zool. Jahrb., viii., 1895, p. 537; ix., 1896, pl. xiii., figs. 6-6*g*.

[14] For Robert Etheridge, junr., late Director and Curator of the Australian Museum.

Additional locality.—Oyster Bay, Tasmania, 26 fathoms; E.5187; one male, two females, two young. Without locality; E.6492; four males, four females (one soft shell).

Measurements.—Male holotype, entire length of carapace 12, width, including spines, 16.5, fronto-orbital width 10.5, width of front between antennal notches 5.5 mm.

Description.—Carapace very convex from front to back, suboval, the front little advanced beyond curve of antero-lateral margins, the latter nearly as long as the convex postero-lateral margins, posterior margin between legs of last pair arcuate. Posterior fourth or third of carapace smooth and bare; remainder covered with a thin coating of short, light-coloured hair, which does not disguise the surface. Regions fairly well outlined; gastro-cardiac depression deep; also the median furrow leading from the mesogastric region to the front. Surface roughened by two or three stout spinules on the hepatic region, by smaller spinules opposite the last lateral tooth, by the granuliform sockets of many of the surface hairs, and by fine, close granulation on the post-lateral regions.

Edge of front invisible in dorsal view, median lobes deeply separated, oblique, extremities broadly rounded; small outer lobe dentiform with a tuberculiform tip. Supra-orbital border irregularly spinulose and granulose, inner angle not accented, notches obscure; outer angle or first antero-lateral tooth broad, tipped by a short, stout, curved spine, behind which is a spinule, and under which are several spinules; a notch separates this tooth from the suborbital margin, armed with four or five stout spinules, and near the inner angle a broad tooth with bispinulose tip. The second, third and fourth antero-lateral teeth are similar to the first, but larger; the fourth has a narrower base than the second and third, and the spinule on its posterior slope may be absent. Submarginal regions granulose and spinulose, subhepatic region with three or more spinules, some of which are visible from above.

Chelipeds of large male stout, unequal, but similar in shape and ornamentation; merus very high, armed above with two large spine-pointed teeth, followed behind by obscure granulation on margin and on outer surface; wrist and hand armed with stout, acute spines, which on the palm become lower and more and more tuberculiform toward the lower and distal margins until they altogether

disappear; dactyli spinulose above at base only; a punctate groove runs backward from the next to the lowest sinus of fixed finger, a similar groove near upper edge of dactylus; also a row of punctæ near the prehensile teeth of each finger; fingers pale brown in the male, darker in the female, the colour not extending quite to their bases. Dorsal aspect of chelipeds hairy.

In the female, the propodus has a straighter lower border, the small palm is rough all over the outer surface and half way down the fingers, the large palm is also rougher than in the male but finely so, and the spinulous area on the dactylus is longer. In the small male the armature of the lesser palm resembles that of the female.

Merus of ambulatory legs subentire above; carpus and propodus armed with spines, carpus with about four, propodus about five.

Remarks.—The convexity of the carapace in connection with the complex lateral spines is sufficient to fix this species.

PILUMNUS TOMENTOSUS, *Latreille.*

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

Pilumnus tomentosus, Latreille, Encyc. Méth. Hist., Nat., Entom., x., Paris 1825, p. 125 (Nouvelle Hollande). Milne Edwards, Hist. Nat. Crust., i., 1834, p. 418. Not Filhol, Mission de l'Ile Campbell, Paris, 1885, p. 375, pl. xlv., figs. 6-8.

Pilumnus tomentosus (?), Miers, Challenger Rept., Zool., xvii., 1886, p. 160, pl. xiv., fig. 4.

Shoalhaven Bight, New South Wales, 15-45 fathoms; E.278; one male, two females (one ovigerous). P.2139; one ovigerous female.

Off Gabo Island, Victoria, 80-100 fathoms; E.4780; one male, one female.

South-east of Cape Everard to south of Gabo Island, Victoria, 90-150 fathoms; E.6095; three males, three females.

From sixty miles south of Diana's Peak to about forty miles south of Mt. Cann, Victoria, 70-80 fathoms; E.6088; two males, two females.

South of Mt. Cann, Victoria, 55-70 fathoms; E.6081; four males, seven females.

South of Mt. Cann, Victoria, 55-100 fathoms; E.6180; two young (one shedding).

South and south-west of Mt. Cann, Victoria, 70-100 fathoms; E.6119; two females.

East of Bass Strait, 70-80 fathoms; E.4825; two young.

East of Flinders Island, Bass Strait; E.5670; two males, seven females.

East of Flinders Island, Bass Strait; P.2321; one male. P.2322; one male.

East of Flinders Island, Bass Strait, 200-300 fathoms; E.4809; one ovigerous female. E.4810; one male. E.4811; one male. E.4812; one male, one ovigerous female. E.4813; two ovigerous females.

Off Falmouth, Tasmania, 60-70 fathoms; E.6135; one female.

Marsden Point, Kangaroo Island, South Australia, 17 fathoms; E.4454; eight males, ten females.

Spencer Gulf, South Australia, 20 fathoms; E.4440; one female.

Spencer Gulf, South Australia, 16 fathoms; E.6488; two young.

Fifteen miles north by west of Cape Jervis, South Australia, 17 fathoms; E.4443; two males, one female with Rhizocephalid, one young.

South-west of Eucla, about long. 127° E., Great Australian Bight, 80-120 fathoms; E.3665; one ovigerous female.

Sixty to eighty miles west from Eucla, Great Australian Bight, 80-120 fathoms; E.3176; two ovigerous females. P.3560; one ovigerous female. P.3561; one male. P.3562; one male. P.3563; one male, two ovigerous females.

South Australia; E.4439; one female.

Measurements. — Largest specimen, female, E.3176: Entire length of carapace 25.2, entire width 35, width in front of posterior pair of spines 31.2, width of front, to antennal notches 10.4, width of front and orbits 20.4, width of posterior end of mesogastric region 7.2 mm. Largest male, E.4454: Entire length of carapace 24.4, entire width 31.3, width in front of posterior pair of spines 28.4, width of front to antennal notches 8.9, width of front and orbits 18.8, width of posterior end of mesogastric region 6.2 mm.

Description.—Front advanced, antero-lateral margins arcuate, postero-lateral margins strongly convergent. Surface covered with short, numerous, but not crowded, single, yellow (in alcohol) hairs which entangle a coat of refuse; regions well marked, branchial region partially subdivided, several (three or four) subacute spines or spinules near the marginal spines. Front subtriangular, lobes with a short inner and long outer slope and rounded tip, edge denticulate; outer tooth single, independent, triangular, spiniform. Inner angle of orbit suberect, not at all advanced. Upper orbital margin with a few spinules, two subequal emarginations, and an outer spine of moderate size. Spinules of lower orbital margin larger and more regular than those of the upper margin, inner spine the largest. A narrow subhepatic spine is visible in dorsal view where it appears as a second antero-lateral spine; in side view it is in same straight line as three succeeding spines; these are large, sharp-pointed, conical spines, each with one or more spinules on its slope; the first of the three spines points almost directly forward.

Chelipeds and legs clothed with similar hairs to those on the carapace, but on the legs the hairs are longer; on the chelipeds the hairs are thickest about the bases of the spines. Chelipeds very unequal; merus with a terminal and a subterminal spine above, lower border obscurely denticulate, one or two spinules on inner border; carpus armed with scattered, conical, acute spines, the longest one erect at inner angle. Larger palm covered with numerous, similar spines, pointing distad and sometimes—especially in full grown males—disappearing toward the lower margin and fixed finger; proximal end of lower margin tuberculate. Each finger has two outer, punctate grooves; the dactylus is tuberculate above at its base. Smaller palm similarly armed, usually all over the outside,

the spines showing signs of longitudinal arrangement and continued half way down the dactylus and nearly as far on the immovable finger.

The ambulatory legs are rather broad, and little armed; the merus has a terminal spinule on the upper border and a rightangled subterminal tooth.

The very young have some long soft hairs among the short bristly ones.

Remarks.—*P. tomentosus* is by far the most abundant species of *Pilumnus* in the "Endeavour" collection. One would think from Miers's figure, *loc cit.*, that it was very smooth and trim looking, but it has a strong tendency to collect dirt and is very untidy looking. Some of the spines, especially those on the back, retain a red colour in alcohol.

PILUMNUS HIRSUTUS, *Stimpson.*

(Plate xxviii.)

Pilumnus hirsutus, Stimpson, Proc. Acad. Nat. Sci., Philadelphia, x., 1858, p. 37 [34]; Smithsonian Misc. Coll., xlix., 1907, p. 69, pl. ix., fig. 1.

Twelve miles north-north-east of Bowen, Queensland, 19-25 fathoms; E.3156; one female.

Twenty miles north-north-east of Double Island Point, Queensland, 30 fathoms; E.4436; one male, one female.

Measurements.—Female (E.3156), total length of carapace 10.1, width including spines 14.1, fronto-orbital width 11 mm. Female (E.4436), length 9.8, width 14.1, fronto-orbital width 10.4 mm. Male (E.4436), length 7.4, width 10.1, fronto-orbital width 7.8 mm. Ratio of length to width in the three specimens, 1:1.4, 1:1.44, 1:1.37, the male being narrower than the females, and the females with a wide range of variation.

There is also some variation in the convexity and in the advancement of the front. The larger female is the most convex, the smaller female has the least produced front, and appears to have (though really has not) the greatest relative fronto-orbital width.

The orbits are very wide, and the distance between the subequal, triangular, superior notches is uncommonly long. The four antero-lateral teeth are similar, having a triangular base and a very slender terminal spine which is shorter in the first or orbital tooth. In only the largest of the three specimens is there a subhepatic spine; it is very short, but visible in dorsal view. In the other two specimens there is on the subhepatic region a cluster of about three sharp granules, which is barely visible from above. The hair on the carapace is very soft and of two sorts, a short, fine fur, with small clusters of longer, coarser hairs, including a line just behind the frontal lobes. These lobes are broadly rounded, and are separated by a large notch; the outer tooth of the front is rather wide as these teeth go, subrectangular, and with a very small point; the inner orbital angle is obtuse and inconspicuous. Upper margin of orbit and front finely granulated; lower margin with a definite outer notch, followed by a short granulate edge and then by sharp spinules mixed with granules.

Chelipeds very unequal; merus with two spines at distal end followed by spinules; wrists and palms armed with sharp tubercles or stout spines, which cover only half of the larger palm, and are seriate on the smaller palm. The brown colour of the fingers does not quite come to their bases. The larger thumb has a punctate groove not far above the margin; the dactylus is rough above near its base. Fingers of smaller chela deeply grooved, and roughened for half their length.

Pilumnus spinicarpus, *Grant and McCulloch.*

Pilumnus spinicarpus, Grant and McCulloch, Proc. Linn. Soc., New South Wales, xxxi., 1906, p. 15, pl. i., figs. 2 and 2*a*, and synonymy.

Seven miles north-north-east of Bowen, Queensland, 16 fathoms; E.3100; one female.

Eleven to fourteen miles north-west of Pine Peak, Queensland, 24-26 fathoms; E.3189; one female.

South 29° east of Pine Peak, Queensland; P.5330; one female, one young.

Largest specimen (E.3100), length of carapace 9.8, width 13 mm.

PILUMNUS ACER, *sp. nov.*

(Plate xxix.)

Type-locality.—Sixty to eighty miles west from Eucla, Great Australian Bight, 80-120 fathoms; E.3178; one male holotype, one ovigerous female.

Additional localities.—South-west of Eucla, about long. 127° E., Great Australian Bight, 80-120 fathoms; E.3663; one male.

Sixty to eighty miles west of Eucla, 80-120 fathoms; P.3564; one male, one ovigerous female.

Measurements.—Male holotype, total length of carapace 15.4, width without spines, measured behind the last pair, 20.4; width with spines 22.3 mm.

The gastric region and its three subdivisions are faintly outlined; a little deeper groove runs from the mesogastric region to the median sinus of the front. The dorsal surface of the carapace and appendages is covered with numerous hairs which are distinctly yellow in the specimens preserved in alcohol, and of different lengths, but on the whole rather long, and placed singly with few exceptions. The width of the front is less than half the length of the carapace; its large lobes are so deflexed that they do not show in a dorsal view, they are subtriangular, ends broadly rounded, outer slope longer than inner, edge obscurely granulate, as is also the upper margin of the orbit. This shows two small, subequal, rounded sinuses, and at the outer angle a slender spine. At the inner suborbital angle there is a slender spine springing from a conical base; on the lower margin there are also six or seven small spines or spinules, the outer of which is the largest and is separated by a V-shaped sinus from the exorbital spine. Suborbital region with one larger spine and one or two smaller spines and some spinules. Further back on the lateral border there are three slender horny spines set in larger, cylindrical sockets, from each of which spring behind the spine two or three hairs longer than the spine.

The two spines near the distal end of the arm are similar to those bordering the carapace, and are succeeded by a few spinules; lower margin with a few small tubercles,

inner margin with two unequal spines, surfaces punctate and nearly smooth. The ischium bears a few blunt spinules on inner margin. The carpus is armed with long spines (right 14, left 12) one of which is erect at the inner angle. In the male the outer surface of the large hand may be divided somewhat obliquely into two unequal parts, the upper and larger part spinous and hairy, the lower part smooth and naked; the spines are arranged in six rows and those of large size number about twenty, but toward the distal and lower borders the spines diminish in size, becoming conical tubercles. A patch of hair and blunt, spinous tubercles at base of dactylus above. The rows of spines and tubercles cover the outside of the small hand and are arranged in seven rows, of which two rows are continued slightly on the fixed finger.

In the female the larger hand is practically entirely covered outside with spines, which become smaller below.

The merus joints of the ambulatory legs have a row of several curved spines on the upper edge, the carpus has three long spines above, except in the last pair, only two.

Relationships.—This species is near *P. vestitus,* Haswell,[15] having the same shaped carapace and front, a border of spines, a spine at either end of orbit, a similar arrangement of spines on chelipeds and ambulatory legs. It differs from *vestitus* in having the hairs arranged singly instead of in bunches, in the fainter areolation, narrower and more deeply separated frontal lobes, in the character of the lateral spines whose bases are cylindrical, not conical, in the spines of the wrist few and long instead of numerous and short, in the longer ambulatory legs, with one or two more spines on each merus and much longer spines on the carpal segments.

The species also has a resemblance to *P. terra-reginæ*,[16] which has a granulate carapace, no spine outside the orbit, wrist rough with granules instead of spines, and unarmed legs.

[15] Haswell—Proc. Linn. Soc. New South Wales, vi., 1881 (1882), p. 753.

[16] Haswell—*loc. cit.,* p. 752.

ACTUMNUS SETIFER (*de Haan*).

Cancer (*Pilumnus*) *setifer*, de Haan, Fauna Japon., Crust., 1835, p. 50.

Cancer (*Xantho*) *setifer*, de Haan, *op. cit.*, pl. iii., fig. 3.

Actumnus setifer, Alcock, Journ. Asiat. Soc. Bengal, lxvii., 1898, p. 202 [437], and partial synonymy.

Fifteen miles north-west of Cape Jervis, South Australia, 17 fathoms; E.4458; one female, 8.7 mm. long, 11.4 mm. wide.

Marsden Point, Kangaroo Island, South Australia, 17 fathoms; E.4465; one male, somewhat smaller than the female.

ACTUMNUS PUGILATOR, *A. Milne Edwards*.

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

Actumnus pugilator, A. Milne Edwards, Nouv. Arch. Mus. Hist. Nat., Paris, ix., 1873, p. 195, pl. vii., figs. 1, 1*a*.

Eleven to fourteen miles north-west of Pine Peak, Queensland, 24-26 fathoms; E.3192; one female, with large Rhizocephalid parasite attached under the abdomen.

Platypus Bay, Queensland, 28/7/'10; P.3526; one female, carapace 16.3 mm. long, including lobes, 22.2 mm. wide.

Platypus Bay, Queensland, 5-9 fathoms; E.6489; one male, without chelipeds.

ACTUMNUS KINGSTONI, *sp. nov.*

(Plate xxx.)

Type-locality.—Forty miles west of Kingston, South Australia, 30 fathoms; E.4435; one female, thin shell, holotype.

Measurements.—Female holotype, length of carapace 14.2, width of same 19.2, fronto-orbital width 12.3, width of front, between antennæ, 6.3 mm.

Description.—Carapace moderately convex from side to side, and not strikingly so from front to back; covered with soft, uneven, and rather short hairs, which do not conceal the unevenness of the surface below; interregional grooves deep; gastric region divided into three; two areoles on the anterior branchial region. Middle lobes of front oblique, separated by a deep, narrow notch, edge sparsely and minutely spinulous; outer tooth triangular, tipped with a white spinule and separated by a right-angled sinus from the blunt, inner angle of the orbit. Upper margin of orbit hairy, feebly bi-emarginate, a small tooth tipped with a white spinule at outer angle; below this a broad V-sinus; lower margin sparsely spinulous; outer half transverse, inner half advancing gradually to the spine-pointed inner angle. A subhepatic spine a little longer than the outer orbital one. Behind it three conical, curved spines with sharp white tips.

Chelipeds of female unequal, the left palm two-thirds as high as the right; the exposed surface is hairy, except on the fingers; merus with two spines above, at, and near the distal end, upper and lower edges obscurely roughened, proximal end of inner margin as well as the inner margin of the ischium spinulous. The carpus and upper proximal half of the manus are armed with strong and rather sparse spines, which form the centres of clusters of hairs; on the carpus four or five of the spines run along the distal margin and the largest one is at the inner angle; on the lower, distal half of the manus the spines become smaller, more tuberculiform, and more numerous, reaching quite under the lower surface and part way on the immovable finger; this finger of the major chela is much broken, its lower line is continuous with the horizontal line of the palm until near the tip, which bends gradually upward; the dactylus has a deep groove a little below and parallel to the upper margin, the basal two-fifths of its upper surface is spinulous. The immovable finger of the minor chela is slightly deflexed before it turns upward at the tip; the spinulation and hairiness of the fingers are more extensive than in the larger chela.

Ambulatory legs covered with hairs like those on the carapace and also long hairs which are disposed chiefly along the margins.

ACANTHODES ARMATUS, *de Haan.*

(Plates xxxi.-xxxii., fig. 1 and Fig. 3.)

Cancer (Acanthodes) armatus, de Haan, Fauna Japon. Crust., 1835, p. 52, pl. B (part), pl. iv. Doflein, Abh. k. bayer. Akad. Wiss., Cl. ii., xxi., 1902, p. 661, pl. ii.

Fig. 3.—Abdomen of *Acanthodes armatus*, male.

South-west of Eucla, long 126½° E., Great Australian Bight, 130-190 fathoms; E.3674; one male; carapace, length 34.3 mm., width 38.1 mm.

South-west of Eucla, about long. 127° E., Great Australian Bight, 80-120 fathoms; E.3664; one young female; carapace, length 19.4 mm., width 21.5 mm.

Sixty to eighty miles west from Eucla, Great Australian Bight, 80-120 fathoms; E.3179; one young male; carapace, length 16.3 mm., width 18.8 mm.

The measurements do not include spines.

The smallest crab is very hairy and *Pilumnus*-like; hairs long and numerous, without concealing the surface. The hairs lessen with the growth of the animal, and in the larger male are rather scanty on the carapace. On the antero-lateral margin there are four long primary spines, the first of which is at the orbital angle; in the interspaces are three shorter spines, the first one a little below the marginal line. Above and subparallel to this row there is an irregular row of seven spines of which the first is near the orbit, the second is below the line, the fourth is largest, the seventh is opposite the post-lateral margin. In

addition there are three spines in a triangle on the epibranchial region and two on the hepatic region. There are in all nine gastric spines, in transverse series: two on each epigastric lobe, and on each protogastric lobe, and in line with the latter, a small mesogastric spine. Frontal marginal spines six, the middle pair largest, the outer pair situated at the angle of the orbit; behind them there is a row of four spines. There are two supraorbital spines besides the three already mentioned; suborbital spines five, the inner one much the longest, the others diminishing in size. Post-lateral regions rough with short spinules. A row of tubercles above the posterior margin.

Chelipeds unequal in all the specimens, but not much so; the armature is strong and similar. The spines of the legs are slenderer.

In the three small specimens handled the spines retain about the same proportion to the size of the crab. In the type figured (about natural size) by de Haan, *loc. cit.*, which is a female, not a male, as labelled, the spines of the appendages and of the margin of the carapace maintain about the same relative size as in the young, but the dorsal spines are reduced in size and the hairs of the carapace seem to have disappeared. Both chelæ are spinous as in the young.

In Doflein's figure (*loc. cit.*) which is of a much larger specimen, a male 15 cm. wide, all the spines are much reduced, some of them to spinules; the major cheliped has increased enormously while the minor one has remained stationary; the major chela is nearly smooth.

This species had not before been taken outside of Japanese waters.

Subfamily ERIPHIINÆ.

TRAPEZIA CYMODOCE (*Herbst*).

Cancer cymodoce, Herbst, Naturg. Krabben u. Krebse, iii., part 2, 1801, p. 22, pl. li., fig. 5.

Trapezia cymodoce, Alcock, Journ. Asiat. Soc. Bengal, lxvii., 1898, p. 219 (454), and synonymy.

North-west Island, off Rockhampton, Queensland; E.4517; one male, one ovigerous female.

Family PORTUNIDÆ.

Subfamily CARCINIDINÆ.

NECTOCARCINUS INTEGRIFRONS (*Latreille*).

Nectocarcinus integrifrons, Haswell, Cat. Austral. Crust., 1882, p. 81, and synonymy.

Without locality; E.6493; one young male, 11.6 mm. wide.

The front of this species has a slight median emargination, which in the small specimen in hand is relatively larger than in well-grown specimens.

NECTOCARCINUS TUBERCULOSUS, *A. Milne Edwards*.

Ann. Sci. Nat. Zool. (4), xiv., 1860, p. 220; Arch. Mus. Hist. Nat., Paris, x., 1861, p. 405, pl. xxxvii.

Bay of Fires, Tasmania; E.6082; one male, with carapace 63 mm. long and 81.7 mm. wide.

Originally described from Tasmania.

Subfamily PORTUNINÆ.

PORTUNUS (PORTUNUS) SANGUINOLENTUS (*Herbst*).

Neptunus sanguinolentus, Alcock, Journ. Asiat. Soc. Bengal, lxviii., 1899, p. 32 [500], and synonymy.

Thirteen miles north by west of Double Island Point, Queensland, 25-26 fathoms; E.2051; one female. E.2052; one large male. P.2397; one very large male, 65.6 mm. long by 151.7 mm. wide.

The two males are uncommonly large specimens.

PORTUNUS (PORTUNUS) PELAGICUS (*Linnæus*).

Neptunus pelagicus, Alcock, Journ. Asiat. Soc. Bengal, lxviii., 1899, p. 34 [502], and synonymy, except *Neptunus trituberculatus*.

Thirteen miles north by west of Double Island Point, Queensland, 25-26 fathoms; E.2041; one large female, not mature, 59.6 mm. long, 129 wide (allowing for tip of left spine, which is broken off); granules high and numerous, set in dense pubescence.

Platypus Bay, Queensland, 5-9 fathoms; E.3108; one young male, half grown, carapace very pubescent, largely obscuring the granules.

Southern Queensland; E.3138; one very large male, 84.7 mm. long, 165.8 wide; granules of carapace distant, pubescence scanty, one small specimen of Balanidæ encrusting. P.3539; one large male, 72 mm. long, 149 wide; granules higher and a little more numerous than in E.3138, partly obscured by pubescence.

CHARYBDIS (CHARYBDIS) NATATOR (*Herbst*).

Charybdis (*Goniosoma*) *natator*, Alcock, Journ. Asiat. Soc. Bengal, lxviii., 1899, p. 61 [529], and synonymy.

Seven miles south-south-east of Double Island Point, Queensland, 32-33 fathoms; E.2036; one male. Front deformed, second of the eight frontal teeth (counting from the left) somewhat reduced, sixth tooth showing only a very short stump; distal tooth of outer row on top of major manus wanting.

Platypus Bay, Queensland, 5-9 fathoms; E.3110; one female.

CHARYBDIS (CHARYBDIS) INCISA[17], *sp. nov.*

(Plate xxxiii.)

Type-locality.—Off Point Inskip, Great Sandy Strait, Queensland, 10 fathoms; E.3151; one ovigerous female, holotype.

Measurements.—Female holotype, total length of carapace 17.3, extreme width 26, width at base of spine at lateral angle 23, fronto-orbital width 18, width between orbits 10.2 mm.

Description.—Belongs to the subgenus *Charybdis*, in which the antennal flagellum is excluded from the orbit, the ridge that bounds the dorsum posteriorly forms a curve with the postero-lateral borders, the posterior border of the arm lacks a spine, and to that division of the subgenus in which there are no distinct ridges on the carapace behind the level of the last spine of the antero-lateral borders.

[17] *Incisus*, cut into, referring to the cut into the first lateral tooth to form the second.

Three ridges present on carapace, one between the spines of the last pair, which is thrice interrupted, two gastric ridges, the posterior of which is interrupted at the middle, while the anterior one is broadly interrupted. Front cut into six rounded teeth, not including the inner supra-orbital angles; the middle two are slightly more prominent than the next pair, which are wider and somewhat oblique on their inner slope; outer pair least advanced, narrow and deeply separated from the second pair. Antero-lateral borders cut into six teeth, five of which are spiniform and similar, the sixth one a little longer. The second tooth is very small, dentiform, and is not salient beyond the outer slope of the first tooth, of which it seems to form an integral part. Orbit with a slight dorsal inclination; the major diameter is about two-fifths as wide as the inter-orbital distance; inner end of lower margin in the form of a broad, blunt tooth. A granular ridge on lobule at outer angle of basal segment of antenna.

Chelipeds of female stoutish, hairy on the depressed portions of the exposed surfaces. Three enlarged spines on anterior border of arm. Wrist with granular costæ on upper and outer surfaces, the inner angle strongly spiniform, three spinules near outer angle. Hand with five granular costæ, and on the upper surface five spines. Merus of last leg over twice as long as wide; posterior border of propodus spinous.

Relationships.—The species looks much like *C. spinifera* (Miers)[18], but the latter has a wider carapace, the median pair of frontal lobes are not narrower than the submedian pair, the second tooth of the antero-lateral margin is of greater size and prominence, and the carpus of the last pair of feet has a strong spine on its posterior margin[19], and the propodus is unarmed.

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[18] Miers—Rept. Zool. Coll. "Alert," 1881-2, London, 1884, Crust., p. 233, pl. xxiii., figs. C and c.

[19] Dr. Calman kindly examined the type of *spinifera* and sent sketches of the frontal teeth and the natatory leg for comparison.

CHARYBDIS (GONIOHELLENUS) TRUNCATA (*Fabricius*).

Charybdis truncata, Rathbun, Proc. U.S. Nat. Mus., xxvi., 1902, p. 27, and synonymy. Not *Charybdis (Gonioneptunus) truncata*, Alcock, Journ. Asiat. Soc. Bengal, lxviii., 1899, p. 67 [535].

Seven miles north-north-east of Bowen, Queensland, 16 fathoms; P.3522; one ovigerous female. E.3103; two ovigerous females.

Platypus Bay, Queensland, 5-9 fathoms; E.3109; one ovigerous female.

Platypus Bay, Queensland; July 28, 1910; P.3524; one male.

The females are sensibly narrower than the male.

Subtribe OXYSTOMATA.

Family LEUCOSIIDÆ.

MEROCRYPTUS LAMBRIFORMIS, *A. Milne Edwards.*

(Plate xxxii., figs. 2-3.)

Merocryptus lambriformis, A. Milne Edwards, Journ. Mus. Godeffroy, iv., Hamburg, 1873, p. 85, pl. xiii., figs. 1-1*c*. Whitelegge, Mem. Austral. Mus., iv., 1900, p. 162, and synonymy.

East of Bass Strait, 70-80 fathoms; E.4822; two males, four females (one ovigerous).

Twenty miles east of Babel Islands, Bass Strait, 65-70 fathoms; E.5162; one male, one female.

East of Babel Islands, Bass Strait, about 70 fathoms; E.5193; eleven males, thirteen females (four ovigerous).

Sixty to eighty miles west from Eucla, Great Australian Bight, 80-120 fathoms; E.3169; one male.

Carapace of largest male (E.5193) 10.8 mm. in total length, 14.3 mm. in total breadth. The same measurements for the female are 14.8 and 19.3 mm.

The protuberances of the carapace are more striking in the male than in the female. The cardiac prominence is conical in the male, dome-shaped in the old female; the gastric projections are of similar shape in the sexes, but longer and nearer to each other in the male. In the male the teeth of the posterior margin are larger and occupy the whole of the margin, in the female they are separated by a wide interspace. Frontal sinus deeper cut in male than in female.

In both sexes there are visible in dorsal view three small, acute teeth below the lateral border of the carapace, one on the subhepatic region and two just in front of the branchial wing.

EBALIA TUBERCULOSA (*A. Milne Edwards*).

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

Persephona tuberculosa, A. Milne Edwards, Journ. Mus. Godeffroy, iv., Hamburg, 1873, p. 86.

Phlyxia granulosa, Haswell, Proc. Linn. Soc. New South Wales, iv., 1880, p. 54, pl. vi., fig. 3.

Ebalia tuberculosa, Miers, Challenger Rept., Zool., xvii., 1886, p. 306, pl. xxv., figs. 1, 1*a*. Whitelegge, Mem. Austral. Mus., iv., 1900, p. 161. Grant, Proc. Linn. Soc. New South Wales, xxx., 1905, p. 315.

Off Gabo Island, Victoria, about 200 fathoms; E.5197; three males, one female.

South-east of Cape Everard to south of Gabo Island, Victoria, 70-80 fathoms; E.6092; one ovigerous female. E.6093; one male.

South-east from Cape Everard, Victoria, 70-80 fathoms; E.6173; two females.

South of Cape Everard, Victoria, 80 fathoms; E.6165; one male, two females.

South and south-west of Mt. Cann, Victoria, 70-100 fathoms; E.6113; seven males, eight females (one ovigerous).

Forty miles south-south-west of Mt. Cann, Victoria, 70 fathoms; E.6484; three males, three females (one ovigerous).

East of Bass Strait, 70-80 fathoms; E.4821; fourteen males, eight females (two ovigerous).

Twenty miles east of Babel Islands, Bass Strait, 65-70 fathoms; E.5160; seven males, twenty females (eight ovigerous).

East of Babel Islands, Bass Strait, about 70 fathoms; E.5192; two males, six females (two ovigerous).

Sixty to eighty miles west of Eucla, Great Australian Bight, 80-120 fathoms; E.3170; two females. P.3556; one male.

Total length of male carapace (E.6484) 9.3, width 9 mm. Length of female (E.5160) 7.8, width 7.7 mm. Length of smallest ovigerous female (E.6484) 5.5 mm.

Variation.—Whitelegge (*loc. cit.*) mentions the variability in the granulation. Besides the varieties which he observed we have some specimens, part of E.4821, in which, regardless of sex, all the granules of the carapace are flat and disc-like, but many of them are as if crowded up to a higher level, making a very uneven surface. As a rule the carapaces with this surface have higher and rougher protuberances, while the smooth, evenly paved carapaces have low, smoothly rounded protuberances which more often in the female than in the male, may be almost obsolete on the branchial regions. Milne Edwards (*loc. cit.*) may have described such a specimen, as he does not mention branchial tubercles.

Regardless of the above characters, the posterior lobes are shallow in the female, protuberant in the male.

Phlyxia intermedia, *Miers.*

Ebalia (*Phlyxia*) *intermedia*, Miers, Challenger Rept., Zool., xvii., 1886, p. 308, pl. xxv., figs. 2-2c.

Off Marsden Point, Kangaroo Island, South Australia; E.4518; one ovigerous female; length of carapace, between tips of spines, 7.8 mm.

Oyster Bay, Tasmania, 26 fathoms; E.5186; one immature female, length of carapace 10.2 mm.

In the larger specimen the posterior margin is straight; in the smaller one it is slightly convex; the two broad teeth thus formed are very obtuse angled. As Miers says, the largest of the lateral marginal tubercles is on the postero-lateral margin; of the smaller tubercles one is at the widest part of the carapace, forming a lateral angle, and another nearly half way to the hepatic protuberance. There is a suggestion of another tubercle in a slight marginal swelling a little behind the lateral angle. The only dorsal tubercle is that on the intestinal region in front of the posterior spine.

Myra fugax (*Fabricius*).

Myra fugax, Alcock, Journ. Asiat. Soc. Bengal, lxv., 1896, p. 202, and synonymy. Ihle, Siboga-Exped., Monog. xxxix*b*^{2}., 1918, p. 256, and synonymy.

Twenty miles north-east of Cape Gloucester, Queensland, 35 fathoms; E.3119; one female.

Philyra murrayensis, *sp. nov.*

(Plate xxxiv.)

Type-locality.—Off Murray River mouth, South Australia, 20 fathoms; E.4467; one adult female, holotype.

Measurements.—Female, total length of carapace 26, length of median line from margin to margin 25, width 25.7 mm., posterior margin between tips of teeth 10.5, anterior width between tips of subhepatic teeth 4.8 mm.

Description.—The edge of the buccal cavity shows very slightly beyond the front, but the anterior end of the subhepatic facet projects well beyond the outer angle of the orbit in a thick, blunt, suberect tooth. The posterior margin of the carapace is nearly straight and at either end has a small acute tooth pointing backward.

Carapace subcircular, nearly smooth; a furrow on either side of the cardiac region, depressions behind the front and each orbit; surface obscurely granulate, granules depressed, unequal, mixed with punctæ. Sinus above cheliped broad, obtuse angled. Four small lateral marginal tubercles, one at posterior end of sinus, one over base of first ambulatory

leg and at widest part of carapace, one over second leg and a short distance behind second tubercle, fourth and largest over base of last leg. A large, pointed, median tubercle on intestinal region just over posterior margin; this margin is rough with granulation.

The subhepatic facet is almost entirely visible from above; it has a strong tooth at its postero-external angle, and the anterior half has a granulate outer margin.

Front four-toothed, teeth thick, middle pair small, separated by a rectangular sinus, outer pair broad and shallow. Upper sinus of orbit deep.

Anterior portion of outer maxillipeds granulate and hairy. Chelipeds stout, smooth to the touch, finely granulate, the granules largest on the cylindrical merus; palms of female moderately swollen, greatest width two-thirds of upper or outer length; fingers longer than palm, deflexed, tapering regularly to tips and leaving a very slight opening at base when closed.

Of the ambulatory legs the merus joints are cylindrical, the propodus sharply carinate above, dactylus carinate on either side.

The unique holotype has a very large Rhizocephalid parasite enclosed within the abdomen.

Relationships.—The species differs from all others with straight posterior margin in having an acute backward-pointing tooth at the ends of that margin. Compare remarks by Miers[20] on the species related to *P. rectangularis*.

Family CALAPPIDÆ.

Calappa lophos (*Herbst*).

Calappa lophos, Alcock, Journ. Asiat. Soc. Bengal, lxv., 1896, p. 144.

Seven miles north-north-east of Bowen, Queensland, 16 fathoms; E.3095; one female.

Eight miles east of Sandon Bluffs, New South Wales, 35-40 fathoms; E.2031; one male.

[20] Miers—Zool. "Alert," Crust., 1884, pp. 546-547.

Male, extreme length of carapace 74.3, extreme width 115 mm.; female, extreme length of carapace 39, extreme width 53.7 mm. The specimens show a range in length from not quite two-thirds the extreme width in the old to nearly three-fourths the extreme width in the half grown.

The marginal teeth in the old male resemble those figured by de Haan[21].

In the small female, the lateral teeth of the wings of the carapace are shallow and obtuse angled; the posterior margin of the last of these teeth is shorter than the corresponding margin of the adjoining tooth of the posterior border of the carapace. The reverse is true in the old male. These characters are varietal and not sexual.

MATUTA PLANIPES (*Fabricius*).

Matuta planipes, Fabricius, Ent. Syst., Suppl., 1798, p. 369; Rathbun, Proc. U.S. Nat. Mus., xxvi., 1902, p. 30.

Matuta lunaris, Alcock, Journ. Asiat. Soc. Bengal, lxv., 1896, p. 161, not *Cancer lunaris*, Herbst, 1783.

Off Point Inskip, Great Sandy Strait, Queensland, 10 fathoms; E.3152; one large male.

Family DORIPPIDÆ.

DORIPPE DORSIPES (*Linnæus*).

Dorippe dorsipes, Alcock, Journ. Asiat. Soc. Bengal, lxv., 1896, p. 277, and synonymy.

Platypus Bay, Queensland, 5-9 fathoms; E.3114; one female.

Twenty-five miles south-east of Double Island Point, Queensland, 33 fathoms; E.4466; one male.

Extreme length of male carapace 29, width 27.2 mm. Extreme length of female carapace 31, width 32 mm.

[21] de Haan—Fauna Japon., Crust., pl. xx., fig. 1.

CYMONOMOPS SIMILIS, *Grant.*

(Plate xxxv., figs. 3-5.)

Cymonomops similis, Grant, Proc. Linn. Soc. New South Wales, xxx., 1905, p. 315, pl. x., fig. 1.

Off Babel Islands, Bass Strait, 50-80 fathoms; E.4818; one male, two ovigerous females.

Twenty miles east of Babel Islands, Bass Strait, 65-70 fathoms; E.5161; one male, one ovigerous female.

Largest male (E.4818), total length of carapace 6.2, width 5.8 mm. Largest female (E.4818), total length of carapace 6.6, width 7 mm.

The chelipeds of the male are similar to those of the female, but more unequal (E.4818), both chelipeds of the measured female being the size of the left or larger cheliped of the measured male. In this male the first left ambulatory leg is reduced in length considerably below that on the right side, especially noticeable in the merus. The male abdomen is very small, extremity semicircular and apparently fused with the fifth segment. Eggs large, about .6 mm. in diameter.

Subtribe DROMIACEA.

Family LATREILLIIDÆ.

LATREILLIA AUSTRALIENSIS, *Henderson.*

Latreillia australiensis, Henderson, Challenger Rept., Zool., xxvii., 1888, p. 24, pl. ii., figs. 4-4*b*. Whitelegge, Mem. Austral. Mus., iv., 1900, p. 165.

East of Bass Strait; E.4799; two males. E.6143; one male, and two ovigerous females.

Off Babel Islands, Bass Strait, 60 fathoms; E.6150; four males, one ovigerous female.

Twenty miles east of Babel Islands, Bass Strait, 65-70 fathoms; E.5166; one male.

South-eastern Australia; E.4401; one female.

These specimens show a variation in the length of the supraorbital spines from two-thirds as long to just as long as the ocular peduncles. They are inclined obliquely upward with a slight curve (convex dorsally), except the tip, which is straight and a little upturned.

Antennæ not so long as antennules, although they overreach the peduncle of the latter.

Chelæ of male as long as those of female, but stouter, palm widening considerably to distal end; the fingers when closed leave an oval gape at base.

Propodus of last pair of legs half as long as carpus; dactylus, when flexed, opposed by a single spine and some spinules on the propodus.

The male has a spine on the second segment only of the abdomen.

LATREILLOPSIS PETTERDI, *Grant.*

(Plate xxxvi.)

Latreillopsis petterdi, Grant, Proc. Linn. Soc. New South Wales, xxx., 1905, p. 317, pl. x., figs. 2, 2*a*, 2*b*. McCulloch, Rec. Austr. Mus., vi.-5, 1907, p. 353, pl. lxv.

South of Gabo Island, Victoria, 120-275 fathoms; E.4396; one large male with well-developed chelæ.

Off Gabo Island, Victoria, 80-100 fathoms; E.4776; one male, medium size. E.4777; one male. E.4778; one young male.

South of Gabo Island, Victoria, 200 fathoms; E.6210; one male with well-developed chelæ.

East of Babel Islands, Bass Strait, 65-70 fathoms; E.5139; one female. E.5140; one immature female.

Off Babel Islands, Bass Strait, 50-300 fathoms; E.4786; one female. E.4787; one male, medium size. E.4788; one male, medium size. E.4789; one ovigerous female, encrusted with serpulids. E.4790; one male, medium size. E.4791; one female, immature.

East-north-east of Maria Island, Tasmania, 127-180 fathoms; E.5171; one young female. E.5172; one young female. E.5173; one young male. E.5174; one young, the smallest specimen taken.

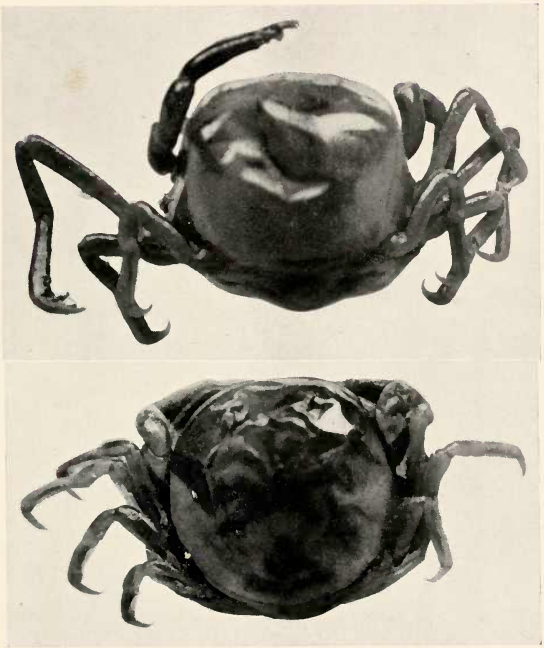
EXPLANATION OF PLATE XVI.

Pinnotheres subglobosa, Baker. Female (E.4519). Carapace 7.8 mm. wide.

Fig. 1.—Dorsal view.

Pinnotheres novæzelandiæ, Filhol. Female (E.5676). Carapace 8.5 mm. wide.

Fig. 2.—Dorsal view.



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C. R. Shoemaker, photo.

EXPLANATION OF PLATE XVII.

Pilumnoplax heterochir (Studer). Male (E.6211). Carapace 11 mm. wide.

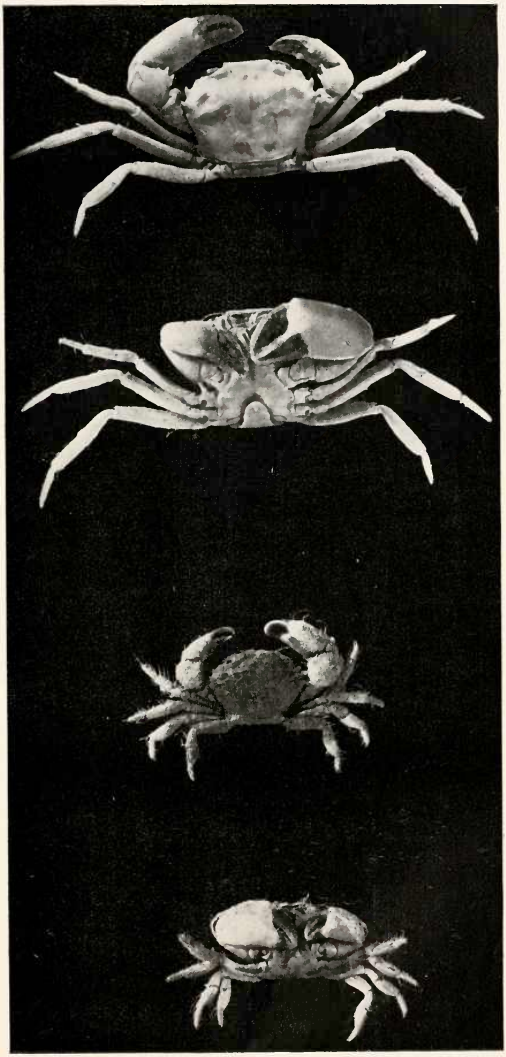
Fig. 1.—Dorsal view.

Fig. 2.—Ventral view.

Pilumnus fissifrons, Stimpson. Male (E.3184). Carapace 8 mm. wide.

Fig. 3.—Dorsal view.

Fig. 4.—Ventral view.



G. C. CLUTTON, photo.

EXPLANATION OF PLATE XVIII.

Carcinoplax meridionalis, sp. nov. Male holotype. Carapace 30.2 mm. wide.

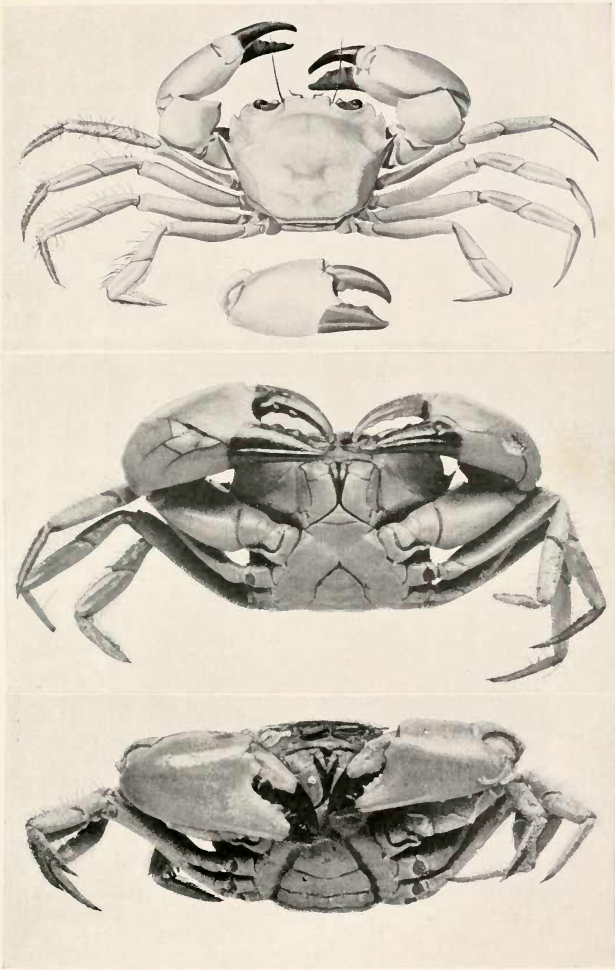
Fig. 1.—Dorsal view.

Fig. 2.—Right chela.

Fig. 3.—Ventral view.

Carcinoplax meridionalis, sp. nov. Female (E.6117). Carapace 30.4 mm. wide.

Fig. 4.—Ventral view.



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PHYLLIS F. CLARKE (1-2), del.
C. R. SHOEMAKER (3-4), photo.

Thirty-five miles south-east of Bruni Island, Tasmania, 150-230 fathoms; E.5128; one male, largest specimen taken. E.5129; one male. E.5130; one male. E.5131; one male with well-developed chelæ. E.5132; one male with rostrum abnormal, reduced to a minute spine. E.5133; one male. E.5134; one male. E.5135; one male. E.5136; one male, medium size. E.5137; one male, medium size. E.5138; one ovigerous female. E.5156; one young female.

South-east of Eucla, long. 130° 50′ E., Great Australian Bight, 250-300 fathoms; E.3685; one male, medium size.

South of Eucla, long. 129° 6½′ E., Great Australian Bight, 200-300 fathoms; E.3658; two large ovigerous females.

South-west of Eucla, long. 126° 45¼′ E., Great Australian Bight, 190-320 fathoms; E.3691; one young male.

Seventeen and one-half miles south-east of Rame Head, Victoria, 76 fathoms; E.2234; one ovigerous female, encrusted with serpulids, sponge and polyps.

Seventeen miles south-east of Rame Head, Victoria, 76 fathoms; P.2941; one ovigerous female, with encrusting serpulids.

Largest male (E.5128): Length of carapace to tip of rostrum 82, greatest width of carapace 65, width between anterior subhepatic spines 46.3, length of eye and stalk 18.5, greatest diameter of eye 7.3, greatest length of propodus of cheliped 69.2, superior length of same 42.6, height of same 24.3, thickness of same 22.1, length of dactylus of same 32.3, approximate length of first ambulatory leg 270, approximate length of second ambulatory leg 295, approximate length of third ambulatory leg 320; approximate length of last leg 190 mm.

Largest female (E.3658): Length of carapace to tip of rostrum 56.8, greatest width of carapace 42, greatest length of propodus of cheliped 35.6, superior length of same 22.2, height of same 3.8, thickness of same 3.2, length of dactylus of same 13.6 mm.

This species was described by its author from a single small specimen only 9 mm. long. In the "Endeavour" collection there is a fine series of thirty-four specimens ranging from 18.6 to 82.4 mm. in length of carapace. Some modifications of the original description therefore need to be made to fit the adult.

The *linea anomurica* is well marked in its posterior half, except near the posterior margin; the anterior half is less distinct.

The supraocular horns possess, besides an inner subterminal tubercle or spinule and two large outer spines, an outer spinule further from the tip than the inner one, and may have also a dorsal spinule further back and a fourth spinule on the outer margin of the anterior of the spines. The horns are relatively longer in the young than in the old.

In the following table all the measures are of males and are taken to the bottom of the sinus between horn and rostrum:—

Reg. No.	Sex.	Carapace Length.	Rostrum Length.	Horn Length.
E.5173	Male	20.2	5.6	12.6
E.3691	Male	23.6	6.4	15.6
E.4776	Male	31.6	7.3	15.8
E.5135	Male	43	10	23
E.5131	Male	51.3	12	23
E.5128	Male	69.6	14	28

The surface of the carapace is covered with a short pubescence which is formed of single, acorn-shaped vesicles and embraces the granules and tubercles with which the carapace is roughened as well as the intervening spaces.

The chelipeds are stout in the adult male, slender in the female and young male; arms rough with tubercles and granules arranged mostly in longitudinal rows, and with a row of five spines above. Wrist furnished with larger tubercles and with granules. The palms of the female are slender and weak and remain so with age; they are almost cylindrical, very slightly flattened and of nearly uniform width, except at the articulations. The male, on the contrary, shows a slender palm, only until the carapace (including rostrum) measures about 3 cm. in length, in one case 4 cm. (E.3685). It then changes by widening gradually to the distal end (E.4788), but soon grows more swollen, at first rather uniformly so throughout its length (E.4776), at the same time being a little compressed. It then becomes more and more swollen in the middle until in the largest specimen (8 cm.) the palm is remarkably inflated, its height in the middle 24.3 mm., its thickness in the middle 22.1 mm.

In both sexes the palms are covered with unequal granules, the largest of which are arranged in irregular rows. Fingers longer in male than in female, colour black, not reaching quite to either end. In the old male the fingers gape narrowly in the basal half; in the gape the dactyl has a truncate tooth, and nearer the palm the immovable finger has a low, rounded lobe.

On the three following legs, besides the upper and lower rows of spines, there are other spines and sharp spinules or tubercles. The carpus and propodus are finely roughened with small, slender, horny spines, moving in sockets. The dactylus is armed with six rows of horny spines, two rows above reaching to the dark-coloured tip, a short row at the proximal end on the lower margin and on the inner and outer faces.

The merus of the last pair of legs has three rows of spines and some scattered spinules, the only superior spine is at the distal end. The carpus and propodus are roughened as in the preceding legs, and the propodus has besides two rows of spines between which fits the row of spines on the dactylus.

The abdomen of the male is about two-thirds as wide as that of the female. The first, second, third, fourth and sixth segments each bear a median spine or tubercle; the third, fourth and sixth segments bear also a spine on each side. In the female the terminal segment is invaginated in the penultimate, a small lobe on each side of the latter being produced, but not attached, alongside the proximal end of the terminal segment.

Homola orientalis, *Henderson.*

(Plate xxxvii.)

Homola orientalis, Henderson, Challenger Rept., Zool., xxvii., 1888, p. 19, pl. ii., figs. 1, 1*a*. Whitelegge, Mem. Austral. Mus., iv., 1900, p. 163. Doflein, Abhand. k. bayer. Akad. Wiss., ii. Cl., xxi., iii. Abth., 1902, p. 651, pl. iv., figs. 5 and 6.

Homola barbata orientalis, Doflein, Brachyura Valdivia, vi., 1904, p. 14, pl. v., figs. 4 and 5.

Off Gabo Island, Victoria, 80 fathoms; E.4774; one young female.

Off Gabo Island, Victoria, 80-100 fathoms; E.4775; one male.

South from Cape Everard, Victoria, 80-120 fathoms; E.3135; one male. P.3538; one female.

Twenty-five miles south of Cape Everard, Victoria, 82 fathoms; E.6122; one male. E.6123; one male.

South of Mt. Cann, Victoria, 50-80 fathoms; E.4804; one ovigerous female.

South and south-west of Mt. Cann, Victoria, 70-100 fathoms; E.6101-6108; six males, two females.

Twenty miles east of Babel Islands, Bass Strait, 65-70 fathoms; E.5164; one ovigerous female.

East of Babel Islands, Bass Strait, 65-75 fathoms; E.5142; one male. E.5143; one male. E.5144; one male. E.5145; one male.

Off Babel Islands, Bass Strait, 50-300 fathoms; E.4792; one male.

Twenty miles off Babel Islands, Bass Strait, 50-70 fathoms; E.6137; one male. E.6138; one ovigerous female.

To the differences given by Doflein between typical *H. barbata* and *orientalis* may be added the shorter, broader ambulatory legs of the latter, especially noticeable in the width of the merus. No intergrading forms were noted.

Family DROMIIDÆ.

In attempting to fit the species of Dromiidæ into the genera of Borradaile's revision[22] of the family, emphasis has been placed on the presence or absence of an epipodite on the cheliped, and the approximation or separation of the ends of the sternal sulci of the female. Of the four genera represented in the collection, *Dromidiopsis* and *Petalomera* have an epipodite, *Dromidia* and *Cryptodromia* have none; in *Dromidiopsis* and *Dromidia* the sternal sulci end together; in *Petalomera* and *Cryptodromia* they end apart. Some of the other characters which have been given to these genera are not dependable, such as the knobbed or ridged legs and the thorn on the dactyl of the last leg.

[22] Borradaile—Ann. Mag. Nat. Hist. (7), xi., 1903, pp. 297-303.

DROMIDIOPSIS EDWARDSI, *Rathbun.*

Dromia caput mortuum, Milne Edwards, Hist. Nat. Crust., ii., 1837, p. 178. Not *Cancer caput mortuum,* Linnæus, 1766.

Dromidia caput-mortuum, de Man, Arch. f. Naturg., liii., i., 1887 (1888), p. 393, pl. xvii., figs. 5, 5*a*.

Dromidiopsis caput-mortuum, Borradaile, Ann. Mag. Nat. Hist., (7), xi., 1903, p. 299.

Dromidiopsis caput-mortuum, Ihle, Siboga-Exped., Monog. xxxix*b*., 1913, p. 28, and synonymy except reference to Linnæus.

Dromidiopsis edwardsi, Rathbun, Proc. Biol. Soc. Washington, xxxii., 1919, p. 197.

Seven miles north-north-east of Bowen, Queensland, 16 fathoms; E.3136; one male.

Twenty-five miles south-east of Double Island Point, Queensland, 33 fathoms; E.4473; one female.

Length of carapace of male on middle line 78.2, greatest width 82.2 mm. Length of female 24.6, width 26 mm.

The male specimen corresponds very well with de Man's description (*loc. cit.*) of a somewhat smaller male. The first antero-lateral tooth, however, is different on the two sides; on the right side it is united with the so-called second tooth in a broad, truncate lobe; on the left side it is conical, subacute, and the second tooth is obsolete.

The young female resembles the male in most respects; it has, however, a subacute tooth, instead of a lobe, on the supraorbital margin; the epistome is more prominent and the tooth at either end is acute instead of tuberculiform. The sternal sulci are as described by Ihle, *op. cit.*, pp. 28-29.

The species does not quite agree with Borradaile's definition of the genus (*op. cit.*, p. 298); the carapace is broader than long, the efferent branchial ridges though distinct are broken, the fifth leg though longer than the fourth is not nearly so long as the third, overlapping only slightly its propodal segment.

Dromidiopsis excavata (*Stimpson*).

(Plate xxxviii.)

Dromidia excavata, Stimpson, Proc. Acad. Nat. Sci., Philadelphia, x., 1858, p. 239 [77]; Smithson. Misc. Coll., xlix., 1907, p. 172.

Dromia excavata, Haswell, Cat. Austral. Crust., 1882, p. 140.

Dromia ciliata, Henderson, Challenger Rept., Zool., xxvii., 1888, p. 3, pl. i., figs. 1-1*c*. Ihle, Siboga-Exped., Monog. xxxix*b*., 1913, p. 89.

Between Port Stephens and Newcastle, New South Wales, 22-60 fathoms; P.2133; one male.

Shoalhaven Bight, New South Wales, 15-45 fathoms; P.2132; one male under a compound ascidian.

Twofold Bay, New South Wales, 30 fathoms; E.6085; one male.

South of Mt. Cann, Victoria, 50-80 fathoms; E.4803; one male.

South and south-west of Mt. Cann, Victoria, 70-100 fathoms; E.6111; one female under a compound ascidian.

Bass Strait; E.1338; one ovigerous female. E.1339; one ovigerous female. E.5199; one male. E.6133; one female under a large, heavy sponge (? *Suberites*).

Twenty miles off Babel Islands, Bass Strait, 50-70 fathoms; E.6136; one male under a compound ascidian.

Off Marsden Point, Kangaroo Island, South Australia, 17 fathoms; E.802; one male, one female (male under a simple ascidian). E.4475; one male. P.2312; one female under a compound ascidian.

Fifteen miles south of St. Francis Isles, South Australia, 30 fathoms; E.4468; one female.

Bay of Fires, Tasmania, 53 fathoms; E.6162; one ovigerous female under a compound ascidian.

Largest male (P.2133): Length of carapace 31, width 33.5 mm. Largest female (E.6133): Length of carapace 29.5, width 31.6 mm. Diameter of eggs about 2 mm.

In dorsal view the transverse fringe of longish hairs across the carapace just above the hepatic regions almost conceals the front. In front view we see in a subvertical plane a little more than a quarter section of a disc, the circumference of which is the fringe of hair above mentioned, and the straight sides, also fringed, run along the outer margins of the subhepatic region to a point between the ischiums of the outer maxillipeds; this section, therefore, encloses the frontal and subhepatic regions, the orbits, the antennæ and the merus and a small part of the ischium of the maxillipeds.

At the distal end of the propodus of the last pair of legs there is a small spine at the outer base of the dactylus; on the outer surface of the propodus of the penultimate pair there are two small spines at the base of the dactylus. One of these spines on the penultimate leg may be suppressed, while sometimes there may be a second, small, supplementary spine on the last leg.

The sternal sulci of the female are convergent, and terminate on a protuberance opposite the bases of the ambulatory legs of the first pair.

Dromidia australis, *sp. nov.*

(Plate xxxix.-xl., fig. 1.)

Type-locality.—Sixty to eighty miles west from Eucla, Great Australian Bight, 80-120 fathoms; E.3165; one ovigerous female, holotype. E.3164; one immature female.

Additional localities.—South of Mt. Cann, Victoria, 55-70 fathoms; E.6077; one male.

Bass Strait; E.6132; one male covered by a large porous sponge.

Measurements.—Length of carapace of female holotype, on median line, 27.3, width 29 mm., diameter of egg 2 mm. Length of immature female (E.3164) 15.5, width 15.8 mm. Length of carapace of male (E.6132) on median line 29.3, width 33.7 mm. The other male is larger, but the carapace is broken; it is about 35.3 mm. long.

Description of the female.—Body and legs covered with a very short pubescence; a longer fringe of hair borders the carapace, chelipeds, legs and abdomen. Cervical suture

well marked, also the short curved groove either side of the cardiac region and the median groove on the frontal region. Three frontal teeth of similar shape, acute, median tooth much depressed and little visible in dorsal view. Three orbital, sub-spiniform teeth, one inner, suborbital, two supraorbital, the outer of which is separated by a fissure from a small suborbital lobe. Antero-lateral margin leading to the orbit and not to the buccal cavity, armed with four spiniform teeth, of which the first two are largest and subequal, and the last one smallest. A slightly projecting tooth behind the notch at the cervical suture.

The basal segment of the antenna bears a flat, inward-pointing spine at its antero-internal angle. At either end of the epistome there is a small, sharp spine, while the neighbouring angle of the buccal cavity is spiniform. On the same margin where the outer angle of the maxilliped fits, there is a tubercle. When the maxillipeds are in place a subtriangular opening remains, leading to the efferent branchial channel.

Merus of chelipeds unarmed; carpus with three distal prominences; a spine on proximal half of upper margin of right palm, two pointed tubercles on left palm, a tubercle at articulation with dactylus. Fingers gaping when closed. Carpus of first and second walking legs with a small tubercle at the distal end just below upper margin. These legs are shorter than the cheliped; last leg much longer than the preceding but shorter than the second ambulatory. On the propodus of the first prehensile leg there are two long spines opposing the dactylus (which flexes between them) and two small spines on the posterior surface near the base of the dactylus. On the propodus of the last leg are likewise two small spines, but only one large spine forming a chela with the dactyl; furthermore, on the outer edge of the dactyl itself there is a spine, which is contrary to Borradaile's definition of the genus. This spine is present on the left leg but has been broken off the right leg. In the immature specimen they are well developed on both sides.

The sternal sulci meet opposite the first pair of walking legs. In the immature female their extremities are further apart and do not reach beyond the line of the walking legs of the second pair.

Description of the male.—The males have such a different aspect from the females that on first examination they were thought to be a different species. The males are larger but are not more convex with the increase in size; the additional width forms a flattened, and in the widest part, even a slightly upcurved rim, which adds to the appearance of moderate convexity. The median tooth of the front is more deflexed than in the female, and in the smaller of the males is invisible in dorsal view. The spacing of the antero-lateral teeth is not just the same as in the type female, but neither does it correspond in the two males.

The details of the antennal and buccal areas and of the chelipeds and legs are the same in the two sexes, excepting that the upper border of the palm has always two, in one case three, tubercles. In the larger male the propodus of the right last leg shows three spinules in place of the customary two. In the smaller male the right penultimate leg and the left last leg are abnormally reduced and the latter is devoid of a spine on the dactylus.

The sixth segment of the abdomen has a shallow sinus in the lateral margins.

Relationship.—Allied to D. cranioides, de Man,[23] which is more rotund, with furrows very ill defined, lateral teeth of front smaller, no tooth or spine at outer angle of orbit, antero-lateral margin bent down so that it is directed towards the suborbital tooth, and there is no spine on dactyl of last leg.

Dromidia insignis, *sp. nov.*

(Plate xl., figs. 2-3.)

Type-locality.—South and south-west of Mt. Cann, Victoria, 70-100 fathoms; E.6112; one female, holotype.

Measurements.—Female, length of carapace on median line 16.6, width 17.5 mm.

Description.—Surface, except on portions of the fingers, covered with a coarse, spatuliform pubescence, which is short and close, except on the abdomen and maxillipeds and the margins and ridges of the carapace and legs. Carapace very

[23] de Man—Journ. Linn. Soc. London, Zool., xxii., 1888, p. 208, pl. xiv., figs. 6-8.

high, its border having an antero-lateral angle on either side. Between these angles there is an irregular row of small pits or depressions in the pubescence which are to be seen only when viewed from before. A deep median depression on the frontal region; a short, deep furrow each side of the cardiac region, ending anteriorly in a pit, where it meets the well-marked cervical suture; another furrow passes behind the cardiac region and forward to the cervical notch; intestinal region depressed, from it a furrow runs laterally just in front of the posterior margin.

Median tooth of front narrow, acute, and so deflexed that only the tip is visible from above; lateral teeth widely separated, their outer margins continued by a rounded sinus to a tooth at the inner angle of the orbit; this frontal border is conspicuously fringed with long setæ. A fissure marks the outer angle of the orbit; while a triangular, pointed tooth occupies the greater part of the lower border. The anterior part of the antero-lateral margin is concave, the remainder is convex; the two parts meet at a blunt, obtuse angle. There is a slight tooth behind the cervical suture, otherwise the lateral margin is entire.

The edge of the epistome is nearly horizontal; the outer tooth is broadly triangular.

Chelipeds rather small, shorter than the first two pairs of walking legs. The carpus and manus are ornamented with about four longitudinal rows of elongated setæ which simulate ridges. The pubescence on the fingers forms a triangle on their outer faces, the margins bare and white. The propodal finger has four large prehensile teeth, two of which are terminal and fit tight against the tip of the dactylus. The dactylus is flat outside except its upper margin, which forms a raised rim.

The first two ambulatory legs are rather narrow; their carpal and propodal segments are ornamented similarly to those of the cheliped. The fourth leg is slender, much longer than the third but not so long as the second. The propodus of the third, very short, leg has at its distal end, besides the spine which forms a chela with the dactylus, three small, slender spines or spinules on the outer surface. The propodus of the last leg has a spine at each of its distal angles, that at the lower angle very little shorter than the other, which forms a subchelate arrangement with the dactylus.

The sternal sulci end not far apart on a line with the intervals between the cheliped and the next leg.

Relationships.—This species has much in common with *Dromidia spongiosa*, Stimpson[24], which, according to the author's figure, has no antero-lateral angle, but a regularly rounded margin; otherwise the features of the anterior and lateral margins appear to be similar. In *spongiosa* the legs of the last pair are broader, and both prehensile legs are devoid of the supplementary spines characteristic of *insignis*.

Cryptodromia octodentata (*Haswell*).

(Plate xli.)

Dromia octodentata, Haswell, Proc. Linn. Soc. New South Wales, vi., 1881 (1882), p. 755; Cat. Austral. Crust., 1882, p. 140. Fulton and Grant, Proc. Roy. Soc. Victoria, n.s., xix., 1906, p. 20. Baker, Trans. Roy. Soc. S. Australia, xxxi., 1907, p. 179, pl. xxiii., fig. 4.

Off Marsden Point, Kangaroo Island, South Australia, 17 fathoms; E.800; one female. E.801; one male. E.4474; one female. P.2309; one male. P.2311; one female.

Fifteen miles south of St. Francis Isles, South Australia, 30 fathoms; E.4469; one female.

Off Sanders Bank, Kangaroo Island, South Australia, 28 fathoms; E.6271; one male.

South Australia; E.4471; one female.

This species differs from Borradaile's description of *Cryptodromia* in that the walking legs are not knobbed or ridged and there is a thorn on the outer side of the dactylus of the last leg.

The following description is taken almost entirely from manuscript prepared by Mr. A. R. McCulloch:—

"A series of eight specimens, 20-64 mm. wide, shows the same variation as noted by Baker in the armature of the antero-lateral borders of the carapace and the upper margin of the hand.

[24] Stimpson—Smithson. Misc. Coll., xlix., 1907, p. 171, pl. xx., fig. 1.

"The carapace is broader than long, and strongly convex. It is covered with coarse, erect hairs, which have a brush of minute lateral setæ near their tip. The cervical groove is usually distinct, sometimes rather indefinite. A median longitudinal groove between the orbits, and a broad, shallow one on each side of the cardiac region. Front cut into three teeth, of which the middle one is on a much lower plane than the others; in the smallest specimens it is directed downward, and in the other projects somewhat forward. The outer teeth form the inner orbital angle.

"The orbits have a conical tooth in the centre of their upper border, which is sharper on the young. The outer angle is prominent, sometimes forming a tooth, and below it there is a V-shaped notch which may be broad, or very narrow. Inner angle of the suborbital lobe dentiform. The antero-lateral borders are armed with four or five teeth which are variable, the small specimens having four and the larger ones four or five; in some examples the fourth tooth is replaced by a blunt lobule, while others have a small denticle at the base of the fifth tooth. Postero-lateral borders slightly convergent, and they have either a blunt tooth, or a lobule immediately behind the cervical groove.

"The subhepatic region is swollen into an obtuse pyramidal projection. The antero-external angle of the buccal cavern is spiniform, and there is a conical tubercle a little farther back. A broad spiniform tubercle projects obliquely inward and backward on the basal anteunal joint, and both the inner and outer angles of the second joint are produced. The ischium of the external maxillipeds is longer than broad, and is divided anteriorly; its surface is slightly hollowed. The merus is pentagonal, and is much longer than broad, the outer surface is usually somewhat sinuous. The palp is attached below the anterior internal angle. The exopod is about three and one-half times as long as broad, and its greatest width near the base is about half that of the merus."

The inner and outer edges of the ischium and merus of the chelipeds bear rows of rounded tubercles. The inner angle of the wrist is armed with a large obtuse spine, and the antero-internal edge bears, in the larger specimens, rounded tubercles. The crests of the hands bear from one to seven similar tubercles. The last two pairs of legs

chelate. The penultimate legs always have two large spines facing the dactyli, and sometimes several other smaller spines. The last pair usually have only one large spine, that facing the dactylus; on the outer side of the dactylus a little way from the base there is a small spine, the tip of which may be broken off.

The abdomen of both sexes consists of seven free segments, and has a broad raised ridge along the middle line. The last segment in the male is triangular, and the penultimate one is deeply excavated on either side. Those of the female decrease regularly in breadth from the third to the seventh. The sternal sulci of the female end wide apart just behind and close to the articulation of the chelipeds. The eggs are very large and numerous, being 2 mm. in breadth.

Petalomera lateralis (*Gray*).

Dromia lateralis, Gray, Zool. Misc., 1831, p. 40.

Cryptodromia lateralis, Stimpson, Proc. Acad. Nat. Sci. Philadelphia x., 1858, p. 226 [64]; Smithson. Misc. Coll., xlix., 1907, p. 174, pl. xx., fig. 3. Thomson, Trans. New Zealand Inst., xxi., 1898, p. 170, pl. xx., figs. 1 and 2. Alcock, Cat. Ind. Dec. Crust., Brachyura, 1901, p. 77, and synonymy.

Petalomera lateralis, Borradaile, Ann. Mag. Nat. Hist., (7), xi., 1903, p. 301.

Sixty to eighty miles west from Eucla, Great Australian Bight, 80-120 fathoms; E.3163; one ovigerous female.

South and south-west of Mt. Cann, Victoria, 70-100 fathoms; E.6110; one male.

Twenty miles off Babel Islands, Bass Strait, 50-70 fathoms; E.6140; one female.

Length of carapace of female (E.6140) 17.2, width of same 19.7 mm.

The sternal segments of the female end far apart, opposite the first pair of ambulatory legs.

PETALOMERA LAMELLATA (*Ortmann*).

(Plate xlii., figs. 2-3.)

Cryptodromia lamellata, Ortmann, in Semon, Zool. Forschungsr. Austral. u. d. Malay. Arch., Jena. Denkschr., viii., 1894, p. 34, pl. ii., fig. 8.

East-north-east of Maria Island, Tasmania, 57-75 fathoms; E.5151; one male.

Length of carapace of male 10.3, width of same 13 mm.

The carapace is coarsely granulate near the anterior and antero-lateral margins. An epipod is present on the cheliped, and in other respects the species conforms to the definition of *Petalomera.*

PETALOMERA DEPRESSA (*Baker*).

Cryptodromia depressa, Baker, Trans. Roy. Soc. South Australia, xxxi., 1907, p. 180, pl. xxv., figs. 1-1*b*.

Fifteen miles south of St. Francis Isles, South Australia, 30 fathoms; E.4470; one male.

Length of carapace of male 25.6, width of same 27.3 mm.

The species has an epipod on the cheliped and is akin to *lateralis,* which Borradaile puts in *Petalomera. P. depressa* has certain characters contrary to his definition of the genus, viz., the walking legs are knobbed, not sharply ridged, and the sternal grooves of the female are, according to Baker, *op. cit.,* p. 181, situated between the coxæ of the chelipeds instead of between those of the ambulatory legs of the first pair.

PETALOMERA WILSONI (*Fulton and Grant*).

(Plate xlii., fig. 1.)

Cryptodromia wilsoni, Fulton and Grant, Proc. Roy. Soc. Victoria, n.s., xv., 1902, p. 61, pl. ix.

Dromia pseudogibbosa, Parisi, Atti. Soc. Ital. Sci. Nat., liv., 1915, p. 5, pl. ii., figs. 1 and 2.

Between Port Stephens and Newcastle, New South Wales, 22-60 fathoms; E.279; one male, one ovigerous female.

Shoalhaven Bight, New South Wales, 15-45 fathoms; P.2140; one female.

Thirty-three miles south-east from Green Cape, New South Wales, 470 fathoms; E.3149; one female.

Five to ten miles south-east of Rame Head, Victoria, 66-68 fathoms; E.2239; one male.

Off Cape Everard, Victoria, 80 fathoms; E.6071; one male.

South of Mt. Cann, Victoria, 55-70 fathoms; E.6078; two males.

South and south-west of Mt. Cann, Victoria, 70-100 fathoms; E.6109; one female.

From sixty miles south of Diana's Peak to about forty miles south of Mt. Cann, Victoria, 70-80 fathoms; E.6087; one male.

East of Flinders Island, Bass Strait; E.5671; two immature females.

Twenty-four miles south-south-east of Eagle Nest, Bass Strait, 45 fathoms; E.6072; one male.

Bay of Fires, Tasmania, 53 fathoms; E.6161; one young, 4.5 mm. long by 5.6 wide, under a thin, conical fragment of sponge.

Oyster Bay, Tasmania, 26 fathoms; E.5183; three males, one female.

Forty miles west of Kingston, South Australia, 30 fathoms; E.4477; one male, two females. E.4478; one female. E.4479; one male. E.4480; one male, five females.

South Australia, E.4476; three males, one female.

The following description was prepared by Mr. A. R. McCulloch:—

"All parts except the tips of the fingers and dactyli are thickly covered with tomentum.

"The carapace is much broader than long, and is convex. The tomentum forms pits and strong ridges, which define the regions very clearly, but when it is cleaned away they become less conspicuous. There is a row of small circular pits starting from between the second and third teeth of the anterolateral borders and stretching obliquely forwards, meeting between the orbits. These pits cannot be seen at all when the tomentum is taken off, but there is a distinct but flat ridge which they follow. The front is cut into three teeth, the centre one being very small, acute, and on a much lower plane than the two outer ones, which are large, obtuse and form the inner supra-orbital angle. There is a deep, or well-marked, median groove between these teeth.

"The orbits are large. There is a large tooth in the middle of the upper orbital border, which is joined by a very slight curve to the large obtuse tooth at the inner supraorbital angle; these two together form a considerable projection over the orbit. The suborbital border is dentiform, and is easily seen in a dorsal view, it being situated outside the large projection of the upper border. The outer angle seems to form a continuous line, but if the tomentum be scraped away it shows that the borders are separated by a groove. The antero-lateral borders are cut into four teeth, the first being the smallest and on a much lower plane than the other three, it being on a slightly lower level than the outer orbital angle. The second and third are large, the distance between them being distinctly less than that between the first and second or third and fourth. The latter is small, and is situated behind the cervical groove. There is a small tubercle, which may either be acute or very flat, on the ridge behind the cervical groove, and almost at the base of the fourth tooth. Postero-lateral borders are slightly convergent and are convex.

"There is a small acute tubercle on the subhepatic region situated midway between the first tooth of the antero-lateral border and the endostome, and another smaller one at the base of the suborbital lobe.

"The crest of the merus of the cheliped bears a few small granules under the tomentum. The carpus is nodular, and at the inner angle there is a sharp tubercle covered by a tuft of long silky hairs. The tomentum on the outer surface of the hand forms longitudinal ridges. Both the inner and outer surfaces of the movable and immovable fingers are strongly grooved, and along these grooves the tomentum grows. The inner surface of the hand and fingers, and the lower edge of the merus, bear the long silky hairs already mentioned. There is a space between the fingers at their base. In some specimens they meet only at the tips, while in others they meet the last half of their length. There are seven or eight teeth along their outer borders, which interlock perfectly when the fingers are closed.

"The first and second ambulatory legs bear strong spinular nodules on their carpi and propodi. Both the third and fourth pairs are flattened, and have no nodules; the fourth pair being dorsally situated."

The sternal sulci of the female end far apart in a line between the coxae of the first and second ambulatory legs.

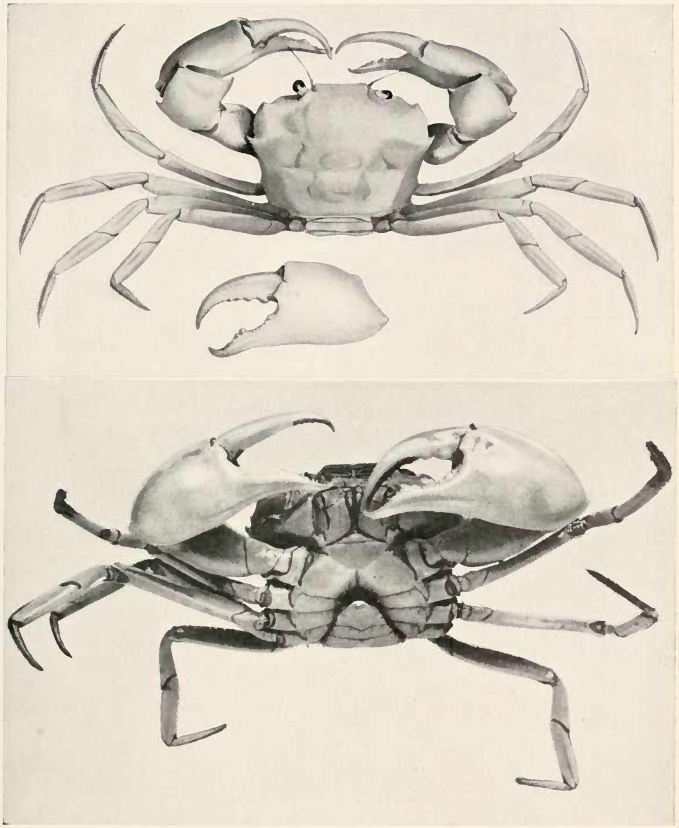
EXPLANATION OF PLATE XIX.

Carcinoplax victoriensis, sp. nov. Male holotype. Carapace 34 mm. wide.

Fig. 1.—Dorsal view.

Fig. 2.—Left chela.

Fig. 3.—Ventral view.



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PHYLLIS F. CLARKE (1-2), del.
C. R. SHOEMAKER (3), photo.

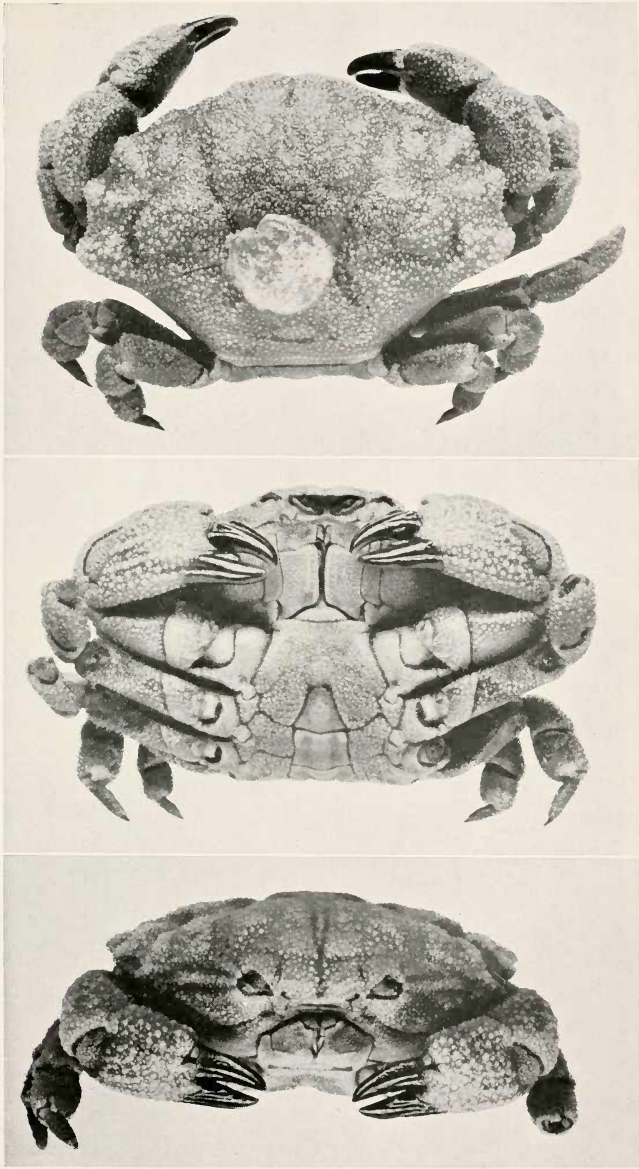
EXPLANATION OF PLATE XX.

Xantho bowenensis, sp. nov. Male holotype. Carapace 46.3 mm. wide.

Fig. 1.—Dorsal view.

Fig. 2.—Ventral view.

Fig. 3.—Frontal view.



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C. R. SHOEMAKER, photo.

EXPLANATION OF PLATE XXI.

Actæa inskipensis, sp. nov. Male holotype. Carapace 7.7 mm. wide.

Fig. 1.—Dorsal view.

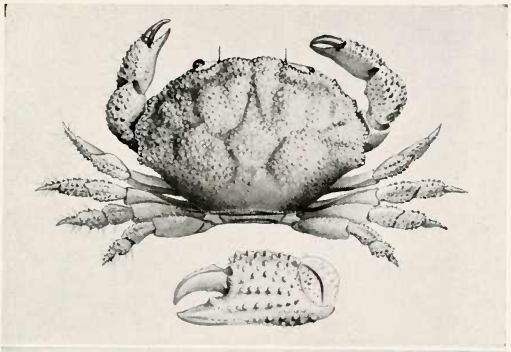
Fig. 2.—Left chela.

Fig. 3.—Ventral view.

Actæa peronii (Milne Edwards). Male (E.6086). Carapace 21 mm. wide.

Fig. 4.—Dorsal view.

Fig. 5.—Ventral view.



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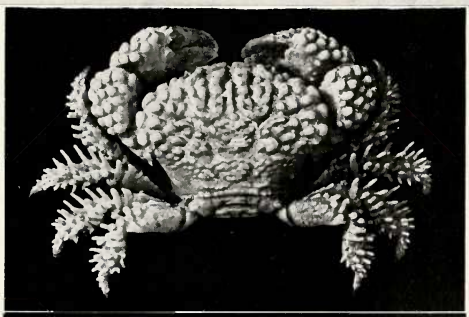

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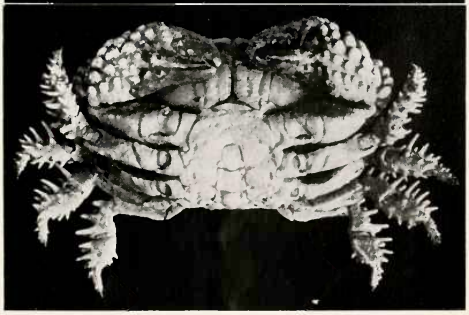

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PHYLLIS F. CLARKE (1-2), del. C. R. SHOEMAKER (3), G. C. CLUTTON (4-5), photos.

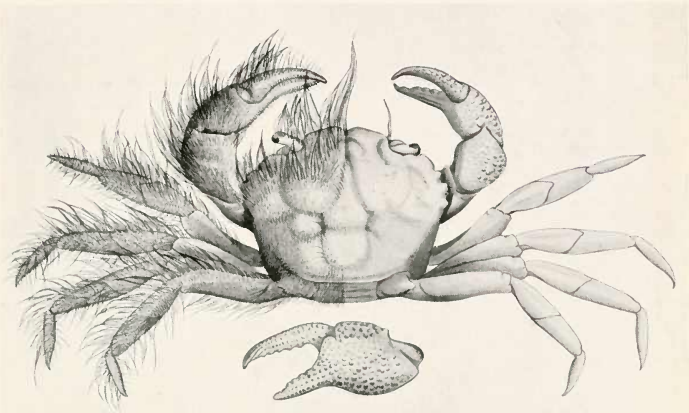
EXPLANATION OF PLATE XXII.

Pilumnus digitalis, sp. nov. Male holotype. Carapace 12 mm. wide.

Fig. 1.—Dorsal view, right half denuded.

Fig. 2.—Left chela, denuded.

Fig. 3.—Ventral view.



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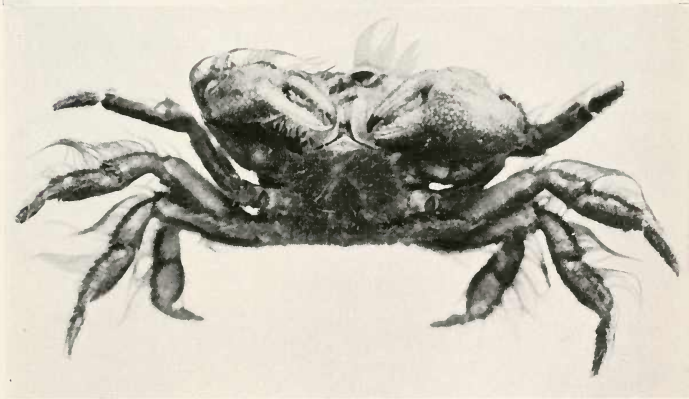

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PHYLLIS F. CLARKE (1-2), del.
C. R. SHOEMAKER (3), photo.

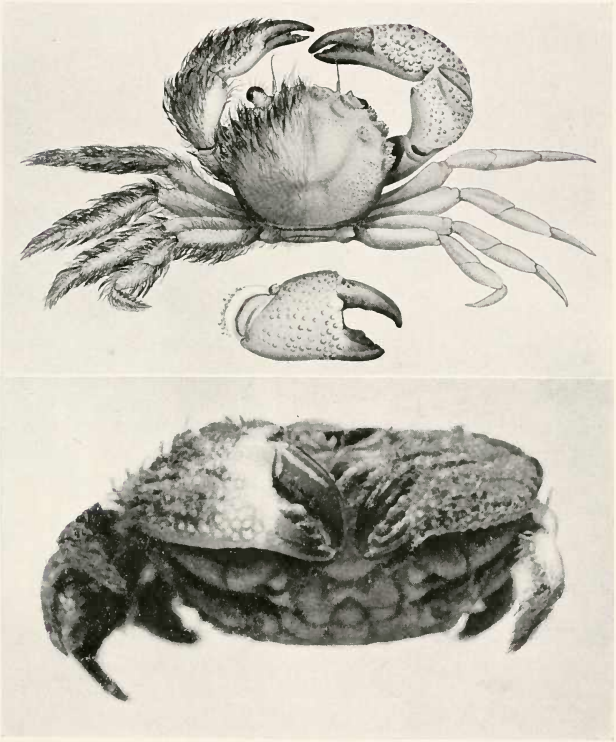
EXPLANATION OF PLATE XXIII.

Pilumnus contrarius, sp. nov. Male holotype. Carapace 13.5 mm. wide.

Fig. 1.—Dorsal view, right half denuded.

Fig. 2.—Right chela, denuded.

Fig. 3.—Ventral view.



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PHYLLIS F. CLARKE (1-2), del.
C. R. SHOEMAKER (3), photo.

EXPLANATION OF PLATE XXIV.

Pilumnus semilanatus, Miers. Male (P.3519). Carapace 29 mm. wide.

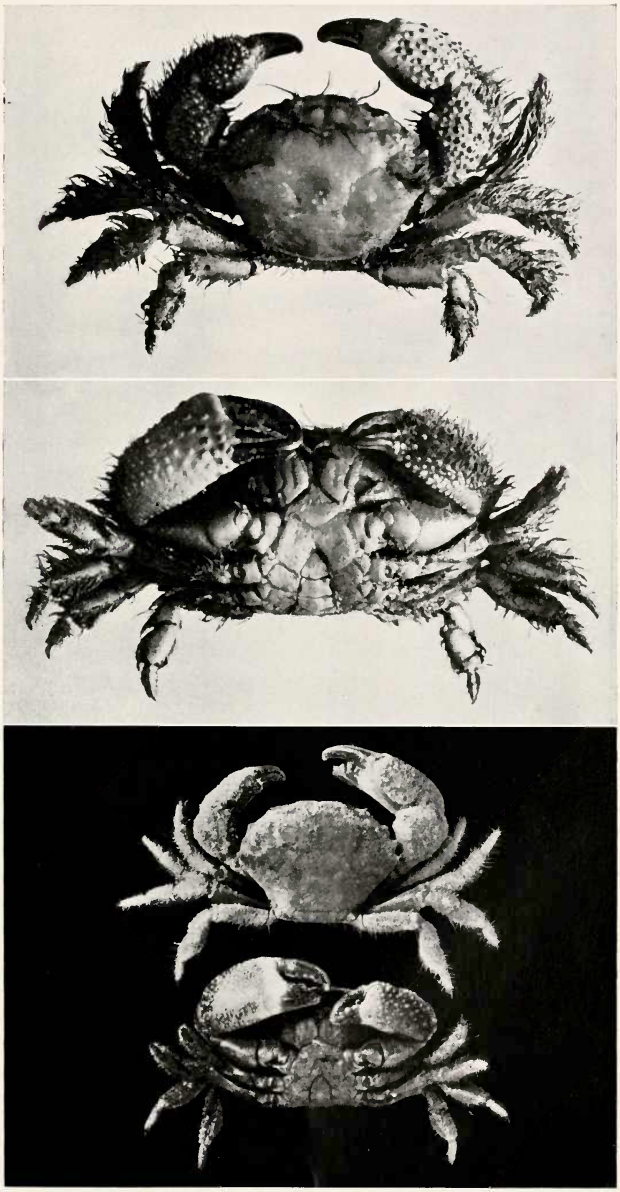
Fig. 1.—Dorsal view.

Fig. 2.—Ventral view.

Pilumnus rufopunctatus, Stimpson. Male (E.4444). Carapace 13 mm. wide.

Fig. 3.—Dorsal view.

Fig. 4.—Ventral view.



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G. C. CLUTTON, photo.

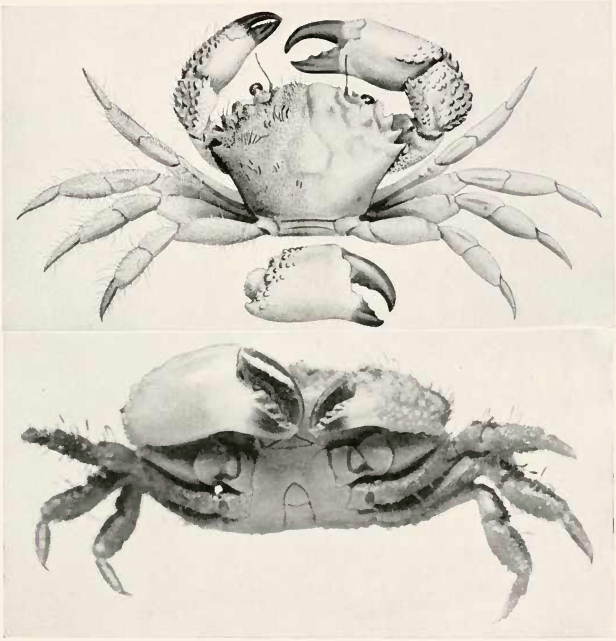
EXPLANATION OF PLATE XXV.

Pilumnus tantulus, sp. nov. Male holotype. Carapace 10.2 mm. wide, including teeth.

Fig. 1.—Dorsal view, right half denuded.

Fig. 2.—Right chela.

Fig. 3.—Ventral view.



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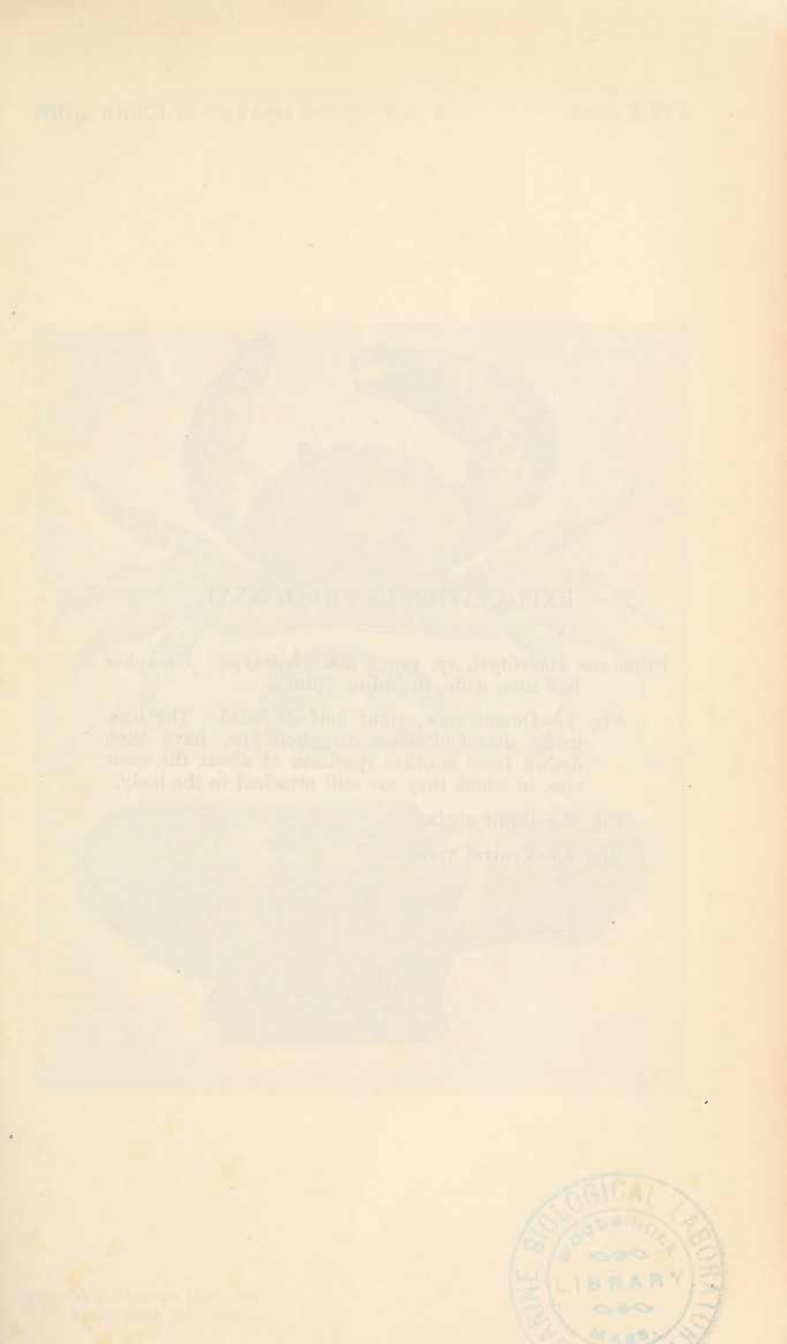
PHYLLIS F. CLARKE (1-2), del.
C. R. SHOEMAKER (3), photo.



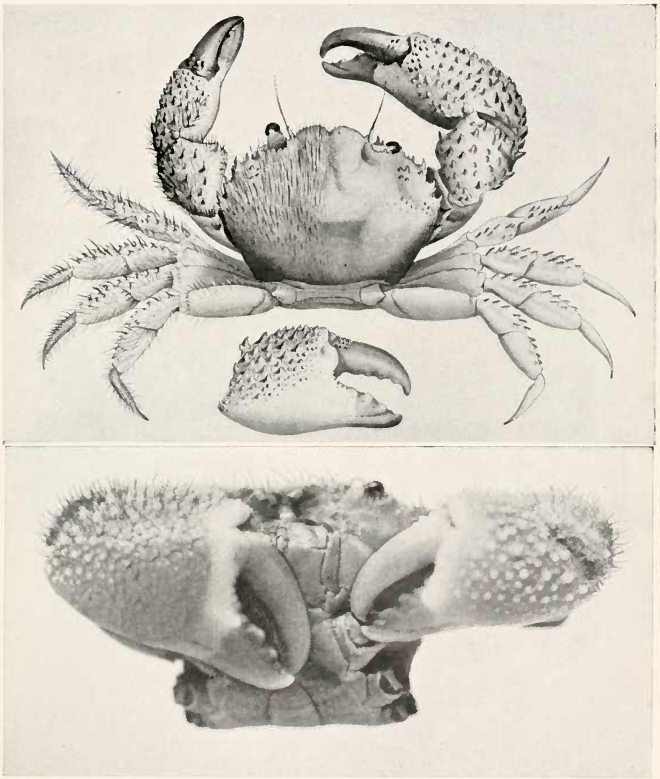
EXPLANATION OF PLATE XXVI.

Pilumnus etheridgei, sp. nov. Male holotype. Carapace 16.5 mm. wide, including spines.

Fig. 1.—Dorsal view, right half denuded. The legs, being detached from the holotype, have been drawn from another specimen of about the same size, in which they are still attached to the body.

Fig. 2.—Right chela.

Fig. 3.—Ventral view.



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PHYLLIS F. CLARKE (1-2), del.
C. R. SHOEMAKER (3), photo.

EXPLANATION OF PLATE XXVII.

Pilumnus tomentosus, Latreille. Male (E.4454). Carapace 31.3 mm. wide.

Fig. 1.—Dorsal view.

Fig. 2.—Ventral view.

Actumnus pugilator, A. Milne Edwards. Female (E.3192). Carapace 18.6 mm. wide.

Fig. 3.—Dorsal view.

Fig. 4.—Ventral view.

G. C. CLUTTON, photo.

EXPLANATION OF PLATE XXVIII.

Pilumnus hirsutus, Stimpson. Female (E.4436). Carapace 14.1 mm. wide.

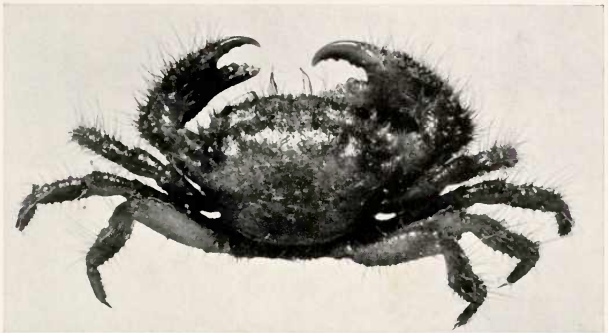
Fig. 1.—Dorsal view.

Fig. 2.—Ventral view.

Pilumnus hirsutus, Stimpson. Male (E.4436). Carapace 10.1 mm. wide.

Fig. 3.—Dorsal view.

Fig. 4.—Ventral view.



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C. R. SHOEMAKER (1-2) } photos.
G. C. CLUTTON (3-4) }

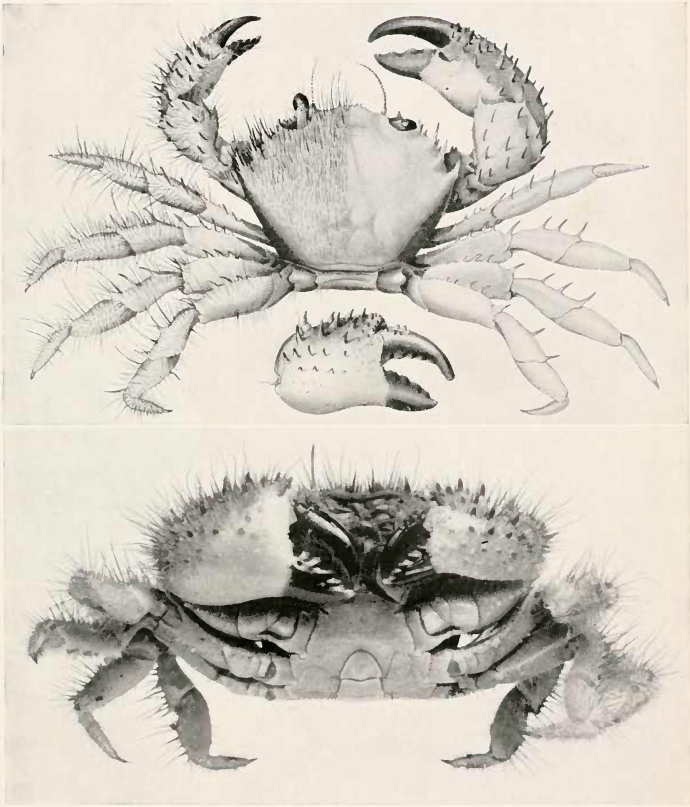
EXPLANATION OF PLATE XXIX.

Pilumnus acer, sp. nov. Male holotype. Carapace 20.4 mm. wide, spines excluded.

Fig. 1.—Dorsal view, right half denuded.

Fig. 2.—Right chela, denuded.

Fig. 3.—Ventral view.



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PHYLLIS F. CLARKE (1-2), del.
C. R. SHOEMAKER (3), photo.

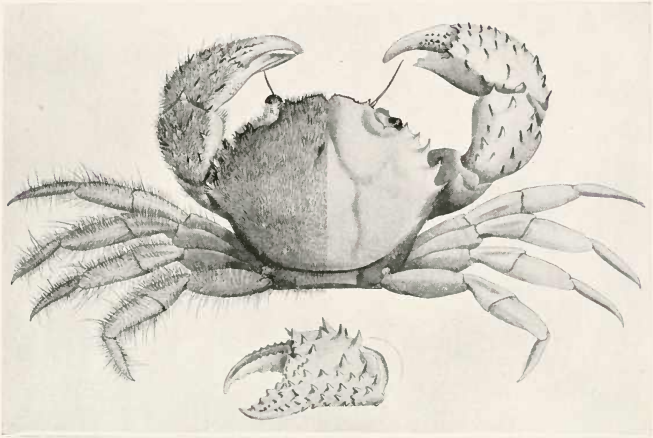
EXPLANATION OF PLATE XXX.

Actumnus kingstoni, sp. nov. Female holotype. Carapace 19.2 mm. wide.

Fig. 1.—Dorsal view, right half denuded.

Fig. 2.—Left chela, denuded.

Fig. 3.—Ventral view.



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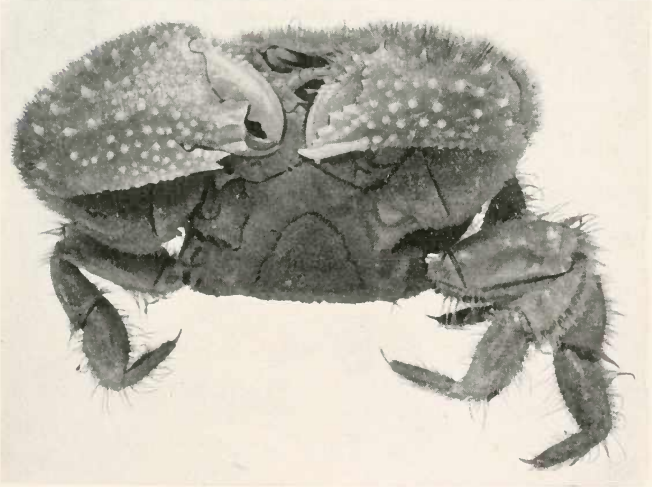

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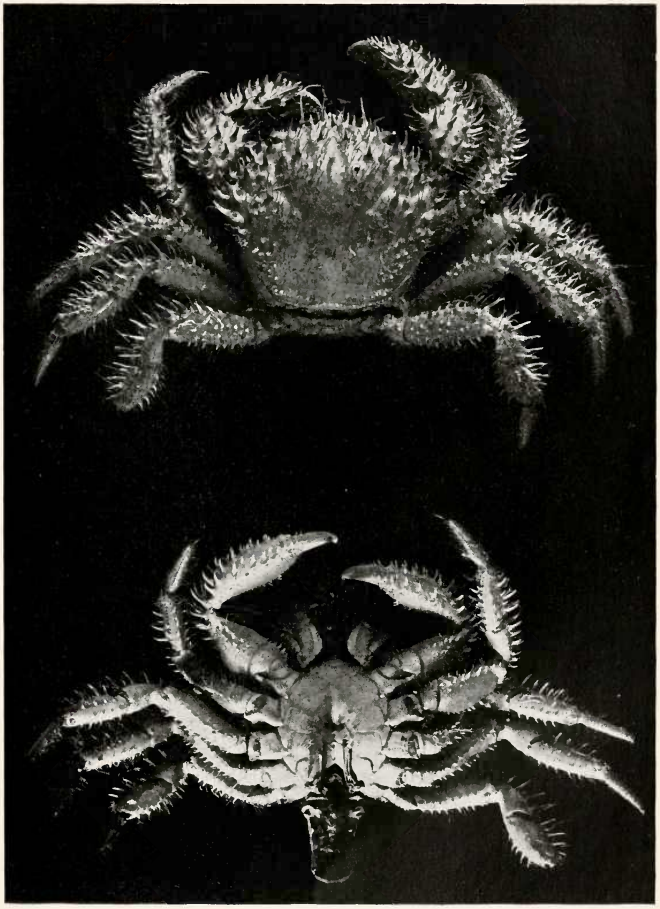
PHYLLIS F. CLARKE (1-2), del.
C. R. SHOEMAKER (3), photo.

EXPLANATION OF PLATE XXXI.

Acanthodes armatus, de Haan. Male (E.3674). Carapace 38.1 mm. wide.

Fig. 1.—Dorsal view.

Fig. 2.—Ventral view, to show sternal openings.



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G. C. CLUTTON, photo.

EXPLANATION OF PLATE XXXII.

Acanthodes armatus, de Haan. Male juv. (E.3179). Carapace 18.8 mm. wide.

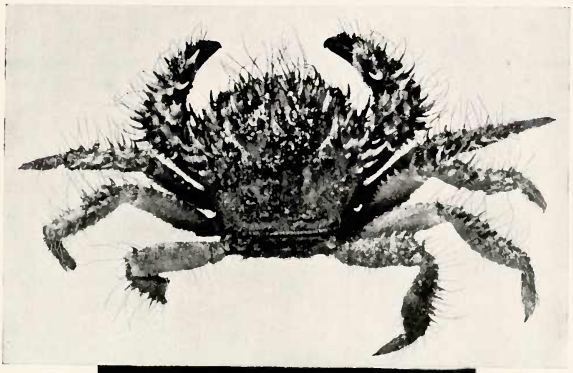
Fig. 1.—Dorsal view.

Merocryptus lambriformis, A. Milne Edwards. Female (E.5193). Carapace 19.3 mm. wide.

Fig. 2.—Dorsal view.

Merocryptus lambriformis, A. Milne Edwards. Male (E.5193). Carapace 14.3 mm. wide.

Fig. 3.—Dorsal view.



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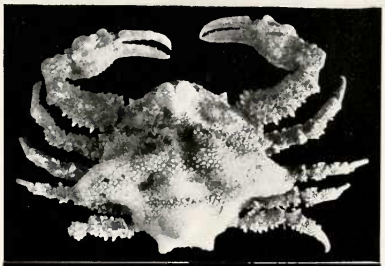

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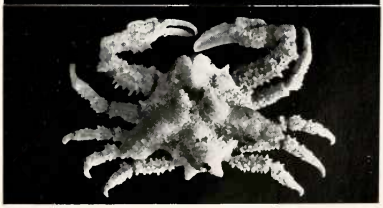

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C. R. SHOEMAKER (1) } photos.
G. C. CLUTTON (2-3) }

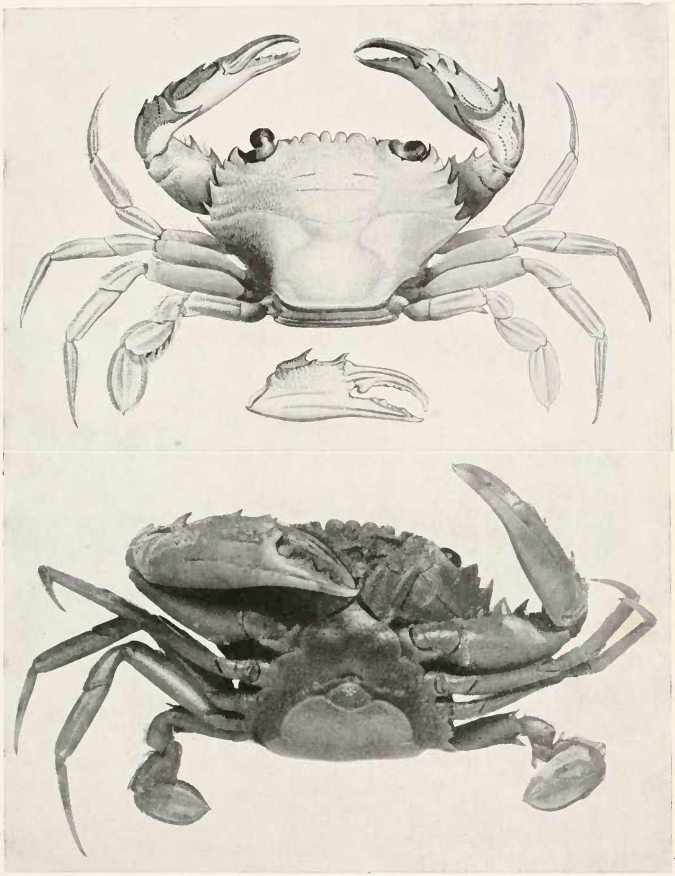
EXPLANATION OF PLATE XXXIII.

Charybdis (*Charybdis*) *incisa*, sp. nov. Female holotype. Carapace 26 mm. wide.

Fig. 1.—Dorsal view, right half denuded.

Fig. 2.—Right chela.

Fig. 3.—Ventral view.



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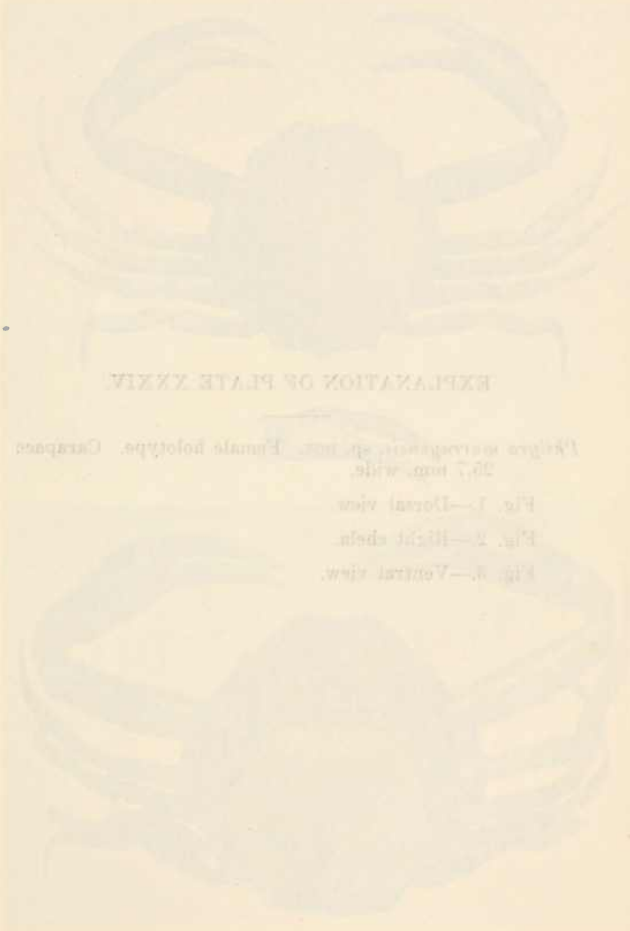
PHYLLIS F. CLARKE (1-2) del.
C. R. SHOEMAKER (3), photo.



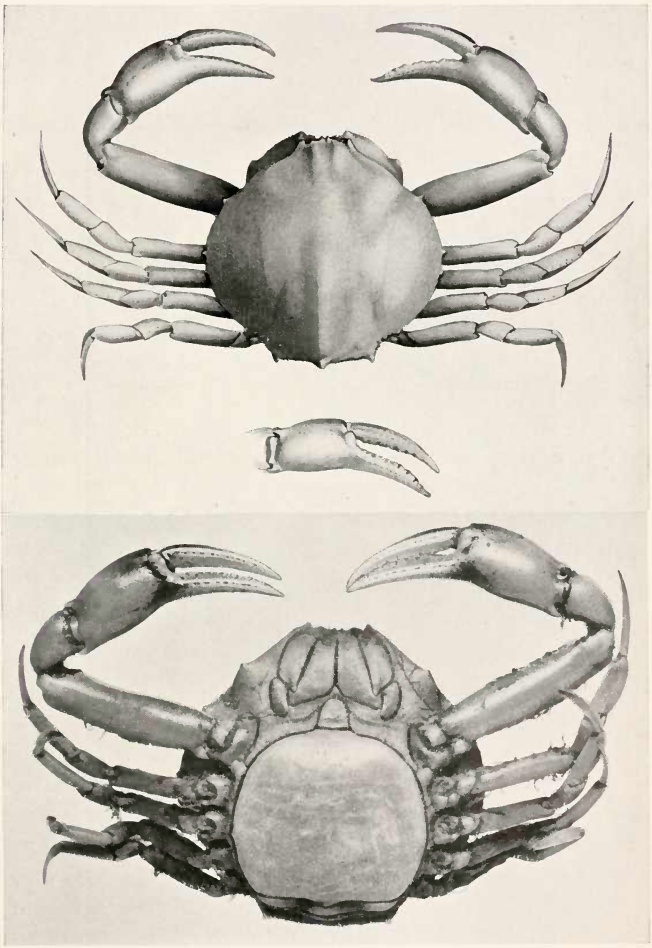
EXPLANATION OF PLATE XXXIV.

Philyra murrayensis, sp. nov. Female holotype. Carapace 25.7 mm. wide.

Fig. 1.—Dorsal view.

Fig. 2.—Right chela.

Fig. 3.—Ventral view.



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PHYLLIS F. CLARKE (1-2), del.
C. R. SHOEMAKER (3), photo.

EXPLANATION OF PLATE XXXV.

Ebalia tuberculosa (A. Milne Edwards). Male (E.5160). Carapace 8.8 mm. wide.

Fig. 1.—Dorsal view.

Ebalia tuberculosa (A. Milne Edwards). Male (E.6484). Carapace 9 mm. wide.

Fig. 2.—Dorsal view.

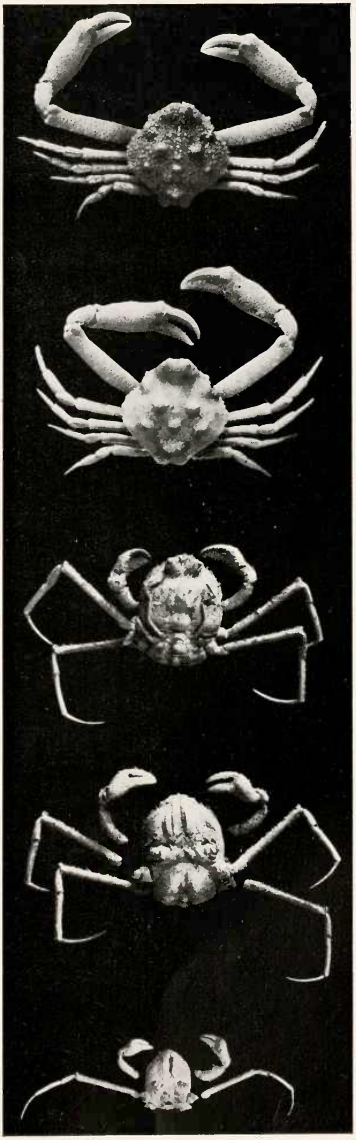
Cymonomops similis, Grant. Female (E.4818). Carapace 7 mm. wide.

Fig. 3.—Dorsal view.

Fig. 4.—Ventral view.

Cymonomops similis, Grant. Male (E.4818). Carapace 5.8 mm. wide.

Fig. 5.—Ventral view.



G. C. CLUTTON, photo.

EXPLANATION OF PLATE XXXVI.

Latreillopsis petterdi, Grant. Male (E.5128). Carapace 65 mm. wide. Ventral view.

G. C. CLUTTON, photo.

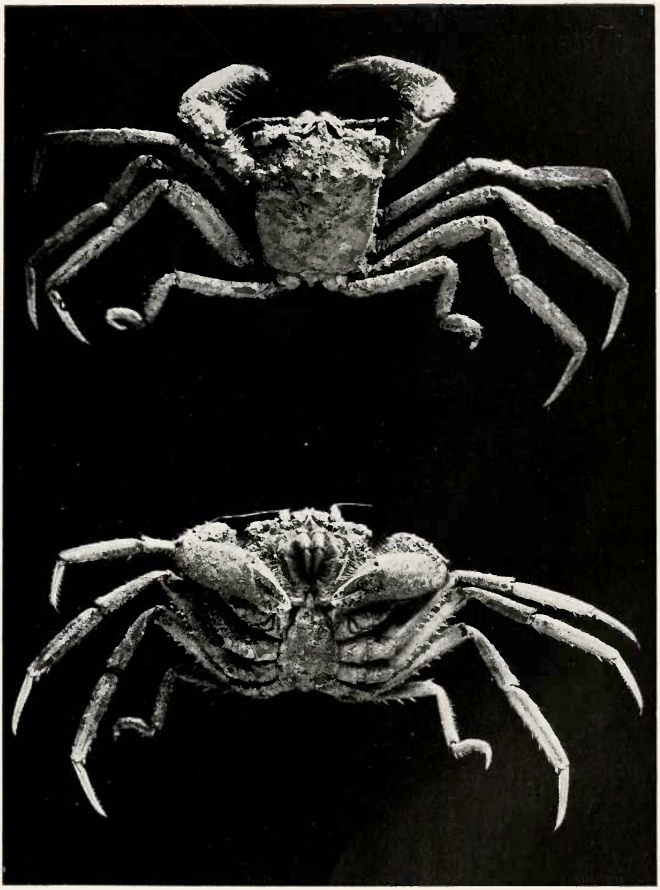
EXPLANATION OF PLATE XXXVII.

Homola orientalis, Henderson. Male (E.6137). Carapace 22.5 mm. wide.

Fig. 1.—Dorsal view.

Homola orientalis, Henderson. Male (E.5144). Carapace 27 mm. wide.

Fig. 2.—Ventral view.



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G. C. Clutton, photo.

EXPLANATION OF PLATE XXXVIII.

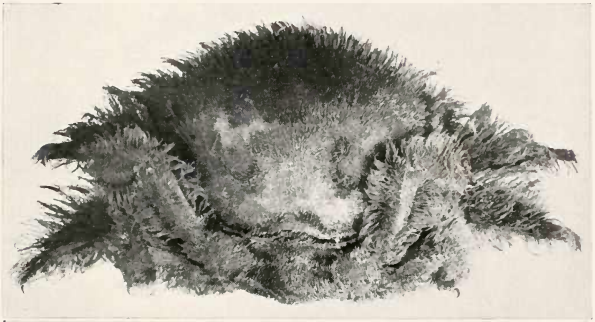
Dromidiopsis excavata (Stimpson). Male (E.5199). Carapace 32.5 mm. wide.

Fig. 1.—Dorsal view.

Fig. 2.—Ventral view.

Dromidiopsis excavata (Stimpson). Male (P.2132). Carapace 30.5 mm. wide; under a compound ascidian.

Fig. 3.—Frontal view.



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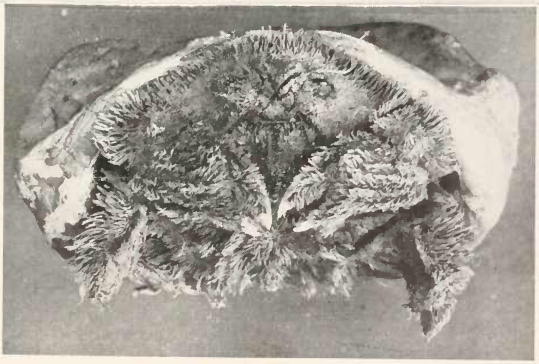

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G. C. CLUTTON, photo.

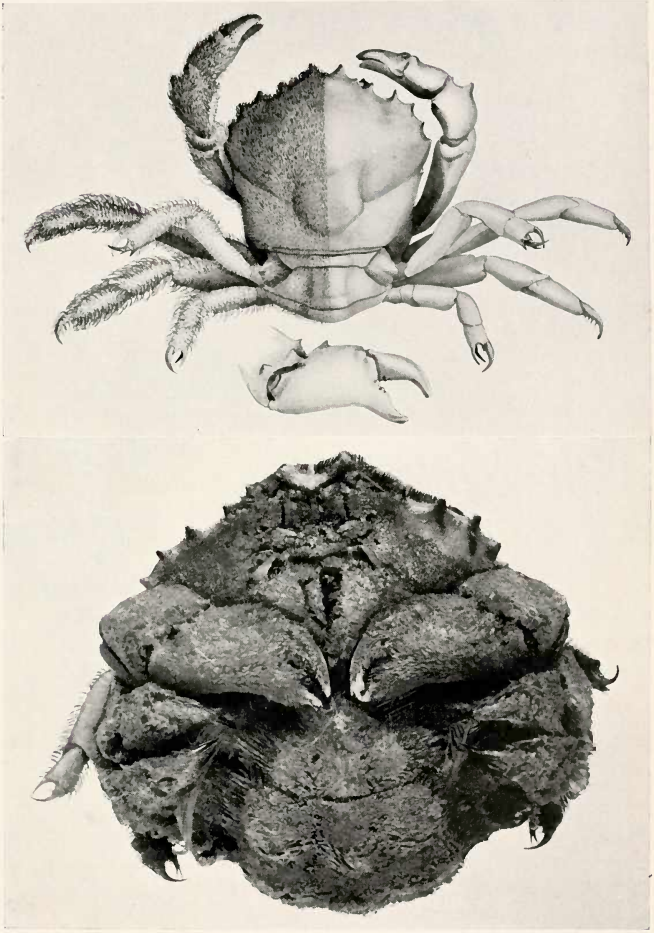
EXPLANATION OF PLATE XXXIX.

Dromidia australis, sp. nov. Female holotype. Carapace 29 mm. wide.

Fig. 1.—Dorsal view, right half denuded.

Fig. 2.—Right chela, denuded.

Fig. 3.—Ventral view.



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PHYLLIS F. CLARKE (1-2), del.
C. R. SHOEMAKER (3), photo.

EXPLANATION OF PLATE XL.

Dromidia australis, sp. nov. Male (E.6132). Carapace 33.7 mm. wide.

Fig. 1.—Dorsal view.

Dromidia insignis, sp. nov. Female holotype. Carapace 17.5 mm. wide.

Fig. 2.—Dorsal view.

Fig. 3.—Ventral view.

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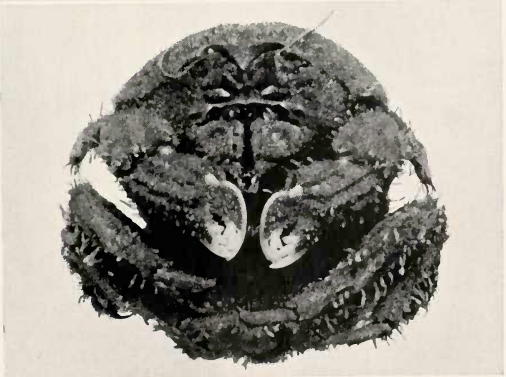

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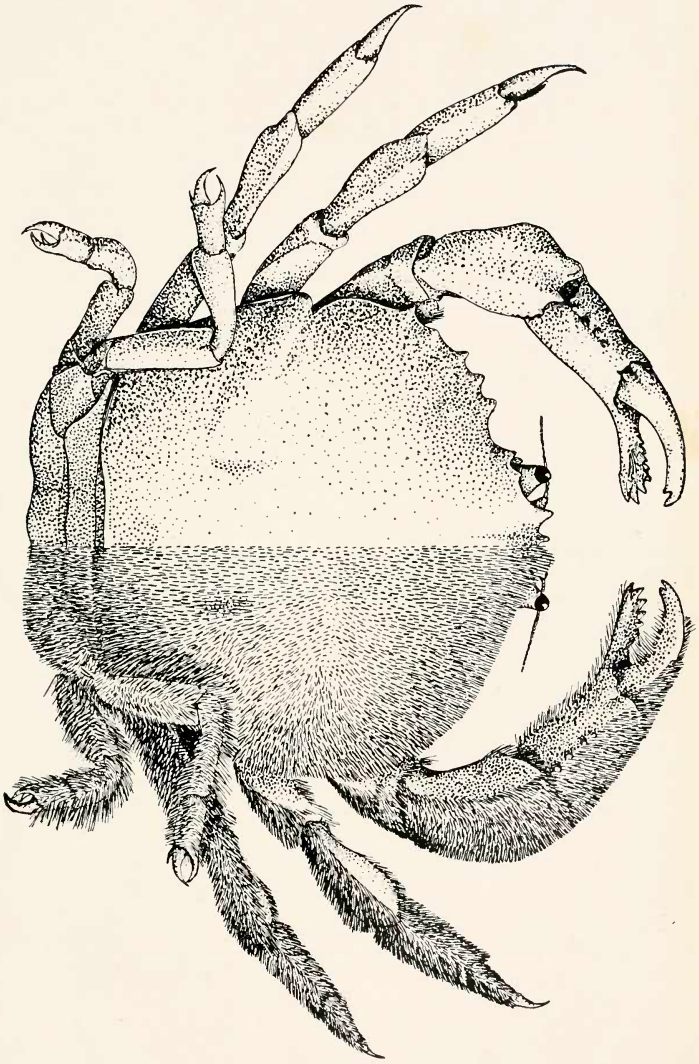
C. R SHOEMAKER, photo.

EXPLANATION OF PLATE XLI.

Cryptodromia octodentata (Haswell). Female (P.2311). Carapace 46 mm. wide. Dorsal view, left half denuded.



J. R. KINGHORN, del.

EXPLANATION OF PLATE XLII.

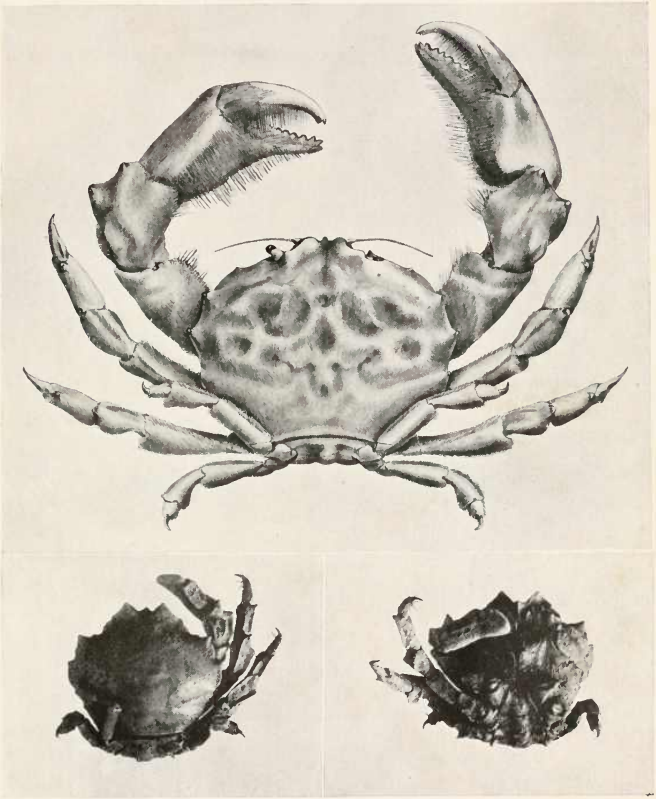
Petalomera wilsoni (Fulton & Grant). Male (E.2239). Carapace 32.3 mm. wide.

Fig. 1.—Dorsal view.

Petalomera lamellata (Ortmann). Male (E.5151). Carapace 13 mm. wide.

Fig. 2.—Dorsal view.

Fig. 3.—Ventral view.



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J. R. KINGHORN (1), del.
G. C. CLUTTON (2-3), photos.

Report on some Fishes obtained by the F.I.S. "Endeavour" on the coasts of Queensland, New South Wales, Victoria, Tasmania, South and south-western Australia.

Part V.

BY

[The late] ALLAN R. McCULLOCH,
Zoologist, Australian Museum, Sydney.

Plates xliii-lvi. Figures 1-4.

Family SQUALIDÆ.

Oxynotus bruniensis *Ogilby.*

Oxynotus bruniensis (Ogilby) McCulloch, Biol. Res. Endeavour ii. 3, 1914, p. 80, pl. xiii.

A specimen trawled off Gabo Island, Victoria, extends the known range of this species northward to near the New South Wales border.

Family RHINOBATIDÆ.

Rhynchobatus djiddensis *Forskal.*

Rhynchobatus djeddensis Day, Fish. India, 1878, p. 730, pl. excii, fig. 1. *Id.* Ogilby, Proc. Linn. Soc. N. S. Wales x, 1885, p. 465, and Ann. Qld. Mus. ix, 1908, p. 5, and Mem. Qld. Mus. v, 1916, p. 84.

A specimen 610 mm. long, agrees in all details with Day's figure of this species. It was apparently trawled in Queensland waters, but no particulars were supplied with it. According to Ogilby (*loc. cit.*, 1916), the "Endeavour" took the species off Cartwright Point and off North-West Islet, Queensland.

Rhinobatus banksii *Müller and Henle.*

Shovel-nosed Ray.

(Figs. 1-4.)

Rhinobatus banksii (Müller and Henle) Waite, Mem. Austr. Mus. iv, 1, 1899, p. 38, pl. iii. *Id.* Ogilby, Mem. Qld. Mus. v, 1916, p. 85, fig. 1 (*vide* synonymy).

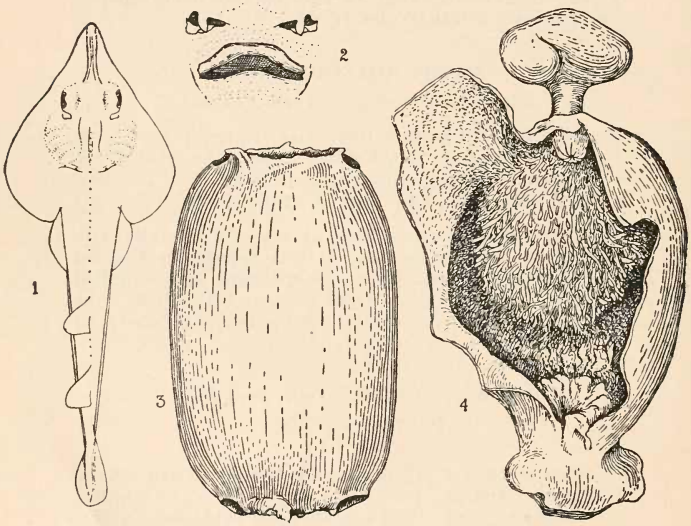
Rhinobatus vincentianus Haacke, Zool. Anz. viii, 1885, pp. 488 and 508.

Rhinobatus philippi Garman, Mem. Mus. Comp. Zool. xxxvi, 1913, p. 278 (part). *Id.* Waite, Rec. S. Austr. Mus. ii, 1, 1921, p. 27 (? not *R. philippi* Müller and Henle).

Nine small specimens from Queensland, 350-465 mm. long, exhibit but little variation, though the dorsal and cephalic tubercles are a little more numerous and better developed in some than in others. They do not differ from specimens of the same size from Port Jackson.

Synonymy.—Garman unites *R. philippi* Müller and Henle, with *R. banksii* M. and H., but certain details of the structure of the snout and the position of the nostrils, as described under *R. philippi*, differ from those of *R. banksii*. It is, therefore, doubtful that the two names refer to the same species.

According to Haacke, the typical specimens of his *R. vincentianus* were deposited in the South Australian



Figures 1-4.

Rhinobatus banksii Müller and Henle. One of several young specimens described by Haacke as *R. vincentianus*. 1. Embryo, 97 mm. long. 2. Nostrils and mouth of same specimen, 9 mm. wide. 3. Egg-capsule, 74 mm. long. 4. Uterus, 77 mm. long, laid open to show interior.

Museum, but they cannot now be traced. A bottle containing seventeen small embryos, 88-102 mm. long, together with two of the uteri and two egg-capsules, described by Haacke (*loc. cit.* p. 488), are still preserved, however, and have been forwarded to me for

examination by Mr. E. R. Waite; these are figured in the accompanying illustration. Though still very small, the embryos indicate that *R. vincentianus* is identical with *R. banksii*; the dorsal tubercles can only just be traced but they agree in their disposition with those of *R. banksii*, while the nostrils are disposed as in that species.

Localities.—Ogilby (*loc. cit.*) observed this species in the trawl eleven times while the "Endeavour" was in Queensland waters. Specimens are preserved from the following localities.

Twenty miles off Bustard Head Light, Queensland, 20 fathoms; 8th July, 1910.

Five miles S.E. of Boomerang Hill, Fraser Island, Queensland, 15 fathoms; 29th June, 1910.

Family NARCOBATIDÆ.

Genus Narcobatus, Blainville.

Torpedo, Narcacion, and *Narcobatus*—see Jordan, Gen. Fish. i, 1917, pp. 22, 39, and 95, and ii, 1919, p. 167.

Narcobatus fairchildi *Hutton.*

Narcacion fairchildi Waite, Rec. Cantb. Mus. i, 2, 1909, p. 144, pl. xvii (*vide* synonymy).

Torpedo fairchildi McCulloch, Rec. Austr. Mus. xii, 8, 1919, p. 171, pl. xxv (references and description).

Narcobatus fairchildi Waite, Rec. S. Austr. Mus. ii, 1, 1921, p. 28, fig. 40—after McCulloch.

Variation.—Three specimens 265-273 mm. wide, differ considerably in general appearance from a larger 470 mm. example which I have figured (*loc. cit.*), and agree much better with Waite's figure quoted above. The anterior portions of the ventrals are covered by the pectorals in the smaller specimens, while they are fully exposed in the larger one, which makes the latter appear proportionately longer. The spiracles are less open in the "Endeavour" specimens, and therefore appear smaller. The exact shapes of the dorsal and caudal fins are variable, as noted by Waite, but they are generally broader and rounder than in the larger

specimen. The pectoral disc is wider in one of the "Endeavour" specimens than in the others, its length being 1·25 in the breadth as against 1·16-1·18; the dorsal surface of the disc is more uniform, there being less of the underlying skeletal structures visible than in the larger example. A careful comparison of all four specimens, however, leads me to the conclusion that they are merely variations of the one species.

Localities.—Eastern edge of Bass Strait, 100-220 fathoms; Dec., 1912.

Great Australian Bight, edge of bank, 80-120 fathoms; April, 1913.

Great Australian Bight, South of Eucla, 130-320 fathoms.

Distribution.—New Zealand, South and south-eastern Australia, from off Green Cape, N. S. Wales, to south of Eucla, on the border between South and West Australia.

Family MYCTOPHIDÆ.

Diaphus cœruleus *Klunzinger.*

(Plate xliii, figs. 1-2.)

Scopelus cœruleus Klunzinger, Verh. K. Zool. Bot. Ges. Wien xxi, 1871, p. 152.

Myctophum (Diaphus) cœruleum Brauer, Deutch. Tiefsee Exped. xv, Fische, 1906, p. 217, fig. 137.

Diaphus cœruleus Gilbert, Mem. Carnegie Mus. vi, 2, 1913, p. 94.—Synonymy.

D.16; A.15; P.11; V.8; C.19. L. Lat. 37.

Depth (24 mm.) 4·6 in length to hypural joint (112); head (32) 3·5 in the same. Eye (8) 4 in head, and 1·2 in interorbital width (10). Snout (4·5) 1·7 in the eye.

Origin of the dorsal fin above that of the ventrals, and about midway between the adipose dorsal and the hinder margin of the eye. Anal commencing just behind the vertical of the last dorsal ray, and terminating below the adipose dorsal fin. Pectorals short, not reaching the vertical of the ventrals. Ventral fins large, reaching backward to the vent.

Upper anteorbital photophore small, close to the orbit and a little above the level of the nostril; lower anteorbital immediately below the upper, and extending around the margin of the orbit to below the anterior third of the eye. No sub- or postorbital photophores. Four pairs of thoracics, the last higher than the others and in advance of the base of the ventrals. Two subpectorals forming an oblique row with the first thoracic. Suprapectoral nearer the base of the pectoral fin than the lateral line, with a large supplementary gland; postpectoral nearer the ventral than the pectoral fin. Supraventral almost midway between the ventral fin and the lateral line. Four pairs of ventral photophores, the second high above the others. Three superanals on each side, the upper behind an oblique line cutting the two lower; it is more widely separated than the other two, but is separated by a short space from the lateral line. First anteroanal elevated, but not so high as the middle superanal; three more form an oblique row on the right side and four on the left. Lower posterolateral obliquely above and behind the last anteroanal, the upper not touching the lateral line. Five posteroanals in an oblique row on the left side and six on the right. Four precaudals, the last separated from the others, but not reaching the level of the lateral line.

Described and figured from a specimen 138 mm. long, from the Great Australian Bight, 350-450 fathoms. It is denuded of scales, but their position is clearly shown by the scale-pits and markings, and its luminous organs are well preserved.

Variation.—Fifty-two other specimens, all in a bad state of preservation, appear to have their photophores similarly arranged, but one example has only four anteroanals and six posteroanals, as is shown on the right side of the specimen described. These are illustrated in Pl. xliii, fig. 2.

Localities.—Fifty-four specimens, 118-172 mm. long, are preserved from the following localities:

Great Australian Bight, south from Eucla, 350-450 fathoms; 14th May, 1913.

Great Australian Bight, south-east from Eucla, long. 131° E., 200-300 fathoms; 5th and 6th May, 1913.

Family ALEPOCEPHALIDÆ.

The genera *Xenodermichthys* Günther, *Aleposomus* Gill, and *Rouleina* Jordan are closely allied, but appear to be distinguished as follows:

A. Gill-openings not extending above the pectorals; mouth small. XENODERMICHTHYS.
B. Dorsal and anal fins long, with 33 rays. *nodulosus.*
AA. Gill-openings extending well above the pectorals; mouth large. ALEPOSOMUS.
C. Dorsal and anal fins long, with more than 25 rays. Subgenus ALEPOSOMUS.
Includes *copei* Gill (syn. *socialis* Vaillant) and *cyaneus* Zeugmayer.
CC. Dorsal and anal fins shorter, with 20 or less rays. Subgenus ROULEINA.

ALEPOSOMUS Gill.

Subgenus ROULEINA Jordan.

Aleposomus Roule, Bull. Mus. Hist. Nat., 1915, 2, p. 46 (*guntheri*)—*sensu lato.*

Rouleina Jordan, Classification Fish., 1923, p. 122 (*guntheri*).

Rouleina is only subgenerically distinct from *Aleposomus*, differing only in having shorter dorsal and anal fins. By the kindness of the Director of the Muséum d'Histoire Naturelle, I am able to compare my specimens of *R. squamilaterus* with an example of *A. socialis* Vaillant (= *copei* Gill). I find them similar in all larger structural details, though the lateral line is without modified scales in *A. socialis*. They differ from *Xenodermichthys* in having the gill-openings extending far above the bases of the pectoral fins and in their larger mouths. A bony stay across the operculum is well developed, which is apparently wanting in *Xenodermichthys*.

Key to the Species.

A. Lateral line indistinct, without scales.
B. D.15, A. 14. *guntheri* Alcock.
BB. D.18, A.17. *nudus* Brauer.
AA. Lateral line distinct, with scales.
C. Pectorals reaching more than half the distance from ventrals. *lividus* Brauer.
CC. Pectorals reaching less than half their distance from ventrals.
D. Head 3·7-4·1 in length; D.19-21, A.16-19. *squamilaterus* Alcock
DD. Head 4·66 in length; D.18-19, A.17. *watasei* Tanaka.

ALEPOSOMUS, ROULEINA, SQUAMILATERUS Alcock.
(Plate xliv, fig. 1.)

Xenodermichthys squamilaterus Alcock, Ann. Mag. Nat. Hist. (7) ii, 1898, p. 148 and Cat. Ind. Deep-sea Fish. Investigator, 1899, p. 181. *Id.* Illustr. Zool. Investigator, Fishes, 1899, pl. xxv, fig. 4.

D.20; A.19; P.8; V.7; C.19.

Head, from premaxillary symphysis to end of opercular lobe, 3·8 in the length to the base of the caudal rays; depth at the pectorals 5·9 in the same. Transparent disc of the eye considerably smaller than the orbit, 4·0 in the head; bony orbit 3·3 in the same. Snout 1·6 in the orbit.

Body elongate, compressed. Profile forming a convex curve upwards from the snout to the back; the snout a little prominent. Interorbital space flat; its bony portion is about half as wide as the eye but the bones are so soft that they cannot be satisfactorily measured. Nostrils large, close together; the anterior circular, the posterior a pear-shaped opening. Eye entirely within the anterior half of the head and close to its upper profile. Preorbital very narrow and membranaceous. Mouth large, oblique; the maxillary is broad and rounded posteriorly, with a well developed supramaxillary, and reaches backward almost to the vertical of the posterior margin of the eye. Mandible closing within the premaxillaries but with a very prominent symphysial angle. Preopercular angle partly free, the rest of its margin covered by dermal membrane. Opercles membranaceous, supported by stronger bony ridges curving obliquely downward to an inframarginal angle; a broad skinny border forms the margin of the gill-opening. Gill-openings very wide, commencing high above the pectoral and only a short distance below the lateral line; they extend forward to below the eye and the membranes are quite free from the isthmus. Four gill-arches, with a slit behind the fourth; pseudobranchiæ present. About nineteen broad gill-rakers on the lower limb of the first arch, of which those at the posterior angle are about half as long as the orbit. Premaxillaries with a single row of minute cardiform teeth which extends backward onto the lower edge of the maxillary; a similar row on each side of the mandible; palate toothless. Tongue large and free.

Body naked, the soft skin closely wrinkled into minute, longitudinal folds; the angular muscle-segments well defined. Lateral line a salient canal supported by close-set, scale-like rings with points almost meeting in the middle line; a minute tubercle is present at the base of each ring. It commences above the preoperculum and runs obliquely downward to the middle of the body and terminates on the middle caudal rays. Branches of the lateral line system extend forward onto the head; one crosses the nape and another extends forward on each side of the upper surface of the head to the snout; still another canal forms an obtuse angle near the postero-inferior portion of the eye and extends along the pre-orbital. Each of these is marked with open pores.

Photophores are distributed as in the accompanying figure and are more or less similarly disposed in several specimens. A row is present beneath the eye and several are scattered behind it. One is on the maxillary and two on the cheek behind its posterior margin. A row extends along each ramus of the mandible and others are present upon the throat and gill-membranes. The operculum, suboperculum, and preopercular border each bear scattered photophores as shown in the figure. Minute papillæ are present on parts of the head which apparently bear microscopic luminous organs. The body bears numerous photophores which are most plentiful on the lower surfaces; in the abdominal region they are disposed in transverse rows. Similar photophores are present on the dorsal and anal fins, the base of the caudal, and the lower surfaces of the ventrals.

The anal fin is entirely within the posterior third of the body but the anterior dorsal rays are situated in advance of it. Both fins appear to be somewhat rounded with their median rays longest and approximately two-thirds as long as the base of the fin. Ventral nearer the base of the caudal fin than to the anterior margin of the eye, its adpressed rays not quite reaching the vent. Pectorals inserted low on the sides; the second ray appears to be longest and reaches much less than half its distance from the ventrals. Caudal deeply forked.

Colour.—Deep violet-black; the head lighter. A naked bluish stripe at the bases of the dorsal and anal fins.

Described and figured from an example 182 mm. long without the caudal fin. It is the smallest of fourteen specimens, but is in a better state of preservation than larger examples.

Variation.—Fourteen specimens, 182-266 mm. long without the caudal fin, exhibit similar variation in their proportions and number of fin-rays to that noted by Roule (Bull. Mus. Hist. Nat. 1915, 2, p. 42) in *Alepocephalus socialis*. A tabulation of the measurements of the fourteen specimens shows that they vary individually and irrespective of size.—D.19-21, A.16-19, P.7-9, V.7-8. Head 3·7-4·1 in the length to the base of the tail; depth 5·7-6·4 in the same. Eye 3·8-4·2 in the head; orbit 3·0-3·3 in the same. Snout 1·6-1·8 in the orbital diameter.

Identity.—These specimens do not quite agree with the proportions of *R. squamilaterus*, but having tabulated their range of variation, and allowing for the fact that Alcock's description and figure were prepared from a single young example, I consider the differences too slight to be of specific value.

Locality. All the specimens were trawled together in the Great Australian Bight, south from Eucla, 350-450 fathoms; 14th May, 1913.

Family GONOSTOMIDÆ.

A. A single row of photophores on each side of the abdomen; dorsal originating opposite anterior portion of anal.
Bonapartia.

AA. Two or more rows of photophores on each side.

B. Two rows of photophores on each side of the abdomen.

C. Dorsal fin originating opposite anterior portion of anal.
Gonostoma, Neostoma, Cyclothone, Valenciennellus.

CC. Dorsal originating well in advance of anal fin.

D. Dorsal origin before that of the ventrals; anal short with 14-15 rays.
Ichthyococcus.

DD. Dorsal origin over or behind that of the ventrals.

E. No adipose dorsal fin.

F. Anal fin long, with 29-33 rays.
Manducus. Yarella.

EE. Adipose dorsal present.

G. Anal fin short, with 14-15 rays.
Vinciguerria.

GG. Anal fin longer, with 20 or more rays.
H. Lateral photophores terminating above or before the ventral fins.
I. Ventral photophores united with anteroanals.
Argyripnus.
II. Ventral photophores separated from anteroanals.
Maurolicus.
HH. Lateral photophores extending backward to near vent.
J. Entire dorsal fin far in advance of anal; mandible and palate with long fangs.
Photichthys.
JJ. Posterior dorsal rays above anterior anal rays; jaws and palate without large fangs.
Polymetme.

BB. Three or more rows of photophores on each side.
Lynchnopoles, Diplophos, and *Triplophos.*

POLYMETME *gen. nov.*

Body elongate, apparently scaly. Bones of head thin and loosely joined. Mouth wide, the upper jaw largely formed by the maxilla, which extends backward almost to the preopercular angle; mandible projecting beyond the upper jaw when the mouth is closed. Teeth well developed, but without enlarged fangs; two rows on the premaxillaries and mandible, and one on the maxillary; teeth on the vomer and palatines with teeth. Gill-openings very wide; gill-rakers slender; no pseudobranchiæ. Photophores very conspicuous, in two rows on each side of the abdomen and in one from the vent to the caudal fin. Dorsal fin short, above the interspace between the ventral and anal fins; its posterior rays above the origin of the anal; adipose dorsal present. Anal fin long, with 24-29 rays. Caudal forked. Pectorals and ventrals well developed.

Type.—P. illustris sp. nov.

This genus is closely allied to *Photichthys* Günther, but differs in its dentition and in having the dorsal fin placed somewhat farther back. *Photichthys* has several canines in the premaxillaries, and about seven longer fangs on each side of the mandible; a small canine on each side of the vomer, and each palatine bears a long

row of fangs which become smaller backwards. There are no fangs or enlarged teeth in *Polymetme*.

Photichthys corythœolus Alcock also belongs to this genus, and likewise the recently described *Yarrella africana* Gilchrist and Bonde (Rept. Fish. and Marine Biol. Survey S. Africa iii, 4, 1922 (1924), p. 8, pl. i, fig. 2).

I am indebted to Mr. G. Archey of the Canterbury Museum, Christchurch, New Zealand, for the loan of a specimen of *Photichthys argenteus* for comparison with my new species.

Polymetme illustris *sp. nov.*

(Plate xlv, fig. 1.)

Br. 13; D.11; A.29; P.11; V.7; C.18. Apparently about 42 scales between the shoulder and the base of the caudal.

Depth (24 mm.) 5·5 in the length to the hypural joint (133); head (31) 4·2 in the same. Eye (7·25) a trifle longer than the snout (7), 4·2 in the head. Interorbital space (6) 1·2 in the eye. Third dorsal ray (20) 1·5, fourth anal ray (17) 1·8, pectoral (22) 1·4 in the head.

Head and body compressed; the dorsal and ventral profiles almost evenly arched. The profile rises in a gradual curve to the nape from the conical snout; interorbital space almost flat, with bony crests above each eye which converge on the snout. Nostrils close together, near upper surface of snout; posterior larger than the anterior. Eye close to the upper profile and situated within the anterior half of the head. Mouth oblique; upper jaw formed by the premaxillary anteriorly, but by the maxillary posteriorly, which reaches backward to the base of the preoperculum; it is a little expanded posteriorly, and is traversed by a raised ridge along its length. The cheek is covered by some large and very thin scales, and one extends over a large portion of the maxillary. The premaxillary and maxillary with curved teeth; these appear to be arranged in two rows on the premaxillaries; the outer being the larger. Maxillary teeth in a single row, larger than those on the premaxillary and with smaller ones set between them. Mandible projecting beyond the upper jaw, with two

rows of similar teeth. A few scattered teeth on the vomer, and a short row on each palatine; no enlarged fangs. Preoperculum very narrow; its anterior edge forming a pronounced ridge. Operculum, suboperculum and interoperculum each separate; their surfaces marked with concentric striæ.

Four gill-arches; a slit behind the fourth. No pseudobranchiæ. Gill-rakers slender, the length of those at the angle of the first arch about equal to the interorbital width; twelve on the lower limb of the first arch. Body now naked but showing traces of large scale-pits.

Photophores.—A large photophore is present on the preorbital, another above the suspension of the preoperculum, one beneath the suboperculum and one beneath the interoperculum. Nine form a row between the bases of the branchiostegal rays. Nine pairs are arranged along the isthmus and one on the base of the pectoral. Eleven more form a row to the ventral and eight between the ventral and the anal. There are seventeen in a row from above the pectoral base to above the vent. Seventeen above the anal, of which the anterior is placed higher than the others, and five more to the base of the tail.

The origin of the dorsal fin is nearer the base of the caudal fin than the snout and is situated well behind the ventral, its posterior rays overlapping the anterior ones of the anal. Adipose dorsal fin well in advance of the termination of the anal. The anterior anal rays are much longer than those following them. Pectoral reaching about three-fourths its distance from the ventral; caudal forked.

Colour.—Brown above, silvery on the sides; the junction of the two colours sharply defined. Opercles blackish; each caudal lobe with some black rays posteriorly.

Described and figured from a specimen 158 mm. long, which, however, is considerably damaged, and details have been studied in other specimens.

Variation.—Nine specimens, 103-148 mm. long without the caudal fin, exhibit some little variation. D.11-12; A.27-32; P.10-11; V.7. The head is 4·2-4·6 in the length and the depth 5·0-5·9 in the same. The photophores are the same in number and arrangement in all.

Affinities.—This species differs from *P. corythœolus* Alcock, in its larger number of dorsal rays and photophores. It is very near *P. africanus* Gilchrist and von Bonde, but the number and arrangement of the photophores in that species are different from those of *P. illustris*, in which they are uniform in all of my nine specimens. *P. africanus* has only 25 rays in the anal fin as against 27-32 in *P. illustris*.

Localities.—Great Australian Bight, south from Eucla, 350-450 fathoms; 14th May, 1913.

Great Australian Bight, long. 127° 40′ E., S.W. of Eucla, 200 fathoms; 29th May, 1913.

South of Gabo Island, Victoria, 200 fathoms; 6th October, 1914.

Argyripnus iridescens *sp. nov.*

(Plate xlv, fig. 2.)

Br. 10; D.13; A.25; P.16; V.7; C.19. About 44 muscle bands between the shoulder and the base of the caudal fin.

Depth (30·5 mm.) 3·3 in the length to the hypural joint (103); head (31·5) 3·2 in the same. Eye (12) 2·6 in the head; interorbital width (6·5) a trifle less than the length of the snout (7), which is 1·7 in the eye. Fourth dorsal ray (18) 1·7, third anal ray (13) 2·4, and pectoral fin (25) 1·2 in the head.

Head and body strongly compressed; the dorsal and ventral profiles almost evenly arched anteriorly. Interorbital space a little concave, with arched crests above the eyes, from which ridges extend forward converging on the snout. Nostrils close together in the middle of the snout. Eye touching the upper profile. Mouth oblique; the anterior fourth of the upper jaw formed by the premaxillaries, the remainder by the large maxillary which reaches backward to the vertical of the posterior margin of the eye; it is but little expanded posteriorly, and its hinder portion is overlain by a large spatuliform supramaxillary. Premaxillaries, maxillaries, and mandible each with a single row of curved needle-like teeth, of which those on the maxillaries are no larger than elsewhere. One or two small teeth on each side of the vomer,

and a few very small ones on each palatine. Mandible projecting beyond upper jaw. Preopercular angle rounded; its anterior margin forms a raised crest behind the eye. Operculum, suboperculum and interoperculum almost membranaceous with smooth surfaces.

Four gill-arches, a slit behind the fourth. No pseudobranchiæ. Gill-rakers slender, the length of those at the angle of the first arch equal to that of the snout; sixteen on the lower limb of the first gill-arch. Body denuded of scales.

Photophores.—A large photophore is present on the preorbital, another behind the eye above the suspension of the preoperculum, and one at the preopercular angle behind the maxillary; two are on the suboperculum, one above the other and separated by a black, metallic-hued space, and six form a row on the gill-membranes between the branchiostegal rays. Six are arranged in a row on each side of the isthmus, the hinder ones curving upward to the base of the pectoral. Ten pairs of rounded photophores are present on the ventral surface between the thorax and the ventral fins, and seven dumb-bell shaped ones on each side beneath the pectoral fins. Twenty-one form a series commencing above the ventral fin, which first dips sharply downward and then runs obliquely upward to above the origin of the anal, where it rises abruptly and extends backward subhorizontally to end above the eleventh anal ray; the anterior photophores of this series are much larger than the others. Five larger photophores are united in a row above the middle of the anal, and a row of thirteen more is present on each side of the lower surface of the caudal peduncle.

Origin of the dorsal fin a little nearer the snout than the base of the tail, and a little behind the vertical of the ventrals; its posterior rays are above the anterior anal rays. Adipose dorsal well developed, situated above the posterior portion of the anal, its length equal to about two-thirds the width of the eye. Anterior anal rays much longer than those following them. Pectoral reaching backward to beyond the ventrals. Ventrals imperfect, broken. Caudal deeply forked.

Colour.—Occiput, portion of opercles, throat and chest black, with iridescent colours. A saddle-shaped area on the anterior portion of the back is black, and

blackish dots form oblique rows along the muscle bands on the upper half, which unite to form a dark patch on the caudal peduncle. All the photophores with black borders. The remainder of the body was apparently silver in life, and such scales as remain show highly iridescent colours of bronze and green. Apical half of dorsal fin black, and a black dot at the base of each ray. Supplementary caudal rays and the outer ray of each lobe black.

Described and figured from a specimen 128 mm. long, from the Great Australian Bight, 350-450 fathoms.

Variation.—A tabulation of the characters of fifteen specimens exhibits some little variation. D.12-14; A.24-25; P.16-17; V.7. The number of photophores on the sides of the abdomen and before the ventral fins is constant, but those in the curved series behind the ventral vary from 20-21; there are always five together above the middle of the anal, and 12-14 pairs beneath the caudal peduncle. Depth 3·1-3·4 in the length to the hypural joint; head 3·2-3·8 in the same. Eye 2·5-2·7 in the head.

Affinities.—This species is so similar to *A. ephippiatus* Gilbert and Cramer, that I separate it with much hesitation. The number of dorsal and anal rays is consistently greater in *A. iridescens*, and the numbers of photophores in the branchiostegal, ventro-anal, and caudal series is slightly different from those of *A. ephippiatus*.

Localities.—Twenty-six specimens, 90-135 mm. long, are preserved from the following localities:

Great Australian Bight, south from Eucla, 350-450 fathoms; 14th May, 1913.

Great Australian Bight, long. 127° 40′ E., 200 fathoms; 29th May, 1913.

Family HALOSAURIDÆ.

Halosaurus pectoralis *sp. nov.*

(Plate xliii, fig. 3.)

Br. 18; D.10; A.158; P.16; V.1/9; C.13. About 17 scales between the middle of the dorsal fin and the belly.

Head and trunk (217 mm.) 1·6 in the tail. Head, without opercular lobe (73), a trifle more than half as

long as its distance from the vent. Depth (28) 2·6, eye (13·5) 5·4, snout (34) 2·1 in the head. Preoral portion of the snout (14) 2·4 in its length; interorbital width (6) 2·1 in the eye. Pectoral fin (55) 1·3, caudal fin (45) 1·6 in the head. Second dorsal ray (33) 2·2, fourth anal ray (22) 3·3, and ventral fin (29) 2·5 in the head.

Body elongate, tapering to a very slender tail; the profile is convex on the nape. Snout conical, rounded in a horizontal plane; it is formed of flabby integument supported by cartilages which can be felt through the skin. Interorbital space flat. Nostrils close together, situated a little in front of the eye, the anterior with a small dermal lobe. Eye large, covered by membrane. A large channel extends backward from each side of the snout, across the cheek to the preoperculum, and a small one on each side of the mandible to the operculum. Opercular bones membranaceous, projecting backward beyond the gill-covers. Mucigerous canals cross the nape and postocular regions. Maxillary not quite reaching the vertical of the anterior border of the eye, and terminating in a small spine; lower jaw closing within the upper. Bands of villiform teeth on the jaws, palate, and tongue. Gill-openings extending forward to below the front margin of the eye, their membranes free from the isthmus. Seventeen gill-rakers on the lower limb of the first arch, which are slender posteriorly, and become shorter anteriorly; those at the angle are about one-third as long as the eye. Four gills, an opening behind the last.

Thin cycloid scales cover the upper surface of the head and extend far forward on the snout; they were also present on the cheeks and opercles. Very few scales remain upon the body, though the scale-pits are distinct; such as are present are thin and concentrically striated. The scales of the lateral line were probably not enlarged. Some cycloid scales remain on the dorsal fin and anterior portion of the anal.

Origin of the dorsal fin nearer the vent than the hinder margin of the eye; its first ray is simple, the others are branched, and the margin is rounded. Pectoral fin inserted high up on the side, with a narrow base; the fourth ray is longest, and reaches beyond the vertical of the origin of the ventrals, but not so far as that of the dorsal fin; the median rays are branched, and the lower ones are very small. Ventrals inserted well in

advance of the dorsal but reaching the vertical of the ninth dorsal ray when adpressed; they are united by membrane only at their bases; a short spine-like ray precedes the first articulated one, which is simple while the others are branched. The anterior anal rays are branched and higher than the body above them, but those following them are simple and decrease in length until towards the posterior third of the tail where they become gradually longer. A short interspace separates the last anal ray from the caudal, but the two are apparently united by membrane. Upper caudal ray long and branched, the others decreasing in length downwards.

Colour.—Whitish after long preservation, the scale-pits margined with brown on the upper parts. Eye and gill-covers black. Posterior third of the anal fin and the caudal fin with brown margins.

Described and figured from the holotype, 545 mm. long.

Variation.—Two paratypes, 535 and 595 mm. long, have twelve rays in the dorsal fin, and only five or six rays in the caudal.

Affinities.—This species belongs to the typical section of the genus *Halosaurus,* characterised by the presence of scales on the upper surface of the head, and by having the scales on the lateral line not or but little enlarged. Its very long pectoral fins distinguish it from most of its allies, but it is very similar to *H. owcni* from Madeira and the Atlantic, differing principally in having a longer head as compared with the trunk.

Locality.—Great Australian Bight, south from Eucla, 350-450 fathoms; 14th May, 1913.

Family GADIDÆ.

Key to the Australian Genera.

A. First dorsal with several long rays.
  B. Anal without a detached or semi-detached portion anteriorly.
    C. An outer row of strong teeth in each jaw followed by a narrow band of smaller ones; scales very small. *Lotella.*
    CC. Teeth subequal in size, in bands; scales larger.
      D. Premaxillary teeth in a single broad band on each side. *Physiculus.*
      DD. Premaxillary teeth divided into two series on each side by a groove. *Austrophycis.*

BB. Anal deeply notched, the anterior portion elevated but united with the posterior by low rays.
E. Teeth on vomer, barbel present. *Antimora.*
EE. No teeth on vomer and no barbel. *Euclichthys.*
AA. First dorsal a single ray on the occiput. *Bregmaceros.*

EUCLICHTHYS *gen. nov.*

Body elongate, compressed; head compressed, with broad septate canals covered by membrane; the upper profile curved, snout rather obtuse. No mental barbel. Head and body covered with scales of moderate size. A band of villiform teeth in each jaw; vomer and palatines toothless. Gill-openings extending far forward, membranes uniting across the isthmus. Seven branchiostegals. Pseudobranchiæ rudimentary, covered with membrane. Gill-rakers of the first arch long and slender, about nineteen on the lower limb. Two dorsal fins, separated by a very narrow interspace; the first high and composed of numerous rays and the margin of the second not deeply incised. Anal divided into two portions; the first short and high and followed by a long series of short rays, increasing in length backward. Caudal fin free. Ventrals with narrow bases, each composed of five free filamentous rays, of which the anterior is divided into two. Pectorals pointed, more than half as long as the head.

Type.—E. polynemus sp. nov.

Affinities.—This genus belongs to the sub-family Morinæ, in which the anal is more or less divided. It is nearest *Halargyreus*, from which it appears to differ in having the anal fin almost divided into two instead of notched, and in the form of its ventral fins.

EUCLICHTHYS POLYNEMUS *sp. nov.*

(Plate xliv, fig. 2.)

Br. 7; D.ii/13, 74; A.ii/13, 77; P.19; V.5.

The depth (41 mm.) is 6·2 in the total length (255); head (51) 5·0 in the same. Orbit (16) 3·1 in the head, and 1·5 in the postorbital length (25). Length of the snout (10) a trifle shorter than the width of the interorbital space (10·75) 1·6 in the orbit. Second dorsal spine (36) 1·4, first ray of second dorsal (22) 2·3, third anal ray (25) 2·0, and pectoral fin (39) 1·3 in the head.

The backward process of the premaxillaries forms a tubercle on the snout from which a median ridge projects backward to the interorbital space; the latter is almost flat. A broad septate canal, covered with membrane, extends backward from above the eyes to the shoulder; another extends around the preopercular border, and one along the suborbital region. The whole head appears to have been scaly, though only a few cycloid scales now remain on its under surface. Opercular margins thin and rounded. Maxilla extending backward to behind the vertical of the posterior orbital margin and forming an obtuse angle posteriorly. The teeth form a narrow band in each jaw, separated by an interspace at the symphysis.

The scales of the body appear to have been of moderate size but none now remain. There seem to have been about six between the lateral line and the interspace between the two dorsals, but the position of the lateral line itself is indefinite. The vent is situated immediately in advance of the anal fin.

The first dorsal originates a little behind the vertical of the base of the pectoral; it is preceded by a minute spine, but the following spine is elongate, with a filamentous tip; the succeeding rays decrease in length backward. The second dorsal commences immediately behind the termination of the first; its anterior ray is highest but the others decrease only slightly in length backward, and its posterior portion is rounded. The anal commences beneath about the tenth ray of the second dorsal, and is preceded by two short spines. The first four rays of the anterior portion are long, but the others decrease in length backward. Immediately following and connected with the first portion of the anal is a long series of short slender rays which increase in length backwards as they approach the posterior elevated portion of that fin, which is rounded. The ventrals are inserted in advance of the preoperculum and are composed of separate filiform rays; the two anterior are united at their basal portion and the first, which is divided, reaches backward to the base of the first anal ray. Pectoral pointed; the sixth upper ray longest, but not nearly reaching the vertical of the vent. The caudal extends around the end of the tail with many short rays above and below. The lower rays are longer than the upper and form an angular lobe.

Colour.—Whitish, with a bluish-black area encompassing the throat, pectoral, and anterior abdominal region and a similar area around the vent. The tip of the first dorsal and a narrow margin of the second is black.

Described and figured from the holotype, 255 mm. long. Twenty-seven others, 118-253 mm. long, are preserved.

Localities.—Great Australian Bight, south-east from Eucla, 250-300 fathoms; 6th May, 1913.

Great Australian Bight, south from Eucla, 350-450 fathoms; 14th May, 1913.

Great Australian Bight, south-west from Eucla, 190-320 fathoms; 29th May, 1913.

Family CORYPHÆNOIDIDÆ.

CŒLORHYNCHUS *Giorna.*

Cœlorhynchus (Giorna) Gilbert and Hubbs, Proc. U.S. Nat. Mus. li, 1916, p. 169, and Bull. U.S. Nat. Mus. 100, i, 7, 1920, p. 424.

The masterly papers quoted above, by Professor Gilbert and Dr. Hubbs, include a complete list of known Macruroid fishes and a comprehensive key to the species of *Cœlorhynchus* and its subgenera. The following key to the Australian and New Zealand species of the subgenus *Paramacrurus* is based upon an examination of many specimens of four species, and one of *asperocephalus.*

A. Teeth of both jaws in villiform bands. Subopercle produced into an acute angle posteriorly; snout of variable length; ridges of head usually distinct and armed with specialised scales. Spinules on scales forming subparallel rows of equal strength. subg. PARAMACRURUS.

B. Snout, measured obliquely, as long as or shorter than the eye.

C. Lower surface of head covered with asperities; scales on upper surface close-set.

D. 4½ scales between the lateral line and the tip of the adpressed dorsal; carinæ of scales widely spaced; head covered with rugose scales, some of which are specialised and form strong ridges, and are distinct on the opercles. *australis.*

DD. 5½ scales between the lateral line and the tip of the adpressed dorsal; carinæ of scales close-set; head covered with fine asperities, none of which are markedly specialised and they do not form strong ridges, while they are scarcely distinct as scales on the opercles. *asperocephalus.*

CC. Lower surface of head almost or entirely naked; scales of upper surface spaced.
E. Eye-diameter longer than the postorbital portion of the head; no scales on the lower portion of the head. *fasciatus.*
EE. Eye-diameter subequal to the postorbital portion of the head; some scales present on the lower surface of the head behind the angle of the mouth. *mirus.*
BB. Snout greatly produced, measured obliquely, longer than the eye. *innotabilis.*

CŒLORHYNCHUS, PARAMACRURUS, AUSTRALIS *Richardson.*

Cœlorhynchus australis (Richardson) McCulloch, Zool. Res. Endeavour i, 1, 1911, p. 38—references and synonymy.

Two examples with incomplete tails, are remarkable for their size. The larger measures 530 mm. and its head 125 mm. The orbit (38 mm.) is but little shorter than the snout (42) and much shorter than the post-orbital portion of the head (51).

Locality.—Eastern edge of Bass Strait, outside 100 fathom line.

CŒLORHYNCHUS, PARAMACRURUS, FASCIATUS *Günther.*

Macrurus fasciatus Günther, Ann. Mag. Nat. Hist. (5) ii, 1878, p. 24. *Id.* Gilchrist, Rept. Fish. Marine Biol. Survey S. Africa ii, 1922, p. 59.

Macrurus, Cœlorhynchus, fasciatus Günther, "Challenger" Rept., Zool. xxii, 1887, p. 129, pl. xxviii, fig. a.

Cœlorhynchus fasciatus McCulloch, Rec. Aust. Mus. vi, 1907, p. 348. *Id.* Thompson, Proc. U.S. Nat. Mus. 1, 1916, p. 473.

Cœlorhynchus, Paramacrurus, fasciatus Gilbert and Hubbs, Bull. U.S. Nat. Mus. 100, i, 7, 1920, p. 426.

This species is not uncommon off the eastern slope of Bass Strait. Gilchrist (*loc. cit.*) records that it is so plentiful in South African waters that several tons were taken in a single haul of the net.

Sixty specimens, 105-255 mm. long, are preserved in the "Endeavour" collection, together with a much larger specimen in which the end of the tail is wanting; its head measures 97 mm. These exhibit some little

variation in the size of the eye, and its diameter is proportionately greater in the younger specimens than in the larger ones. But even in the largest it is distinctly longer than the postorbital portion of the head, as is shown in Günther's figure. None have any scales on the under surface of the head.

Localities.—South-south-east of Gabo Island, Victoria, 176-200 fathoms; 15th February, 1914.

Eastern edge of Bass Strait, 100-220 fathoms.

North-east of Babel Island, Bass Strait, 70-100 fathoms.

35 miles south-east of Bruni Island, Tasmania, 150-230 fathoms.

Great Australian Bight, south-east from Eucla, 250-300 fathoms; 6th May, 1913.

Great Australian Bight, south from Eucla, 350-450 fathoms; 14th May, 1913.

Great Australian Bight, south-west from Eucla, 126° 45½′ E. long., 190-320 fathoms; 4th May, 1913.

Cœlorhynchus, Paramacrurus, mirus *sp. nov.*

(Plate xlvi.)

Br. 6; D.ii/11; P.17; V.7. Three scales between the lateral line and the middle of the first dorsal, and four at the origin of the second dorsal.

Head and trunk (83 mm.) 2·7 in the total length (228 mm.—tail incomplete). Depth (40) 1·2 in the head (50). Eye (19) 2·6 in the head, and subequal to its postorbital portion; snout (12) 1·5 in the eye, its length a little greater than the interorbital width (11·5). Second dorsal spine (39) as long as the postrostral portion of the head. Pectoral fin (27) 1·8, anterior anal rays (13) 3·8 in the head.

An area on each side of the anterior portion of the snout, and around the nostrils is naked; the rest of the upper portion and sides of the head is covered with scales, though they are widely spaced on the interorbital region. The lower surface of the head is largely naked, but the area between the angle of the mouth and that of the preoperculum is covered with rugose scales. The rostral tubercle is covered with short spinules, and a median ridge extending backward from it to the level of the eyes

is covered with a row of scales. Another scaly ridge extends forward from the ocular margin, above and around the nasal region. The occiput and interorbital regions are without prominent ridges. The lateral ridge from the rostral tubercle to the preopercular angle is armed with thickened spinate scales. Nostrils close together, a little before the eye; the anterior is circular, and the posterior forms a curved slit. Maxillary reaching backward to below the hinder third of the eye. A broad band of villiform teeth in each jaw. Mental barbel almost half as long as the eye. Preopercular angle forming an obtuse point; suboperculum produced into a sharp angle.

Body scales with many subparallel rows of spinules on their exposed surfaces; these are of equal size and number as many as sixteen on some scales below the first dorsal fin. The median scales before the dorsal fin do not form a crest as is often present in *C. fasciatus*. The vent is situated a short distance before the anal fin; a median naked sulcus is present between it and the ventral fins. Lateral line forming a low curve anteriorly.

Anterior dorsal spine minute, the second is smooth and its filamentous tip projects beyond the first ray; when adpressed it reaches the origin of the second dorsal. The interspace between the two dorsals is twice as long as the base of the first. The rays of the second dorsal are very low anteriorly, but increase in length backward. First ventral ray filamentous, reaching the origin of the anal. The tail is incomplete in the type, but in another specimen, 275 mm. long, the head (56 mm.) is 4·9 in the total length.

Colour.—Head and body uniform grey. A small black spot on the lower pectoral rays forms a contrast with the light-coloured base of that fin which is sharply defined in a dark bluish area. The filamentous ventral ray is whitish, the others bluish-black.

Described and figured from a specimen, 230 mm. long, from 150 fathoms, east of Sydney.

Affinities.—This species is very similar to *C. fasciatus* but differs consistently in having a somewhat smaller eye, which is subequal to instead of longer than the post-orbital portion of the head, and in having scales on the

lower surface of the head, behind the angle of the mouth. The scales in advance of the dorsal fin are less rugose than those of *fasciatus* and the body appears to be without dark cross-bands.

Thirty specimens, 133 to 275 mm. long, are preserved. The eye of the smallest is but little longer than the post-orbital portion of the head, and scales are present on the area behind the mouth as in the adults. All of the "Endeavour" specimens are largely denuded of scales, so an example in the Australian Museum collection (I.15247) has been selected as the holotype.

Localities.—East of Sydney, 150 fathoms; May, 1920. Holotype and four paratypes.

Off Montague Island, New South Wales, 70-100 fathoms; October, 1921.

Eastern edge of Bass Strait, 100-220 fathoms.

CŒLORHYNCHUS, PARAMACRURUS, INNOTABILIS *McCulloch.*

Cœlorhynchus innotabilis McCulloch, Rec. Austr. Mus. vi. 5, 1907, p. 348, pl. lxiii, figs. 2-2a.

Cœlorhynchus, Paramacrurus, innotabilis Gilbert and Hubbs, Bull. U.S. Nat. Mus. 100, i, 7, 1920, p. 429.

Six examples, 235-240 mm. long, have been compared with the holotype which is only 138 mm. long. The edges of the snout are a little less curved in the "Endeavour" specimens than in the small holotype, but they agree in all other details. The following are the proportions of the largest:

Head and trunk (79 mm.) 2·03 in the tail (161); head (55) 4·3 in the total length. Depth before the ventral fins (24) 2·2, eye (16·5) 3·3, and snout (22) 2·5 in the head. Interorbital width (9) 1·8 in the eye. Second dorsal spine (24) 2·2 in the head, and 1·3 in the postrostral length of the head (32). Pectoral fin (20) 2·75 in the head. The eye is 1·3 in the snout, and longer than the postorbital portion of the head. The width of the mouth at its posterior angle is 2·5 in the breadth of the head at the same point, and the maxillary reaches backward beyond the vertical of the middle of the eye.

The spinules on the scales of the sides are directed obliquely backward, and form ten to twelve subparallel carinæ of about equal strength. The body is without

definite markings. The subparallel carinæ of the scales place this species in the subgenus *Paramacrurus,* but in other characters it seems to resemble the species of *Oxymacrurus.*

All six specimens were taken together, but they are unfortunately without data. It is nearly certain, however, that they were obtained eastward of Bass Strait.

Malacocephalus lævis *Lowe.*

(Plate xlvii.)

Macrurus, Malacocephalus, lævis (Lowe) Holt and Calderwood, Tr. Roy. Dublin Soc. (2) v, 9, 1895, p. 472, pl. xl, fig. 3-3a (references). *Id.* Alcock, Cat. Ind. Deep-sea Fish., 1899, p. 119. *Id.* Brauer, Deutsch. Tiefsee Exped., Fische, 1906, p. 270.

Malacocephalus lævis Gilbert and Hubbs, Proc. U.S. Nat. Mus. li, 1916, p. 189.

An excellent series of seventeen specimens 225(+) – 385(+) mm. long, exhibits but little variation. Five examples 260(+) – 385(+) mm. long have the following characters:

D.ii/10-11; P.16-19; V.8. The head (43-74 mm.) is 5·0-6·3 in the total length, but the tips of the tails are missing in all. Depth (36-63) 1·1-1·2 in the head. Orbit (14-26) 2·8-3·0 in the head, and 1·1-1·2 in its postorbital portion (17-30). Bony interorbital width (12-24) 1·0-1·1 in the orbit.

Identity.—The characters relied upon to distinguish the four known species of *Malacocephalus* are largely proportional measurements of a few individuals of each. They are far from satisfactory, and I find nothing to distinguish the Australian specimens from *M. lævis* as described and figured by Holt and Calderwood (*loc. cit.*).

Range.—Though originally described from Madeira, *M. lævis* has since been taken in the North Sea, north and south Atlantic Ocean, and the Indian Ocean. It is therefore not surprising to find it in southern Australian waters, because several other deep-sea fishes with a similar range have been obtained by the "Endeavour" in the Great Australian Bight.

Locality.—Great Australian Bight, south from Eucla, 350-450 fathoms; 14th May, 1913.

LIONURUS NIGROMACULATUS *McCulloch.*

Macrourus nigromaculatus McCulloch, Rec. Austr. Mus. vi, 5, 1907, p. 346, pl. lxiii, figs. 1-1a.

Four specimens, 130-255 mm. long, resemble the types in all details. The black dorsal spot is very pronounced in all.

Localities.—South-east of Genoa Peak, Victoria, 200 fathoms; 5th October, 1914.

Great Australian Bight, south from Eucla, 350-450 fathoms; May, 1913.

Hitherto this species has been known only from the coast of New South Wales.

LEPIDORHYNCHUS *Richardson.*

Macrourus vel *Lepidorhynchus* Richardson, Ichth. Erebus and Terror, pt. 4, 1846, p. 53 (*denticulatus*).

Macrurus, subgenus *Optonurus* Günther, Challenger Rept., Zool. xxii, 1887, pp. 124, 147 (*denticulatus*).

Optonurus was separated from *Macrurus* (= *Coryphænoides*) by Günther on account of its heterodont intermaxillary teeth, the outer ones being strong and widely spaced, and the inner forming a villiform band; the mandibular teeth are strong and form a single row; no teeth on the palate. A membrane connecting the first gill-arch with the inner side of the cheek restricts the opening of the first gill-slit. Gill-rakers tubercular, about thirteen on the lower limb of the second arch. Pseudobranchiæ rudimentary, represented by ciliated folds. Six branchiostegal rays. First dorsal with a smooth spine; anal rays much longer than those of the second dorsal. Pectoral normal, not pedunculate. Anus before the anal fin, not preceded by a naked fossa. Scales of moderate size, closely beset with numerous spines. Chin with a barbel.

Status.—According to Gilbert and Hubbs (Proc. U.S. Nat. Mus. li, 1916, p. 163) the dental characters and the armature of the dorsal spine are variable within *Coryphænoides*, and they suggest the identity of *Optonurus* with that genus. I have no species of *Coryphænoides* with characters approaching those of *Optonurus* for comparison, and therefore retain the genus only because its validity has not been definitely disproved.

Nomenclature.—Richardson used *Lepidorhynchus* as an alternative generic name for *denticulatus* in case that species proved to be distinct from *Macrourus,* and it was duly recorded by Agassiz and Scudder. No generic definition accompanied the name, but its association with a genotype gives it priority over *Optonurus* which was proposed for the same species later. Jordan (Gen. Fish. iii, 1919, p. 398) attributes the name *Lepidorhynchus* to Bleeker, 1879, and quotes *L. villosus,* a species of *Trachonurus,* as the orthotype; but a reference to Bleeker's paper leaves no doubt that he merely utilised Richardson's name.

LEPIDORHYNCHUS DENTICULATUS *Richardson.*

(Plate xlviii.)

Macrourus vel *Lepidorhynchus denticulatus* Richardson, Ichth. Erebus and Terror pt. 4, 1846, p. 53, pl. xxxii, figs. 1-3.

Coryphænoides denticulatus Günther, Brit. Mus. Cat. Fish. iv, 1862, p. 396, and Challenger Rept., Zool., i, 6, 1880, p. 26. *Id.* Macleay, Proc. Linn. Soc. N. S. Wales, vi, 1881, p. 122. *Id.* Zietz, Trans. Roy. Soc. S. Austr. xxxiii, 1909, p. 266. *Id.* Gilbert and Hubbs, Proc. U.S. Nat. Mus. li, 1916, pp. 144, 147.

Macrurus, Optonurus denticulatus Günther, Challenger Rept., Zool. xxii, 1887, p. 147.

Optonurus denticulatus McCulloch, Rec. Austr. Mus. vi, 5, 1907, p. 346, and Austr. Zool. ii, 2, 1921, p. 33, pl. xi. *Id.* Waite, Rec. Cantb. Mus. i, 1, 1907, p. 17, and Rec. S. Austr. Mus. ii, 1, 1921, p. 66. *Id.* Lord, Proc. Roy. Soc. Tasm. 1922 (1923), p. 65.

Br.6; D.xi/140; A.123; P.18; V.9; C.3.

Head and trunk (116 mm.) 3·9 in the total length (460); head (77) 5·9, and depth (64) 7·1 in the same. Eye (26) almost 3 in the head; the length of the snout is equal to the interorbital width (17) and 1·5 in the eye. Pectoral fin (62) 1·2 in the head.

Snout and interorbital area covered with a delicate membrane enclosing deep cavities between thin bony crests; a median crest arises before the vertical of the front margins of the eyes and slopes obliquely downward and forward to form a small angle anteriorly; a second crest is present on each side, curving over the nostrils

and likewise forming a small anterior angle. A paired crest commences at the middle of the orbital margin and, converging towards its fellow, disappears on the nape. Broad septate canals, covered by delicate membrane, extend backward from the snout to below the hinder margin of the eye, and then turning sharply upward unite with a similar canal, which runs backward from the interorbital region to the shoulder; another broad canal is present between the inner crest and edge of the preoperculum. Opercular bones thin, their margins membranaceous; suboperculum produced backward as an angular lobe. Nostrils close together, a little before the antero-superior angle of the eye; the anterior round, the posterior an oblique slit. Eye very large, the orbital margin just cutting the profile. Mouth oblique, the maxillary reaching backward to below the posterior third of the eye; it is very narrow posteriorly.

Premaxillaries with an outer row of strong curved cardiform teeth, which are spaced and largest anteriorly; behind these is a band of villiform teeth formed of narrow oblique rows with grooves between them. Mandible with a single row of teeth which are small anteriorly but become larger on the sides. Palate and tongue toothless. A small mental barbel. Anterior gill-rakers of first arch tubercular and unarmed, ten on the lower limb of the first arch; those on the hinder edge are larger, pedunculate and armed with spines.

Head and body almost entirely denuded of scales, only a few remaining on the posterior half of the interorbital region, on the lower surface of the mandible, and on the under surface of the thorax and abdomen. A scale from near the vent is armed with long spines upon its exposed surface, arranged in oblique rows, and directed obliquely outward and backward. No naked groove before the vent.

The dorsal fin originates behind the vertical of the pectoral and ventral fins, and the length of its base is but little more than that of the eye; the first ray is without articulations and its edges are smooth. The second dorsal commences far behind the tip of the adpressed first dorsal (in other specimens the interval between the two fins is variable, the anterior rays of the second being overlapped by the tip of the first dorsal in young examples); the anterior rays are minute but

they become longer backwards and are as long as those of the anal near the tail. Anal rays simple, highest anteriorly. Pectoral rays very slender, the median ones divided. First ventral ray with a short filament, reaching beyond the origin of the anal.

Upper portion light in colour after long preservation. The throat, whole abdominal area and the ventral surface of the anterior half of the tail are bluish black. Fins without markings.

Described and figured from a specimen 460 mm. long, from 350-450 fathoms in the Great Australian Bight.

Forty-six specimens, 125-533 mm. long, are preserved, but very few retain any of their scales. The young examples are very similar to the adults, though their teeth are relatively smaller.

Localities.—This species is not uncommon in deep water eastward of Bass Strait. It was first described from South Australia, and has since been taken in New Zealand waters and at the Kermadec Islands.

Great Australian Bight, south and south-west from Eucla, 130-450 fathoms; May, 1913.

Eastern edge of Bass Strait, 100-220 fathoms.

South-south-east from Genoa Peak, Victoria, 200 fathoms; 5th October, 1914.

Pseudochromis *Rüppell.*

Pseudochromis Rüppell, Neue Wirbelth. Fische, 1835, p. 8 (*oliraceus*). *Id.* McCulloch, Mem. Qld. Mus. iii, 1915, p. 47—synonymy.

Assiculus Richardson, in Stokes, Discov. in Austr. i, 1846, p. 492 (*punctatus*).

Nesiotes De Vis, Proc. Linn. Soc. N. S. Wales viii, 1884, p. 453 (*purpurascens*). *Id.* Jordan, Gen. Fish. iv, 1920, p. 427.

Onar De Vis, Proc. Linn. Soc. N. S. Wales ix, 1885, p. 875 (*nebulosum*).

Subgenus *Leptochromis* Bleeker, Verh. Akad. Amsterdam xv, 1876, p. 21 (*cyanotænia*).

Synonymy.—The identity of *Nesiotes* and *Pseudochromis* has been recorded by Jordan, whom I supplied

with information after examining what were believed to be the types of *N. purpurascens* in the Queensland Museum. These specimens are duly registered and labelled, but they differ from De Vis' generic and specific descriptions in so many details that it is difficult to believe that they are the types. De Vis counted twelve instead of three dorsal spines, and he found the lateral teeth "confluent, with distinct serration," whereas they are merely juxtaposed in the "types"; he recorded the depth of the body as 3·5 in the total length instead of 4·1. In view of these discrepancies, nothing but the notorious inaccuracies of De Vis' writings justifies one in accepting these specimens as the types of *Nesiotes purpurascens*.

Key to Australian Species.

A. Some anterior dorsal rays simple, the posterior branched.
  B. More than 30 dorsal rays. subg. PSEUDOCHROMIS.
    C. About 50 rows of scales between origin of lateral line and hypural joint; bases of dorsal and anal rays covered by scales. *novæ-hollandiæ*.
  BB. Less than 30 dorsal rays.
    D. Bases of posterior dorsal and anal rays covered with scales. *fuscus*.
    DD. Bases of posterior dorsal and anal rays naked, not scaly.
      E. Operculum with 3-5 flat spines on its posterior border; dorsal fin elevated, the posterior rays much higher than the body beneath them. *punctatus*.
      EE. Operculum unarmed; posterior dorsal rays about as high as the body beneath them. *purpurascens* (not Australian).
AA. All the dorsal and anal rays are branched. Subgenus LEPTOCHROMIS.
  F. Less than thirty dorsal rays; bases of posterior dorsal and anal rays naked.
    G. Operculum armed with 4-5 flat spines on its posterior border. Dorsal and anal spines pungent; 25-26 dorsal rays; about 40 rows of scales. *quinquedentatus*.
    GG. Operculum unarmed.
      H. Dorsal and anal spines weak and flexible; 22 dorsal rays. *tapeinosoma*.

PSEUDOCHROMIS, PSEUDOCHROMIS, FUSCUS *Müller and Troschel.*

Pseudochromis fuscus Müller and Troschel, Horæ Ichthyologicæ iii, 1849, p. 23, pl. iv, fig. 2. *Id.* Bleeker, Nat. Tijd. Ned. Ind. iii, 1852, p. 708, and ix,

1855, p. 69. *Id.* Günther, Brit. Mus. Cat. Fish. ii, 1860, p. 257. *Id.* Bleeker, Atlas Ichth. ix, 1877, pl. ccclxxxviii, fig. 4. *Id.* Regan, Proc. Zool. Soc., 1914, pt. 3, p. 650.

Onar nebulosum De Vis, Proc. Linn. Soc. N. S. Wales ix, 1885, p. 875.

Pseudochromis wildii Ogilby, Ann. Qld. Mus. No. 9, 1908, p. 34.

Pseudochromis nebulosus McCulloch, Mem. Qld. Mus. iii, 1915, p. 49, pl. xvi, fig. 2.

The holotype of *P. wildii* presents the following characters: D.iii/17, 10; A.iii/14; P.17; V.i/5; C.17. L. lat. 28/8; about 40 rows of scales between the operculum and the hypural joint. Total length 68 mm. Depth (17 mm.) 3·1 in the length of the hypural joint (54); head (18) 3·0 in the same. Eye (5) longer than the snout (4) 3·6 in the head; interocular space (3) 1·6 in the eye. Pectoral fin (12) 1·5, twenty-fourth dorsal ray (9) 2·0, and ventral fin (13) 1·3 in the head.

The dorsal and anal spines are stout and pungent, and increase in length backward. The anterior seventeen dorsal rays are simple, the remainder and also all the anal rays are branched. Scales finely ctenoid on the body, but cycloid on the head, anterior portion of the back, and the breast; those on the cheek are arranged in about five rows, and scales cover the bases of the posterior dorsal and anal rays. The colour is brown with a dark spot at the base of each scale together forming rows along the sides. The fins are dark brown, and the dorsal bears traces of rows of darker spots or lines. There is a curved dark line across the base of the pectoral with a lighter area before and behind it.

Synonymy.—The Director of the Queensland Museum, Mr. H. A. Longman, has lent me the holotype of *Pseudochromis wildii* Ogilby for comparison with the co-type of *Onar nebulosum* De Vis in the Australian Museum, which I re-described and figured in 1915. The two specimens are similar in all characters, and leave no doubt that *P. wildii* is synonymous with *P. nebulosus*.

Their identity with *P. fuscus* is not certain, but they appear to agree well enough with Müller and Troschel's description of that species.

Localities.—P. fuscus is recorded from Monte Bello Islands, West Australia. The type of *P. nebulosum* was obtained at Murray Island, Torres Strait, and that of *P. wildii* was said to have come from Moreton Bay, Queensland. Other specimens in the Australian Museum which I identify as *P. fuscus* are from New Britain and the Solomon Islands.

PSEUDOCHROMIS, PSEUDOCHROMIS, PURPURASCENS *De Vis.*

(Plate xlix.)

Nesiotes purpurascens De Vis, Proc. Linn. Soc. N. S. Wales viii, 1884, p. 453. *Id.* Jordan and Seale, Bull. U.S. Fish. Bur. xxv, 1906, p. 293.

D.iii/14, 9; A.iii/14; P.17; V.i/5; C.17. L. lat. 28/6; about 34 rows of scales between the origin of the lateral line and the hypural joint.

Depth of body (15 mm.) 3·3 in the length to the hypural joint (50); head (16) 3·1 in the same. Eye (4·5) much longer than the snout (3), and 3·4 in the head. Interocular space (2) 2·2 in the eye. Pectoral fin (11·5) 1·3, caudal (13) 1·1, and depth of caudal peduncle (7) 2·2 in the head.

Body compressed, the head obtusely pointed. Anterior nostril in a short tube, the posterior a simple opening near the eye. Series of minute pores encircle the eye, cross the nape, and extend around the preorbital bone and mandible; they are prominent on the preoperculum, where they are associated with short tubes which open on the extreme margin of the bone and form several small angles. Maxillary reaching backward almost to below the middle of the eye. Large cycloid scales cover the head, extending forward to the interorbital space above, and onto the interoperculum below; they are arranged in four rows on the cheeks.

Two pairs of large canines on the front portion of each premaxillary, followed by a row of conical teeth on each side; a band of minute teeth covers the symphysial area. Canines on each side of the mandible anteriorly and one or two farther back on each side; an inner band of microscopic teeth anteriorly and a single row of larger ones which are more or less juxtaposed on each side. An angular patch of microscopic teeth on the vomer, and a rounded patch on the anterior portion of each palatine bone.

Scales of the body rather large and finely ctenoid, except on the nuchal region and breast where they are cycloid; they extend over the base of the caudal, but leave all the other fins naked. The lateral line rises abruptly from the shoulder and extends backward, parallel with the back to below the fifteenth dorsal ray; its tubes are simple and extend across about two-thirds of each scale. One and a half scales are present between the lateral line and the back and four rows separate the end of the upper portion of the lateral line from the lower, which extends along the middle of the sides of the caudal peduncle.

Dorsal spines very slender and somewhat flexible, increasing in length backward, but the third is shorter than the eye. The anterior fourteen rays are simple, the remainder branched; they are high and subequal in length, the twentieth (8·5 mm.) 1·8 in the head. Anal spines weak like those of the dorsal, the third longest. Pectoral and caudal fins rounded. Second ventral ray longest, not quite reaching backward to the vent; the spine is inserted a trifle in advance of the origin of the dorsal fin.

Colour.—Dark brown on the head and back, becoming lighter on the sides and below. A dark line crosses the middle of each scale of the anterior half of the body, and uniting with its fellows, forms striking lines which extend obliquely downward and backward through each row of scales; these largely disappear behind the middle of the body, but are traceable about the region of the lateral line. Head with dark spots and lines extending along the suborbital bone and across the operculum. An indefinite yellow band is present along the middle of each side. Dorsal fin brown, with many darker spots and curved lines between the rays which tend to form irregular horizontal bands. Anal similar to the dorsal, but with the dots less distinct. Caudal with irregular transverse rows of darker dots. Pectoral and ventral fins hyaline.

Described and figured from a somewhat damaged specimen, 64 mm. long, from the New Hebrides.

Identity.—Two specimens labelled as *Nesiotes purpurascens* are preserved in the Queensland Museum and registered I.1351. The largest is 66 mm. long; length to hypural joint 52 mm. the depth at the origin of the

anal 16 mm., and the head 16 mm. The orbit is 5 mm. and the snout 3 mm. It has iii/23 dorsal and iii/14 anal rays, and is a species of *Pseudochromis*. A sketch of this specimen, together with some notes made at the Queensland Museum, enable me to identify the example here described and figured as *Pseudochromis purpurascens*.

Locality.—Ringdove Bay, Api Island, New Hebrides; coll. A. R. McCulloch, September, 1910.

Pseudochromis, Leptochromis, quinquedentatus *sp. nov.*

(Plate 1.)

D.iii/26; A.iii/14; P.18; V.i/5; C.17. L. lat. 36/6, l. tr. $1\frac{1}{2}/14$; 41 rows of scales between the origin of the lateral line and the hypural joint.

Depth (14 mm.) 3·4 in the length to the hypural joint (48); head (15) 3·2 in the same. Eye (4) longer than the snout (3·5), 3·7 in the head; interocular space (2·3) 1·7 in the eye. Pectoral fin (9) 1·6, ventral (10) 1·5, and caudal (12) 1·2 in the head. Nineteenth dorsal ray (8) and depth of caudal peduncle (8) 1·8 in the head.

Body compressed and oblong, the upper profile a little more convex than the lower; snout very obtuse. Series of minute pores encircle the eye, cross the nape, and extend around the preorbital bone and mandible; they are prominent on the preoperculum, and associated with short tubes which open on the extreme margin of the bone and form several angles. Anterior nostril in a short tube, the posterior a simple opening near the eye. Maxillary reaching backward to below the middle of the eye. Head scales cycloid, deeply imbedded in the skin and inconspicuous, especially on the nape; they are arranged in five or six rows on the cheeks. Opercular bone armed with four or five flat teeth on its postero-superior angle.

Upper jaw with several pairs of curved canines anteriorly, and an inner band of minute teeth; this becomes very narrow on each side, where also there is an outer row of somewhat stronger conical teeth. Mandible with several pairs of canines anteriorly, and one laterally; an inner band of minute teeth in front, and a

single row of small conical teeth on each side. An angular patch of minute teeth on the vomer, and some on the anterior portion of each palatine bone.

Gill-membranes united across the isthmus, the gill-opening extending forward to below the hinder margin of the eye. Six branchiostegal rays. Gill-rakers rather slender, about ten on the lower limb of the first gill-arch, the length of those at the hinder angle equal to rather more than one-fourth the diameter of the eye.

Scales of the body ctenoid, except on the nuchal region and the breast where they are cycloid. They extend over the basal portion of the caudal, but leave all the other fins naked. The lateral line rises abruptly from the shoulder and extends backward parallel with the back to below the twenty-first dorsal ray. The tubes of the first portion are broad and simple, those of the caudal peduncle more slender, and terminating in a median notch in the margin of each scale. Three rows of scales separate the anterior and posterior portions of the lateral line, and the latter extends along the middle of each side of the caudal peduncle to the hypural joint.

Dorsal spines weak but pungent, increasing in length backward, but the third much shorter than the anterior ray. All the rays are branched, and they increase in length backward to the nineteenth. The margin of the fin is almost straight, rounded posteriorly, and the last ray is divided to its base. Anal similar in construction to the dorsal, its first spine microscopic. Pectoral broadly rounded, the median rays longest. Ventrals inserted slightly in advance of the vertical of the first dorsal spine, the second rays are longest, but do not nearly reach the vent when adpressed. Caudal rounded.

Colour.—Light yellowish-brown in formalin, each scale of the upper anterior portion of the sides with a brownish spot, which, with its fellows, forms rows. A faint light-coloured stripe along the middle of each side of the body. Dorsal and anal fins dusky between the rays, especially basally; the other fins hyaline.

Described and figured from a specimen, 60 mm. long, from off Cape Capricorn, Queensland. Another smaller example from the same station, is similar in all details. Four others, 48-60 mm. long, are considerably damaged;

they prove the armature of the operculum to be a valid specific character, and have 25-26 dorsal and 13-14 anal rays; the tube-bearing scales of the lateral line vary in number from 34-36/6-9.

Affinities.—*P. quinquedentatus,* having the anterior dorsal rays divided, belongs to the subgenus *Leptochromis,* but differs from the other species of that group, *P., L., tapeinosoma* Bleeker, *cyanotænia* Bleeker, and *melanotænia* Bleeker in having 25-26 dorsal rays instead of 21-22, and 40 instead of 30 rows of scales. It is perhaps one of several species of *Pseudochromis* the descriptions of which do not refer to the form of the dorsal rays, and scale-counts, etc.

Localities.—13 miles south-east from Cape Capricorn, Queensland, 12 fathoms; 29th July, 1910.

12 miles north-west of Pine Peak, Queensland, 25 fathoms; 1st August, 1910.

PSEUDOCHROMIS, LEPTOCHROMIS, TAPEINOSOMA *Bleeker.*

(Plate li.)

Pseudochromis tapeinosoma Bleeker, Nat. Tijd. Ned. Indie. iv, 1853, p. 115. *Id.* Günther, Brit. Mus. Cat. Fish. ii, 1860, p. 258. *Id.* Weber, Siboga Exped., lvii, Fische, 1913, p. 263.

Pseudochromis, Leptochromis, tapeinosoma Bleeker, Atlas Ichth. ix, 1877, pl. cccxc, fig. 1.

D.iii/22; A.ii/13; V.i/5; P.18; C.17. L. lat. 27-29/9; l. tr. c.2/12. About 33 rows of scales between the origin of the lateral line and the hypural joint.

Depth of body (12 mm.) 3·7 in the length to the hypural joint; head (12·75) 3·5 in the same. Eye (3·5) much longer than the snout, 3·6 in the head; interorbital space (1·25) very narrow, 2·8 in the eye. Pectoral fin (8·5), ventral (9) and caudal (9) subequal in length, 1·4-1·5 in the head; 20th dorsal ray (6·5) slightly longer than the 10th anal ray (6), and 1·9 in the head.

Body compressed and oblong, head obtusely pointed, its upper and lower profiles equally convex; caudal peduncle broad and compressed. Series of minute pores encircle the eye, cross the nape and extend around the

preorbital bone and mandible; they are prominent on the preoperculum and are associated with short tubes which open on the extreme margin of the bone and form several small angles. Anterior nostril in a short tube, the posterior a simple opening close to the eye. Maxillary reaching backward to below the anterior third of the eye. Large cycloid scales cover the head, extending forward to the interorbital space above, and onto the interoperculum below; they are arranged in three rows on the cheeks.

Upper jaw with several curved canines anteriorly, and a rather broad inner band of minute teeth; this becomes narrower on each side, where also there is an outer row of somewhat enlarged teeth. Mandible with several canines and an inner band of minute teeth anteriorly, and a single row of small conical teeeth on each side. An angular row of microscopic teeth on the vomer, and some on the anterior part of each palatine bone.

Scales of the body rather large and finely ctenoid except on the nuchal region and breast where they are cycloid. They extend onto the caudal fin, but leave all the other fins naked. The lateral line rises abruptly from the shoulder and extends backward parallel with the back to below the seventeenth dorsal ray. The tubes are short and simple and do not reach the edge of the scale. Three rows of scales separate the anterior and posterior portions of the lateral line, which latter extends along the middle of each side of the caudal peduncle; each of its scales has a small median notch, and the tubes are more slender than those of the other portion and extend right across the scale.

Dorsal spines very weak, the first scarcely discernible, the third much shorter than the anterior ray. All the rays are branched and they increase in length to the twentieth. The margin of the fin is almost straight, rounded posteriorly, and the posterior ray is divided to its base. Anal similar in construction to the dorsal, its first spine obsolete. Pectoral fin broadly rounded, the median rays longest. Ventrals inserted in advance of the vertical of the first dorsal spine; the second and third rays are longest, and their tips form a sharp angle. Caudal rounded, with rows of scales covering the membrane between its rays.

Colour.—See under variation.

Described and figured from an adult male, 56 mm. long, from Masthead Island, Queensland. A female of similar size is also figured.

Variation.—A series of thirty specimens, 18-55 mm. long, exhibits very little variation in structural characters, but includes two very different types of colour-marking which appear to be distinctive of the two sexes. Young examples are almost uniform brown with lighter coloured pectoral, ventral and anal fins; several rows of narrow, slightly oblique and dark lines are usually present on the membrane between the rays of the dorsal fin, but they may be obscure in darker specimens. Of the two colour-variations exhibited by full grown specimens, one (female—Pl. li, fig. 1) is light brownish-yellow in general colour; the dorsal fin is usually marked with dark horizontal lines as in the young, and the caudal fin has a faintly darker inframarginal border. The other (male —Pl. li, fig. 2) is dark brown with the sides of the head and breast yellow; a broad light-coloured band extends backward from the head, and may reach the caudal peduncle or terminate below the dorsal fin; indications of the dark lines may persist. The upper and lower portions of the caudal fin are crossed by broad light-coloured bands. Pectoral and ventral fins light-coloured.

These markings vary in intensity, being distinct in some and obscure in others. The fact that I have collected both forms at three different localities, Masthead Island, Murray Island and the New Hebrides, combined with their similarity in all structural details, convinces me that both are referable to the one species. Dissection of two specimens reveals roe in the light-coloured form, and milt in the darker example.

Localities.—Reef at Masthead Island, Capricorn Group, off Port Curtis, Queensland; coll. McCulloch, September, 1904.

Reef at North-west Islet, Capricorn Group, off Port Curtis, Queensland; coll. H. C. Dannevig, 10th July, 1910.

Cairns Reef, off Port Douglas, Queensland; coll. McCulloch, September, 1909.

Reef at Murray Island, Torres Strait; coll. McCulloch and Hedley, October, 1907.

New Hebrides; coll. McCulloch, September, 1910.

Family CALLIONYMIDÆ.

CALLIONYMUS *Linné*.

Key to the Australian Species.

A. Preopercular spine almost straight and spear-like, with a row of spinules above and an antrorse barb below. Subgenus *Calliurichthys*.

B. All but the posterior dorsal rays simple; 9 dorsal and 8-9 anal rays.

C. Interorbital space a narrow bony ridge; head less than one-third of length to hypural joint. *japonicus*.

D. Occiput with two lateral rugosities only. var. *typica*.

DD. Occiput with two lateral and one median rugose areas. var. *scaber*.

CC. Interorbital space narrow but grooved.

E. Head less than a third of length to hypural joint; preopercular spine with fine denticulations above.

F. Snout but little longer than eye; upper lip projecting beyond preorbitals when mouth is closed. *grossi*.

FF. Snout much longer than eye; preorbitals overhanging the upper lip when mouth is closed. *nasutus*.

EE. Head more than a third of length to hypural joint; preopercular spine with coarse spines above. *belcheri*.

BB. All the dorsal rays are bifurcate; 8 dorsal and 7 anal rays. Interorbital space concave; preopercular spine with fine denticulations above. *rameus*.

AA. Preopercular spine with its distal extremity curved upward, and having one or more large hooks above; lower antrorse barb present or absent. Subgenus *Callionymus*.

G. A broad membrane uniting inner ventral ray with base of pectoral and covering bases of lower pectoral rays; head and body depressed.

H. Lower antrorse barb of preopercular spine present; dorsal rays mostly simple.

I. Preopercular spine with only two distal hooks.

J. Eye as long as snout. *lunatus*.

JJ. Eye shorter than snout. *limiceps*.

K. Occiput and supraorbital ridges rough with bony granules. var. *typica*.

KK. Occiput and supraorbital ridges more or less smooth. var. *sublævis*.

II. Preopercular spine with 3-5 recurved hooks above.

L. First dorsal spine not longer than second.

M. Occiput smooth, entirely covered by skin. *calcaratus*.

MM. Occiput rugose, with reticulating bony ridges.

LL. First dorsal spine longer than second. *macdonaldi.*
N. Cheeks without large dark ocelli. *valenciennesii.*
NN. Cheeks with large dark ocelli. *ocelligena.*
HH. No lower antrorse barb on preopercular spine; dorsal rays branched; preopercular spine with two distal hooks.
O. 7-8 anal rays. *calauropomus.*
OO. 6 anal rays. *papilio.*
GG. Membrane behind inner ventral ray greatly reduced; entire base of pectoral fin exposed; head and body subcylindrical.
P. Body and fins with pronounced dark markings. *phasis.*
PP. Body markings very faint; dorsal fins with dark markings. *apricus.*

CALLIONYMUS, CALLIURICHTHYS, JAPONICUS *Houttuyn.*

Callionymus japonicus Houttuyn, Verh. Holl. Maatsch. Wet. Harlem xx, 1782, p. 311.

Callionymus reevesii Richardson, Ichth. Voy. Sulphur, 1844, p. 60, pl. xxxvi, figs. 1-3.

Callionymus longicaudatus Schlegel, Faun. Japonica, Poiss., 1845, p. 151, pl. lxxix.a, fig. 1. *Id.* Günther, Challenger Rept., Zool. i, 1880, p. 44.

Callionymus affinis Ogilby, New Fish. Qld. Coast, 1910, p. 134 (not *C. affinis* Regan 1908).

Calliurichthys japonicus Jordan and Fowler, Proc. U.S. Nat. Mus. xxv, 1903, p. 942, fig. 2. *Id.* McCulloch, Rec. Austr. Mus. xiv 1, 1923, p. 8.

Synonymy.—A specimen, 210 mm. long, agrees so well with the descriptions and figures quoted above that I believe its identification as *C. japonicus* to be beyond doubt.

Ogilby's description of his *C. affinis* was based upon "a specimen, 260 millim. long, obtained floating off Cape Moreton by Mr. McDonnell." This gentleman was evidently Mr. Donald Macdonald, first officer of the "Endeavour," and it was he who lent the specimen to Ogilby to be described with others collected during the operations of the trawler in Queensland waters (*vide* Ogilby, *op. cit.*, pp. 85 and 135). The description contains several statements concerning proportions of the

snout and eye, etc., in relation to the length of the body, which are obviously incorrect, and which cast doubt upon the accuracy of other details of the description. The only specimen of *C. japonicus* preserved in the "Endeavour" collection is without data, and it differs from the description of *C. affinis* in being 210 instead of 260 mm. long. It tallies so well in all other details, however, that it is clearly specifically identical with *C. affinis*, and under the circumstances, suggests that it is the actual specimen upon which the description was based, its length being misprinted as 260 mm. instead of 210. In any case, it proves the identity of *C. affinis* and *C. japonicus*.

Locality.—The only specimen preserved is unfortunately without data. *C. affinis* was secured off Cape Moreton, Southern Queensland.

Callionymus, Calliurichthys, japonicus *var.* scaber, *nov.*

Callionymus longicaudatus Waite, Prelim. Rept. "Thetis" Exped., 1898, p. 60. *Id.* McCulloch, Rec. Aust. Mus. xiv, 1, 1923, p. 8—part.

Four specimens in the Australian Museum, 124-218 mm. long, differ from the typical form of *C. japonicus* in having the upper surface of the head much more rugose. In the typical form, there are two bony bucklers, one on each side of the occiput, with smooth ridges or tubercles radiating from their centres; the median area behind the eyes is covered with smooth integument. In the var. *scaber* the ridges of the two lateral bucklers are very rough, and the median area behind the eyes is covered with similar bony rugosities. In all other characters the variety appears to be similar to the typical form.

Locality.—Lord Howe Island.

Callionymus, Calliurichthys, nasutus, *sp. nov.*

(Plate lii.)

D.iv/9; A.8; P.17; V.i/5; C.10.

Depth (16 mm.) 10·6 in the length to the hypural joint (170). Head to the posterior margin of the operculum (47) 3·6, and breadth before the pectorals (31) 5·4 in the same: distance between the end of the snout

and the tip of the preopercular spine (46) 3·6 in the length. Eye (10) 1·7 in the snout (17) which is 2·7 in the head. Interorbital space (2) 5·0 in the eye; depth of caudal peduncle equal to the length of the eye.

An osseous rugosity covered by thin skin on each side of the cranium behind the eye; each is formed of short ridges radiating from a low central apex. Gill-openings on the upper surface, above the level of the upper base of the pectoral fin, exposed and situated a little nearer the eye than the pectoral fin. Snout obtusely pointed when viewed from above; the preorbital projecting beyond the upper lip when the mouth is closed. Maxillary not quite reaching the vertical of the minute nostril, which is placed a little before the bony tubercle on the anterior orbital margin. Lower lip with a broad fold forming a supplementary lip anteriorly. Preopercular spine curved slightly outward but not upward at the tip; there are about seventeen small spinules on its inner edge which point forward and increase slightly in size towards the middle of the series; a strong antrorse barb on the outer surface of the base of the spine. A broad band of small teeth in the upper jaw, which are confined to the front and anterior portion; a rather narrower band in the lower jaw, which extends farther backward.

Body greatly compressed anteriorly and even the caudal peduncle is broader than deep in the middle of its length. The lateral lines of each side are united across the nape, and a branch extends forward to the lower posterior margin of the orbit and terminates on the cheeks; it is slightly curved towards the back above the pectorals and extends backward along the angle between the back and sides. Anal papilla large.

The anterior dorsal spine is produced into a long filament which reaches backward to the base of the last anal ray; the three following are successively shorter, but the last is considerably longer than the first dorsal ray and is connected to its base by membrane. Dorsal rays subequal in length and mostly simple; the last is divided at its base and each branch is bifurcate; it reaches backward to the hypural joint. Anal of similar form to, but lower than the second dorsal. Upper margin of pectoral excised; the median rays are longest and nearly all are bifurcate. Ventrals broadly rounded and

scarcely reaching the level of the first anal ray; all the rays are branched. Upper margin of the caudal excised; the median rays longest, and all but the outer ones bifurcate.

Colour-marking.—Head and body very obscurely marbled on the upper surface; white below. Head with numerous rounded ocelliform spots or lines which are most numerous on the cheeks and opercles. A row of large dusky spots along the middle of the sides with some scattered smaller imperfect ocelli between them and the upper surface. First dorsal grey with an elaborate pattern of ocelli arranged as is shown in the figure; blackish spots and angular markings are present between the bases of the three anterior spines and a large black blotch is present on the fourth spine about the middle of its length. Second dorsal grey with many darker grey spots of various sizes. Anal with a faint grey inframarginal band and a white border. Caudal with many dark grey spots and the membrane between the lower rays dusky. Ventrals obscurely spotted.

Described and figured from a single specimen, 240 mm. long to the end of the caudal rays.

Locality.—13 miles south-east from Cape Capricorn, Queensland, 13 fathoms; 29th July, 1910.

CALLIONYMUS, CALLIURICHTHYS, BELCHERI *Richardson.*

Callionymus belcheri Richardson, Zool. Voy. Sulphur i, 1884, p. 62, pl. xxxvii, figs. 1-2.

D.iv/9; A.9; P.19; V.i/5; C.10.

Depth at the vent (9 mm.) 11·6 in the length to the hypural joint (105); head (38) 2·6, and breadth of the body before the pectorals (20) 5·2 in the same. Eye (8) shorter than the snout (9) and 4·7 in the head. Interorbital space (1·5) 5·3 in the eye.

Head very large, depressed and heart-shaped, the snout being pointed and the opercles forming broadly rounded lobes, the free edges of which are attached just before the bases of the pectoral fins. The upper lip projects well beyond the preorbital when the mouth is closed. The supraorbital margins form elevated ridges and enclose a narrow deeply-grooved interorbital space. The

occiput has bony rugose patches on each side separated by a median area of smooth skin; a small median rugosity on the hinder margin of the occiput and a bony knob behind the postero-superior angle of each eye. Gill-openings small, superior, and separated by a space which is less than that between the outer margins of the eyes. Preopercular spines very large, with almost straight tips directed slightly outwards; each is armed with a strong basal antrorse spine, and a row of six coarse spines above, which increase in size forwards. Mouth small, the maxillary not reaching the vertical of the anterior margin of the eye. A curved band of minute teeth in the anterior part of the upper jaw and one in the lower which reaches farther backward.

Body greatly compressed, the caudal peduncle much broader than deep in the middle of its length. Lateral lines united across the nape, and with the usual angular cephalic branches extending around each side of the occiput to the hinder angle of the eye and on to the cheek, and others along the preopercular margin towards the spine and across the operculum.

First dorsal spine longest, but reaching little beyond the base of the anterior ray; there is no membrane behind the fourth spine. All but the last dorsal rays are simple; the first is longer than those following it, but they increase again in length posteriorly, the last being half as long again as the first. Anal rays increasing slightly in length backwards and all but the last are simple. Pectoral margin somewhat excavate above, the median rays reaching backward to the level of the third anal ray. Ventrals broadly rounded and reaching backward to the origin of the anal. Median caudal rays a litttle longer than the head and all but the outer ones bifurcate.

Colour-marking.—Very pale-coloured after preservation in formalin and almost without definite markings. Two characteristic oval spots are present on each side below the lateral line, the first above the anterior portion of the anal and the other above its fifth ray; these are dark grey and enclose rings of small white spots. The first dorsal is marked with a network of grey lines enclosing round light spots; there appear to be darker areas at the tip of each spine between which the membrane bears a narrow white border. The soft dorsal is

marked with about eight narrow longitudinal grey lines. The anal has a black submarginal longitudinal stripe. Caudal with oblique grey lines on the membrane of the upper half and irregular rows of dots below. Pectorals and ventrals with obscure grey dots.

Described from a male specimen, 149 mm. long, which is the largest of five examples preserved in the "Endeavour" collection.

Variation.—The other four are females and show less colour-marking, the lateral spots and black anal stripe being wanting. The anterior dorsal is darker than in the male and the marking consists of indefinite light spots on a blackish ground-colour. A young example, 63 mm. long, in the Australian Museum collection from Port Denison, Queensland, is much more definitely marked than the larger specimen but the markings are similarly disposed and they agree with those described and figured by Richardson. The young specimen has only four strong barbs on the inner edge of the preopercular spine, but these vary from six to ten in number in the larger ones.

Status.—C. belcheri was regarded as the young of *C. longicaudatus* (= *C. japonicus*) by Günther, but it is altogether different from that species. The head is much larger, being more instead of much less than one-third of the length to the hypural joint as in *C. japonicus,* and the preopercular spine is armed with very coarse barbs instead of fine denticles. The interorbital space of *belcheri* is a narrow groove instead of a bony ridge as in *japonicus.*

Locality.—4-20 miles N.E. of Gloucester Head, Queensland, 19-35 fathoms; 2nd August, 1910.

Callionymus, Calliurichthys, rameus, *sp. nov.*

(Plate liii.)

D.iv/8; A.7; P.19; V.i/5; C.10. Depth (19 mm.) 7·4 in the length to the hypural joint (142); head, to the posterior margin of the operculum (35) 4·03, breadth before the pectorals (29) 4·9 in the same. Distance between the premaxillary symphysis and the tip of the preopercular spine (42) 3·3 in the length. Eye (9·5) as long as the preorbital.

Head smooth above, with or without an obscure rugose area on each side of the occiput. Preopercular spine not curved upwards at the tip, its inner edge with about ten small serrations, the outer with a strong antrorse spine near its base. Upper lip covered by the preorbital when the mouth is closed. Maxillary extending backward a little beyond the vertical of the nostril, which is placed a little in advance of the eye. A band of villiform teeth in each jaw. Gill-opening exposed, midway between the hinder margin of the eye and the upper base of the pectoral.

All the dorsal spines are filamentous, the third and fourth reaching backward almost to the base of the tail. The second dorsal is elevated, and all its rays are bifid; the last is divided to its base, and each branch is bifurcate. Most of the anal rays are simple, only the two branches of the last being bifurcate. Upper pectoral rays slightly longer than the second, the ninth and tenth rays longest and almost reaching the vertical of the fourth anal ray; all but the outer rays are bifurcate. Ventrals large, reaching beyond the base of the second anal ray; the inner ray is so deeply divided as almost to appear as two. Caudal large and rounded, most of its rays bifurcate. Lateral line originating in advance of the gill-opening; it curves inwards towards the back above the pectoral fin, and extends backward on the dorsal rather than on the lateral surface.

Colour-marking.—Head and body rather obscurely marbled above, the markings enclosing some lighter spots; an obscure darker band crosses the nape, and there are indications of others on the back. Lower parts white. First dorsal grey, the membrane profusely ornamented with fine lines enclosing lighter coloured stripes and spots, many of which are sinuous or somewhat angular in form; the membrane is blackish near the first spine. Second dorsal with many fine parallel lines crossing it obliquely, some of which coalesce to form broad dark angular markings and enclose incomplete ocelli. Outer half of anal blackish, with some indistinct lines and spots; basal portion white. Caudal with two broad dark cross-bands, and many narrow longitudinal stripes; the membrane between the lower rays is dusky, with small darker spots. Ventrals dusky, with irregular bars across the rays, and numbers of small dark spots. Pectorals with a few grey spots.

Described and figured from a specimen, 210 mm. long, from off Cape Capricorn, Queensland; 13 fathoms.

Variation.—A series of four males and three females, 173-210 mm. long, shows that the structural features described above are very constant, though the filamentous spines of the dorsal fin are somewhat shorter in females than in males. The colour marking of the body and fins varies considerably, and some specimens are much lighter than others. There are six broad dark cross-bands on the back between the nape and the caudal peduncle. The first dorsal may be ornamented with many linear markings or with small rings, or with a combination of the two; the oblique lines on the second dorsal of the holotype are wanting in some specimens, in which the fin bears many dark brown and somewhat nebulous markings. Similarly the longitudinal stripes of the caudal may be indistinct, and the dusky membrane between the lower rays may be either plain or may bear many dark-coloured ocelli. The dark part of the anal also, may bear numerous darker ocelliform spots and bars or be almost uniformly dusky.

Localities.—Off Cape Capricorn, Queensland, 13 fathoms; 29th June, 1910.

25 miles south-east from Double Island Point. Queensland, 33 fathoms; 28th June, 1910.

4-20 miles north-east of Gloucester Head, Queensland, 19-35 fathoms; 2nd August, 1910.

Callionymus limiceps *Ogilby.*

Callionymus limiceps Ogilby, Ann. Qld. Mus. 9, 1908, p. 35. *Id.* McCulloch, Rec. Austr. Mus. xiv, 1, 1923, p. 9, pl. iii, fig. 1.

Localities.—Twenty-seven specimens, 107-224 mm. long, are preserved from southern Queensland.

Mouth of Wide Bay and Hervey Bay.

5 miles south-east from Boomerang Hill, Fraser Island, 15 fathoms; 29th June, 1910.

17-20 miles north-west from Lady Elliot Island, 18 fathoms; 7th June, 1910.

13 miles south-east from Cape Capricorn, 13 fathoms; 29th June, 1910.

7-10 miles north-west of Hummocky Island, near Cape Capricorn, 14-16 fathoms; 1st August, 1910.

11-13 miles north-west of Pine Peak, Percy Islands, 24-26 fathoms; 1st August, 1910.

Callionymus limiceps *var.* sublævis, *nov.*

Two specimens, 182 mm. long, differ from all others of the species in the collection in lacking the granular rugosities on the upper surface of the cranium and supra-orbital ridges. In one this area is almost entirely smooth and covered by skin; the other has smooth bony ridges radiating from a point on each side of the occiput which are most strongly developed on the left side, and a smaller one on the median line posteriorly. Both specimens are males, and have the first and second dorsal spines filamentous; these are marked with the usual grey annuli, but there is no black spot on the third spine as in examples of the typical form. The anal fin is largely black with a light margin, the basal portion being light-coloured only posteriorly; in the typical form the fin is light-coloured with a broad dusky or blackish border.

The differences between these two specimens and a series of the typical *limiceps* are so striking and so consistent that they might well be regarded as of specific value, but the fact that both were secured in hauls which included the true *limiceps*, and their great similarity to that species in all but the characters noted above leads to the belief that they are merely exceptional variations.

Localities.—7-10 miles north-west of Hummocky Island, near Cape Capricorn, Queensland, 14-16 fathoms; 1st August, 1910.

13 miles south-east from Cape Capricorn, Queensland, 13 fathoms; 29th July, 1910.

Callionymus calcaratus *Macleay.*

Callionymus calcaratus Macleay, Proc. Linn. Soc. N. S. Wales v. 4, 1881, p. 628. *Id.* McCulloch, Rec. Austr. Mus. xiv, 1, 1923, p. 10, pl. iii, fig. 2 (synonymy and references).

Eleven specimens, 190-230 mm. long, from Queensland waters agree in all details with others from Port

Jackson. All have the first dorsal spine shorter than the second, and the black spot on the dorsal fin extends over the membrane between the second and fourth spines. These two features appear to be the only characters by which *C. calcaratus* can be separated from *C. valenciennesii*, in which species the first spine is distinctly longer than the second, and the black spot is restricted to the space between the third and fourth spines.

Localities.—C. calcaratus has been recorded hitherto only from New South Wales and Houtman's Abrolhos, Western Australia. Ten of the "Endeavour" specimens were trawled in Queensland waters.

Mouth of Wide Bay, Queensland.

Northern New South Wales.

Callionymus macdonaldi *Ogilby.*

(Plate liv, fig. 1.)

Callionymus macdonaldi Ogilby, Ann. Qld. Mus. No. 10, 1911, p. 56, pl. vi, fig. 2.

D.iv/9; A.9; P.19; V.i/5; C.10.

Depth before the dorsal fin (11 mm.) 8·9, breadth before the pectorals (20) 4·9, and length of head (32) 3·06 in the length to the hypural joint (98). Eye (7) shorter than the snout (8) and 4·5 in the head. Interorbital space (1) 7·0 in the eye. First dorsal spine (8·5) 3·7, last dorsal ray (14·5) 2·2, and last anal ray (13) 2·4 in the head. Caudal fin (27) 1·1 in the head.

Head rugose above, with reticulating bony ridges radiating from centres and enclosing shallow circular pits; a patch on each side of the occiput is largest and two smaller ones are present immediately behind the orbital ridges and interorbital groove, and three on the posterior part of the cranium. Snout obtusely rounded when viewed from above; the width of the head at the bases of the preopercular spines is almost equal to the distance between the gill-openings and the tip of the snout. Upper lip projecting beyond the preorbital bones when the mouth is closed, and well beyond the lower jaw. Maxillary reaching backward to the vertical of the nostril. Interorbital space narrow and grooved. Preopercular spine curved upward at the distal extremity,

with five large hooks above and an antrorse spine on its outer base. Gill-openings exposed, on the upper surface, and separated by a space which is much less than that between the outer margins of the orbits; they are a little nearer the eyes than the bases of the pectorals and well above the level of the latter. A broad band of villiform teeth in each jaw; palate toothless.

Body greatly depressed, the caudal peduncle much broader than deep at the middle of its length. Lateral line curving downward to above the middle of the pectoral, and then rising slightly and extending backward above the middle of the sides. No anal papilla.

First dorsal spine inserted above the base of the upper pectoral ray; it is short, subequal in length to the second, and not nearly reaching the second dorsal when adpressed. Anterior ray much longer than the spine but shorter than the last, which does not reach backward to the hypural joint; all the rays are simple except the last, which is divided to its base, and each branch is bifurcated. Anal of similar form to the dorsal but lower and commencing and terminating well behind it. Upper margin of pectoral excised, the median rays longest and reaching beyond the vertical of the second anal ray. Ventral rays coarsely branched; the fifth longest and reaching backward to the vent; a broad membrane between its anterior half and the base of the pectoral fin. Caudal fin rounded; all but the upper and lower rays bifurcate.

Colour-marking.—Upper surface closely covered with brown markings which coalesce to enclose many light irregularly shaped spots; on the head these markings tend to form small darker spots. First dorsal black, lighter at the base anteriorly. Rays of the second dorsal with numerous brown spots and there are some indefinite markings on the membrane between them. Anal almost colourless. Caudal and ventrals with irregular brown spots, and some paler ones are present on the upper half of the pectoral.

Described and figured from a specimen 125 mm. long, which is apparently a female.

This is preserved in the collection of the Queensland Museum, and I am indebted to the Director, Mr. H. A. Longman, for the loan of it to redescribe and figure here. It is entered in the register as "I.2473. *Callionymus*,

Moreton Bay, donated J. D. Ogilby," and the entry is in Ogilby's handwriting. The type of *C. macdonaldi* was said to have been preserved in the collection of the Amateur Fishermen's Association of Queensland, but no specimen can be found therein which corresponds to the description of that species. The specimen here described tallies with Ogilby's description and measurements, and there is every reason to believe it is his holotype.

Affinities.—*C. macdonaldi* is closely related to *C. calcaratus*, from which it differs principally in having the occiput rugose, and in its colouration.

Callionymus ocelligena *sp. nov.*

(Plate lv, fig. 1.)

D.iv/9; A.9; P.20; V.i/5; C.10.

Depth at origin of anal fin (15 mm.) 1·03, breadth before the pectorals (30) 5·1, and length of head (46) 3·3 in the length to the hypural joint (155). Eye (10) shorter than the snout (14·5), and 4·6 in the head. Interorbital space (2) 5·0 in the eye. First dorsal spine (21) 2·1, last dorsal ray (36) 1·2, and last anal ray (23) 2·0 in the head. Caudal fin (65) 0·4 longer than the head.

Head smooth above, without rugose bones. Snout broadly rounded when viewed from above; the width of the head at the bases of the preopercular spines is less than the distance between the gill-openings and the tip of the snout. Upper lip projecting beyond the preorbital bones when the mouth is closed, and well beyond the lower jaw. Maxillary scarcely reaching the vertical of the nostril. Interorbital space narrow, deeply grooved. Preopercular spine curved upwards at the distal extremity, with three large hooks above, and an antrorse spine on its outer base. Gill-openings exposed, on the upper surface, and separated by a space which is less than that between the outer margins of the orbits; they are a little nearer the eyes than the bases of the pectorals, and well above the level of the latter. A broad band of villiform teeth in each jaw; palate toothless.

Body greatly depressed, the caudal peduncle broader than deep at the middle of its length. Lateral line curving downward beneath the pectoral fin and extending backward a little above the middle of the side. Anal papilla well developed.

First dorsal spine inserted in advance of the pectoral fins; it is longer than the others and is produced into a short filament which scarcely reaches backward to the first dorsal ray. Anterior ray longer than the spine, but shorter than the last, which reaches backward beyond the hypural joint; all the rays are simple except the last, which is divided to its base, and each branch is bifurcate. Anal of similar form to the dorsal but lower, and commencing and terminating well behind it. Upper margin of pectoral excised, the median rays longest and reaching backward to the vertical of the second anal ray; all but the upper rays are bifurcate. Ventral rays coarsely branched, not quite reaching the origin of the anal fin. Caudal fin elongate, much longer than the head; all but its outer rays are bifurcate.

Colour-marking.—General colour greyish brown in formalin, the upper surface closely covered with small and indistinct lighter spots with dark margins. The sides of the head bear a number of large brown ocelli with light margins; these are most conspicuous upon the lateral angle between the mouth and the preopercular spine, but are also present upon the preorbital region and operculum. A large, black, white-edged spot on the operculum beneath the preopercular spine. Several indefinite dark blotches on each side of the body below the lateral line. First dorsal grey with a large incomplete dark ring on the third spine, and some indefinite darker markings. Second dorsal with numerous blackish dots irregularly disposed between the rays. Anal dusky, lighter basally. Caudal with black dots similar to those of the second dorsal, and a grey stripe between the lower rays. Ventral with a dark border.

Described and figured from a single male example, 218 mm. long.

Of the Australian species, this is nearest *C. calcaratus,* from which it is readily distinguishable by its colour-marking, longer tail, and in having the first dorsal spine distinctly longer than the second.

Locality.—This specimen is unfortunately without data. It is registered in association with some Queensland fishes, but cannot be definitely recorded from that State.

Callionymus calauropomus *Richardson.*

Callionymus calauropomus Richardson, Ichth. Erebus and Terror, 1844, pp. iv and 10, pl. vii, figs. 4-5. *Id.* McCoy, Prodr. Zool. Vict., dec. xx, 1890, pl. excii. *Id.* McCulloch, Rec. Austr. Mus. xiv, 1, 1923, p. 12 (*vide* synonymy).

Thirteen specimens, 60-360 mm. long, agree well with McCoy's figures, and exhibit considerable variation. The caudal rays are shorter than the head in some specimens, and more than twice its length in others. The colour-marking varies in intensity, but is of the same pattern as is illustrated by McCoy. The armature of the preopercular spine, which has only two recurved hooks at its tip and lacks a basal antrorse barb, and the bifurcation of the dorsal rays afford excellent specific characters, being constant in all specimens examined.

Localities.—East of Flinders Island, Bass Strait.

Off Marsden Point, Kangaroo Island, South Australia; 19th August, 1909.

Doubtful Island Bay, south-western Australia, 20-25 fathoms; 30th November, 1911.

Callionymus apricus *sp. nov.*

(Plate liv, fig. 2.)

D.iv/8; A.7; P.23; V.i/5; C.10.

Depth at origin of dorsal fin (13 mm.) 6·4, breadth before the pectorals (15) 5·6, and length of head (27) 3·1 in the length to the hypural joint (84). Eye (9·5) much longer than the snout (6) and 2·8 in the head. Interorbital space (1) very narrow. First dorsal spine (31) 2·7, median dorsal rays (24) 3·5, and median caudal rays (37) 2·2 in the length of the hypural joint.

Head and body subcylindrical, and not much broader than deep; the width of the head between the bases of the preopercular spines is only a trifle greater than the distance between the tip of the snout and the hinder margin of the eye. Upper surface of head with a loose transparent epidermis raised high above the bones of the cranium; the occiput has a low conical prominence on each side with very fine reticulating ridges radiating

from its centre. Snout obtusely conical, its upper profile very oblique and broadly rounded when viewed from above. Upper lip projecting well beyond the preorbital bones when the mouth is closed and well beyond the lower jaw. Maxillary reaching backward beyond the vertical of the anterior margin of the eye. Interorbital space very narrow, forming a shallow groove. Eyes very large and rising high above the profile of the head. Preopercular spine curved upwards at its distal extremity to form a spine of the same size as two others on its upper margin; no antrorse spine at the base below. Gill-openings exposed on the supero-lateral surface of the neck, and separated by a space which is much less than that between the outer margins of the eyes; they are much nearer the bases of the pectorals than the eyes, and well above the level of the former. A broad band of teeth in each jaw which is widest anteriorly and extends farther back in the lower than in the upper; palate with large fleshy papillæ, but toothless.

Body not depressed, the caudal peduncle little broader than deep at the middle of its length. Lateral line crossing behind the occiput and curving downward in advance of the pectorals; it is then arched upward above that fin and descends again to the middle of the side behind its tip; the usual cephalic extensions are present, one descending towards the preopercular spine and another to the hinder angle of the eye, but it apparently does not cross the cheek. A small, well developed anal papilla.

First dorsal spine inserted above the preopercular spine and a little behind the vertical of the origin of the ventrals; all four spines are produced into extremely slender filaments and are longer than the base of the second dorsal; the second is incomplete and the third extends beyond the base of the last dorsal ray. Second dorsal elevated, its median rays longest, but not reaching backward to the hypural joint when adpressed; all are bifurcate and the last is again divided to its base. Anal rays simple, only the last divided to its base; they are lower than those of the dorsal and increase in length backwards. Pectorals rounded, all but the upper ray bifurcate, the median reaching backward to beyond the vertical of the second anal ray; the entire base of the pectoral fin is exposed. Ventral rays branched, the

fourth longest and reaching backward beyond the second anal ray; the broad membrane which usually connects the inner ray to the middle of the pectoral base in typical species of *Callionymus* is almost entirely wanting, being traceable at the base of the ray only. Caudal elongate, its upper and lower rays simple, the others bifurcate.

Colour-marking.—Almost colourless after preservation in formalin, with traces of a few brown markings on the upper half of the body, dorsal fins, and bases of the pectorals and caudal, disposed as is shown in the accompanying figure. When first received, the head and body were rose-pink with orange spots and bars; the most striking of these was one below the postero-inferior angle of the eye, a saddle-shaped mark across the middle of the back with a round spot before it, and several small spots on the caudal peduncle. A yellowish-brown spot on the upper base of the pectoral; the rest of the fin rose-pink. Membrane of the first dorsal orange, the spines white. A blackish-brown spot behind the first spine, a similar one on the second spine but lower than the first, and traces of others behind the third and fourth spines. The second dorsal was marked with broad oblique bars alternately orange and white, the orange ones partly corresponding with the rays. Blackish bars descended obliquely backward and downward from the tips of each ray. Caudal rays white; the membrane orange above, white below. Anal rose-pink. Ventrals white.

Described from a unique example, 123 mm. long.

Affinities.—This species is very close to *Callionymus phasis* Günther, from which it differs chiefly in its delicate coloration. Two small specimens of that species in the "Endeavour" collection have definite markings as figured by Günther, whereas those of *C. apricus* are scarcely traceable on the body, being distinct only on the dorsal fins. The dorsal spines of *C. apricus* are longer than those of *C. phasis*, and the pectoral fins have twenty-three instead of twenty rays, but in all other structural characters the two species appear quite similar.

Locality.—Great Australian Bight, south from Eucla, 350-450 fathoms; 14th May, 1913.

CALLIONYMUS PHASIS *Günther.*

Callionymus phasis Günther, Challenger Zool. i. 1880, p. 28, pl. xv, fig. c. *Id.* McCulloch, Rec. Austr. Mus. xiv, 1, 1923, p. 9.

"Two specimens, 48 and 66 mm. long, exhibit some variation in the lengths and numbers of their fin-rays and spines. In the larger the dorsal spines are much longer than the rays as in the holotype, but in the other the longest spine is a little shorter than the anterior rays. The latter has nine dorsal rays while the former has only eight; both have seven anal rays." McCulloch (*loc. cit.*).

Locality.—Gippsland coast, Victoria, 80 fathoms; 17th October, 1914. South of Cape Everard, Victoria, 200 fathoms; 7th October, 1914.

Family TRIGLIDÆ.

Subfamily PERISTEDIONTINÆ.

PERISTEDION PICTURATUM, *sp. nov.*

(Plate lvi, figs. 1-3.)

Br. 5; D.viii/21; A.20; P.12/2; V.1/5; C.12. L. lat. 36; l. tr. 4.

Head, including rostrum (56 mm.) 2·5 in the length to the hypural joint (140); depth of the body (22·5) 6·2 in the same. Eye (9) a little narrower than the interorbital space (10), 3·6 in the length of the snout. Snout (33) 1·7 in the head, rostral processes (13) 1·5 in their distance from the eye. Width of the head at the preopercular angle (33) equal to the length of the snout. Second dorsal spine (14) 4, second dorsal ray (12) 4·6, and third anal ray (10·5) 5·3 in the head. Pectoral (20) 2·8, ventral (22) 2·5, and caudal (21·5) 2·6 in the head.

Snout with two flat, subparallel blades, which are granular; each bears a very small spine near its base on the upper surface. No spines on the forehead or upper surface of the snout. A supraorbital spine above the posterior margin of the orbit, followed by two more on each side of the occiput; a nodular ridge is situated a little lower down on each side of the head, which terminates in a spine above the post-temporal bone.

Occipital region flat, quadrate, and granular; interorbital space with a deep median groove, which runs into a ridge extending forward on the median line of the snout. A ridge on each side from before the eye to the base of each rostral process. A suborbital ridge forms a sharp angle posteriorly. Operculum wth a transverse ridge projecting backward as a strong spine. Lateral margin of the head sharp, granular, and sinuous; a few denticles are present on each side of the snout, which are followed by a series of lobes; preopercular angle forming an expanded lobe, without a spine. Jaws toothless; maxillary not nearly reaching the vertical of the anterior margin of the eye. Lower lip with many simple tentacles which are shorter than the diameter of the eye, and a long branched process on each side which reaches the vertical of the anterior edge of the orbit.

A single plate on the back before the dorsal fin, which is armed with a spine at each hinder angle; behind this are thirty dorsal scutes each bearing a spine, of which those on the caudal peduncle are indistinct and the last two at the base of the tail are largely developed. Lateral line consisting of simple pores upon thirty-six scutes, beginning at the shoulder and curving sharply downward to the middle line of the body; the first three scutes are small, and form a horizontal row; twenty-four or twenty-five scutes are armed with a single spine, projecting backward, but about ten on the side of the tail are provided with an anterior as well as a posterior spine. The spines of the sub-lateral row are well developed, but those of the ventral series are obsolete except anteriorly. Abdomen with two pairs of large plates, which are provided with ridges on each side; a pair of plates meets on the median line behind the vent, and those of a second pair just touch in advance of the first anal ray. No extra series below the caudal peduncle. Vent with a minute papilla.

Anterior dorsal rounded, joined by membrane to the base of the first ray. Second dorsal highest anteriorly, and formed entirely of simple rays. Anal commencing a trifle behind the origin of the second dorsal, and terminating a little in advance of its last ray; the rays are highest anteriorly and simple. Pectoral rounded, reaching backward to the level of the first anal ray; the fifth ray is longest, and the median ones are bifurcate. The upper

free ray is a little longer than the fin. Ventrals reaching a little beyond the vent; the rays are branched, and the inner ones are broadly united with the abdomen by membrane. Caudal slightly emarginate.

Colour-marking.—Apparently pink in life, with brown markings on the upper surfaces. Both dorsal fins with broad black margins, the tips of the spines and rays white. Anal with a dark submarginal band posteriorly. Pectoral with a broad black band crossing its distal half, and some dusky blotches near its base. Caudal with a dusky upper border.

Described and figured from the unique holotype, 159 mm. long.

Locality.—East of Flinders Island, Bass Strait, 70-100 fathoms; 4th December, 1913.

The descriptions of many species of *Peristedion* omit reference to several important specific characters, and therefore cannot be compared satisfactorily with this new form. *P. picturatum* belongs to a group of species in which the angle of the preoperculum does not project backward as a spine, but forms either an obtuse angle or an expanded lobe. It is apparently distinguishable from its nearest allies as follows:

A. Dorsal and pectoral fins with dark marginal or submarginal bands.
  B. Two pairs of abdominal scutes before the vent.
    C. Three pairs of scutes between vent and first anal ray.
      liorhynchus Gthr., and *nierstraszi* Weber.
    CC. Two pairs of scutes between vent and first anal ray.
      picturatum sp. nov.
  BB. Three pairs of abdominal scutes before the vent.
    rivers-andersoni Alc., and *orientale* Schleg.
AA. No black marks on dorsal or pectoral fins.
  truncatum Günther.

P. miniatum Goode, *altipinnis* Regan, and *crustosum* Garman, have only 17-18 dorsal and 16-18 anal rays instead of 21 and 20 as in *picturatum*. *P. cataphractum* Linné, has strong spines on the snout and forehead, and *barbiger* Garman has a pair of hooked spines between the nostrils, which are wanting in *picturatum*. In *longispatha* G. and B., the rostral processes are widely divergent instead of parallel, and *gracile* G. and B., lacks supraorbital spines. In *P. imberbe* Poey, the barbels are

minute. The remaining species have a long spine projecting backward from the angle of the preoperculum:

platycephalum G. and B., *murrayi* Gthr., *adeni* Lloyd, *brevirostre* Gthr., *engyceros* Gthr., *undulatum* Weber, *investigatoris* Alc., *serrulatum* Alc., *halei* Day, *hians* Gilb. and Cram., *gilberti* Jordan, *amiscum* Jord. and Starks, *indicum* Brauer, *laticeps* Schlg., *mollucense* Bleeker, *rieffeli* Kaup, *prionocephalum* Dumeril.

The description of *P. roseum* Ribeiro is not available to me.

Family PSYCHROLUTIDÆ.

NEOPHRYNICHTHYS MARCIDUS *sp. nov.*

(Plate lv, fig. 2.)

Br. 7; D.vii/18; A.12; P. 22; V. i/3; C.4/9/4.

Depth at the origin of the dorsal (77 mm.) 3·1 in the length to the hypural joint (240); head (101) 2·3 in the same. Width of the head at the preoperculum (96) 1·05 in its length. Eye (15) 1·9 in the snout (29) and 2·2 in the interocular width (33). Pectoral fin (68) 1·4, ventral fin (34) 2·9 and caudal (53) 1·9 in the head.

Head, body and fins entirely covered in loose, flabby skin, which almost entirely conceals the characters beneath it. Head globose, with a few open pores around the upper and lower jaws; a number of minute papillæ on the under surface of the mandible. Anterior nostril in a short tube; posterior a simple opening in advance of the eye. Interorbital narrow, sub-equal to the width of the eye; its width is greatly increased by the expansions of the ocular margins, which form a broad interocular space. Upper jaw projecting beyond the lower; the maxillary is broad and somewhat rounded posteriorly and reaches to below the vertical of the hinder margin of the eye. Both jaws broadly rounded anteriorly and each bearing a broad band of villiform teeth, those of the premaxillaries being separated at the symphysis. Palate toothless. Tongue thick, rounded, and adnate to the floor of the mouth. Bony stay of the cheek prominent with three obtuse protuberances. Preopercular margin covered with loose skin through which a broad cavernous

border can be detected. Operculum unarmed, its superior angle forming a pointed lobe. Gill-openings broad, extending forward as far as the base of the pectorals and separated by a broad, flat interspace.

Body very broad anteriorly, compressed towards the caudal peduncle. It is highest at the origin of the dorsal fin, behind which it decreases rapidly. The lateral line is indicated only by a raised ridge on the shoulder region. Vent about twice as far from the insertions of the ventrals as from the first anal ray; it is provided with a prominent post-anal papilla.

All the fins are so completely enveloped in thick fleshy skin that their rays can be counted only when this is removed. The first dorsal originates a little in advance of the end of the opercular lobe. Its margin is rounded and the median spines are longest, but their tips are lost in the membrane and their length cannot be determined. A distinct dip in the margin of the fin distinguishes the first from the second dorsal. The greater number of the dorsal rays are bifurcate and the last is united to the caudal peduncle by membrane. The anal commences well behind the origin of the second dorsal and is of a similar form to that fin. Pectoral broad and reaching beyond the vertical of the first anal ray. Seventh ray longest and the median ones are bifurcate. Ventrals inserted behind the anterior base of the pectoral and reaching about two-thirds of their distance to the vent. They consist of a single spine and three rays, all of which are very closely united within a thick membrane. Caudal rounded, its rays branched.

Colour.—Uniformly whitish in preservative.

Described and figured from a unique holotype, 293 mm. long.

Affinities.—*N. marcidus* differs from the other species of the genus, *N. latus* Hector, and *N. marmoratus* Gill, in lacking colour-marking. *N. latus* further has a very different fin-formula, and both have the lower jaw projecting beyond the upper.

Locality.—This specimen is unfortunately without data, but was certainly trawled in deep water on the southern Australian or Tasmanian coast.

EXPLANATION OF PLATE XLIII.

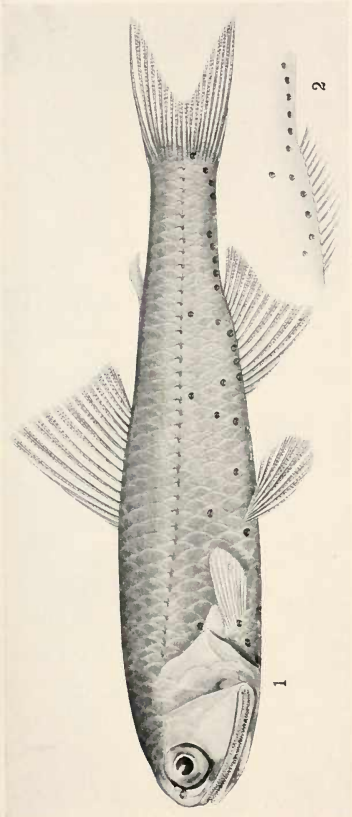
Diaphus caruleus Klunzinger.

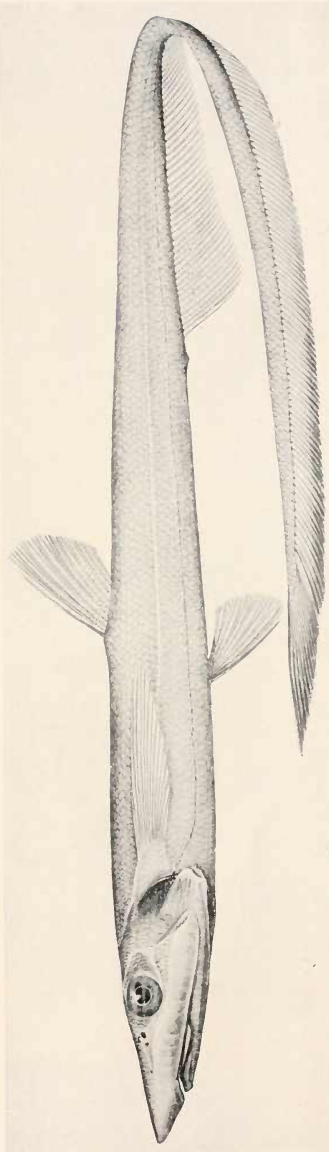
Fig. 1. A specimen 138 mm. long, from the Great Australian Bight, 350-450 fathoms.

Fig. 2. Anteroanal, posterolateral, and posteroanal photophores of another specimen, from the Great Australian Bight, 200-300 fathoms.

Halosaurus pectoralis, sp. nov.

Fig. 3. Holotype, 545 mm. long, from the Great Australian Bight.





A. R. McCULLOCH, del.

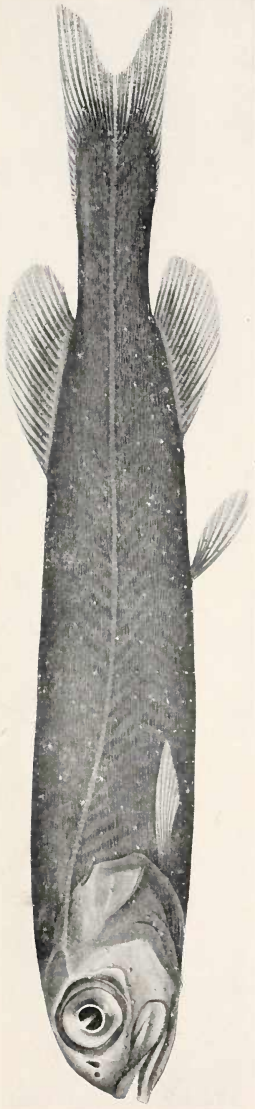
EXPLANATION OF PLATE XLIV.

Alepocephalus, Roulcina, squamilaterus Alcock.

Fig. 1. A specimen 182 mm. long without the caudal fin, from the Great Australian Bight, 350-450 fathoms.

Euclichthys polynemus sp. nov.

Fig. 2. Holotype, 255 mm. long, from the Great Australian Bight, south-east from Eucla, 250-300 fathoms.



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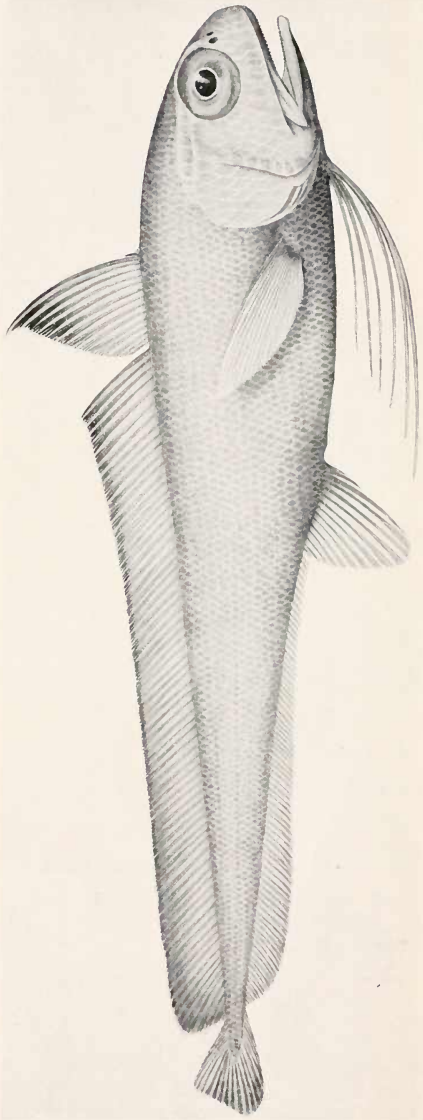


2

A. R. McCULLOCH, del.

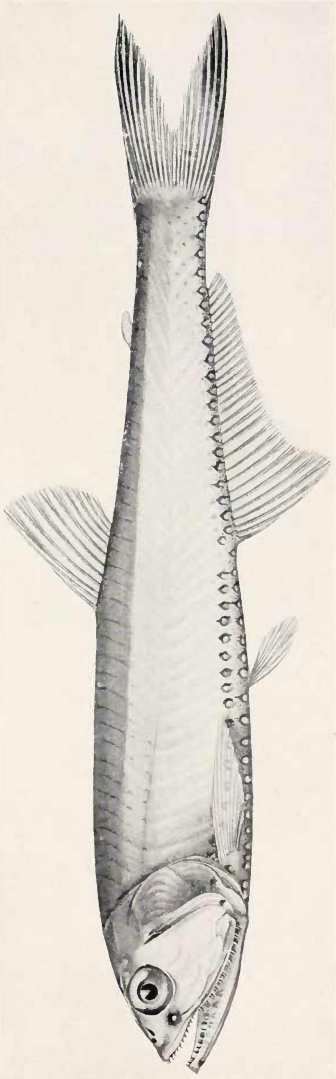
EXPLANATION OF PLATE XLV.

Polymetme illustris sp. nov.

Fig. 1. Holotype, 158 mm. long, from the Great Australian Bight.

Argyripnus iridescens sp. nov.

Fig. 2. Holotype, 128 mm. long, from the Great Australian Bight.



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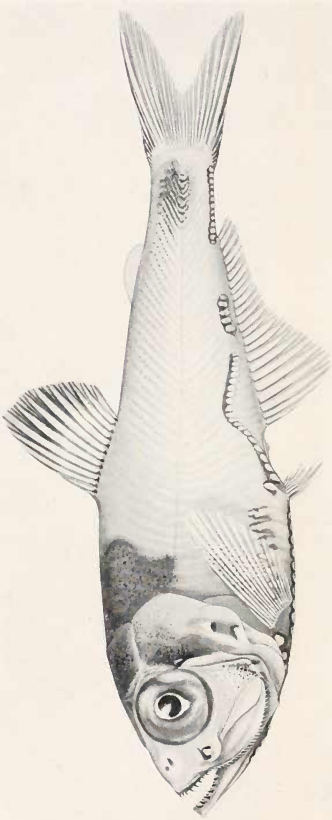


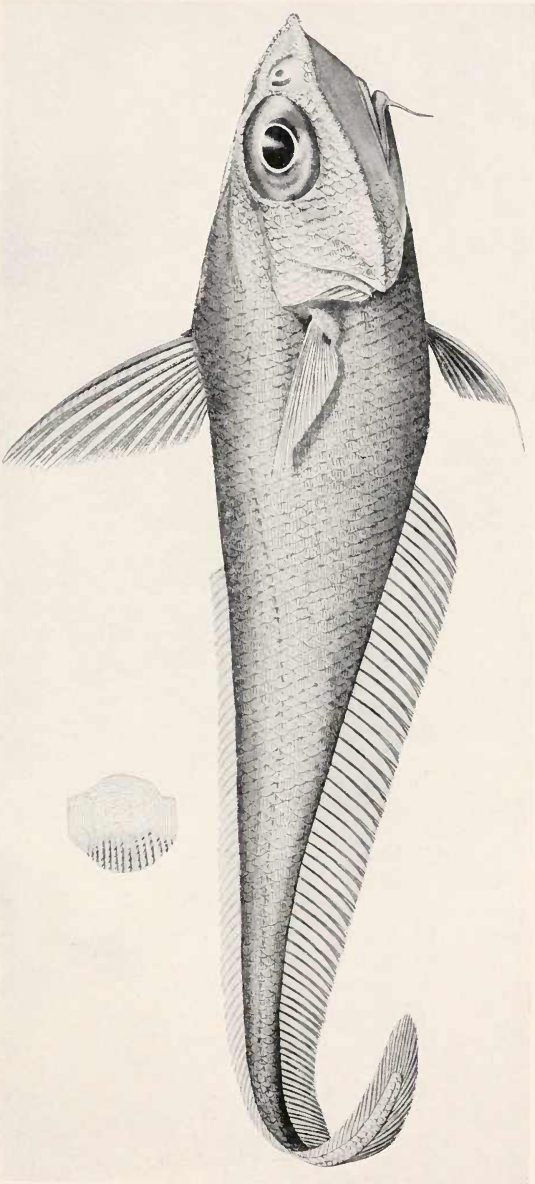
2

A. R. McCulloch, del

EXPLANATION OF PLATE XLVI.

Cœlorhynchus, Paramacrurus, mirus sp. nov.

Holotype, 230 mm. long, from east of Sydney, 150 fathoms.

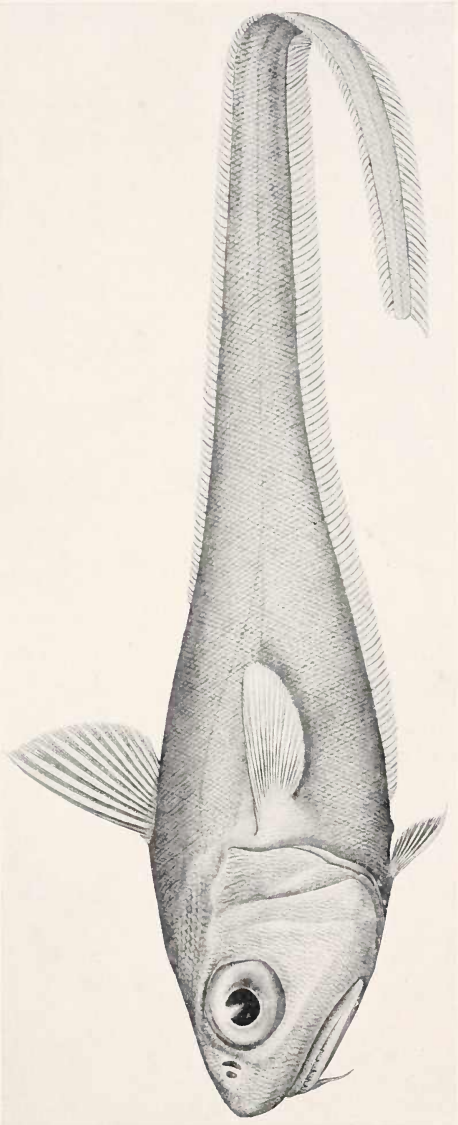


A. R. McCulloch, del.

EXPLANATION OF PLATE XLVII.

Malacocephalus lævis Lowe.

A specimen 385 (+) mm. long (tail incomplete), from the Great Australian Bight, 350-450 fathoms.

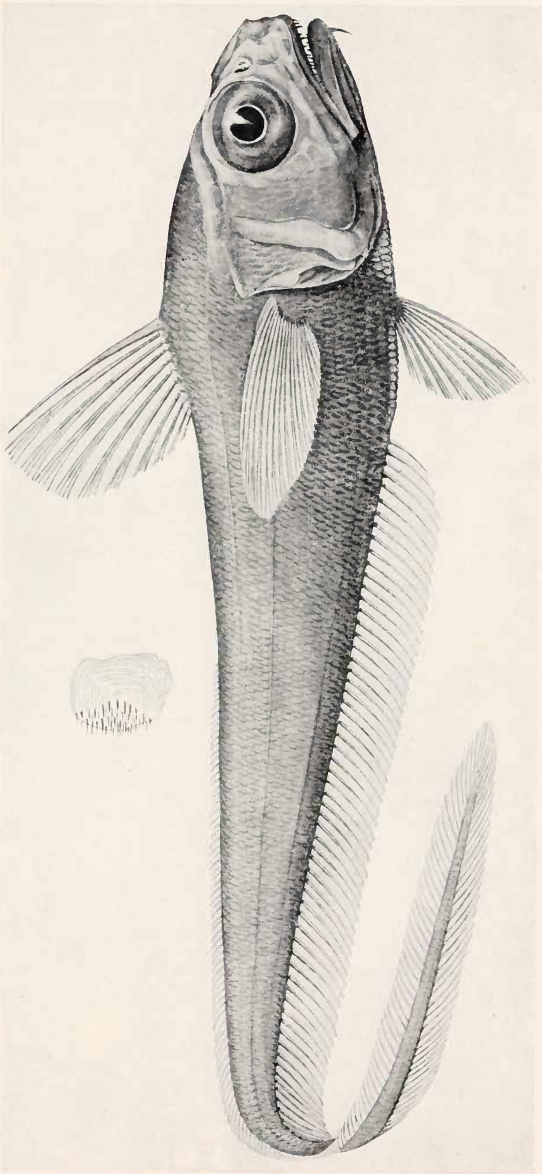


R. McCulloch, del.

EXPLANATION OF PLATE XLVIII.

Lepidorhynchus denticulatus Richardson.

A specimen 460 mm. long, from the Great Australian Bight, 350-450 fathoms. A scale from near the vent of the same specimen.

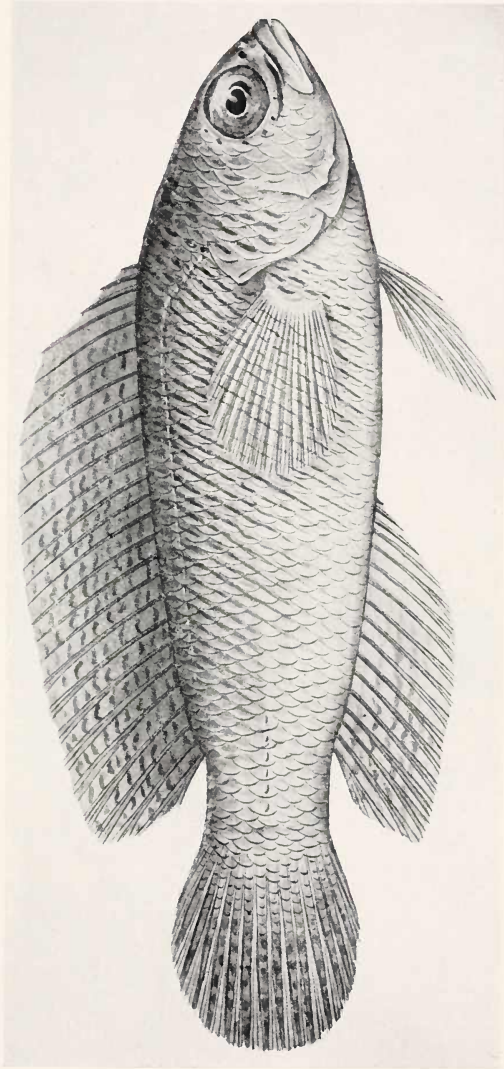


A. R. McCULLOCH, del.

EXPLANATION OF PLATE XLIX.

Pseudochromis Pseudochromis, purpurascens De Vis.

A specimen, 64 mm. long, from Ringdove Bay, Api Island, New Hebrides.

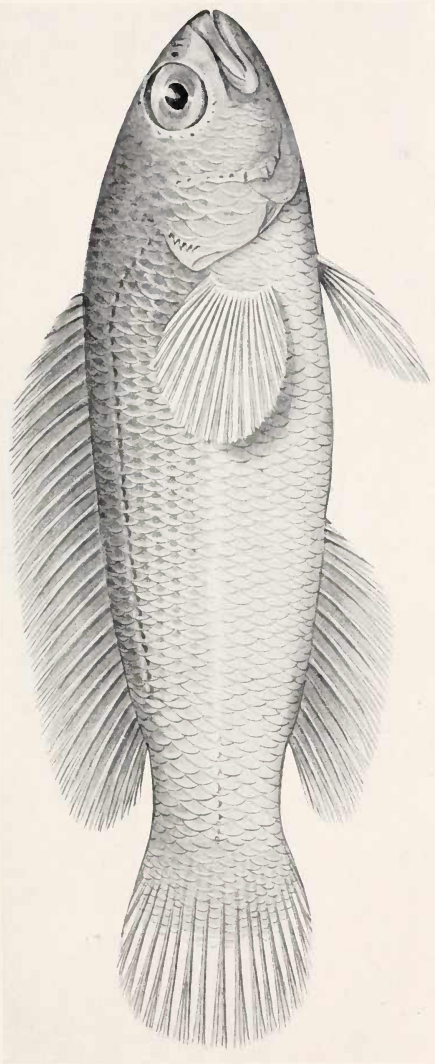


A. R. McCULLOCH, del.

EXPLANATION OF PLATE L.

Pseudochromis, Leptochromis, quinquedentatus, sp. nov.

Holotype, 60 mm. long, from off Cape Capricorn, Queensland.



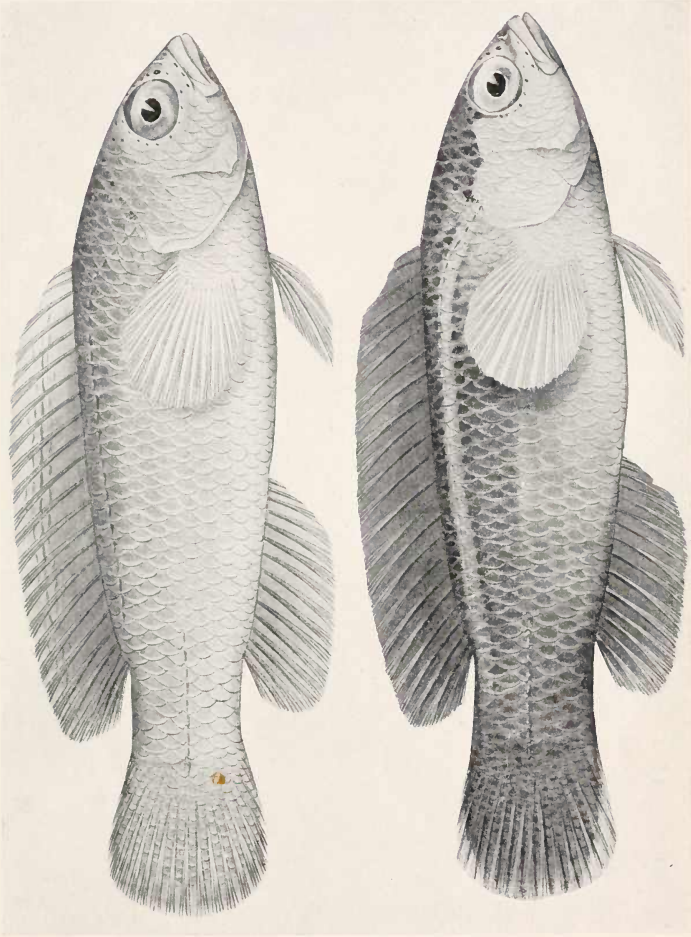
A. R. McCULLOCH, del.

EXPLANATION OF PLATE LI.

Pseudochromis, Leptochromis, tapeinosoma Bleeker.

Fig. 1. A female specimen, 54·5 mm. long, from Masthead Island, Queensland.

Fig. 2. A male, 56 mm. long, also from Masthead Island, Queensland.



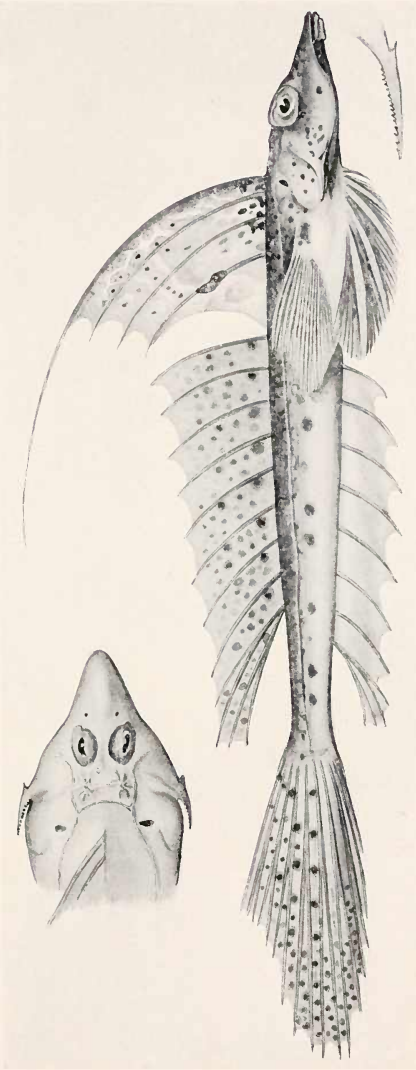
1 2

A. R. McCULLOCH, del.

EXPLANATION OF PLATE LII.

Callionymus, Calliurichthys, nasutus sp. nov.

Holotype, 240 mm. long, from off Cape Capricorn, Queensland.



A. R. McCULLOCH, del.

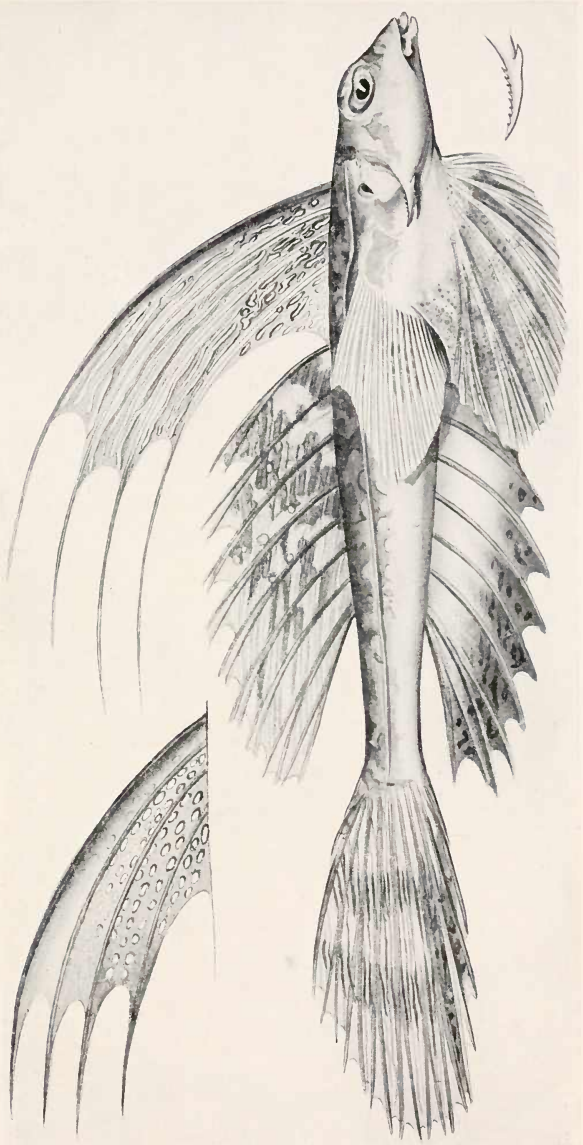
EXPLANATION OF PLATE LIII.

Callionymus, Calliurichthys, rameus, sp. nov.

Fig. 1. Holotype, 210 mm. long, from off Cape Capricorn, Queensland, 13 fathoms.

Fig. 2. Preopercular spine of the holotype.

Fig. 3. Dorsal fin of a female paratype.



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A. R. McCULLOCH and
G. P. WHITLEY, del.

EXPLANATION OF PLATE LIV.

Callionymus macdonaldi Ogilby.

Fig. 1. ? Holotype, 125 mm. long, from Moreton Bay, Queensland.

Callionymus apricus sp. nov.

Fig. 2. Holotype, 123 mm. long, from the Great Australian Bight.

1

2

A. R. McCULLOCH, del.

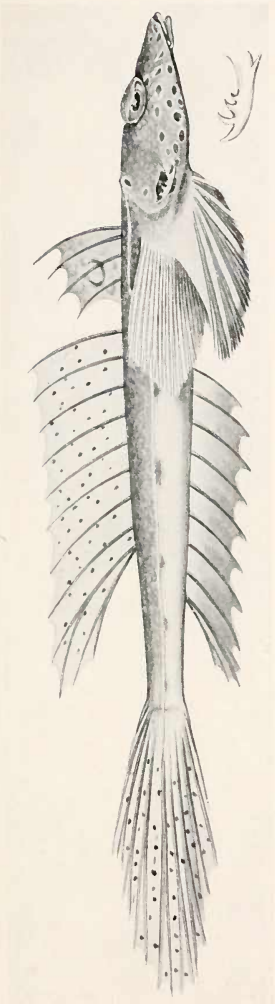
EXPLANATION OF PLATE LV.

Callionymus, Calliurichthys, ocelligena sp. nov.

Fig. 1. Holotype, 218 mm. long, supposed to have been trawled in Queensland waters.

Neophrynichthys marcidus sp. nov.

Fig. 2. Holotype, 293 mm. long.



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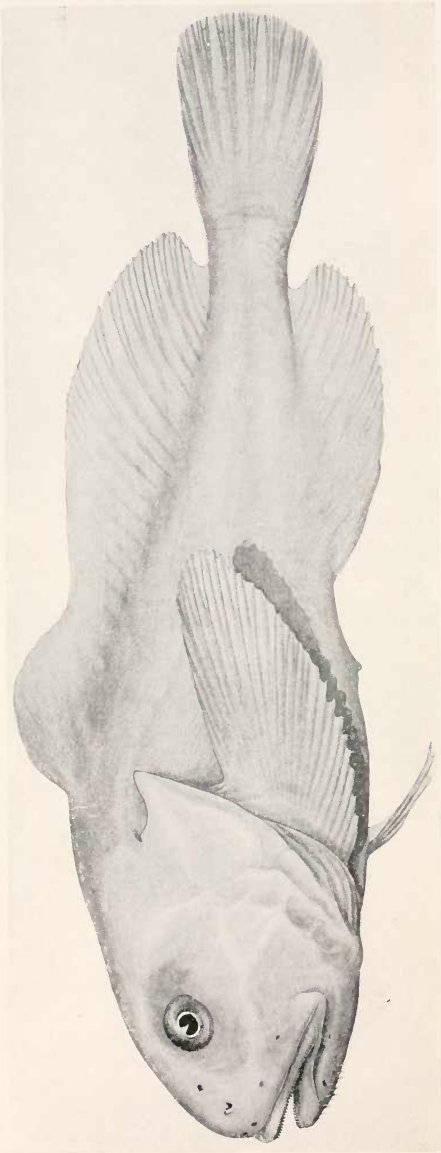


2

A. R. McCULLOCH, del.

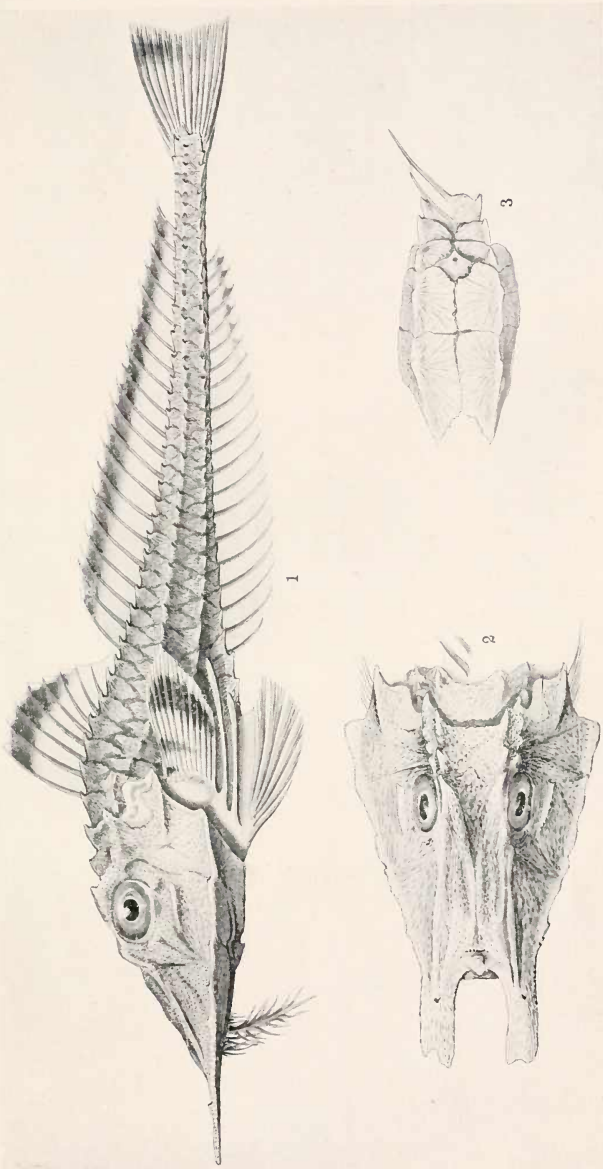
EXPLANATION OF PLATE LVI.

Peristedion picturatum sp. nov.

Fig. 1. Holotype, 159 mm. long, from east of Flinders Island, Bass Strait.

Fig. 2. Upper surface of the head of the holotype.

Fig. 3. Ventral surface of the abdomen of the holotype.



A. R. McCULLOCH and
G. P. WHITLEY, del.

A Report on the Flatfishes (Heterosomata) collected by the F.I.S. "Endeavour," with a Synopsis of the Flatfishes of Australia and a Revision of the Subfamily Rhombosoleinæ.

BY

J. R. NORMAN.

(Figures 1-15.)

INTRODUCTION.

The Flatfishes collected by the F.I.S. "Endeavour" and included in this report number about 250, and represent about 30 species, of which six are described as new to science. Some of the specimens were obtained in the seas of southern and south-western Australia, but the bulk of the collection was taken off the coasts of Queensland and northern New South Wales. In addition to the "Endeavour" collections, I have studied all the Australian material preserved in the collection of the British Museum (Natural History), a number of duplicate specimens provided by the Australian Museum, and a small collection of Flatfishes from South Australia kindly placed at my disposal by the authorities of the South Australian Museum.

In addition to the report on the "Endeavour" specimens, I have included a synopsis of all the known Heterosomata of Australia, with keys to the genera and species. With the exception of two or three species known only from the original descriptions of the older ichthyologists, the types of which have not yet been re-examined, I have been able to identify all the Australian species. The synonymy and known distribution is given, and, where necessary, a re-description has also been included.

No attempt has been made to make the synonymy complete for every species, but I have endeavoured to include all the more important Australian references.

Finally, I have included a complete revision of the subfamily Rhombosoleinæ, which is almost entirely confined to the waters of Australia and New Zealand.[1] This subfamily presents several particularly interesting features, of which the following are the more important: the form of the nasal organs, and their evolution within the group; the evolution of many sole-like characters within the group, which provides an interesting example

[1] In connection with this revision I am greatly indebted to Mr. G. Archey, of the Canterbury Museum, Christchurch, and to the authorities of the Dominion Museum, Wellington, for New Zealand material.

of parallelism; and finally, the ambicoloration and reversal of certain examples of the genus *Rhombosolea,* with the associated variations towards symmetry shown by the pelvic fins.

I take this opportunity of offering my thanks to the late Allan R. McCulloch and the Director of the Australian Museum for their kindness in entrusting me with this investigation, and for providing me with an excellent series of additional specimens, and notes and illustrations of others concerning which I was in doubt; and to Mr. E. R. Waite, for his assistance in providing me with South Australian material, and for generously placing in my hands the notes on this group which had been already made by him. Finally, I have to thank Mr. C. Tate Regan, F.R.S., for the valuable advice which he has given me during the preparation of this report.

The scheme of classification adopted is that published by Mr. Regan in 1910.[2]

ARTIFICIAL KEY TO THE FAMILIES AND SUBFAMILIES OF HETEROSOMATA REPRESENTED IN AUSTRALIA.

I. Dorsal fin not extending forward on the head, the anterior rays spinous; each pelvic fin with a spine and five soft rays; eyes on the right or left side ..... 1. PSETTODIDÆ

II. Dorsal fin extending forward on the head at least to above eye, none of the rays spinous; pelvic fins without spine.

A. Præoperculum with a free margin, lower jaw generally prominent.

1. Eyes on the left side, except in reversed examples. ..... 2. BOTHIDÆ

a. Pelvic fins equal, short based .... 2a. *Paralichthinæ*

b. Left pelvic fin median, with base much longer than that of right ..... 2b. *Bothinæ*

2. Eyes on the right side, except in reversed examples. ..... 3. PLEURONECTIDÆ

a. Mouth symmetrical, with the jaws and dentition nearly equally developed on both sides; anterior rays of dorsal fin greatly prolonged. 3a. *Samarinæ*

b. Mouth usually asymmetrical, the dentition always more developed on the blind side; anterior dorsal rays not greatly prolonged ... 3b. *Rhombosoleinæ*

B. Præopercular margin not free, hidden by the skin and scales of the head; lower jaw never prominent.

1. Eyes on the right side ..... 4. SOLEIDÆ

2. Eyes on the left side ..... 5. CYNOGLOSSIDÆ

[2] Ann. Mag. Nat. Hist., Ser. 8, VI, 1910, p. 484.

Family I. PSETTODIDÆ.

1. Psettodes.

Psettodes, Bennett, Proc. Zool. Soc. 1831, p. 147.

Sphagomorus, Cope, Trans. Amer. Phil. Soc., XIII, 1869, p. 407.

Two species from West Africa and the Indo-Pacific; one known from Australia.

1. *Psettodes erumei*. [Queensland Halibut.]

Pleuronectes erumei, Bloch, Schneider, Syst. Ichth., p. 150 (1801).

Psettodes erumei, Günther, Cat. Fish., IV, p. 402 (1862); Bleeker, Atl. Ichth., VI, p. 4, Pleuron. pl. I, fig. 2 (1866); Day, Fish. India, p. 422, pl. XCI, fig. 4 (1877); Saville-Kent, Great Barrier Reef, p. 297, pl. XLVI, fig. 5 (1893); Stead, Fish. Australia, p. 181 (1906).

Hab.—East Africa to the Pacific; Australia, East Coast of Queensland.

E.2787.—4-5 miles N.W. of Gloucester Head, Queensland; 19-25 fathoms.

E.2790.—4-5 miles N.W. of Gloucester Head, Queensland; 19-25 fathoms.

E.6640.—4-5 miles N.W. of Gloucester Head, Queensland; 19-25 fathoms.

E.2536.—7 miles N.N.E. of Bowen, Queensland; 16 fathoms.

E.6637-8.—7 miles N.N.E. of Bowen, Queensland; 16 fathoms.

This species has sometimes been united with *P. belcheri*, Bennett, from West Africa, but an examination of specimens from both localities shows that the two are distinct. The principal differences are as follows:

I. Depth of body 2¾ to 2⅔ in the length, length of head 3⅜ to 3⅝; lower jaw 3⅔ to 4¼ in length of body; 24 to 28 scales in a transverse series between lateral line and middle of back, 34 to 38 round caudal peduncle; caudal fin without dark spots ..... 1. *erumei*

II. Depth of body 2½ to 2⅝ in the length, length of head 3⅜ to 3½; lower jaw 4½ to 5 in length of body; 21 to 22 scales in a transverse series between lateral line and middle of back, 29 to 30 round caudal peduncle; caudal fin with vertical rows of large dark spots ..... 2. *belcheri*

Family II. BOTHIDÆ.

Synopsis of Australian Genera.

I. Pelvic fins equal, short-based. (*Paralichthinæ*). Pelvic fins subsymmetrical; mouth moderate or large; teeth uniserial; eyes separated by a ridge ..... 1. PSEUDORHOMBUS

II. Left pelvic fin median, with base much longer than that of right. (*Bothinæ.*)

A. Lateral line not developed on blind side of body.

1. Eyes separated by a bony ridge or a concave space of moderate width; interorbital region similar in both sexes; gill-opening extending upwards to or nearly to commencement of lateral line; rostral spines generally absent, but if developed they are present in both sexes.

a. Rostral spines absent; anterior rays of dorsal fin sometimes moderately prolonged in the males .... 2. ARNOGLOSSUS

b. Rostral spines present; anterior rays of dorsal fin prolonged in both sexes, filamentous in the males ..... 3. LOPHONECTES

2. Interorbital region concave, generally very broad in the males; gill-opening extending upwards to commencement of lateral line; rostral and ocular spines developed only in the males; scales large .... 4. ENGYPROSOPON

3. Interorbital region concave, generally very broad in the males; gill-opening ending a short distance above pectoral fin; membrane connecting operculum with shoulder scaleless; rostral and ocular spines developed only in the males; scales small ..... 5. BOTHUS

B. Lateral line developed on both sides of body; interorbital region rather narrow, concave, similar in both sexes; gill-opening ending midway between pectoral fin and lateral line; scales small ..... 6. GRAMMATOBOTHUS

I have been unable to identify *Neorhombus unicolor*, Castelnau [Researches Fish. Austral., p. 45 (1875)] from Fremantle, a genus and species which has not been recognised since first described. This may be a species of *Pseudorhombus*.

Revision of the Australian Species of *Pseudorhombus*.

1. PSEUDORHOMBUS.

Pseudorhombus, Bleeker, C. R. Akad. Sci. Amsterdam, XIII, 1862, p. 5; Günther, Cat. Fish., IV, p. 423 (1862).

Eyes on the left side, separated by a ridge. Mouth moderate or rather large; teeth in jaws conical, pointed, uniserial; palate toothless. Dorsal fin originating in front of or above anterior part of upper eye, the rays nearly all simple and more or less scaly on both sides.

Anal fin similar to dorsal. Pectoral fin of ocular side more strongly developed than that of blind side. Scales small or of moderate size, ctenoid or cycloid. Lateral line developed on both sides of body, with a strong curve anteriorly.

Several species from the Indo-Pacific; nine known from Australia.

Synopsis of Australian Species.

I. Origin of dorsal well in front of both nostrils of blind side; a line connecting base of first dorsal ray with posterior nostril, if continued, passes above hinder end of maxillary; dorsal profile of head markedly convex; gill-rakers "palmate" ..... 1. *spinosus*

II. Origin of dorsal behind, above, or a little in front of nostrils of blind side; a line connecting base of first dorsal ray with posterior nostril, if continued, crosses the maxillary; dorsal profile of head straight or notched in front of eyes.

A. Scales of ocular side cycloid; no anterior canine teeth; gill-rakers longer than broad ..... 2. *tenuirastrum*

B. Scales of ocular side ctenoid.

1. Gill-rakers "palmate"; 3 or more double ocelli on body.

a. Depth $2\frac{2}{5}$ to $2\frac{2}{3}$ in the length; maxillary extending almost to below posterior border of eye or beyond, length 2 to $2\frac{1}{4}$ in head; anterior teeth of both jaws forming strong canines, 4 to 8 teeth on blind side of lower jaw ..... 3. *diplospilus*

b. Depth $2^{1}/_{10}$ to $2\frac{2}{5}$ in the length; maxillary extending to below middle of eye or beyond, length $2\frac{1}{3}$ to $2\frac{1}{2}$ in head; anterior teeth of jaws not greatly enlarged, 13 to 22 teeth on blind side of lower jaw ..... 4. *dupliciocellatus*

2. Gill-rakers pointed, longer than broad; no conspicuous double ocelli.

a. Origin of dorsal above or a little in front of nostrils of blind side, and well in advance of eye.

* Anterior teeth of both jaws enlarged and canine-like; 72-79 dorsal rays ..... 5. *arsius*

** Anterior teeth scarcely enlarged; 68-72 dorsal rays ..... 6. *elevatus*

b. Origin of dorsal just behind posterior nostril of blind side, and above or very slightly in advance of anterior part of eye.

* 14-16 gill-rakers on lower part of anterior arch ..... 7. *argus*

** 7-10 gill-rakers on lower part of anterior arch.

† Gill-rakers rather short and stout; 67-75 scales in a longitudinal series .... 8. *multimaculatus*

†† Gill-rakers rather long and slender; 84 scales in a longitudinal series ..... 9. *anomalus*

1. *Pseudorhombus spinosus.*

Pseudorhombus spinosus, McCulloch, Biol. Res. "Endeavour," II, p. 129, pl. XXV (1914).

Depth of body $2\frac{1}{3}$ to $2\frac{1}{2}$ in the length, length of head $3\frac{2}{5}$ to $3\frac{4}{5}$. Dorsal profile of head evenly convex, not notched in front of eyes. Snout longer than eye, diameter of which is $4\frac{1}{2}$ to 5 in length of head; lower eye scarcely in advance of upper, which is separated from upper edge of head by a space equal to $\frac{2}{3}$ its diameter. Maxillary extending to below posterior $\frac{1}{3}$ or $\frac{1}{4}$ of eye, or not quite as far, length about twice in head; lower jaw not projecting, a knob at the symphysis, length $1\frac{2}{3}$ to $1\frac{1}{5}$ in head. Teeth of upper jaw rather small laterally, not close-set, enlarged anteriorly; teeth of lower jaw stronger, a single pair of enlarged teeth anteriorly. Gill-rakers "palmate" (short, broad, the distal margins spinulate); 10 on lower part of anterior arch.[3] Scales of ocular side cycloid or weakly ctenoid, often more or less embedded in the skin; those of blind side cycloid; 78-86 scales in a longitudinal series,[4] 26-30 between lateral line and highest point of dorsal profile. Height of arch of lateral line $2\frac{3}{4}$ to 3 in length of same; a short accessory branch, not reaching base of dorsal fin. Dorsal 72-75 (76); commencing well in front of both nostrils of blind side, and at a distance in front of eye equal to or greater than its diameter; a line connecting base of first ray with posterior nostril, if continued, passes above hinder end of maxillary. Anal 57; tip of first interhæmal spine generally projecting through the skin on median line, below vent and immediately in front of first anal ray. Left pectoral with 10 to 12 rays (7 to 9 branched), base almost horizontal, length $1\frac{2}{5}$ to 2 in head. Caudal with 2/13/2 rays, middle rays longest, $1\frac{1}{5}$ to $1\frac{1}{3}$ in length of head. Length of caudal peduncle $2\frac{1}{3}$ to $2\frac{2}{3}$ in its depth, which is $2\frac{2}{5}$ to $2\frac{2}{3}$ in length of head. Light brownish or greyish, with darker spots and annular markings, and with 3 large conspicuous ocelli arranged thus .:. ; fins generally spotted and blotched with brown.

Hab.—Western Australia; southern Queensland.

Described from 11 specimens, 95 to 245 mm. in total length.

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[3] Counted on blind side of head.

[4] Counted from upper angle of gill-opening across arch of lateral line, and from thence above the straight portion.

E.1958-1960.—(6) 25 miles off Bustard Head Light, Queensland; 20 fathoms.

E.2858.—Platypus Bay, Queensland; 7-9 fathoms.

E.6672-3.—(3) 3-7 miles N.W. of Hervey Bay, Queensland; 9-11 fathoms.

E.2613.—3-7 miles N.W. of Hervey Bay, Queensland; 9-11 fathoms.

2. *Pseudorhombus tenuirastrum.*

[Deep-water Flounder; Slender Flounder.]

Paralichthys tenuirastrum, Waite, Mem. Austral. Mus. IV, 1899, p. 121, pl. XXVIII, text-fig. 10.

Pseudorhombus tenuirastrum, Ogilby, Mem. Queensland Mus., I, 1912, pp. 43, 45; McCulloch, Biol. Res. "Endeavour," II, p. 130 (1914); McCulloch, Austral. Zool., II, 1921, p. 45; Lord, Papers Proc. Roy. Soc. Tasmania (1922), 1923, p. 65.

Depth of body $2\frac{1}{8}$ to $2\frac{1}{3}$ in the length, length of head 4 to $4\frac{1}{2}$. Dorsal profile of head notched in front of eyes. Snout shorter than eye, diameter of which is 4 to $4\frac{1}{2}$ in length of head; upper eye generally a little in advance of lower, and close to upper edge of head. Maxillary extending about to below middle of eye, length $2\frac{3}{4}$ to 3 in head; lower jaw a little projecting, a small knob at the symphysis, length 2 to $2\frac{1}{6}$ in head. Teeth all small, rather close-set, scarcely enlarged anteriorly. Gill-rakers rather slender, 4-6 times as long as broad, their inner edges feebly spinulate; 11-13 on lower part of anterior arch. Scales of both sides of body cycloid, those of the ocular side frequently with a rough or spiny patch well within the hinder margin of the scale; (73) 75-82 scales in a longitudinal series, 27 to 33 between lateral line and highest point of dorsal profile. Height of arch of lateral line $2\frac{1}{3}$ to $2\frac{2}{3}$ in length of same; an accessory branch generally well-developed, reaching base of eighth or ninth ray of dorsal fin. Dorsal (73) 74-80; commencing just behind level of posterior nostril of blind side, and above or a little in front of anterior edge of eye. Anal 58-61 (63); no visible spine. Left pectoral with 11 to 13 rays (6 to 8 branched), base oblique, length $1\frac{1}{2}$ to $1\frac{3}{4}$ in head. Caudal with 2/13/2 rays, middle rays longest, equal to or greater than length of head. Length of caudal peduncle more than twice in its depth, which is about

twice in length of head. Brownish, with a number of darker spots and markings, of which 6 ocelli arranged thus ⁘ and a series of 5 or 6 smaller ones at edges of body are generally most prominent; fins with numerous dark brown spots and markings; the dorsal and anal each with a series of 7 to 9 more prominent spots near basal parts of fins; a pair of dark blotches at base of caudal fin.

Hab.—New South Wales and southern Queensland; Flinders Island, Bass Strait; Tasmania. Common in deeper water.

Described from 25 specimens, 150 to 265 mm. in total length.

I.10946.—25 miles S.E. of Double Island Point, Queensland; 33 fathoms.

I.11069-11071.—(6) Northern New South Wales.

E.1486.—25 miles S.E. of Double Island Point, Queensland; 33 fathoms.

E.1738-1740.—(6) Northern New South Wales.

E.1775-1779.—(10) 8 miles E. of Sandon Bluff, New South Wales; 35-40 fathoms.

E.1588.—Locality unknown.

3. *Pseudorhombus diplospilus*, sp. n.

[Twin-spot Flounder.]

(Fig. 1.)

Pseudorhombus sp., Ogilby, Mem. Queensland Mus., I, 1912, p. 44.

Depth of body $2\frac{2}{5}$ to $2\frac{2}{3}$ in the length, length of head $3\frac{2}{5}$ to $3\frac{3}{5}$. Dorsal profile of head strongly notched in front of eyes. Snout a little longer than eye in adults; diameter of eye $4\frac{1}{2}$ (young) to $5\frac{3}{4}$ in length of head; upper eye a little in advance of lower, and separated from upper edge of head by a space equal to $\frac{1}{3}$ or $\frac{1}{2}$ its diameter. Maxillary extending to below posterior border of eye or beyond in adults, length 2 to $2\frac{1}{4}$ in head; lower jaw prominent but scarcely projecting, a strong knob at the symphysis, length $1\frac{2}{3}$ to $1\frac{3}{4}$ in head. Teeth of upper jaw small and rather close set laterally, one or two pairs of strong canines anteriorly, which are clearly visible when the mouth is closed; lateral teeth of lower

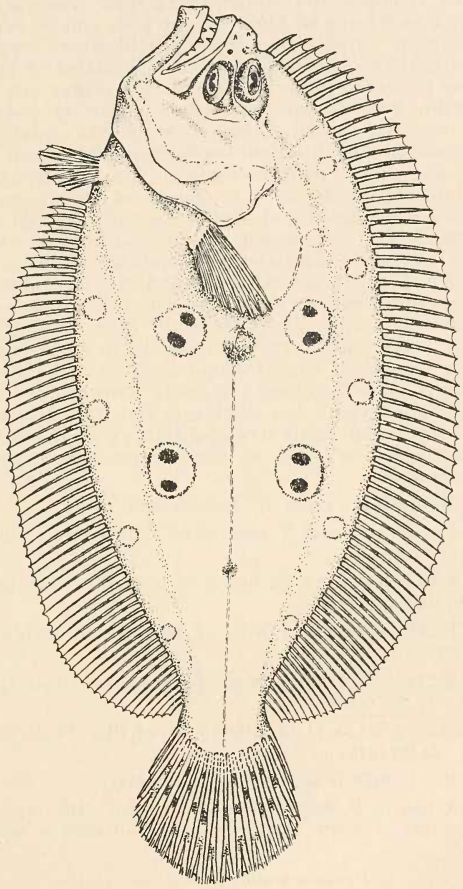

Fig. 1.—*Pseudorhombus diplospilus* sp. nov. Holotype (E. 6678) from 3-7 miles N.W. of Hervey Bay, Queensland. About $\frac{2}{3}$ nat. size. W. P. C. Tenison *del.*

much stronger and wider apart than those of upper jaw, 4 to 8 teeth on blind side of jaw; one or two pairs of strong canines anteriorly. Gill-rakers "palmate" (short, broad, the distal margins spinulate); 8 to 10 on lower part of anterior arch. Scales of ocular side mostly ctenoid, some of those on posterior part of body without marginal spinules; those of blind side cycloid; 92 to 98 scales in a longitudinal series, 29 to 33 between lateral line and highest point of dorsal profile. Height of arch of lateral line $2\frac{2}{3}$ to 3 in length of same; accessory branch reaching base of ninth or tenth ray of dorsal fin. Dorsal 75-79; commencing just behind level of posterior nostril of blind side, and at a distance in front of eye equal to $\frac{1}{4}$ or $\frac{1}{3}$ its diameter. Anal 61-64; no visible spine. Left pectoral with 12 rays (6 to 8 branched), base almost horizontal, length about twice in head. Caudal with 2/13/2 rays, middle rays longest, $1\frac{1}{3}$ to $1\frac{1}{2}$ in length of head. Length of caudal peduncle $2\frac{2}{5}$ to $2\frac{3}{4}$ in its depth, which is $2\frac{1}{2}$ to $2\frac{4}{5}$ in length of head. Brownish, with some faint darker spots and markings, and with 4 large conspicuous double ocelli arranged thus : : ; fins with small brown spots; a series of annular markings on dorsal and anal.

Hab.—East coast of Queensland.

Described from 7 specimens, 122-265 mm. in total length.

E.6677-9.—(3) 3-7 miles N.W. of Hervey Bay, Queensland; 9-11 fathoms.

E.2698.—12 miles N.E. of Bowen, Queensland; 19-25 fathoms.

E.2785.—4-20 miles N.E. of Gloucester Head, Queensland; 19-35 fathoms.

E.2852.—(2) 11-14 miles N.W. of Pine Peak, Queensland; 24-26 fathoms.

No. E.6678 is selected as the holotype.

Allied to *P. dupliciocellatus*, Regan, differing chiefly in the larger mouth, stronger teeth, and smaller scales.

4. *Pseudorhombus dupliciocellatus.*

(Fig. 2.)

Pseudorhombus dupliciocellatus, Regan, Ann. Mag. Nat. Hist., Ser. 7, XV, 1905, p. 25.

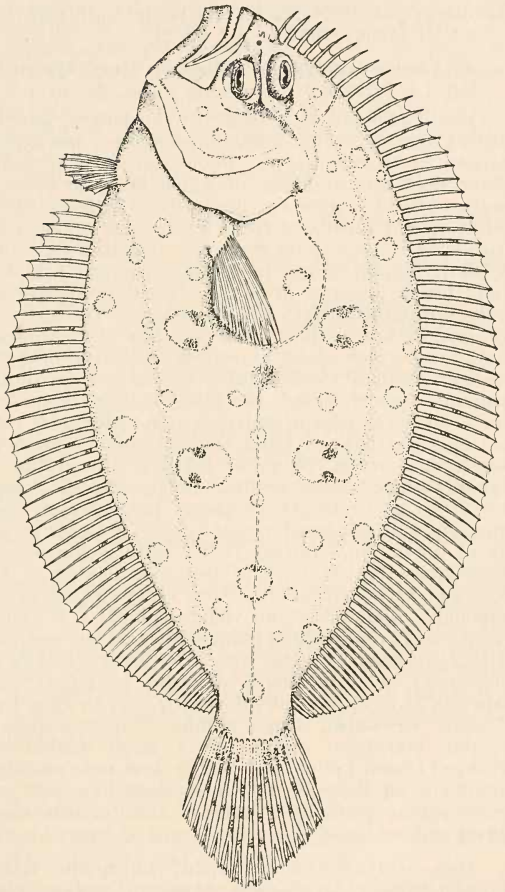

Fig. 2.—*Pseudorhombus dupliciocellatus* Regan. A specimen (E. 1589) from an unknown locality in Australian waters. About $\frac{2}{3}$ nat. size. W. P. C. Tenison *del.*

Platophrys palad, Evermann and Seale, Bull. Bur. Fish., XXVI (1906), 1907, p. 105, fig. 21.

Pseudorhombus cartwrighti, Ogilby, Mem. Queensland Mus., I, 1912, p. 47.

Depth of body $2^{1}/_{10}$ to $2\frac{2}{5}$ in the length, length of head $3\frac{1}{2}$ to 4. Dorsal profile of head more or less strongly notched in front of eyes. Snout equal to or a little longer than eye, diameter of which is $4\frac{1}{2}$ to $6\frac{1}{5}$ in the length of head; upper eye generally a little in advance of lower, and separated from upper edge of head by a space equal to $\frac{1}{3}$ or $\frac{1}{2}$ its diameter. Maxillary extending to below middle of eye or beyond, length $2\frac{1}{3}$ to $2\frac{1}{2}$ in head; lower jaw not projecting, a rather obtuse knob at the symphysis, length $1\frac{5}{6}$ to 2 in head. Teeth of upper jaw small and rather close-set laterally, somewhat larger and wider apart anteriorly; those of lower jaw stronger, 13 to 22 teeth in blind side of jaw. Gill-rakers "palmate" (short, broad, the distal margins spinulate); 8 or 9 on lower part of anterior arch. Scales of ocular side ctenoid, those of blind side cycloid; 78 to 85 in a longitudinal series, 26 to 31 between lateral line and highest point of dorsal profile. Height of arch of lateral line $2\frac{1}{2}$ to $2\frac{3}{4}$ in length of same; an accessory branch generally well developed, reaching base of eighth or ninth ray of dorsal fin. Dorsal 74-78; commencing above or immediately behind level of posterior nostril of blind side, and at a distance in front of eye equal to $\frac{1}{2}$ its diameter. Anal 56-63; no visible spine. Left pectoral with 10 to 12 rays (6 to 8 branched), base oblique, length $1\frac{3}{4}$ to $2\frac{1}{5}$ in head. Caudal with 2/13/2 rays, middle rays longest, $1\frac{1}{3}$ to $1\frac{1}{2}$ in length of head. Length of caudal peduncle $2\frac{1}{2}$ to $2\frac{3}{4}$ in its depth, which is $2\frac{2}{5}$ to $2\frac{3}{5}$ in length of head. Brownish, with a number of darker spots and annular markings, and 3 or 4 large double ocelli arranged thus :: or .:, which are not usually so prominent as those of *P. diplospilus*; fins with small brown spots; generally a series of annular markings on dorsal and anal, and sometimes a pair at base of caudal.

Hab.—Inland Sea of Japan; Philippine Islands; Indo-Australian Archipelago: Australia; east coast of Australia southwards to northern New South Wales.

Described from numerous examples, 150-325 mm. in total length, including the type of the species.

E.1483-4.—25 miles S.E. from Double Island Point, Queensland; 33 fathoms.

E.1587.—Locality unknown.

E.1589-90.—(3) Locality unknown.

E.1720.—Locality unknown.

E.1741-4.—(8) Northern New South Wales.

E.2752.—11-14 miles N.W. of Pine Peak, Queensland; 24-26 fathoms.

E.6650.—11-14 miles N.W. of Pine Peak, Queensland; 24-26 fathoms.

E.6699.—(3) 12 miles N.E. of Bowen, Queensland; 19-25 fathoms.

I.10944-5.—25 miles S.E. from Double Island Point, Queensland; 33 fathoms.

I.10993.—Wide Bay, South Queensland.

I.11005-6.—22 miles S. W. of Double Island Point, Queensland; 29 fathoms.

I.11072-4.—(6) Northern New South Wales.

5. *Pseudorhombus arsius.*

[Large-toothed Flounder.]

Pleuronectes arsius, Hamilton (Buchanan), Fish. Ganges, p. 128 (1822).

Platessa russellii, Gray, Illust. Indian Zool., II, pl. 94, fig. 2 (1833-4).

Pseudorhombus russellii, Günther, Cat. Fish., IV, p. 424 (1862); Macleay, Proc. Linn. Soc. N. S. Wales, II, 1878, p. 362; Castelnau, *Ibid*, III, 1879, p. 391; Klunzinger, Sitzber. K. Ak. Wiss., LXXX, Abt. 1, 1880, p. 406; Macleay, Proc. Linn. Soc. N. S. Wales, VI, 1882, p. 124; Ogilby, Cat. Fish. N. S. Wales, p. 31 (1887); Rendahl, Nyt. Mag. Naturv. Kristiania, LX, 1922, p. 190.

Pseudorhombus arsius, Günther, Cat. Fish., IV, p. 426 (1862); Waite, Rep. Fish. "Thetis," p. 45 (1898); McCulloch, Austral. Zool., II, 1921, p. 45, pl. XIII.

? *Pseudorhombus polyspilus*, Klunzinger, Sitzber. K. Ak. Wiss., LXXX, Abt. 1, 1880, p. 406.

Teratorhombus exeisiceps, Macleay, Proc. Linn. Soc. N. S. Wales, VI, 1882, p. 126.

Pleuronectes mortoniensis, De Vis, Proc. Linn. Soc. N. S. Wales, VII, 1883, p. 370.

Paralichthys arsius, Waite, Mem. Austral. Mus., IV, 1899, p. 120, fig. 8; Stead, Fish. Australia, p. 178 (1906); Stead, Edible Fish. N. S. Wales, p. 103 (1908).

Depth of body $1\frac{7}{8}$ to $2\frac{1}{4}$ in the length, length of head $3\frac{1}{3}$ to $3\frac{3}{4}$. Dorsal profile of head straight or a little notched in front of eyes. Snout much longer than eye in adults; diameter of eye $4\frac{3}{4}$ to $7\frac{2}{3}$ in length of head; upper eye generally slightly in advance of lower, and separated from upper edge of head by a space equal to $\frac{1}{2}$ to $\frac{4}{5}$ its diameter. Maxillary extending to below posterior half of eye or beyond in adults, length $2\frac{1}{6}$ to $2\frac{2}{3}$ in head; lower jaw scarcely projecting, a knob at the symphysis, length $1\frac{3}{4}$ to 2 in head. Teeth of upper jaw small and moderately close-set laterally, two to four pairs of moderate canines anteriorly; lateral teeth of lower jaw much stronger and wider apart than those of upper jaw, one or two pairs of strong canines anteriorly, 6 to 11 on blind side of jaw. Gill-rakers of moderate length or rather short, their inner edges spinulate; 9 to 15 on lower part of anterior arch. Scales of ocular side ctenoid, those of blind side cycloid; 70 to 80 in a longitudinal series, 24 to 30 between lateral line and highest point of dorsal profile. Height of arch of lateral line $2\frac{1}{4}$ to $2\frac{1}{2}$ in length of same; accessory branch reaching base of seventh to twelfth ray of dorsal fin. Dorsal 72-79; commencing above or a little in advance of nostrils of blind side, and at a distance in front of eye equal to $\frac{3}{5}$ or $\frac{4}{5}$ its diameter. Anal 54-62; no visible spine. Left pectoral with 11 to 13 rays (6 to 9 branched), base nearly horizontal, length $1\frac{1}{3}$ to 2 in head. Caudal with 2/13/2 rays, middle rays longest, equal to or longer than length of head. Length of caudal peduncle $2\frac{1}{4}$ to $2\frac{1}{3}$ in the depth, which is $2\frac{1}{6}$ to $2\frac{1}{2}$ in length of head. Brownish, with or without some indistinct dusky spots and annular markings; usually an indefinite dark blotch at the junction of the straight and curved portions of the lateral line, and another on the middle of the straight portion; fins with small brown spots.

Hab.—East Africa to the Pacific; Australia; northwest Australia (Rendahl); Northern Territory; Queensland; New South Wales; South Australia.

Described from numerous examples, 130-325 mm. in total length.

E.2615.—3-7 miles N.W. of Hervey Bay, Queensland, Fairway Buoy; 9-11 fathoms.

E.2867.—(2) 3-7 miles N.W. of Hervey Bay, Queensland, Fairway Buoy; 9-11 fathoms.

E.2616.—Off Point Inskip, Great Sandy Strait, Queensland; 10-12 fathoms.

E.2786.—4-20 miles N.E. of Gloucester Head, Queensland; 19-35 fathoms.

E.6642-5.—4-20 miles N.E. of Gloucester Head, Queensland; 19-35 fathoms.

I.11032.—Mouth of Wide Bay, Queensland.

I.11068.—Northern New South Wales.

Five of the examples of this species obtained by the "Endeavour" (group A in table below) differ from the rest of the Australian specimens which I have studied (group B) in having generally a somewhat larger eye, and fewer and shorter gill-rakers. Examination of typical examples of *P. arsius* from East African and Indian Seas (group C) shows that the number of gill-rakers ranges from 8 to 13, and that the size of the eye is variable, as in most Flatfishes.

The specimens forming group A were taken in somewhat deeper water (19 to 35 fathoms) than those of group B. They do not seem to present sufficient differences to warrant their separation as a distinct species or subspecies, and may be regarded as a race of *P. arsius*.

	Group A. E.6642-5 .... E.2786	Group B. 15 examples	Group C. 20 examples
Diameter of eye in length of head	4¾ to 5½	5¼ to 7½	4¼ to 6⅔
Number of gill-rakers ..	9-10	11-15	8-13

Teratorhombus excisiceps, Macleay, proves to be an abnormal (ambicolorate) example of *Pseudorhombus arsius*. Mr. McCulloch informed me that in this specimen, and in another ambicolorate example preserved

in the Australian Museum, the scales of both sides of the body are ctenoid (see page 279).

Pseudorhombus polyspilus, Bleeker, is closely related to *P. arsius*, but Dr. L. F. de Beaufort informs me that the two species are, in his opinion, distinct.

6. *Pseudorhombus elevatus*.

[Deep Flounder.]
(Fig. 3.)

Pseudorhombus elevatus, Ogilby, Mem. Queensland Mus., I, 1912, p. 45.

Depth of body $1\frac{5}{6}$ to twice in the length, length of head $3\frac{1}{3}$ to $3\frac{2}{5}$. Dorsal profile of head more or less notched in front of eyes. Snout equal to or a little longer than eye, diameter of which is 4 to $4\frac{1}{5}$ in length of head; lower eye very slightly in advance of upper, which is separated from upper edge of head by a space equal to $\frac{1}{3}$ or $\frac{1}{2}$ its diameter. Maxillary extending to below middle of eye or not quite as far, length $2\frac{1}{4}$ to $2\frac{1}{2}$ in head; lower jaw scarcely projecting, a knob at the symphysis, length about $1\frac{1}{5}$ in head. Teeth all very small and rather close-set, scarcely enlarged anteriorly. Gill-rakers slender, about 5 times as long as broad, their inner edges feebly spinulate; 13 to 16 on lower part of anterior arch. Scales of ocular side ctenoid, those of blind side cycloid; 67 to 71 in a longitudinal series, 25 to 28 between lateral line and highest point of dorsal profile. Height of arch of lateral line about $2\frac{1}{2}$ in length of same; accessory branch reaching base of eighth to tenth ray of dorsal fin. Dorsal 68-72; commencing above or a little in front of level of anterior nostril of blind side, and at a distance in front of eye equal to about $\frac{2}{3}$ its diameter. Anal (54) 55-58; end of first interhæmal spine projecting through the skin on the blind side behind vent and above first or second anal ray. Left pectoral with 11 or 12 rays (6 to 8 branched), base oblique, length about $1\frac{1}{2}$ in head. Caudal with 2/13/2 rays, middle rays longest, $1\frac{1}{3}$ in length of head. Length of caudal peduncle $2\frac{1}{2}$ to 3 in its depth, which is $2\frac{2}{3}$ to 3 in length of head. Pale brownish, with an indefinite dark blotch at the junction of the straight and curved portions of the lateral line, and a small dark spot behind middle of straight portion; five series of inconspicuous annular markings; fins with brown spots and markings.

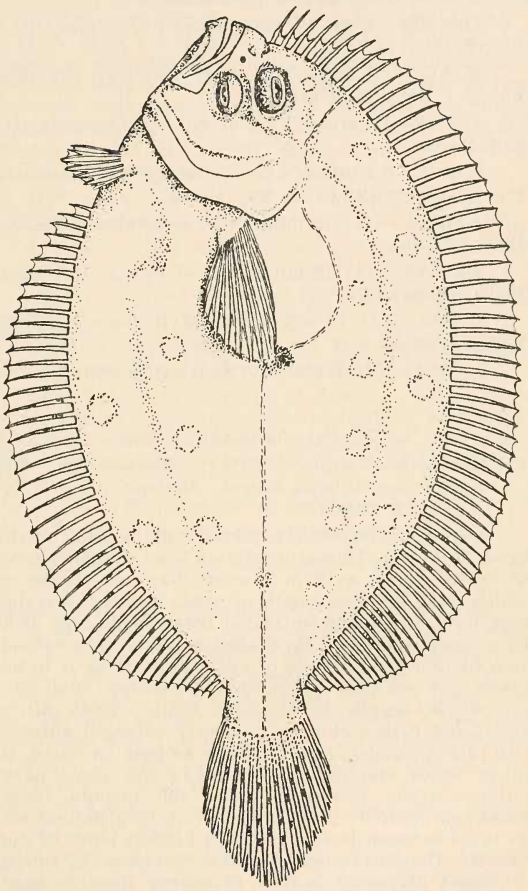

Fig. 3.—*Pseudorhombus elevatus* Ogilby. A specimen (E. 6658) from 12 miles N.E. of Bowen, Queensland. Almost nat. size. W. P. C. Tenison *del.*

Hab.—East coast of Queensland.

Described from 15 specimens, 70-164 mm. in total length.

E.2611.—3-7 miles N.W. of Hervey Bay, Queensland, Fairway Buoy; 9-11 fathoms.

E.2709.—12 miles N.E. of Bowen, Queensland; 19-25 fathoms.

E.6653.—3-7 miles N.W. of Hervey Bay, Queensland, Fairway Buoy; 9-11 fathoms.

E.6654-5.—(4) 12 miles N.E. of Bowen, Queensland; 19-25 fathoms.

E.6658-9.—(4) 12 miles N.E. of Bowen, Queensland; 19-25 fathoms.

E.6662.—(2) 12 miles N.E. of Bowen, Queensland; 19-25 fathoms.

I.10994.—(2) Wide Bay, South Queensland.

7. *Pseudorhombus argus.*

Pseudorhombus argus, Weber, Fische der Siboga Expedition, Siboga Exped., Monogr. 57, p. 425, pl. XI, fig. 6 (1913).

Depth of body about twice in the length, length of head $3\frac{2}{3}$ to $3\frac{5}{6}$. Dorsal profile of head notched in front of eyes. Snout a little shorter than eye, diameter of which is $4\frac{1}{5}$ to $4\frac{1}{2}$ in length of head; anterior margins of eyes level, the upper separated from upper edge of head by a space equal to $\frac{1}{5}$ its diameter. Maxillary extending to a little beyond middle of eye, length $2\frac{1}{3}$ to $2\frac{3}{5}$ in head; lower jaw scarcely projecting, an obtuse knob at the symphysis, length $1\frac{5}{6}$ to 2 in head. Teeth all very small and rather close-set, scarcely enlarged anteriorly. Gill-rakers slender, about 5 times as long as broad, their inner edges spinulate; (12) 14-16 on lower part of anterior arch. Scales of ocular side ctenoid, those of blind side cycloid; (68) 73 to 78 in a longitudinal series, 28 to 33 between lateral line and highest point of dorsal profile. Height of arch of lateral line about $2\frac{1}{4}$ in length of same; accessory branch extending towards base of seventh to ninth ray of dorsal fin. Dorsal 68-69; commencing just behind level of posterior nostril of blind side, and immediately in front of eye or above its anterior

edge. Anal 51-54; no visible spine. Left pectoral with 10 or 11 rays (6 to 8 branched), base oblique, length $1\frac{2}{3}$ to $1\frac{1}{2}$ in head. Caudal with 2/13/2 rays, middle rays longest, about $\frac{4}{5}$ length of head. Caudal peduncle about 3 times as deep as long, depth 2 to $2\frac{1}{5}$ in length of head. Brownish, with darker spots and markings, of which 5 large, conspicuous ocelli arranged thus ⁘ are most prominent; fins with brown spots, a series of annular markings on dorsal and anal fins.

Hab.—Aru Islands; Southern Queensland. Not recorded previously from Australia.

Described from 3 specimens, 160-180 mm. in total length.

E.2610.—3-7 miles N.W. of Hervey Bay, Queensland, Fairway Buoy; 9-11 fathoms.

E.6675-6.—3-7 miles N.W. of Hervey Bay, Queensland, Fairway Buoy; 9-11 fathoms.

This species is close to *P. ocellifer*, Regan, from Japan, and to *P. pentophthalmus*, Günther, from China, differing chiefly in the shorter head, smaller mouth, more posterior origin of dorsal fin, and deeper caudal peduncle.

8. *Pseudorhombus multimaculatus.*

[Small-toothed Flounder.]

Platessa ——?, Jenyns, Zoology "Beagle," III, p. 138, 1842.[5]

Pseudorhombus multimaculatus, Günther, Cat. Fish., IV, p. 427 (1862); Macleay, Proc. Linn. Soc. N. S. Wales, VI, 1882, p. 125; Ogilby, Cat. Fish. N. S. Wales, p. 32 (1887); Ogilby, Edible Fish. Crust. N. S. Wales, p. 157, pl. XXXVIII (1893); Waite, Rep. Fish. "Thetis," p. 46 (1898); McCulloch, Biol. Res. "Endeavour," II, p. 131, pl. XXIV (1914); Austral. Zool., II, 1921, p. 45; Lord, Papers Proc. Roy. Soc. Tasmania, 1922, p. 65.

? *Pseudorhombus moorei*, Thominot, Bull. Soc. Philom., Ser. 7, IV, 1880, p. 175.

Pseudorhombus multiradiatus (*lapsus calami*), Macleay, Proc. Linn. Soc. N. S. Wales, VII, 1883, p. 13.

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[5] I have examined the specimen collected by the "Beagle" in King George's Sound, and described by Jenyns as *Platessa* sp. This is a dried skin, and appears to belong to this species.

Paralichthys novæ-cambriæ, Ogilby, Proc. Linn. Soc. N. S. Wales, XXIII, 1898, p. 296; Waite, Mem. Austral. Mus., IV, 1899, p. 120, fig. 9; Stead, Fish. Australia, p. 179, fig. 65 (1906); Stead, Edible Fish. N. S. Wales, p. 103 (1908).

Pseudorhombus novæ-cambriæ, Ogilby, Proc. Roy. Soc. Queensland, XXI, 1908, p. 25; Mem. Queensland Mus., I, 1912, pp. 43, 45.

Depth of body $1\frac{3}{4}$ to twice in the length, length of head $3\frac{1}{8}$ to 4. Dorsal profile of head generally more or less notched in front of eyes. Snout equal to or a little longer than eye, diameter of which is $4\frac{1}{2}$ to 7 in length of head; upper eye slightly in advance of lower, and separated from upper edge of head by a space equal to $\frac{1}{6}$ or $\frac{1}{5}$ its diameter. Maxillary extending to just beyond middle of eye or as far as its posterior margin, length $2\frac{1}{4}$ to $2\frac{1}{2}$ in head; lower jaw not or scarcely projecting, a very inconspicuous knob at the symphysis, length $1\frac{3}{4}$ to 2 in head. Teeth of upper jaw small and moderately close-set laterally, becoming somewhat larger and wider apart anteriorly; teeth of lower jaw a little stronger; no prominent canines in either jaw. Gill-rakers somewhat variable in form, generally rather short and broad, less than twice as long as broad, their inner edges spinulate; 7 to 9 on lower part of anterior arch. Scales of ocular side ctenoid, those of blind side cycloid; 64 to 74 in a longitudinal series, 26 to 30 between lateral line and highest point of dorsal profile. Height of arch of lateral line $2\frac{1}{2}$ to $2\frac{3}{4}$ in length of same; accessory branch well developed, extending to base of sixth to ninth ray of dorsal fin. Dorsal 67-71; commencing just behind level of posterior nostril of blind side, and above or a little in front of anterior margin of upper eye. Anal 50-56; no visible spine. Left pectoral with 11 or 12 rays (6 to 8 branched), base oblique, length $1\frac{1}{2}$ to $1\frac{2}{3}$ in head. Caudal with 2/13/2 rays, middle rays longest, equal to or a little shorter than head. Caudal peduncle about 3 times as deep as long, depth $1\frac{5}{6}$ to $2\frac{1}{4}$ in length of head. Brownish or greyish, with darker spots, blotches and markings, of which 5 ocelli arranged thus ⁘ are generally most prominent; fins with brown spots, a series of larger and more distinct dark spots on basal parts of dorsal and anal fins.

Hab.—Coasts of Australia, from Fremantle, Western Australia, to Bustard Head, Southern Queensland.[6]

Described from 18 examples, 122-350 mm. in total length, including the types of the species.

E.1979.—20 miles off Bustard Head Light, Queensland; 20 fathoms.

E.2608-9.—3-7 miles N.W. of Hervey Bay, Queensland, Fairway Buoy; 9-11 fathoms.

E.6649.—3-7 miles N.W. of Hervey Bay, Queensland, Fairway Buoy; 9-11 fathoms.

E.6680-1.—3-7 miles N.W. of Hervey Bay, Queensland, Fairway Buoy; 9-11 fathoms.

Pseudorhombus moorei, Thominot, from Melbourne, probably belongs to this species, but has somewhat fewer dorsal and anal rays. Dr. Pellegrin, of the Paris Museum, informs me that unfortunately the type of this species cannot be found.

I have carefully compared a number of examples representing Ogilby's *P. novæ-cambriæ* with the types of *P. multimaculatus*, and consider the two species identical.

9. *Pseudorhombus anomalus.*

[Ocellated Flounder.]

Pseudorhombus anomalus, Ogilby, Mem. Queensland Mus., I, 1912, p. 48.

Very near *P. multimaculatus*. Gill-rakers rather long and slender, mostly smooth; 10 on lower part of anterior arch. 84 scales in a longitudinal series above lateral line. Dorsal 64. Anal 53. Chocolate-brown; body with a number of irregularly disposed oval or round annular markings, variable in size, each containing a more or less central black spot; head with a few black spots, but without annular markings; vertical fins flecked and speckled with black.

Hab.—Moreton Bay, Queensland.

Known only from the type (142 mm.) in the Queensland Museum.[7]

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[6] Two examples from St. Vincent Gulf, South Australia examined by me do not differ in any way from specimens taken on the East Coast of Australia. Steindachner's (Sitzber. K. Ak. Wiss., lvi, Abt. 1, 1867, p. 318) record of this species from Cape York is probably incorrect.

[7] I am indebted to the Director of the Queensland Museum for an illustration of the type specimen.

2. Arnoglossus.

Arnoglossus, Bleeker, Versl. Med. K. Akad. Wet. Amsterdam, XIII, 1862, p. 427.

Anticitharus, Günther, Shore Fishes "Challenger," p. 47 (1880).

Several species from the Eastern Atlantic, Mediterranean, and Indo-Pacific; six known from Australia.

Synopsis of Australian Species.

I. Eyes separated by a ridge.
  A. 48 to 56 scales in a longitudinal series.
    1. About 50 scales in a longitudinal series; eye $3\frac{1}{3}$ to $3\frac{3}{4}$ in head; 6 to 8 gill-rakers; pectoral fin with 12 rays.
      a. Dorsal profile of head arched, distinctly notched in front of eyes; anal with 68 to 74 rays ... 1. *bleekeri*
      b. Dorsal profile of head not greatly arched, slightly notched in front of eyes; anal with 77 to 82 rays ..... 2. *waitei*
    2. 52 to 56 scales in a longitudinal series, eye $4\frac{2}{3}$ to 5 in head; 9 or 10 gill-rakers; pectoral fin with 8 or 9 rays ..... 3. *fisoni*
  B. 70 to 92 scales in a longitudinal series.
    1. 70 to 73 scales in a longitudinal series; dorsal profile of head somewhat notched in front of eyes; dorsal with 90 to 97 rays ..... 4. *muelleri*
    2. 87 to 92 scales in a longitudinal series; dorsal profile of head convex and evenly curved; dorsal with 98 to 99 rays ..... 5. *bassensis*
II. Interorbital region concave, its width $\frac{1}{4}$ or $\frac{1}{3}$ diameter of eye; 43 to 46 scales in a longitudinal series; gill-rakers "palmate" ..... 6. *intermedius*

1. *Arnoglossus bleekeri.*

Arnoglossus bleekeri, Macleay, Proc. Linn. Soc. N. S. Wales, VI, 1882, p. 124; McCulloch and Whitley, Rec. Austral. Mus., XIV, 1925, p. 346, fig. 2.

The following young examples, which are in bad condition, appear to belong to this species.

Depth of body 2 to $2\frac{1}{5}$ in the length, length of head $4\frac{1}{5}$ to $4\frac{1}{2}$. 7 or 8 gill-rakers on lower part of anterior arch. Scales ciliated on ocular side, cycloid on blind side; about 50 in a longitudinal series. Dorsal 90-93. Anal 68-74.

Hab.—East coast of Queensland.

E.6700-2.—(6) 12 miles N.E. of Bowen, Queensland; 19-25 fathoms.

2. *Arnoglossus waitei*, sp. n.

(Fig. 4.)

Depth of body $2\frac{1}{6}$ to $2\frac{1}{3}$ in the length, length of head $4\frac{1}{4}$ to $4\frac{1}{2}$. Dorsal profile of head not greatly arched, a little notched in front of eyes. Snout about equal to eye, diameter of which is $3\frac{1}{3}$ to $3\frac{3}{4}$ in head; lower eye a little in advance of upper, which is close to upper edge of head; eyes separated by a narrow bony ridge. Maxillary extending to below anterior edge of eye, length 3 to $3\frac{1}{5}$ in head; lower jaw a little projecting, an inconspicuous knob at the symphysis, length $2\frac{1}{5}$ in head. Teeth all small, rather close-set, not enlarged anteriorly. Gill-rakers of moderate length, slender, 7 or 8 on lower part of anterior arch. Scales of both sides of body cycloid, about 50 in a longitudinal series. Dorsal 94-103; commencing above anterior nostril of blind side, and well in front of eyes; all the rays simple, more or less scaly, at least on ocular side. Anal 77-82. Left pectoral with 12 simple rays, length $1\frac{1}{3}$ to $1\frac{2}{3}$ in head; right pectoral much smaller. Anterior ray of left pelvic inserted just behind level of posterior margin of lower eye; first ray of right pelvic opposite third or fourth of left. Caudal with 2-3/11-13/2-3 rays, middle rays longest, nearly as long as head. Caudal peduncle very short, depth about twice in length of head. Pale brownish, with traces of darker markings on body; dorsal and anal fins with some blackish spots and blotches; a pair of dark blotches on caudal fin.

Hab.—East coast of Queensland.

Described from four specimens, 90-110 mm. in total length.

E.2853.—(2) 11-14 miles N.W. of Pine Peak, Queensland; 24-26 fathoms.

E.2959.—(2) Great Sandy Strait, 3-7 miles N.W. of Hervey Bay, Queensland; 9-11 fathoms.

No. E.2959 (a) is selected as the holotype.

Near *A. aspilos*, Bleeker, and *A. profundus*, Weber, differing from the former chiefly in the smaller scales and greater number of dorsal and anal rays, and from the latter mainly in the deeper body, shorter head, and deciduous scales.

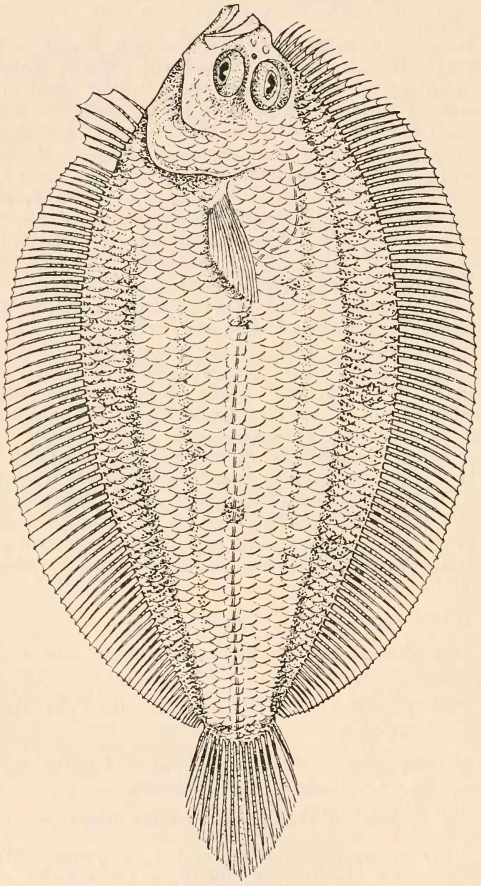

Fig. 4.—*Arnoglossus waitei* sp. nov. Holotype (E. 2959*a*) from Great Sandy Strait, Queensland. $1\frac{3}{5}$ times nat. size. W. P. C. Tenison *del.*

3. *Arnoglossus fisoni.*

(Fig. 5.)

Arnoglossus fisoni, Ogilby, Proc. Linn. Soc. N. S. Wales, XXIII, 1898, p. 295.

Depth of body $1\frac{7}{8}$ to $2^{1}/_{10}$ in length, length of head 4 to $4\frac{1}{3}$. Dorsal profile of head notched in front of eyes. Snout a little longer than eye, diameter of which is $4\frac{2}{3}$ to 5 in length of head; lower eye very little in advance of upper, which is separated from upper edge of head by a space equal to $\frac{2}{3}$ or $\frac{3}{4}$ its diameter; eyes separated by a low narrow bony ridge. Maxillary extending to below anterior edge of eye, length $2\frac{3}{4}$ to 3 in head; lower jaw scarcely projecting, a small knob at the symphysis, length a little more than twice in head. Teeth all small, moderately close-set, uniserial in both jaws; those of ocular side of lower jaw a little larger and wider apart; no canines. Gill-rakers of moderate length, slender, their inner edges feebly spinulate; 9 or 10 on lower part of anterior arch. Scales of both sides of body cycloid, 52 to 56 in a longitudinal series. Height of arch of lateral line about twice in length of same; no accessory branch. Dorsal 96-101; commencing on blind side of head immediately above anterior nostril, and at a distance in front of eye almost equal to its diameter; all the rays simple, naked. Anal (74) 77-80. Left pectoral with 8 or 9 simple rays, the two upper rays a little produced in the male, length $1\frac{1}{3}$ to $1\frac{1}{2}$ in head; right pectoral smaller. Left pelvic subcontinuous with anal, anterior ray inserted below posterior part of lower eye; first ray of right pelvic opposite fifth of left. Caudal with 3-5/8-12/3-5 rays, middle rays longest, about $\frac{5}{6}$ length of head. Caudal peduncle very short, bases of last dorsal and anal rays almost in contact with upper and lower rays of caudal fin; depth of peduncle 2 to $2\frac{1}{4}$ in length of head. Brownish, with or without some irregular dusky markings; a narrow, yellowish band at upper and lower edges of body, parallel with the profile; fins with small brown spots.

Hab.—Coast of southern Queensland.

Described from four specimens, 115-132 mm. in total length.

E.2859.—11-13 miles N.E. of Boomerang Hill, Frazer Island, Queensland; 25 fathoms.

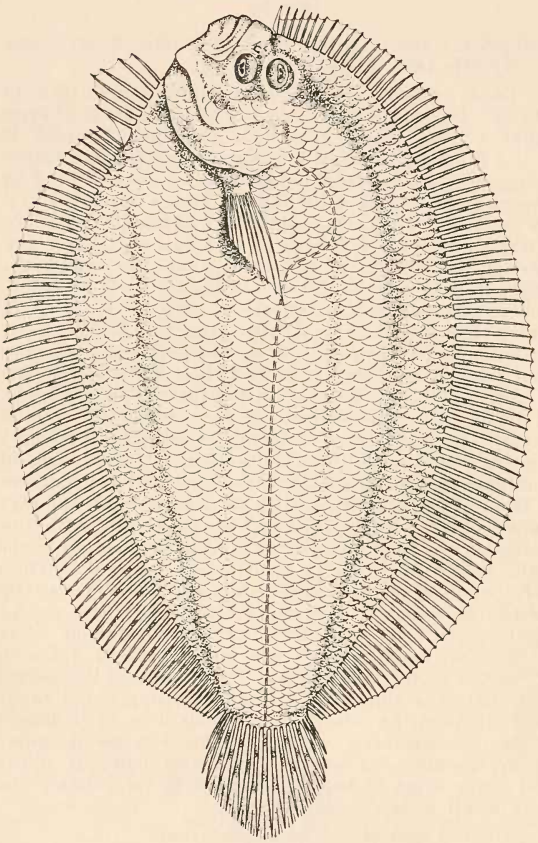

Fig. 5.—*Arnoglossus fisoni* Ogilby. A specimen (E. 6694) from 7-10 miles N.W. of Hummocky Island, Queensland. Slightly enlarged. W. P. C. Tenison *del.*

E.1407.—About 20 miles N. 78° to N. 69° E. of Bustard Head Light, Queensland; 20-21 fathoms.

E.6694.—(2) 7-10 miles N.W. of Hummocky Island, Queensland, 14-16 fathoms.

The specimens described above agree closely with Ogilby's original description of this species, the types of which are apparently lost.

4. *Arnoglossus muelleri.*

Pseudorhombus muelleri, Klunzinger, Archiv. Naturgesch., 1872, p. 40; Sitzber. K. Ak. Wiss., LXXX, Abt. 1, 1880, p. 407, pl. IX, fig. 2; Waite, Mem. Austral. Mus., IV, 1899, p. 123; Rec. Austral. Mus., VI, 1905, p. 73.

Depth of body 2¼ to 2½ in the length, length of head 4 to 4½. Dorsal profile of head somewhat notched in front of eyes. Snout a little longer than eye, diameter of which is 4 to 5 in length of head. Lower eye very little in advance of upper, which is separated from upper edge of head by a space equal to about ⅓ its diameter; eyes separated by a narrow bony ridge. Maxillary extending to below anterior edge or anterior ¼ of eye, length 2⅔ to 3 in head; lower jaw not projecting, an inconspicuous knob at the symphysis, length about twice in head. Teeth rather small and moderately close-set laterally, becoming larger anteriorly; fewer and wider apart on ocular side of lower jaw. Gill-rakers rather short, pointed, their inner edges spinulate; 8 to 10 on lower part of anterior arch. Scales of ocular side weakly ctenoid, those of blind side cycloid; 68 to 73 scales in lateral line. Height of arch of lateral line about 2½ in length of same. Dorsal 90-97; commencing above anterior nostril of blind side, and well in front of eyes; all the rays simple, more or less scaly on ocular side. Anal 72-75. Left pectoral with 10 simple rays, length 1½ to 1¾ in head; right pectoral smaller. Anterior ray of left pelvic inserted behind level of posterior margin of lower eye; first ray of right pelvic opposite fourth of left. Caudal with 2/13/2 rays, middle rays longest, 1¼ in length of head. Caudal peduncle very short, depth 2⅓ to 2½ in length of head. Uniform brownish; all the fins with a number of small brown spots.

Hab.—Southern Australia.

Described from seven specimens, 78 to 180 mm. in total length, including the type of the species.[8]

I.10405.—42 miles S. of St. Francis Island, South Australia; 35 fathoms.

E.989.—42 miles S. of St. Francis Island, South Australia; 35 fathoms.

E.511.—East coast of Flinders Island, Bass Strait.

E.2375.—Great Australian Bight, west from meridian of Eucla; 70-120 fathoms.

E.2325.—(2) Doubtful Island Bay, east from Albany, Western Australia; 20-25 fathoms.

5. *Arnoglossus bassensis*, sp. n.

(Fig. 6.)

Depth of body $2\frac{1}{4}$ to $2\frac{1}{3}$ in the length, length of head $4\frac{1}{5}$ to $4\frac{3}{5}$. Dorsal profile of head evenly curved, scarcely notched in front of eyes. Snout a little longer than eye, diameter of which is 5 to $5\frac{1}{2}$ in head; lower eye a little in advance of upper, which is separated from upper edge of head by a space equal to $\frac{1}{2}$ or $\frac{3}{5}$ its diameter; eyes separated by a low, narrow bony ridge. Maxillary extending to below anterior $\frac{1}{3}$ or $\frac{1}{2}$ of eye, length $2\frac{2}{3}$ to $2\frac{3}{4}$ in head; lower jaw scarcely projecting, an inconspicuous knob at the symphysis, length about twice in head. Teeth uniserial, rather small laterally, becoming larger anteriorly, not close-set, some of those on ocular side of lower jaw movable. Gill-rakers rather short and blunt, their inner edges spinulate; 7 to 9 on lower part of anterior arch. Scales of both sides of body cycloid, 87 to 92 in lateral line. Height of arch of lateral line $2\frac{2}{3}$ to 3 in length of same; no accessory branch. Dorsal 98-99; commencing above or a little in front of anterior nostril of blind side, and well in front of eyes; all the rays simple, more or less scaly on both sides. Anal 77-78. Left pectoral with 10 simple rays, length $1\frac{2}{3}$ to $2\frac{1}{4}$ in head; right pectoral smaller. Anterior ray of left pelvic inserted behind level of posterior margin of lower eye; first ray of right pelvic opposite third of left. Caudal with 2/13/2 rays, middle rays longest, $1\frac{1}{5}$ in head. Caudal peduncle very short, depth nearly $\frac{1}{2}$ length of head.

[8] The type is preserved in the Württembergische Naturaliensammlung, Stuttgart, and I am greatly indebted to Dr. M. Rauther for his kindness in lending me this specimen for examination.

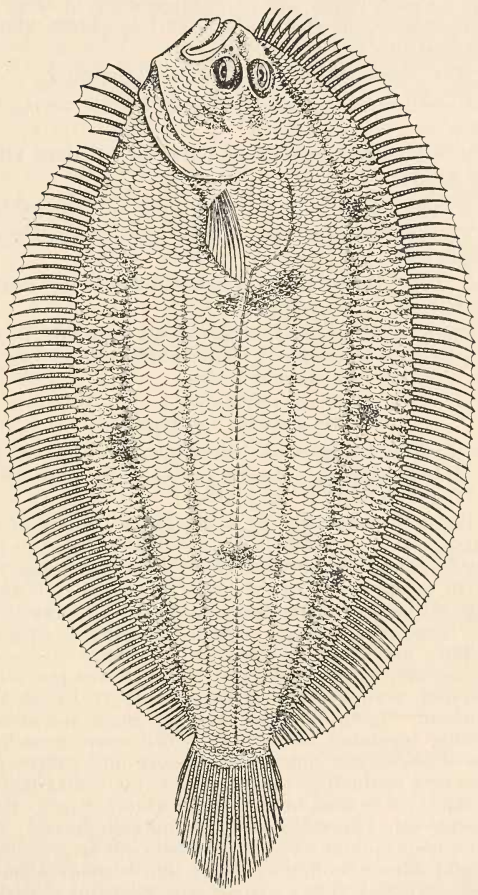

Fig. 6.—*Arnoglossus bassensis* sp. nov. Holotype (E. 389) from the east coast of Flinders Island, Bass Strait. About ⅔ nat. size. W. P. C. Tenison *del.*

Greyish-brown, with some irregular dark blotches and spots on body, of which a pair of large black blotches on lateral line are most prominent.

Hab.—Bass Strait, South-eastern Australia.

Described from two specimens, 190-245 mm. in total length.

E.389.—(Holotype) East coast of Flinders Island, Bass Strait.

E.2196.—North Coast of Tasmania; 25 fathoms.

The following young example may also belong to this species:

E.2420.—Investigator Strait and south of Kangaroo Island.

Close to *A. muelleri*, differing chiefly in the form of the head, the somewhat greater number of dorsal and anal rays, and the smaller scales.

6. *Arnoglossus intermedius.*

Platophrys (*Arnoglossus*) *intermedius*, Bleeker, Ned. Tijdschr. Dierk., III, 1866, p. 47; Atl. Ichth., VI, p. 14, Pleuron. pl. I, fig. 1 (1866).

Depth of body $2\frac{1}{5}$ to $2\frac{2}{5}$ in the length, length of head about $3\frac{1}{2}$. Dorsal profile of head a little notched in front of eyes. Snout longer than eye, diameter of which is $4\frac{1}{2}$ to 5 in head; lower eye a little in advance of upper; width of concave interorbital space $\frac{1}{4}$ to $\frac{1}{3}$ diameter of eye. Generally a small, fleshy tentacle on each eye. Maxillary extending to below anterior edge of eye or a little beyond, length about $2\frac{1}{2}$ in head; lower jaw a little projecting, a slight knob at the symphysis, length $1\frac{3}{4}$ to $1\frac{4}{5}$ in head. Teeth of upper jaw very small and close-set laterally, becoming larger and wider apart anteriorly; those of lower jaw somewhat stronger and wider apart. Gill-rakers "palmate" (short, broad, the distal margins spinulate); 8 or 9 on lower part of anterior arch. Scales of ocular side ciliated, those of blind side cycloid; 43 to 46 in a longitudinal series, 8 or 9 between arch of lateral line and dorsal profile. Lateral line without accessory branch. Dorsal 77-82; commencing above or a little in front of level of anterior nostril of blind side, and well in front of eyes; first ray expanded and somewhat prolonged, remainder all simple. Anal 57-62. Left pectoral

with 9 to 11 simple rays, length about twice in head. Anterior ray of left pelvic inserted below or just behind level of posterior edge of lower eye; first ray of right pelvic opposite space between third and fourth of left. Caudal with 2-3/12-13/2-3 rays, middle rays longest, $\frac{2}{3}$ to $\frac{3}{4}$ length of head. Caudal peduncle very short, depth about $2\frac{2}{5}$ in length of head. Light brownish; a number of dark brown blotches and annular markings on body, of which a series near the upper and lower edges of the body, a pair situated above and below commencement of straight part of lateral line, and another pair on the straight part, are generally most conspicuous; all the fins with numerous dark brown spots; a row of larger blotches on basal parts of dorsal and anal.

Hab.—Seychelle Islands, through the Indian Ocean and Archipelago to Australia; Australia, coast of southern Queensland. Not recorded previously from Australia.

Described from eight specimens, 57-108 mm. in total length.

E.6691-3.—(6) Off Hervey Bay, Queensland.

E.2855.—(2) Off Hervey Bay, Queensland.

3. Lophonectes.

Lophonectes, Günther, Shore Fishes "Challenger," p. 29 (1880).

Two species from Australia and New Zealand; one known from Australia.

1. *Lophonectes gallus.*

[Crested Flounder.]

Lophonectes gallus, Günther, Shore Fishes "Challenger," p. 29, pl. XV, fig. B (1880); Ogilby, Cat. Fish. N. S. Wales, p. 32 (1887); Waite, Rep. Fish. "Thetis," p. 46 (1898); Mem. Austral. Mus., IV, 1899, p. 124; Ogilby, Mem. Queensland Mus., I, 1912, p. 49; McCulloch, Biol. Res. "Endeavour," II, p. 128 (1914); Austral. Zool., II, 1921, p. 45, pl. XIII; Waite, Rec. S. Austral. Mus., II, 1921, p. 156, fig. 256; Lord, Papers Proc. Roy. Soc. Tasmania, 1922, p. 65.

Lœops parviceps (part), Günther, Shore Fishes "Challenger," p. 29 (1880).

Lophorhombus cristatus, Macleay, Proc. Linn. Soc. N. S. Wales, VII, 1883, p. 14; *ibid,* IX, 1884, p. 52.

Hab.—South-eastern Australia, from off the mouth of the Murray River, S. Australia, to southern Queensland; Flinders Island; Tasmania.

E.1787.—(3) 8 miles E. of Sandon Bluffs, N. S. Wales; 35-40 fathoms.

I.11086.—(2) 8 miles E. of Sandon Bluffs, N. S. Wales; 35-40 fathoms.

E.3056-7.—(4) East from Kent group, Bass Strait; 60-80 fathoms.

The bony tubercles on the snout, and that at the symphysis of the lower jaw are developed in both sexes, but are smaller and blunter in the females. In the males the second to fifth or eighth rays of dorsal fin are greatly produced; in the females only the third to fourth or fifth are moderately prolonged. *Arnoglossus mongonuiensis,* Regan, from New Zealand, belongs to this genus. It is very close to the above, but the anterior dorsal rays appear to be longer.

Two specimens taken by the "Challenger" off Twofold Bay, New South Wales, 120 fathoms, and identified by Günther as *Lœops parviceps,* prove to be young examples of this species.

4. Engyprosopon.

Engyprosopon, Günther, Cat. Fish., IV, p. 431 (1862).

Scœops, Jordan and Starks, Bull. U. S. Fish. Comm., XXII (1902), 1904, p. 627.

Several species from the Indo-Pacific; one known from Australia.

1. *Engyprosopon grandisquama.*

Rhombus grandisquama, Schlegel, Fauna Japon., Pisces, p. 183, pl. XCII, figs. 3-4 (1846).

Rhombus pœcilurus, Bleeker, Nat. Tijdschr. Ned. Ind., III, 1852, p. 293.

Platophrys (*Arnoglossus*) *pœcilurus,* Bleeker, Atl. Ichth., VI, p. 14, Pleuron, pl. V, fig. 1 (1866).

Rhomboidichthys spilurus, Günther, Shore Fishes "Challenger," pp. 47, 53, pl. XXI, fig. A (1880).

Rhomboidichthys spiniceps, Macleay, Proc. Linn. Soc. N. S. Wales, VI, 1882, p. 127; Ogilby, Cat. Fish. N. S. Wales, p. 32 (1887).

Scœops grandisquama, Jordan and Starks, Proc. U. S. Nat. Mus., XXXI, 1906, p. 168, fig. 1.

Platophrys spiniceps, McCulloch, Austral. Zool., II, 1921, p. 46.

Engyprosopon (*Scœops*) *grandisquama,* McCulloch and Whitley, Rec. Austral. Mus., XIV, 1925, p. 343, fig. 1.

Depth of body $1\frac{2}{3}$ to twice in the length, length of head $3\frac{3}{5}$ to $4\frac{1}{5}$. Anterior profile of head almost vertical, with a concavity above the snout. Snout shorter than eye, diameter of which is 3 to $3\frac{1}{2}$ in head; anterior edge of upper eye above middle or posterior part of lower; width of interorbital space 1 to $1\frac{3}{4}$ times diameter of eye (♂), or $\frac{2}{3}$ to 1 (♀). Males with a strong spine on snout, a smaller one above anterior part of lower eye, and usually another below front part of upper eye; in the females the rostral spine is small and blunt, the orbital spines absent. Maxillary extending to below anterior edge of eye or a little beyond, length 3 to $3\frac{1}{2}$ in head; lower jaw not projecting, a small knob at the symphysis, length $2\frac{1}{4}$ to $2\frac{1}{2}$ in head. Teeth of upper jaw biserial, an inner row of small closely set teeth, and an outer row of larger ones which are wider apart; a single series of small teeth in lower jaw. Gill-rakers short, 5 or 6 on lower part of anterior arch. Scales of ocular side feebly ciliated, those of blind side cycloid; 39 to 43 in a longitudinal series. Dorsal 82-87; commencing somewhat on blind side of head, and above anterior nostril; all the rays simple. Anal 60-66. Left pectoral with 10 to 12 simple rays, none of which are produced in the males, length equal to or less than that of head; right pectoral much smaller. Anterior ray of left pelvic inserted below lower eye; first ray of right pelvic opposite fourth or fifth of left. Caudal with 3/11/3 rays; rounded. Depth of caudal peduncle about twice in length of head. Brownish; vertical fins generally with some small scattered brown spots; a pair of larger blackish spots situated in the middle of the upper and lower margins of caudal fin.

Hab.—Maldive Islands; Indo-Australian Archipelago; Australia, eastern Queensland and northern New South Wales.

Described from numerous specimens (24 ♂, 16 ♀), 75-140 mm. in total length.

E.1733-6.—(8) Northern New South Wales.

E.2687.—(5) 7-10 miles N.W. of Hummocky Island, Queensland; 14-16 fathoms.

E.2704.—(4) 12 miles N.E. of Bowen, Queensland; 19-25 fathoms.

E.2854.—(7) 20 miles N.N.E. of Double Island Point, Queensland; 29-30 fathoms.

E.2856.—25 miles S.E. of Double Island Point, Queensland; 33 fathoms.

E.2857.—(5) Platypus Bay, Queensland; 7-9 fathoms.

E.2871.—Off Gladstone, Queensland.

E.2861.—No data.

——— .—(7) No data.

Dr. L. F. de Beaufort has kindly compared two of the specimens from Queensland with typical examples of *E. pœcilurus* from the Indo-Australian Archipelago, and informs me that they are identical. I am unable to detect any important differences between this species and *E. grandisquama*, Schlegel, from Japan. Schlegel's figures do not show the characteristic black spots on the caudal fin, but in describing the coloration of the Japanese species he remarks that "les teintes sont en grande partie effacées."

5. Bothus.

Bothus (Rafinesque, 1810), Kyle, Rep. Danish Ocean. Exped., II, A I, p. 94 (1913).

Platophrys, Swainson, Nat. Hist., II, p. 302 (1839).

Rhomboidichthys, Bleeker, Act. Soc. Sci. Ind. Ned., I, 1856, Manado, etc., p. 67.

Several species from the Mediterranean, tropical Atlantic, and Indo-Pacific; one known from Australia.

1. *Bothus pantherinus.*

Rhombus pantherinus, Rüppell, Fische rothen Meers, p. 121, pl. xxxi, fig. 1 (1828).

Platophrys pantherinus, Bleeker, Atl. Ichth., VI, p. 11, Pleuron. pl. II, fig. 3 (1866); Ogilby, Mem. Queensland Mus., II, 1913, p. 90; McCulloch, *ibid*, VII, 1922, p. 244.

Hab.—East Africa to the Pacific; Australia, Darnley Island, Torres Strait (Ogilby); Murray Island, Torres Strait, and near Cape Flattery, North Queensland (McCulloch).

6. Grammatobothus, gen. nov.

Eyes on the left side; interorbital region rather narrow, concave, similar in both sexes. Mouth small; teeth small, pointed, uniserial in both jaws; palate toothless. Gill-membranes united; upper angle of gill-opening midway between pectoral fin and commencement of lateral line; scaling of head and body more or less continuous below lateral line. Dorsal fin commencing in advance of eyes; all the rays simple, scaly. Left pelvic fin median, with rather long base; right lateral, base shorter. Scales small, ciliated on ocular side, cycloid on blind side. Lateral line developed on both sides, with a strong curve anteriorly.

Type.—*Platophrys polyophthalmus*, Bleeker.

Two species known from Australia.

Synopsis of the Species.

I. Depth about $1\frac{2}{3}$ in the length; dorsal with 80-86 rays, second to fifth or sixth rays prolonged, anal with 64-67 rays ..... 1. *polyophthalmus*

II. Depth $1\frac{4}{5}$ to twice in the length; dorsal with 88-91 rays, the third or third and fourth rays prolonged and pinniform; anal with 72-76 rays ..... 2. *pennata*

1. *Grammatobothus polyophthalmus.*

Platophrys polyophthalmus, Bleeker, Ned. Tijdschr. Dierk., III, 1866, p. 46; Atl. Ichth., VI, p. 12, Pleuron. pl. III, fig. 3 (1866); McCulloch, Mem. Queensland Mus., VII, 1922, p. 244.

Rhomboidichthys angustifrons, Günther, Shore Fishes "Challenger," p. 46, pl. XXI, fig. B (1880).

Depth of body about $1\frac{2}{3}$ in the length, length of head $3\frac{1}{2}$ to 4. Dorsal profile of head more or less deeply notched in front of eyes. Snout longer than eye, diameter

of which is $3\frac{1}{2}$ to $3\frac{4}{5}$ in head; lower eye in advance of upper, which is separated from upper edge of head by a space equal to $\frac{3}{5}$ to $\frac{2}{3}$ its diameter; width of interorbital space about $\frac{1}{3}$ diameter of eye. Usually one or two blunt bony knobs in front of lower eye, and two more above the maxillary. Maxillary extending to below anterior edge of eye or a little beyond, length $3\frac{1}{4}$ to $3\frac{1}{3}$ in head; lower jaw not projecting, an inconspicuous knob at the symphysis, length $2\frac{1}{6}$ to $2\frac{1}{4}$ in head. Teeth scarcely enlarged anteriorly. Gill-rakers short, rather stout, 8 or 9 on lower part of anterior arch. 78 to 79 scales in a longitudinal series, 21 to 23 between lateral line and highest point of dorsal profile. A short, bifid accessory branch of lateral line on both sides, not reaching bases of dorsal fin-rays. Dorsal 80-86; commencing on blind side of head immediately above the nostrils; some of the anterior rays (second to fifth or sixth) moderately prolonged. Anal 64-67. Left pectoral with 13 to 15 simple rays, the upper frequently prolonged to below posterior half of dorsal (males?); length without upper ray $1\frac{1}{4}$ to $1\frac{2}{3}$ in head; right pectoral smaller. Anterior ray of left pelvic inserted below middle of lower eye; first ray of right pelvic opposite third of left. Caudal with 2/12-13/2 rays, middle rays longest, almost as long as head. Caudal peduncle very short, depth $2\frac{1}{4}$ to $2\frac{3}{4}$ in length of head. Pale brownish, with 3 large, conspicuous black blotches or ocelli forming a triangle, the two anterior ones above and below the pectoral, the third on the middle of straight portion of lateral line; head and body with a number of smaller and fainter spots and markings arranged in more or less regular series; generally a blackish bar above upper eye; vertical fins with obscure dusky spots and blotches; pectoral fin with broad darker and lighter cross-bands.

Hab.—Indo-Australian Archipelago; Australia, eastern Queensland.

Described from six specimens, 130-140 mm. in total length, including the type of *Rhomboidichthys angustifrons*.

E.2851.—11-14 miles N.W. of Pine Peak, Queensland; 24-26 fathoms.

E.6685-6.—(4) 12 miles N.E. of Bowen, Queensland; 19-25 fathoms.

2. *Grammatobothus pennatus.*

(Fig. 7.)

Platophrys pennata, Ogilby, Mem. Queensland Mus., II, 1913, p. 83.

Closely related to the preceding species, but depth of body $1\frac{4}{5}$ to twice in the length; dorsal profile of head less convex, the notch in front of the eyes less marked; gill-rakers rather more slender, 8 to 10 on lower part of anterior arch; 79 to 83 scales in a longitudinal series; dorsal 88-91; the third ray prolonged, more or less expanded and pinniform; the fourth ray is also prolonged in one or two examples; anal 72-76; upper ray of left pectoral sometimes moderately prolonged; the black blotch on straight portion of lateral line darker and more prominent.

Hab.—Eastern Queensland.

Described from seven specimens, 140-195 mm. in total length.

E.1488.—25 miles S.E. of Double Island Point, Queensland; 33 fathoms.

E.1586.—Locality unknown.

E.2707.—12 miles N.E. of Bowen, Queensland; 19-25 fathoms.

E.6682-4.—12 miles N.E. of Bowen, Queensland; 19-25 fathoms.

I.11004.—22 miles S.W. of Double Island Point, Queensland; 29 fathoms.

Family III. PLEURONECTIDÆ.

Subfamily Samarinæ.

1. *Samaris.*

Samaris, Gray, Zool. Miscell., p. 4 (1831).

1. *Samaris cacatuæ.*

Arnoglossus cacatuæ, Ogilby, New Fish Queensland Coast, p. 130 (1910).

Samaris cacatuæ, McCulloch and Whitley, Rec. Austral. Mus., XIV, 1925, p. 348, pl. XLIX.

Known only from a single example (171 mm.), which was trawled by the "Endeavour" 20 miles N.E. of Gloucester Head, Queensland; 35 fathoms. It is perhaps

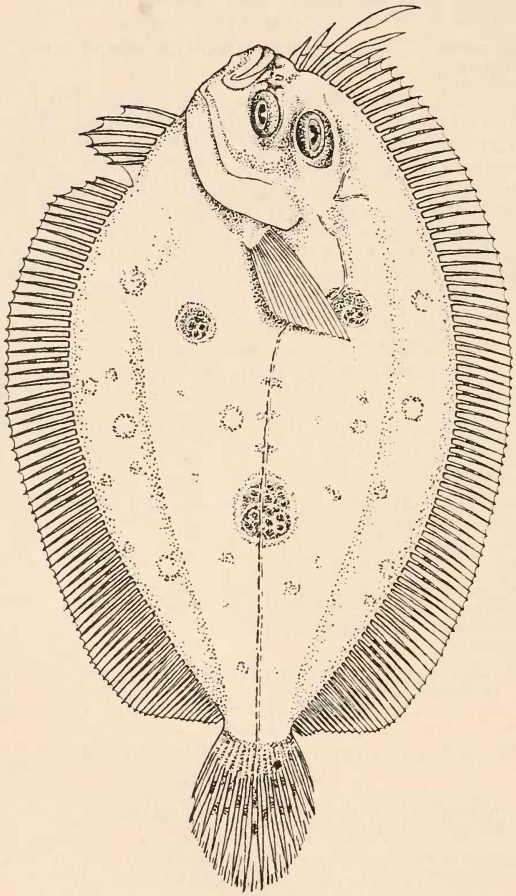

Fig. 7.—*Grammatobothus pennatus* Ogilby. A specimen (I. 11004) from 22 miles S.W. of Double Island Point, Queensland. About ¾ nat. size. W. P. C. Tenison *del.*

identical with *S. cristatus* Gray, but has somewhat fewer scales in a longitudinal series, and a greater number of dorsal and anal rays. In the type of *S. cristatus* (161 mm.) the scales of the blind side are more or less ctenoid, but in *S. cacatuæ* they are described as cycloid.

Revision of the Subfamily Rhombosoleinæ.

Regan's diagnosis of this subfamily (*t.c.*, p. 495), the members of which appear to form a natural and well-marked group, must be modified somewhat to include certain more primitive genera which seem to belong to it. Unfortunately the material at my disposal is insufficient to enable me to investigate the osteological characters of these genera.

In *Pelotretis,* one of the most generalised forms, the anterior end of the dorsal fin is situated immediately behind the nasal organ of the blind side as in the Pleuronectinæ; in *Azygopus* the first ray lies above the posterior nostril; in the remaining genera the fin extends forward on the snout above the nasal organ.

The jaws are almost symmetrical in *Pelotretis* and *Azygopus,* and rather more strongly developed on the ocular side in *Psammodiscus*; in the other genera the mouth is markedly asymmetrical, the jaws on the blind side being strongly curved. The dentition is always more strongly developed on the blind side, and the jaws of the ocular side are devoid of teeth in all the more specialised genera.

The form and position of the nasal organs is of some interest, since this character is considered to be of some importance in the classification of the Heterosomata. In the Pleuronectid subfamilies Pleuronectinæ and Samarinæ, and throughout the family Bothidæ, the nasal organ of the blind side has accompanied or followed the eye in its migration, and is situated nearly on the edge of the head; whereas, in the Soleidæ and Cynoglossidæ the two nasal organs are symmetrical in position. In the subfamily Rhombosoleinæ, we find the left nasal organ nearly on the edge of the head in *Pelotretis,* and somewhat nearer to the edge of the head than is that of the ocular side in *Azygopus* and *Rhombosolea*; but in the remaining genera the nasal organs are almost symmetrical. All those genera with symmetrical nasal organs also agree in possessing comparatively small eyes, and

in this respect resemble the Soleidæ and Cynoglossidæ. The symmetrical position of the nasal organs in these flatfishes appears to be correlated with the size of the eyes, since the migration of a small eye would occasion much less disturbance of the anterior region of the head than would that of a larger eye.

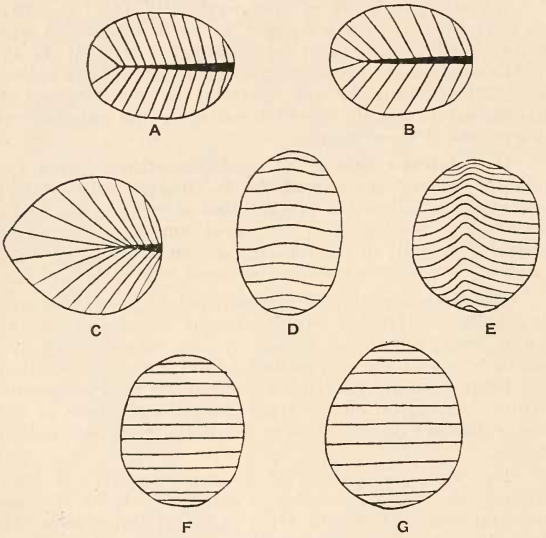

Fig. 8.—Arrangement of olfactory laminæ in nasal organ of:
(A) *Pelotretis flavilatus.* (B) *Azygopus pinnifasciatus.*
(C) *Colistium nudipinnis.* (D) *Ammotretis tudori.*
(E) *Ammotretis rostratus.* (F) *Rhombosolea plebeia.*
(G) *Peltorhamphus novæ-zeelandiæ.*

In the dextral Pleuronectinæ and in the Samarinæ the olfactory laminæ run parallel to one another, and there is no median rachis. This arrangement is quite different from that exhibited by the Paralichthodidæ, the Bothidæ and the Soleoidea, in which the olfactory laminæ are arranged transversely to or radiating from a median rachis. Among the Rhombosoleinæ, *Ammo-*

tretis (Fig. 8 D, 8 E), *Peltorhamphus* (Fig. 8 G), and Rhombosolea (Fig. 8 F), exhibit the typical Pleuronectine arrangement, but in *Psammodiscus*, *Pelotretis* (Fig. 8 A), and *Azygopus* (Fig. 8 B), the laminæ are arranged in pinnate form, with an elongate central rachis. In both the species of *Colistium* the laminæ are arranged in pinnate form, but radiate from a very short rachis (Fig. 8 C); this condition appears to be intermediate between the two types mentioned above.

The conclusion is that the median rachis has been lost within the group Rhombosoleinæ, and that those genera which exhibit the Pleuronectine arrangement are not on that account to be regarded as related to the Pleuronectinæ.

The family Paralichthodidæ was erected by Regan[9] for *Paralichthodes algoensis* from South Africa, which differs from the Bothidæ in having the eyes on the right side, and from the Pleuronectidæ in the arrangement of the olfactory laminæ, which radiate from a median rachis. This character appears to be of less importance than it was thought to be, and perhaps *Paralichthodes* should be included in the subfamily Pleuronectinæ.

The more specialised genera of the subfamily Rhombosoleinæ, i.e. *Ammotretis*, *Peltorhamphus* and *Colistium*, exhibit a certain general resemblance to the members of the family Soleidæ. This resemblance, which is most marked in the last genus, is shown in the general form of the body, the shape of the head, particularly its præorbital part, the small eyes, the symmetrical nasal organs, the strongly curved jaws of the blind side, the absence of teeth in those of the ocular side, and the extension of the dorsal fin to the end of the snout. The development of membraneous folds on the blind side of the vertical fin-rays, the modification of many of the scales on the blind side of the head to form filamentous processes, and the fringed lower lip, are other Soleid features. These Sole-like characters have evidently evolved within the subfamily, and do not indicate relationship to the Soleidæ. The small eyes and barbel-like processes on the head are probably related to nocturnal habits; the shape of the anterior region of the

[9] Ann. Durban Mus., II, 1920, p. 213.

head, and the form of the vertical fin-rays are undoubtedly connected with the habit of burrowing in the sand and mud.

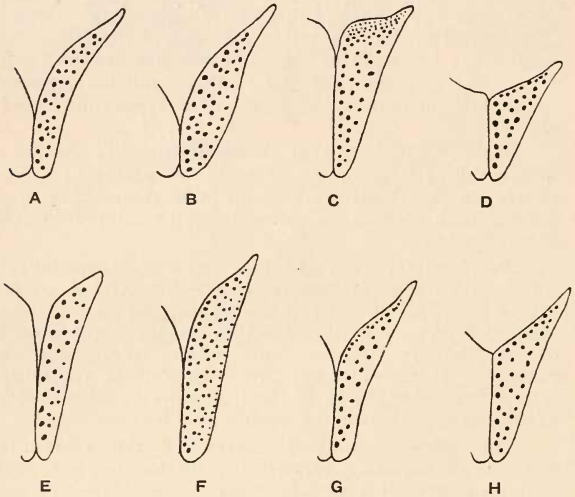

Fig. 9.—Lower pharyngeals of (A) *Pelotretis flavilatus*, (B) *Azygopus pinnifasciatus*, (C) *Ammotretis rostratus*, (D) *Rhombosolea leporina*, (E) *Colistium nudipinnis*, (F) *Peltorhamphus novæ-zealandiæ*, (G) *Rhombosolea plebeia*, (H) *Rhombosolea tapirina*.

Subfamily Rhombosoleinæ.—Eyes on the right side, except in reversed examples. Dorsal fin extending forward on snout above nasal organ of blind side, or beginning behind it; pelvic fins asymmetrical, that of the ocular side median, elongate, extending forward to the urohyal, supported by a cartilaginous plate in advance of the cleithra, that of the blind side, if present, small, short-based. No pectoral radials, the rays inserted on the hypocoracoid; hypocoracoids narrowed forward below. Parapophyses of præcaudal vertebræ not united. Dentition more developed on blind side. Gill-membranes united. Lateral line developed on both sides of body. No pyloric appendages.

Six genera from Australia and New Zealand, and one (*Oncopterus*) from Patagonia. *Psammodiscus* (habitat unknown) also belongs to this subfamily.

Synopsis of the Genera.

I. Two pelvic fins.
  A. Right pelvic free from anal.
    1. Lateral line with a strong curve anteriorly; right pelvic with six rays.
      a. Lateral line with several transverse accessory branches; no anal spine ..... 1. *Oncopterus*
      b. Lateral line with a single accessory branch; anal fin preceded by a spine ..... 2. *Psammodiscus*
    2. Lateral line with a slight curve anteriorly; right pelvic with 10 or 11 rays ..... 3. *Azygopus*
  B. Right pelvic joined to anal.
    1. Dorsal commencing above eyes; snout not produced ..... 4. *Pelotretis*
    2. Dorsal commencing in front of eyes; snout produced into a fleshy hook.
      a. Mouth visible on ocular side; none of the rays of right pectoral produced.
        * Olfactory laminæ parallel, without rachis; dorsal and anal rays scaly, without basal sheath ..... 5. *Ammotretis*
        ** Olfactory laminæ arranged in pinnate form, with short rachis; dorsal and anal rays naked, a low scaly sheath at base on ocular side .. 6. *Colistium*
      b. Mouth not visible on ocular side; upper ray of right pectoral filamentous ..... 7. *Peltorhamphus*
II. One pelvic fin ..... 8. *Rhombosolea*

3. Azygopus, gen. nov.

Eyes narrowly separated, the upper rather close to the dorsal profile. No rostral hook. Nasal organ of blind side nearer median line of head than that of ocular side, and below origin of dorsal fin; olfactory laminæ arranged in pinnate form, with a fairly long median rachis which is parallel to the main axis of the body. Mouth rather small, subsymmetrical; teeth small, movable, pointed, in bands in the jaws; almost entirely confined to blind side. Lower pharyngeals moderately broad, curved, in contact anteriorly, each with three or four irregular series of teeth. Upper angle of gill-opening just above base of pectoral fin; gill-rakers in moderate number, short. Dorsal fin commencing just in front of eyes and above nasal organ of blind side; none of the rays scaly; a low scaly sheath covering basal parts of fin on ocular side. Anal fin similar to dorsal; no

spine. Pectoral fin more developed on ocular side. Two pelvic fins; right with 10 or 11 rays, free from anal; left with 5 or 6 rays. Caudal fin convex; caudal peduncle very short. Scales rather small, imbricated, ctenoid on both sides of body, extending over the dorsal surface of eyeballs. Lateral line with a slight curve anteriorly; no accessory branches. Intestinal tract short.

A single species from southern Australia.

1. *Azygopus pinnifasciatus*, sp. n.

(Fig. 10.)

Depth of body $2\frac{1}{4}$ to $2\frac{3}{5}$ in the length, length of head $4\frac{1}{4}$ to $4\frac{2}{3}$. Dorsal profile of head straight or a little convex. Snout shorter than eye, diameter of which is $3\frac{1}{4}$ to 4 in length of head; anterior margins of eyes level or lower a little in advance, inner margins almost contiguous. Maxillary extending to below anterior $\frac{1}{3}$ or $\frac{1}{2}$ of eye; length of lower jaw of ocular side $2\frac{1}{2}$ to $2\frac{4}{5}$ in head; a small bony knob below the symphysis. Teeth acute, rather close-set; bands in jaws narrowing posteriorly. Lower pharyngeals about 4 times as long as broad, in contact for anterior $\frac{1}{3}$ of their length; teeth cylindrical, with a narrow, pointed terminal cusp. Gill-rakers bluntly conical, 11 or 12 on lower part of anterior arch. Scales of ocular side somewhat more strongly denticulated than those of blind side. 88 to 95 scales in a longitudinal series just above lateral line, 27 to 32 between lateral line and highest point of dorsal profile. Dorsal 104-115; origin almost on median line; first ray entirely free and much longer than those immediately behind it, its length 2 to $2\frac{1}{2}$ in head; rest of fin rather low, rays simple or bifid at their tips. Anal 84-92. Right pectoral with 10 to 11 rays (6 to 8 branched), scaly only at base, length $2\frac{1}{2}$ to 3 in head; left pectoral much shorter. Anterior ray of right pelvic inserted at some distance behind level of maxillary of blind side, none of its rays scaly, the posterior rays twisted a little on to eyed side of median line; first ray of left pelvic opposite sixth or seventh of right. Caudal with 2-3/12-14/2-3 rays; a little rounded or doubly truncate; scales extending on to both sides. Caudal peduncle about 6 times as deep as long, depth 2 to $2\frac{1}{4}$ in length of head. Length of intestinal tract about $\frac{2}{3}$ that of fish; a large coil followed by one or two small loops. Ocular side brownish, with irregular

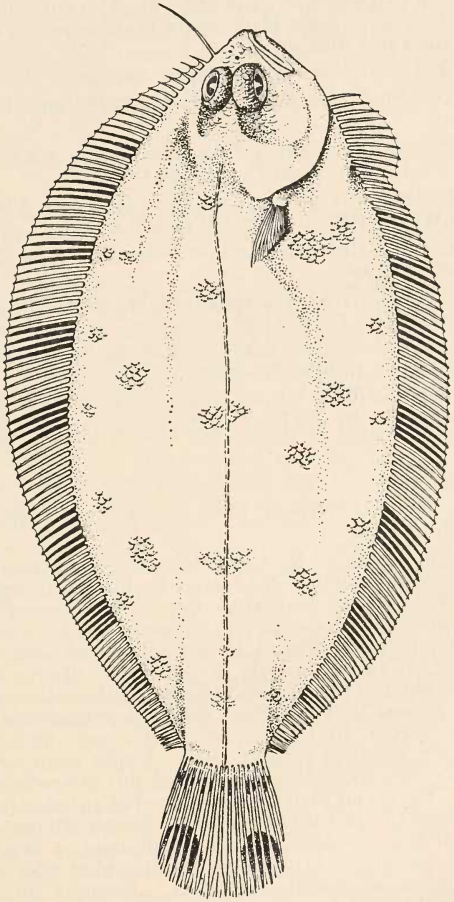

Fig. 10.—*Azygopus pinnifasciatus* sp. nov. Holotype (E. 3600) from the Great Australian Bight. Slightly reduced. W. C. P. Tenison *del.*

blackish patches; a series of short blackish bars on dorsal and anal fins; some black spots or blotches on caudal fin; blind side whitish.

Hab.—Southern Australia, in deep water.

Described from ten specimens, 85-198 mm. in total length.

E.3600.—(Holotype) Great Australian Bight, long. 126° 30′ E., S.W. from Eucla; 100 fathoms.

E.3587.—(2) Great Australian Bight, long. 126° 45½′ E., S.W. from Eucla; 190-320 fathoms.

E.3560.—Great Australian Bight, S. from Eucla; 350-450 fathoms.

E.4293.—Great Australian Bight, long. 127° 8′ E., S. from Eucla; 160-200 fathoms.

E.3007.—Eastern Edge, Bass Strait, from Gabo to Babel Islands; 60-100 fathoms.

E.5508.—(2) S.S.E. of Genoa Peak; 200 fathoms.

E.5509.—(2) S.S.E. of Gabo Island; 176-200 fathoms.

4. Pelotretis.

Pelotretis, Waite, Trans. Proc. New Zealand Inst., 1910, pt. ii, p. 50.

Eyes separated by a low ridge, the upper very close to the dorsal profile. No rostral hook. Nasal organ of blind side almost on median line of head, and just in front of origin of dorsal fin; olfactory laminæ arranged in pinnate form, with a long median rachis which is parallel to the main axis of the body. Mouth small, subsymmetrical; teeth small, movable, pointed, in bands in the jaws of the blind side. Lower pharyngeals narrow, evenly curved, in contact anteriorly, each with three irregular series of conical teeth. Upper angle of gill-opening just above base of pectoral fin; gill-rakers few, short. Dorsal fin commencing at level of anterior part of upper eye and just behind posterior nostril of blind side; most of the rays bifid, scaly on both sides; a low scaly sheath covering basal part of fin on ocular side. Anal fin similar to dorsal; no spine. Pectoral fin more developed on ocular side. Two pelvic fins; right with 7 rays, joined to the anal; left with 5 or 6 rays. Caudal fin convex; caudal peduncle short. Scales moderate,

imbricated, ctenoid on both sides of body; a patch of small scales on dorsal surface of each eyeball. Lateral line with a slight curve anteriorly; no accessory branches. Intestinal tract rather elongate.

A single species from New Zealand.

1. *Pelotretis flavilatus.*

[Lemon Sole.]

Pelotretis flavilatus, Waite, Proc. New Zealand Inst., 1910, pt. ii, p. 50; Rec. Canterbury Mus., I, 1911, p. 212, pl. XLI.

Depth of body $1\frac{3}{4}$ to $2\frac{1}{8}$ in the length, length of head about 5. Dorsal profile of head distinctly concave. Snout shorter than eye, diameter of which is 4 to $4\frac{1}{3}$ in length of head; lower eye a little in advance of upper; interorbital space scaly, its width $2\frac{3}{4}$ to $3\frac{1}{2}$ in diameter of eye; a bony knob in front of lower eye. Maxillary extending to below anterior edge of eye or not quite as far; length of lower jaw of ocular side $2\frac{3}{4}$ to 3 in head; no symphysial knob. Teeth acute, close-set, band in lower jaw a little broader than that in upper. Lower pharyngeals 5 to 6 times as long as broad, in contact for anterior $\frac{1}{3}$ of their length. Gill-rakers conical or with two or three points distally, 7 to 9 on lower part of anterior arch. Scales of ocular side more strongly denticulated than those of blind side, some of which may be quite smooth. 77 to 85 scales in a longitudinal series just above lateral line, 28 to 30 between lateral line and highest point of dorsal profile. Dorsal 83-91; origin a little on blind side of head; none of the rays entirely free; longest rays 2 to $2\frac{1}{4}$ in length of head. Anal 70-75. Right pectoral with 11 to 13 rays (10 to 11 branched), scaly, length $1\frac{2}{3}$ to $1\frac{2}{3}$ in head; left pectoral shorter, scaly only at base. Anterior ray of right pelvic inserted just behind level of maxillary of blind side, all rays scaly, at least on ocular side; first ray of left pelvic opposite sixth or seventh of right. Caudal with 2/14/2 rays; rounded; scales extending on to both sides. Caudal peduncle 4 to 6 times as deep as long, depth $1\frac{1}{3}$ to $1\frac{1}{2}$ in length of head. Length of intestinal tract a little more than that of fish; a large coil followed by a series of irregular loops. Ocular side greyish or brownish, sometimes with irregular darker patches; blind side whitish.

Hab.—New Zealand; Chatham Islands.

Described from three specimens, 225-330 mm. in total length.

5. Ammotretis.

Ammotretis, Günther, Cat. Fish., IV, p. 458 (1862).

Eyes separated by a flattish scaly space, the upper at some distance from the dorsal profile. Snout longer than eye and produced into a fleshy hook which hangs freely in front of the mouth. Nasal organs nearly symmetrical, that of the blind side being at some distance from median line of head; olfactory laminæ parallel to one another and to the main axis of the body, no central rachis. Mouth small, very asymmetrical, jaws of blind side strongly curved; lower lip of eyed side fringed; teeth small, movable, acutely pointed, in bands in the jaws of the blind side. Lower pharyngeals moderately broad, expanded posteriorly, more or less in contact for the greater part of their length; teeth pointed, in several irregular series, smaller and more numerous posteriorly. Upper angle of gill-opening just above base of pectoral fin; gill-rakers few or in moderate number, tubercular. Dorsal fin with 69 to 90 rays; commencing at extremity of rostral hook; anterior rays simple, more or less free, their upper edges bluntly serrated distally; remaining rays mostly bifid; nearly all the rays scaly on both sides; no basal sheath. Anal with 47 to 59 rays; similar to dorsal; no spine. Pectoral fins equally developed on both sides of body, or that of ocular side larger. Two pelvic fins; right with 7 to 13 rays, joined to the anal; left with 3 to 6 rays. Caudal fin convex, scales extending on to both sides; caudal peduncle short. Scales moderate or small, imbricated, ctenoid or cycloid; none on the eyeballs. Lateral line rising slightly or with a slight curve anteriorly; a short temporal branch sometimes developed. Intestinal tract moderate or rather elongate.

Five species from southern Australia.

Synopsis of the Species.

I. Right pelvic fin with 7 rays.

A. Pectoral fins subequal, that of left side pointed ..... 1. *rostratus*

B. Left pectoral much shorter than right, rounded; a fleshy tubercle at tip of first ray ..... 2. *brevipinnis*

II. Right pelvic fin with 10 to 13 rays.
  A. Depth of body $1\frac{7}{8}$ to 2 in the length; a fleshy tubercle at tip of first ray of left pectoral.
    1. Maxillary not reaching anterior edge of eye; 78 scales in a longitudinal series ..... 3. *tudori*
    2. Maxillary extending beyond anterior edge of eye; 66 scales in a longitudinal series ..... 4. *macrolepis*
  B. Depth of body $2\frac{3}{5}$ to $2\frac{1}{2}$ in the length; left pectoral normal ..... 5. *elongatus*

1. *Ammotretis rostratus.*

[Long-snouted Flounder.]

Ammotretis rostratus, Günther, Cat. Fish., IV, p. 458 (1862); Steindachner, Sitzber. K. Ak. Wiss., LXXX, Abt. 1, 1880, p. 171; Klunzinger, *t.c.*, p. 407; Macleay, Proc. Linn. Soc. N. S. Wales, VI, 1882, p. 128; Waite, Mem. Austral. Mus., IV, 1899, p. 123; Stead, Edible Fish. N. S. Wales, p. 103, pl. LXX (1908); McCulloch, Biol. Res. "Endeavour," II, 1914, p. 121; Waite, Rec. S. Austral. Mus., II, 1921, p. 158, fig. 259; McCulloch, Austral. Zool., II, 1921, p. 46, pl. XIII; Waite, Fishes S. Austral., p. 182, fig. (1923).

Rhombosolea tapirina (part), Günther, Cat. Fish., IV, p. 459 (1862).

Ammotretis rostratus vel *adspersus*, Kner, Reise "Novara," Zool. I, 5, Fische, p. 286, pl. XIII, fig. 4 (1869).

Rhombosolea bassensis, Castelnau, Proc. Zool. Soc. Victoria, I, 1872, p. 167; Macleay, Proc. Linn. Soc. N. S. Wales, VI, 1882, p. 132.

Solea uncinata, Klunzinger, Sitzber. K. Ak. Wiss., LXXX, Abt. 1, 1880, p. 408.

Ammotretis zonatus, Macleay, Proc. Linn. Soc. N. S. Wales, VII, 1883, p. 367.

Ammotretis macleayi, Ogilby, *ibid*, X, 1886, p. 122.

Ammotretis adspersus, Ogilby, Cat. Fish. N. S. Wales, p. 32 (1887).

Peltorhamphus bassensis, Waite, Rec. Austral. Mus., VI, 1906, p. 198, pl. XXXIV.

Depth of body $1\frac{2}{3}$ to $1\frac{4}{5}$ in the length, length of head $3\frac{1}{2}$ to 4. Rostral hook extending downwards almost to level of posterior end of maxillary of ocular side. Lower eye a little in advance of upper, diameter of which is

more than twice the interorbital width and 5 to 5½ in length of head. Maxillary not reaching anterior edge of eye; length of lower jaw of ocular side 3⅓ to 3½ in head; a few simple tentacles forming a fringe on lower lip of ocular side. Gill-rakers rather large, 10 to 12 on lower part of anterior arch. Scales ctenoid, those of ocular side more strongly denticulated than those of blind side. 78 to 88 scales in a longitudinal series just above lateral line, 34 to 39 between lateral line and highest point of dorsal profile. Lateral line with a slight curve anteriorly; a short accessory branch, not reaching base of dorsal fin. Dorsal (75) 78-86; longest rays 1⅞ to 2 in length of head. Anal (50) 52-56. Right pectoral with 10 to 13 rays (9 to 10 branched), basal part scaly, length 1¾ to 2 in head; left pectoral of equal length or a little shorter, pointed. Right pelvic with 7 rays, extending forward almost to rostral hook, its anterior ray inserted below middle of jaws of blind side, distal parts of anterior rays serrated, posterior rays scaly on ocular side; left pelvic with 3 to 4 (6) rays, the first ray opposite sixth of right pelvic. Caudal with 3/12-13/3 rays; rounded or subtruncate. Caudal peduncle 2½ to 3 times as deep as long, depth 1⅞ to 2⅕ in length of head. Intestinal tract elongate; a large coil followed by a series of irregular loops. Ocular side varying from blackish to light brown, with or without small dark dots; right pectoral sometimes blackish; blind side whitish.

Hab.—Southern Western Australia; South Australia; Victoria; New South Wales, northwards to Port Jackson; Tasmania.

Described from eight specimens, 100-240 mm. in total length, including the type of the species and two of the types of *Rhombosolea tapirina*.

2. *Ammotretis brevipinnis*, sp. n.
(Fig. 11.)

Depth of body twice in the length, length of head 3⅔. Rostral hook extending downwards to level of posterior end of maxillary of ocular side. Lower eye a little in advance of upper, diameter of which is about 5 times interorbital width and 5 in length of head. Maxillary not reaching anterior edge of eye; length of lower jaw of ocular side 3½ in head; a few simple tentacles forming a fringe on lower lip of ocular side. Gill-

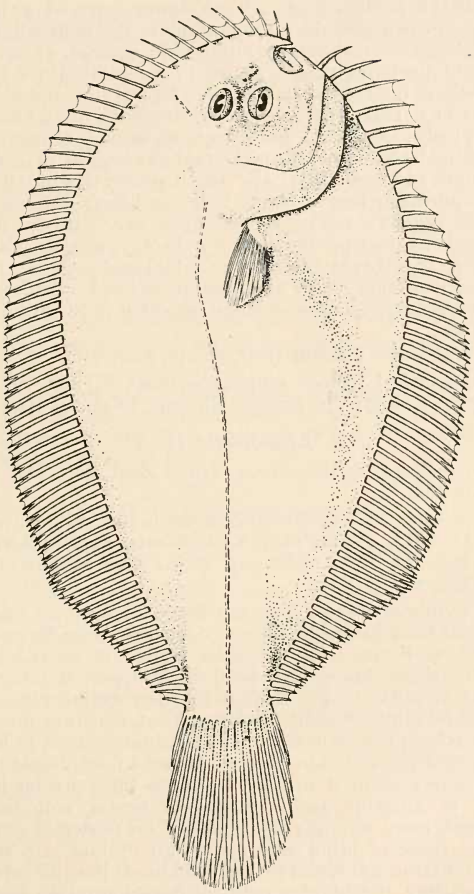

Fig. 11.—*Ammotretis brevipinnis* sp. nov. Holotype, in the collection of the British Museum (Nat. Hist.), from St. Vincent Gulf, South Australia. About 1⅜ nat. size. W. C. P. Tenison *del.*

rakers of moderate size, 9 on lower part of anterior arch. Scales ctenoid on ocular side, the denticulations well-developed; those of blind side cycloid anteriorly, ctenoid posteriorly. 84 scales in a longitudinal series just above lateral line, 30 between lateral line and highest point of dorsal profile. Lateral line with a slight curve anteriorly; a short, indistinct accessory branch, not reaching base of dorsal fin. Dorsal 69; longest rays about $\frac{1}{2}$ length of head. Anal 47. Right pectoral with 10 rays (7 branched), length about twice in head; left pectoral much shorter, rounded, the first ray with a fleshy tubercle at the tip. Pelvic fins as in *A. rostratus*. Caudal with 3/12/3 rays; rounded. Caudal peduncle $3\frac{1}{2}$ times as deep as long, depth $2\frac{1}{3}$ in length of head. Ocular side brownish, with traces of small blackish dots; blind side whitish.

Hab.—St. Vincent Gulf, South Australia.

Described from a single specimen, 87 mm. in total length. Holotype in British Museum (Natural History).

3. *Ammotretis tudori.*

? *Solea liturata*, Richardson, Trans. Zool. Soc., III, 1849, p. 156.

Ammotretis tudori, McCulloch, Biol. Res. "Endeavour," II, 1914, p. 124, pl. XXVI; Waite, Rec. S. Austral. Mus., II, 1921, p. 159, fig. 261; Fishes S. Austral., p. 183, fig. (1923).

Depth of body $1\frac{1}{4}$ in the length, length of head 4. Rostral hook rather broad and flattened, extending downwards to below level of posterior end of maxillary of ocular side. Lower eye level with upper, diameter of which is a little more than twice interorbital width and $6\frac{1}{2}$ in length of head. Maxillary not reaching anterior edge of eye; length of lower jaw of ocular side $3\frac{2}{3}$ in head; a row of fringed tentacles on lower lip of ocular side. Gill-rakers reduced to 2 or 3 minute tubercles on lower part of anterior arch. Scales of ocular side mostly ctenoid, more strongly denticulated on posterior part of body; those of blind side nearly all cycloid. 78 scales in a longitudinal series just above lateral line, 33 between lateral line and highest point of dorsal profile. Lateral line rising slightly anteriorly; a short accessory branch reaching base of twelfth fin ray of dorsal. Dorsal 77 (82); longest rays about $\frac{1}{2}$ length of head. Anal 54 (58).

Right pectoral with (10) 11 rays (7 branched), not scaly, length twice in head; left pectoral much shorter, rounded, the first ray with a fleshy tubercle at the tip. Right pelvic with 10 rays, extending forward to meet tip of rostral hook, its anterior ray inserted below anterior part of jaws of blind side, distal parts of anterior rays serrated, posterior rays scaly on ocular side; left pelvic with 6 rays, the first ray opposite ninth of right pelvic. Caudal with 3/12/3 rays; rounded. Caudal peduncle about 3 times as deep as long, depth twice in head. Intestinal tract of moderate length; a large coil followed by some small, irregular loops. Ocular side greyish-brown, with a number of small black spots on head, body, and fins; blind side whitish.

Hab.—South Australia; Victoria; Tasmania.

Described from a single specimen, 180 mm. in total length.

Reference to Richardson's description of *Solea liturata* leaves little doubt that this is an *Ammotretis*, and, judging from the number of rays in the pelvic fins, is probably this species.

4. *Ammotretis macrolepis.*

Ammotretis macrolepis, McCulloch, Biol. Res. "Endeavour," II, 1914, p. 125, fig. 9.

Perhaps not distinct from *A. tudori*. Maxillary extending beyond anterior edge of lower eye; a few small tubercles on lower lip of ocular side. Scales ctenoid; those of ocular side more strongly denticulated than those of blind side. 66 scales along the lateral line, 24 between lateral line and highest point of dorsal profile. Dorsal 90. Anal 59. Right pelvic with 12 rays, left with 5. Ocular side pinkish, with numerous dark grey ocelli on head and body; fins dotted with dark grey.

Total length 98 mm.

Hab.—Flinders Island, Bass Strait.

5. *Ammotretis elongatus.*

Ammotretis elongatus, McCulloch, Biol. Res. "Endeavour," II, 1914, p. 123, pl. XXVII; Waite, Rec. S. Austral. Mus., II, 1921, p. 159, fig. 260; Fishes S. Australia, p. 183, fig. (1923).

Depth of body $2\frac{1}{3}$ to $2\frac{1}{2}$ in the length, length of head 4 to $4\frac{2}{3}$. Rostral hook not extending downwards as far as level of posterior end of maxillary of ocular side. Lower eye a little in advance of upper, diameter of which is about 4 times interorbital width and $4\frac{1}{4}$ to 5 in length of head. Maxillary not reaching anterior edge of eye; length of lower jaw of ocular side $3\frac{1}{3}$ to $3\frac{1}{2}$ in head; a few simple tentacles forming a fringe on lower lip of ocular side. Teeth much smaller than in *A. rostratus* or *A. tudori*. Gill-rakers rather small, about 10 on lower part of anterior arch. Scales of ocular side ctenoid or cycloid, denticulations, when present, large, but few in number; scales of blind side nearly all ctenoid, denticulations weaker than those of ocular side; 88 to 92 scales in a longitudinal series just above lateral line, 33 to 39 between lateral line and highest point of dorsal profile. Lateral line with a slight curve anteriorly; no accessory branch. Dorsal 74-75; longest rays about $1\frac{3}{4}$ in length of head. Anal 50-51. Right pectoral with 8 to 10 rays (5 to 8 branched), equal to that of left side and $1\frac{3}{4}$ to 2 in length of head. Right pelvic with 13 rays, extending forward to meet tip of rostral hook, its anterior ray inserted below anterior part of jaws of blind side, posterior rays scaly on ocular side; left pelvic with 3 to 4 rays, the first ray opposite space between eleventh and twelfth of right pelvic. Caudal with 3/12/3 rays; rounded. Caudal peduncle very short, the last rays of the dorsal and anal fins being almost contiguous with bases of outer caudal rays; depth $1\frac{1}{2}$ to $1\frac{2}{3}$ in head. Ocular side light brownish, with minute black dots scattered over head, body, and fins; blind side whitish.

Hab.—South Australia.

Described from three specimens, 90-125 mm. in total length.

6. Colistium, gen. nov.

Close to *Ammotretis*, but olfactory laminæ arranged in pinnate form, radiating from a very short median rachis. Gill-rakers numerous, small and rather stout. Rays of dorsal and anal fins naked; a scaly sheath covering basal parts of fin on ocular side.

Two species from New Zealand.

Synopsis of the Species.

I. Rostral hook long, extending downwards below level of posterior end of maxillary of ocular side; right pelvic with 7 rays ..... 1. *nudipinnis*

II. Rostral hook short, not reaching level of posterior end of maxillary of ocular side; right pelvic with 10 to 11 rays ..... 2. *guntheri*

1. *Colistium nudipinnis.*

[Turbot.]

Ammotretis rostratus (non Günther), Hutton, Trans. Proc. N. Zealand Inst., VIII, 1876, p. 215.

Ammotretis nudipinnis, Waite, Trans. Proc. N. Zealand Inst., 1910, pt. ii, p. 50; Rec. Canterbury Mus., I, 1911, p. 209, pl. XXXIX.

Depth of body nearly twice in the length, length of head $3\frac{3}{4}$. Rostral hook long, extending downwards below level of posterior end of maxillary of ocular side. Lower eye level with upper, diameter of which is less than interorbital width and $11\frac{1}{2}$ in length of head; interorbital space more or less scaly anteriorly and posteriorly, naked in the middle. Maxillary not reaching anterior edge of eye; length of lower jaw of ocular side about $3\frac{1}{2}$ in head; about 12 broad tentacles forming a fringe on lower lip of ocular side. Band of teeth in lower jaw about 3 times as long as broad, that in upper jaw about 7 times. Lower pharyngeals rather narrow, scarcely expanded posteriorly, about 4 times as long as broad, more or less in contact for anterior $\frac{1}{2}$ of their length; teeth narrow, pointed, mostly curved, those on outer edges somewhat smaller than the remainder. 32 gill-rakers on lower part of anterior arch. Scales of ocular side ctenoid, the denticulations strongly developed; those of blind side cycloid; most of the scales on blind side of head forming membranous processes. 85 scales in a longitudinal series just above lateral line, 34 between lateral line and highest point of dorsal profile. Lateral line with a slight curve anteriorly; a short accessory branch reaching base of twelfth dorsal ray. Dorsal 80 (85); free parts of anterior rays not serrated; longest rays $2\frac{1}{2}$ in length of head; well developed membranous folds, with their free edges directed posteriorly, on blind side of all rays, the folds on anterior rays short, and with projecting processes. Anal 58 (60); similar to

dorsal. Right pectoral with (11) 12 rays (9 branched), not scaly, length $2\frac{1}{3}$ in head; left pectoral a little shorter. Right pelvic with 7 rays, the first inserted below middle of jaws of blind side; left pelvic with 4 rays, the first behind last ray of right pelvic. Caudal with 3/12/3 rays; rounded. Caudal peduncle much deeper than long, depth $2\frac{1}{4}$ in length of head. Length of intestinal tract $1\frac{1}{6}$ times length of fish; a large coil followed by 3 or 4 large loops. Ocular side greyish, with traces of some irregular darker blotches; an indistinct dark spot edged with lighter below and a little behind pectoral fin; blind side whitish, head, body and fins irregularly blotched and spotted with grey.

Hab.—New Zealand.

Described from a single specimen, 460 mm. in total length.

2. *Colistium guntheri.*

[Brill.]

Ammotretis guntheri, Hutton, Trans. Proc. N. Zealand Inst., V, 1873, p. 267, pl. XI, fig. 82a; Waite, Rec. Canterbury Mus., I, 1911, p. 211, pl. XL.

Depth of body $1\frac{4}{5}$ to $2\frac{1}{5}$ in the length, length of head $5\frac{1}{6}$ to $5\frac{1}{3}$. Rostral hook short, not extending downwards to level of posterior end of maxillary of ocular side. Lower eye a little in advance of upper, diameter of which is about twice interorbital width and $8\frac{1}{3}$ to $9\frac{1}{4}$ in length of head; interorbital space almost entirely scaly. Maxillary not reaching anterior edge of eye; length of lower jaw of ocular side $3\frac{1}{6}$ in head; 10 to 13 broad tentacles forming a fringe on lower lip of ocular side. Band of teeth in lower jaw $2\frac{1}{3}$ times as long as broad, that in upper jaw about 4 times. Lower pharyngeals as in *C. nudipinnis*. 38 to 41 gill-rakers on lower part of anterior arch. Scales of ocular side ctenoid, the denticulations strongly developed; those of blind side cycloid; some of the scales on blind side of head forming membranous processes. 84 to 89 scales in a longitudinal series just above lateral line, 28 to 31 between lateral line and highest point of dorsal profile. Lateral line with a slight curve anteriorly; accessory branch feebly developed or absent. Dorsal 90-92; free parts of anterior rays not serrated, longest rays $2\frac{1}{6}$ in length of head; membranous folds on blind side of rays well developed,

those of anterior rays short and with projecting processes with irregular or crenulated edges. Anal 66-69; similar to dorsal. Right pectoral with (11) 12 rays (10 branched), not scaly, length $1\frac{2}{3}$ to $1\frac{3}{4}$ in head; left pectoral shorter. Right pelvic with 10 or 11 rays, the first inserted below anterior part of jaws of blind side; left pelvic with 4 or 5 rays, the first opposite last ray of right pelvic. Caudal with 2-3/12-14/2-3 rays; rounded. Caudal peduncle much deeper than long, depth $1\frac{3}{5}$ to $1\frac{2}{3}$ in length of head. Length of intestinal tract nearly twice that of fish; a large coil followed by a series of small irregular loops. Ocular side greyish, with numerous blackish spots, which are arranged in irregular groups or form broken longitudinal bands; distal parts of dorsal and anal fins blackish, with a narrow light margin; blind side whitish.

Hab.—New Zealand.

Described from 2 specimens, 335-390 mm. in total length.

7. Peltorhamphus.

Peltorhamphus, Günther, Cat. Fish., IV, p. 460 (1862).

Close to *Ammotretis* and *Colistium.* Rostral hook somewhat flattened and connected with the head by a membranous flap, which almost or quite conceals the mouth on the ocular side. Nasal organs nearly symmetrical; olfactory laminæ parallel to one another and to the main axis of the body; no central rachis. Lower lip of ocular side not fringed. Teeth slender, pointed, in 3 or 4 series in blind side of each jaw. Lower pharyngeals rather narrow, scarcely expanded posteriorly, in contact anteriorly, each with several series of pointed teeth. Gill-rakers in moderate number, small, conical. Dorsal with 94 to 104 rays; the anterior rays partly free but not serrated, remainder bifid and naked; a low scaly sheath covering basal parts of fin on eyed side. Anal with 60 to 70 rays; similar to dorsal; no spine. Second upper ray of right pectoral prolonged into a filament. Right pelvic with 6 rays, left with 4 or 5 rays. Caudal peduncle very short. Scales of ocular side ctenoid, those of blind side ctenoid or cycloid. Lateral line with a slight curve anteriorly; no accessory branches. Intestinal tract elongate.

A single species from New Zealand.

1. *Peltorhamphus novæ-zeelandiæ.*

[Sole.]

Peltorhamphus novæ-zeelandiæ, Günther, Cat. Fish., IV, p. 461 (1862); Hutton, Cat. Fish. N. Zealand, p. 52; Hector, *t.c.* p. 117, pl. IX (1872); Waite, Rec. Canterbury Mus., I, 1911, p. 213, pl. XLII.

Depth of body 2 to $2\frac{1}{2}$ in the length, length of head $3\frac{1}{2}$ to $4\frac{1}{3}$. Rostral hook extending downwards well beyond level of posterior end of maxillary of ocular side. Lower eye level with upper, diameter of which is equal to or greater than interorbital width and 5 to 8 in length of head; interorbital space flat, scaly. Outer series of teeth in both jaws a little enlarged. Lower pharyngeals nearly 5 times as long as broad, in contact for anterior $\frac{1}{2}$ of their length; teeth of inner series enlarged. 8 to 15 gill-rakers on lower part of anterior arch. Scales of blind side nearly all cycloid in adults, ctenoid on both sides of body in young; 75 to 85 in a longitudinal series just above lateral line, 25 to 34 between lateral line and highest point of dorsal profile. Lateral line opening by a series of large pores on blind side of head. Dorsal 94-104; longest rays $2\frac{1}{2}$ to $2\frac{2}{3}$ in length of head; membranous folds on blind side of rays moderately developed. Anal 60-70. Right pectoral with 10 or 11 rays (5 to 7 branched), scaly, length of second upper ray $\frac{1}{2}$ to $\frac{2}{3}$ depth of body; left pectoral smaller, naked, none of the rays produced. Anterior ray of right pelvic inserted below front part of jaws of blind side, and immediately behind tip of rostral hook; first ray of left pelvic behind last ray of right. Caudal with 2-3/10-12/2-3 rays; rounded. Caudal peduncle very short, depth $2\frac{2}{5}$ to $2\frac{2}{3}$ in length of head. Length of intestinal tract more than $1\frac{1}{2}$ times that of fish; a large coil followed by a series of irregular coils and loops. Young examples with the ocular side brownish, often marbled with darker brown and dotted with black; two black blotches frequently present on lateral line; some of the dorsal and anal rays blackish; these markings tend to disappear in the adults which are more or less uniformly dark or light brownish; blind side whitish.

Hab.—New Zealand; Norfolk Island; Chatham Islands.

Described from nineteen specimens, 65-445 mm. in total length, including the types of the species. A skeleton has 36 (9 + 27) vertebræ.

8. Rhombosolea.

Rhombosolea, Günther, Cat. Fish., IV, p. 458 (1862).

Bowenia, Haast, Trans. Proc. N. Zealand Inst., V, 1873, p. 277.

Apsetta, Kyle, Proc. Zool. Soc., 1900, p. 986.

Eyes separated by a low ridge, the lower a little in advance of upper; interorbital space naked. Snout normal or produced into a short fleshy process projecting freely above mouth. Nasal organ of blind side nearer median line of head than that of ocular side and below anterior rays of dorsal fin; olfactory laminæ parallel to one another and to the main axis of the body; no central rachis. Mouth moderate, asymmetrical, jaws of the blind side curved; upper jaw notched to receive symphysis of lower jaws; teeth small, pointed, in bands in the jaws of the blind side. Lower pharyngeals moderate or rather broad, in contact anteriorly. Upper angle of gill-opening level with base of pectoral fin; gill-rakers in moderate number, slender, rather long. Dorsal fin commencing near extremity of snout and well in front of nasal organ of blind side; none of the rays scaly; no basal sheath. Anal fin similar to dorsal; no spine. Pectoral fin more developed on ocular side. The right pelvic fin only normally developed, with 6 rays, joined to the anal. Caudal fin convex, scales extending on to both sides; caudal peduncle moderate or rather short. Scales small or moderate, rather irregularly arranged, nearly all cycloid on both sides of body. Lateral line rising slightly or with a very low curve anteriorly; a short accessory branch. Intestinal tract elongate; forming a series of irregular loops and coils.

Four species from southern Australia and New Zealand.

Synopsis of the Species.

I. Gill-rakers 16 to 19; body more or less coloured on blind side ..... 1. *retiaria*

II. Gill-rakers 9 to 14; blind side of body colourless.

A. Shape of body rhomboidal; vertical fins elevated, longest dorsal rays $1\frac{1}{6}$ to $2\frac{1}{3}$ in head ..... 2. *plebeia*

B. Shape of body ovate; longest dorsal rays 2 to $2\frac{1}{2}$ in head.

1. Snout normal; diameter of eye $6\frac{1}{4}$ to $7\frac{3}{4}$ in length of head ..... 3. *leporina*

2. Snout produced into a fleshy process; diameter of eye $4\frac{2}{3}$ to 6 in length of head ..... 4. *tapirina*

The genus *Bowenia*, Haast, was based on three specimens from Lake Ellesmere, and is said to differ from *Rhombosolea* principally in having two pelvic fins of equal size. In the type specimen of *B. novæ-zealandiæ* the pelvic fins are described as being joined together posteriorly, and connected with the anal fin by a complete membrane; in the other examples only the right pelvic is joined to the anal, the left pelvic being quite free. Mr. G. Archey, of the Canterbury Museum, informs me that the types are no longer preserved in that institution and must be regarded as lost.

Haast describes two of the specimens as having the upper eye nearly on top of the head, and the dorsal fin commencing on a fleshy hook projecting forward above the eye; he concludes that they are both monstrosities, and states that according to the local fishermen such examples are far from uncommon. This condition of the eye and dorsal fin is characteristic of completely ambicolorate Flatfishes, and the two examples described by Haast were almost certainly pigmented on the blind side. The type, the colour of which is described as "uniform light brownish olive," may also have been ambicolorate, but without exhibiting the delayed migration of the eye.

Apart from the form of the pelvic fins, *Bowenia novæ-zealandiæ* appears to be very similar to *Rhombosolea leporina* and *R. plebeia*. Waite (Rec. Canterbury Mus., I, 1911, p. 203) places it in the synonymy of the latter species, but Haast's description is insufficient to enable its position to be definitely settled.

I am indebted to Mr. Archey for kindly sending me a description and figure of another ambicolorate *Rhombosolea*, which was found in the Canterbury Museum in a jar labelled *R. plebeia*. This specimen has the characteristic fleshy hook above the eye, and two equal pelvic fins, neither of which appears to have been connected with the anal. In other respects it agrees very closely with typical examples of *R. plebeia*.

Among a collection of South Australian Flatfishes sent to me by Mr. Waite is an almost completely ambicolorate *Rhombosolea*, with the fleshy hook well developed. In this specimen, which in other characters agrees closely with *R. tapirina*, the two equal pelvic fins

are united posteriorly as in *Bowenia*, but are not connected with the anal fin. On account of the abnormal development of the upper part of the head, the rostral process characteristic of *R. tapirina* is wanting in this example.

The phenomenon of ambicoloration in Flatfishes is particularly interesting on account of the other variations towards symmetry which accompany complete (or almost complete) pigmentation of the blind side.[10]

The assumption by the scales of the blind side of the structure of those of the ocular side is a characteristic variation of this nature. In the European Dab (*Pleuronectes limanda*), which normally has ctenoid scales on the ocular side and cycloid scales on the blind side, the scales are more or less ctenoid on both sides of the body in ambicolorate examples. In the Turbot (*Rhombus maximus*) bony tubercles are normally developed only on the ocular side, but in ambicolorate examples they are also strongly developed on the blind side. Another correlated variation is the delayed or arrested migration of the eye, which interferes with the growth forward of the dorsal fin and leads to the development of the characteristic fleshy hook. Examination of a series of examples shows that this feature is only present where the ambicoloration is almost complete, and pigmentation extends over the greater part of the body on the blind side, and frequently also over a portion of the head. Where the pigmentation of the blind side is confined to the hinder half of the body, the structure of the scales may be affected to some extent in the pigmented area, but the form of the head remains quite normal. The tendency for ambicoloration in Flatfishes to affect the head last of all may be noted; this is the region where asymmetry is most marked.

The development of the pelvic fin of the blind side in the above mentioned examples of *Rhombosolea* is of considerable interest, and there is little doubt that this is another variation towards symmetry associated with ambicoloration.

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[10] Schnakenbeck (Wiss. Meeresunters., N.F., XV, Abt. Helgoland, Heft 1, No. 10, 1923, 22 pp., 1 pl.) has recently investigated the general problem of abnormal coloration in the Pleuronectidæ, but has not dealt with these correlated variations.

Apsetta thompsoni, Kyle,[11] differs from all the known species of *Rhombosolea* in having the eyes on the left side, and in the presence of two equally developed pelvic fins. In all other characters it appears to be identical with *R. plebeia*, and probably represents a reversed example of that species; according to Hutton (Trans. N.Z. Inst., VIII, 1876, p. 215) such examples are not uncommon. In the specimen of *Apsetta* the reversal appears to have been accompanied by the development of two equal pelvics, but there may have been some degree of ambicoloration, for Hutton (*ibid*, VI, 1874, p. 106, pl. XIX) has described a reversed example with a single pelvic fin joined to the anal as in normal specimens of *Rhombosolea*.

Among the specimens of *R. tapirina* in the collection of the British Museum (Nat. Hist.) is a reversed example from Dunedin. In this specimen the left pelvic is median and is joined to the anal as in *Apsetta*; the right pelvic is also present but is lateral, short-based, and is composed of only 4 rays, the first of which is inserted opposite the space between the fifth and sixth rays of the left pelvic.

The researches of Parker[12] on the optic chiasma of Flatfishes have shown that in the suborder Pleuronectoidea the nerve of the migrating eye (i.e. the left eye in *Rhombosolea*) is always dorsal to that of the other eye, *except in reversed examples*, in which that nerve is dorsal which is normally dorsal in the genus. Thus, as far as the optic nerves are concerned, a reversed example is not an exact mirror-image of a normal one, and the tendency to reproduce partially or completely the right pelvic fin (i.e. that which is normally developed) in reversed examples of *Rhombosolea* appears to be a similar phenomenon.

To summarize the above; of the seven known examples of *Rhombosolea* with two pelvic fins, six at least are definitely abnormal in other respects, four being ambicolorate and two reversed. The development of two pelvic fins in ambicolorate examples is to be regarded

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[11] The type of this species is said to have been deposited in the Natural History Department, University College, Dundee. Prof. J. F. Gemmill, F.R.S., has kindly made a thorough search for the specimen, but has failed to find it among the collections.

[12] Bull. Mus. Comp. Zool., XL, 1903, pp. 219-242.

as a variation towards symmetry. In reversed examples the right pelvic fin may or may not be developed, and if present, may be equal to or shorter than the left pelvic.

1. *Rhombosolea retiaria.*

[Black Flounder, Patiki.]

Rhombosolea tapirina (non Günther), Hutton, Trans. Proc. N. Zealand Inst., V, 1873, p. 268, pl. XII, fig. 83b.

Rhombosolea retiaria, Hutton, Ann. Mag. Nat. Hist. (4), XII, 1873, p. 401; Trans. Proc. N. Zealand Inst., VI, 1874, p. 107; Waite, Rec. Canterbury Mus., I, 1911, p. 207, pl. XXXVIII.

Depth of body about twice in the length, length of head $3\frac{1}{5}$ to $3\frac{2}{3}$. Dorsal profile of head straight or a little convex. Blind side of head largely naked, with a series of large muciferous cavities. Snout longer than eye, diameter of which is equal to or greater than interorbital width and $7\frac{1}{2}$ to $8\frac{3}{4}$ in length of head. Maxillary scarcely reaching anterior edge of eye; length of lower jaw of ocular side about $3\frac{1}{3}$ in head. Teeth very small. Lower pharyngeals $3\frac{1}{4}$ times as long as broad, triangular, in contact for anterior $\frac{3}{5}$ of their length; teeth in several irregular series. 16 to 19 gill-rakers on lower part of anterior arch. Scales mostly cycloid on both sides of body, a few on ocular side of head and anterior part of body with feeble denticulations. 63 to 75 scales in a longitudinal series just above lateral line. Lateral line rising slightly anteriorly. Dorsal (60) 65-67; commencing almost at extremity of snout; anterior rays deeply split distally and partly free, remainder bifid; 34th to 37th rays longest, 2 to $2\frac{1}{3}$ in length of head. Anal 43-45. Right pectoral with 10 or 11 rays (9 or 10 branched), naked, length $1\frac{3}{5}$ to 2 in head. Anterior ray of right pelvic inserted below middle of posterior part of lower eye. Caudal with 3/12/3 rays; slightly rounded or doubly truncate. Caudal peduncle $3\frac{1}{4}$ to $3\frac{1}{2}$ times as deep as long; depth 2 to $2\frac{1}{4}$ in length of head. Length of intestinal tract $1\frac{1}{3}$ times that of fish. Ocular side blackish or brownish, marbled with darker; head, body, and fins often with numerous whitish (reddish in life) spots, the largest of which are smaller than the eyes; blind side suffused with greyish or brownish.

Hab.—New Zealand, entering fresh water.

Described from three specimens, 265-290 mm. in total length.

2. *Rhombosolea plebeia.*

[Sand Flounder, New Zealand Flounder, Tinplate.]

Pleuronectes plebeius, Solander, MS.

Rhombus plebeius, Richardson, in Dieffenbach, Travels in N. Zealand, II, p. 222 (1843).

Rhombosolea monopus, Günther, Cat. Fish., IV, p. 459 (1862); Hutton, Cat. Fish. N. Zealand, p. 51; Hector, *t.c.* p. 117, pl. IX (1872); Steindachner, Sitzber. K. Ak. Wiss., LXXX, Abt. 1, 1880, p. 170; Klunzinger, *t.c.*, p. 407; Macleay, Proc. Linn. Soc. N. S. Wales, VI, 1882, p. 129.

Rhombosolea plebeia, Gill, Mem. Nat. Acad. Sci., VI, 1893, p. 121; Waite, Rec. Canterbury Mus., I, 1911, p. 203, pl. XXXV; Rec. S. Austral. Mus., II, 1921, p. 157, fig. 257.

Apsetta thompsoni, Kyle, Proc. Zool. Soc., 1900, p. 986, figs. 1-3.

Depth of body $1\frac{1}{2}$ to $1\frac{4}{5}$ in the length, length of head $3\frac{1}{3}$ to 4. Shape of body distinctly rhomboidal; dorsal profile of head straight or a little concave. Blind side of head almost entirely scaly. Snout a little longer than eye, diameter of which is $2\frac{1}{2}$ to $3\frac{1}{4}$ times interorbital width and 4 to $6\frac{1}{2}$ in length of head. Maxillary extending to below anterior edge of eye, or not quite as far; length of lower jaw of ocular side $2\frac{3}{5}$ to $3\frac{1}{4}$ in head. Lower pharyngeals nearly 5 times as long as broad, scarcely triangular, in contact for anterior $\frac{1}{2}$ of their length; teeth cylindrical, the tips rounded, or with a narrow, blunt terminal cusp; arranged in series along each edge, with a few teeth between these rows. 10 to 14 gill-rakers on lower part of anterior arch. Scales cycloid on both sides of body; 85 to 98 in a longitudinal series just above lateral line. Lateral line with a slight curve anteriorly. Dorsal 55-65; commencing almost at extremity of snout; first ray deeply split and almost entirely free, next two or three rays decreasingly so, remainder mostly bifid or branched at their tips; 28th to 31st rays longest, $1\frac{1}{5}$ to $2\frac{1}{6}$ in length of head. Anal 38-47. Right pectoral with 11 to 13 rays (9 or 10 branched), naked, or with a few scales on its

basal part, length $1\frac{2}{5}$ to $1\frac{3}{4}$ in head. Anterior ray of right pelvic inserted behind level of posterior border of lower eye. Caudal with 3/12/3 rays; slightly rounded Caudal peduncle $1\frac{2}{5}$ to $1\frac{1}{2}$ times as deep as long, depth $2\frac{1}{5}$ to $2\frac{1}{3}$ in length of head. Length of intestinal tract about 3 times that of fish. Ocular side brownish or greyish; some small white spots sometimes present in young examples; extremity of right pectoral darker; blind side whitish.

Hab.—New Zealand; Auckland Is.; Australia (?).

Described from fourteen specimens, 62-430 mm. in total length, including the type of the species and the types of *R. monopus*. A skeleton has 31 (10 + 21) vertebræ.

This species has been recorded from Tasmania and Victoria, but these records are probably incorrect. It is doubtful whether it occurs in any part of Australia.

3. *Rhombosolea leporina.*

[Yellow-belly.]

Rhombosolea leporina, Günther, Cat. Fish., IV, p. 460 (1862); Hutton, Trans. Proc. N. Zealand Inst., V, 1873, p. 268, pl. XI, fig. 83a; Kner, Reise "Novara," Zool. I, 5, Fische, p. 287 (1869).

? *Bowenia novæ-zealandiæ*, Haast, Trans. Proc. N. Zealand Inst., V, 1873, p. 277, pl. XVI.

Rhombosolea flesoides, Hutton, Trans. Proc. N. Zealand, Inst., VIII, 1876, p. 215.

Rhombosolea millari, Waite, Rec. Canterbury Mus., I, 1911, p. 205, pl. XXXVII.

Depth of body 2 to $2\frac{1}{2}$ in the length, length of head $3\frac{3}{5}$ to 4. Shape of body ovate. Dorsal profile of head straight or a little convex. Blind side of head almost entirely scaly. Snout longer than eye, diameter of which is $1\frac{1}{3}$ times to twice interorbital width and $6\frac{1}{4}$ to $7\frac{3}{4}$ in length of head. Maxillary extending to below anterior edge of eye or not quite as far; length of lower jaw of ocular side 3 to $3\frac{2}{3}$ in head. Lower pharyngeals about 3 times as long as broad, triangular, the inner edges in contact for their entire length; teeth arranged in a series along each edge with a few teeth between these rows, those of posterior edge small and pointed, remainder larger, with blunt and sometimes flattened tips. 10 to

14 gill-rakers on lower part of anterior arch. Scales cycloid on both sides of body; 75 to 86 in a longitudinal series just above lateral line. Lateral line with a very slight curve anteriorly. Dorsal 60-69; commencing almost at extremity of snout; anterior rays split distally and partly free, remainder mostly bifid at their tips; 34th to 38th rays longest, 2 to $2\frac{1}{2}$ in length of head. Anal 41-47. Right pectoral with 11 or 12 rays (9 or 10 branched), a few scales on its basal part, length $1\frac{2}{3}$ to 2 in head. Anterior ray of right pelvic inserted below or a little behind level of lower eye. Caudal with 3/12/3 rays; rounded. Caudal peduncle $1\frac{1}{4}$ to $1\frac{2}{5}$ times as deep as long, depth 2 to $2\frac{1}{2}$ in head. Length of intestinal tract about $1\frac{2}{5}$ times that of fish. Ocular side brownish or greyish, with or without irregular darker markings; dorsal, anal and caudal fins often speckled with dark brown; extremity of right pectoral darker; blind side whitish.

Hab.—New Zealand; Australia (?).

Described from eight examples, 215-340 mm. in total length, including the types of the species.

The locality of the type specimens is said to be Australia (Günther), but this species does not appear to have been recognised since by any of the Australian ichthyologists. Kner recorded the species from Sydney, New South Wales, but, according to McCulloch (Austral. Zool. II, 1921, p. 46), this is certainly incorrect. It seems probable that the locality of the types is incorrect, and that this species does not occur in Australian waters.

4. *Rhombosolea tapirina.*

[Melbourne Flounder, Southern Flounder, Greenback Flounder.]

Rhombosolea tapirina (part), Günther, Cat. Fish., IV, p. 459 (1862); Macleay, Proc. Linn. Soc. N. S. Wales, VI, 1882, p. 130.

Rhombosolea flesoides, Günther, Ann. Mag. Nat. Hist. (3) XI, 1863, p. 117; Waite, Rec. Austral. Mus., VI, 1906, p. 197, pl. XXXV; Stead, Edible Fishes N. S. Wales, p. 104 (1908); McCulloch, Austral. Zool., II, 1921, p. 46, pl. XIII; Waite, Fishes S. Austral., p. 181 (1923).

Pleuronectes? victoriæ, Castelnau, Proc. Zool. Soc. Victoria, I, 1872, p. 168.

Rhombosolea tapirina, Hutton, Ann. Mag. Nat. Hist. (4), XII, 1873, p. 401; Trans. Proc. N. Zealand Inst., VI, 1874, p. 106, pl. XIX, fig. 83c.; *ibid,* VIII, 1876, p. 215; Waite, Subantarctic Isl. N.Z., XXV, Vertebrata, p. 590 (1909); Rec. Canterbury Mus., I, 1911, p. 204, pl. XXXVI.

Rhombosolea victoriæ, Macleay, Proc. Linn. Soc. N. S. Wales, VI, 1882, p. 132; Waite, Rec. S. Austral. Mus., II, 1921, p. 158.

? *Rhombosolea monopus,* Woodward, W. Austral. Yearbook, 1900-1 (1902), p. 272.

Rhombosolea monopus, Stead, Fish. Australia, p. 181 (1906).

Depth of body $1\frac{2}{3}$ to $2\frac{1}{8}$ in the length, length of head $3\frac{1}{8}$ to $3\frac{2}{5}$. Shape of body ovate; dorsal profile of head straight or a little convex. Blind side of head almost entirely scaly. Snout longer than eye, produced into a fleshy process which projects freely in front of the mouth. Diameter of upper eye 4 to 5 times interorbital width and $4\frac{4}{5}$ to 6 in length of head. Maxillary scarcely reaching anterior edge of eye; length of lower jaw of ocular side 3 to $3\frac{2}{5}$ in head. Lower pharyngeals about 4 times as long as broad, slightly triangular, in contact for anterior $\frac{3}{5}$ of their length; teeth mostly cylindrical, with a narrow, bluntly pointed, terminal cusp; arranged in a series along each edge, with a number of teeth between these rows. 7 to 12 gill-rakers on lower part of anterior arch. Scales cycloid on both sides of body; 72 to 83 in a longitudinal series just above lateral line. Lateral line with a very slight curve anteriorly. Dorsal 56-59; commencing at base of rostral process; first two rays split at their tips and partly free, remainder mostly bifid or branched at their tips; 32nd to 36th rays longest, 2 to $2\frac{1}{2}$ in length of head. Anal 40-50. Right pectoral with 10 to 13 rays (9 to 12 branched), naked, length $1\frac{1}{2}$ to $1\frac{5}{6}$ in head. Anterior ray of right pelvic inserted below middle or posterior part of lower eye. Caudal with 2-3/12-15/2-3 rays; subtruncate, rounded, or doubly truncate. Caudal peduncle about twice as deep as long, depth 2 to $2\frac{1}{3}$ in length of head. Length of intestinal tract about $1\frac{1}{5}$ times that of fish. Ocular side brownish or greyish, with or without large darker blotches; extremity of right pectoral darker; blind side whitish.

Hab.—Western Australia (?); South Australia; Victoria; southern New South Wales; Tasmania; New Zealand; Auckland Islands; Campbell Island.

Described from twenty-four examples, 72-350 mm. in total length, including the type of the species and the type of *R. flesoides*.

The shape of the body and the proportions of the depth and length exhibit a considerable amount of variation in this species; an examination of a series of specimens shows that this character is of doubtful value in the determination of the species of this genus.

Family IV. Soleidæ.

Synopsis of the Australian Genera.[13]

I. Dorsal and anal fins free from caudal.
  A. Pectoral fins present ..... 1. *Soleichthys*
  B. Pectoral fins absent.
    1. An open pore above base of each dorsal and anal ray ..... 2. *Pardachirus*
    2. Dorsal and anal rays without suprabasal pores ..... 3. *Aseraggodes*

II. Dorsal and anal fins united with caudal.
  A. Pelvic fins not united by membrane; right pelvic free from anal ..... 4. *Brachirus*
  B. Pelvic fins more or less united by membrane; right pelvic completely joined to anal ..... 5. *Phyllichthys*

1. Soleichthys.

Soleichthys, Bleeker, Act. Soc. Sc. Indo-Neerl., VI, 1859, p. 183; McCulloch, Austral. Zool., I, 1917, p. 90.

Two species known from Australia.

Synopsis of Australian Species.

I. Head $6\frac{1}{3}$ to $6\frac{1}{2}$ in the length; 106 to 112 scales in a longitudinal series; anal with 78 to 82 rays .... 1. *heterorhinos*

II. Head $5\frac{2}{3}$ to 6 in the length; 83 to 88 scales in a longitudinal series; anal with 65 to 67 rays ..... 2. *microcephalus*

1. *Soleichthys heterorhinos.*

Solea heterorhinos, Bleeker, Act. Soc. Sc. Indo-Neerl., I, 1856, Amboina p. 64; Atl. Ichth., VI, p. 17, Pleuron. pl. IX, fig. 2 (1866).

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[13] Kner (Reise "Novara," Zool. I, 5. Fische, p. 288) records *Microbuglossus humilis*, Cantor, from Sydney, but this is probably incorrect.

Soleichthys heterorhinos, Bleeker, Act. Soc. Sc. Indo-Neerl., VIII, 1860, Amboina p. 14; McCulloch, Mem. Queensland Mus., V, 1916, p. 60.

Solea heterorhina, Günther, Cat. Fish., IV, p. 466 (1862); Kent, Great Barrier Reef, p. 297, pl. XVI, fig. 5 (1893); Günther, Fische Südsee, VIII, p. 345 (1909).

Solea nigrostriolata, Steindachner and Kner, Sitzber. K. Ak. Wiss., LXI, Abt. 1, 1870, p. 427, pl. I, fig. 2.

? *Solea lineata,* Ramsay, Proc. Linn. Soc. N. S. Wales, VII, 1883, p. 406; Ogilby, Cat. Fish. N. S. Wales, p. 32 (1887); McCulloch, Austral. Zool., II, 1921, p. 47.

Hab.—From the Andaman Islands through the Indo-Australian Archipelago to Australia and the Pacific; Australia; Thursday Island, Torres Strait (Kent); Port Stephens, N. S. Wales (Ramsay - *lineata*).

McCulloch suggests (1921) that *S. lineata* may be the young of *S. microcephalus,* but this seems to me improbable. *S. lineata* is much closer to *S. nigrostriolata* of Steindachner and Kner, which, as far as I am able to judge from an examination of seven examples, is identical with *S. heterorhinos.*

2. *Soleichthys microcephalus.*

[Small-headed Sole.]

Solea microcephala, Günther, Cat. Fish., IV, p. 466 (1862); Kner, Reise "Novara," Zool. I, 5, Fische, p. 288 (1869); Macleay, Proc. Linn. Soc. N. S. Wales, VI, 1882, p. 135; Ogilby, Cat. Fish. N. S. Wales, p. 32 (1887); Waite, Mem. N. S. Wales Nat. Club, No. 2, p. 44 (1904); Stead, Edible Fish. N. S. Wales, p. 105, pl. LXXI (1908); Roughley, Fish. Australia, p. 176, pl. LXI (1916).

Soleichthys microcephalus, McCulloch, Austral. Zool., II, 1921, p. 47, pl. XIII.
Hab.—Coast of New South Wales.

2. Pardachirus.

Pardachirus, Günther, Cat. Fish., IV, p. 478 (1862).

Several species from the Indo-Pacific; two known from Australia.[14]

Synopsis of Australian Species.

I. Marginal spinules of scales feebly developed or absent; right pelvic fin separated from anal by a narrow space which is less than diameter of eye, joined by a membrane to the urinogenital papilla; body without black blotches ..... 1. *pavoninus*

II. Marginal spinules of scales well developed; right pelvic fin separated from anal by a space which is greater than diameter of eye, not joined to urinogenital papilla; 3 series of black blotches on body, in addition to the usual ocelli ..... 2. *hedleyi*

1. *Pardachirus pavoninus.*

[Peacock Sole.]

Achirus pavoninus, Lacépède, Hist. Nat. Poiss., IV, pp. 658, 661 (1902).

Pardachirus pavoninus, Günther, Cat. Fish., IV, p. 479 (1862); Ogilby, Mem. Queensland Mus., V, 1916, p. 142, pl. XVI [q.v. for full synonymy of this species].

Hab.—Andaman Islands, through the Malay Archipelago to Southern Japan, Australia and the Pacific; Australia; northern Queensland.

In this species all the scales of the ocular side are provided with a rough patch posteriorly; the marginal spines are few and feeble or altogether absent, and, if present, are generally confined to the scales of the head and anterior part of the body. The scales of the blind side are similar, but the rough patch is smaller.

2. *Pardachirus hedleyi.*

[Southern Peacock Sole.]

Pardachirus hedleyi, Ogilby, Mem. Queensland Mus., V, 1916, p. 144, pl. XVII [q.v. for full synonymy of this species]; McCulloch, Austral. Zool., II, 1921, p. 47, pl. XIII.

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[14] A third species of this genus may occur in Australian waters, if Weber's identification of his *P. klunzingeri* with *P. poropterus* (?) of Klunzinger is correct:

Pardachirus klunzingeri.

Solea (*Achirus*) *poropterus* (?), Klunzinger, Sitzber, K. Ak. Wiss. Wien, LXXX, Abt. 1, 1880, p. 408.

Pardachirus klunzingeri, Weber, Nova Guinea, V, Zool., 1907, p. 250, pl. XIII, fig. 2.

Hab.—New Guinea (Weber); Port Darwin, Northern Territory (Klunzinger).

Hab.—New South Wales and Southern Queensland (Port Jackson to Moreton Bay).

3. Aseraggodes.

Aseraggodes, Kaup, Archiv. Naturgesch., 1858, p. 103.

Several species from the Indo-Pacific; four known from Australia.

Synopsis of Australian Species.

I. Dorsal with 58 to 70 rays.
  A. 96 to 104 scales in a longitudinal series; body with dark cross-bars ..... 1. *macleayanus*
  B. 68 to 75 scales in a longitudinal series; body with small dark spots but without cross-bars.
    1. Depth about 3 in the length; pelvic fins sub-symmetrical, well separated from anal ..... 2. *haackeanus*
    2. Depth $2\frac{3}{4}$ to $2\frac{5}{8}$ in the length; right pelvic longer than left, close to anal and joined to urinogenital papilla ..... 3. *melanostictus*
II. Dorsal with 85 to 90 rays ..... 4. *jaubertensis*

1. *Aseraggodes macleayanus.*

[Narrow-banded Sole.]

Solea macleayana, Ramsay, Proc. Linn. Soc. N. S. Wales, V, 1881, p. 462.

Solea fluviatilis, Ramsay, *ibid*, VII, 1882, p. 111.

Aseraggodes macleayanus, Ogilby, Mem. Queensland Mus., V, 1916, p. 137, pl. XV [q.v. for full synonymy of this species]; McCulloch, Austral. Zool., II, 1921, p. 47, pl. XIII.

Aseraggodes macleayana, Roughley, Fish. Australia, p. 175, pl. LX (1916).

Hab.—Coasts of New South Wales and Southern Queensland (from southern New South Wales to Caloundra).

E.2083.—8 miles from North Head, Richmond River, New South Wales; 16-18 fathoms.

E.2995.—4-20 miles N.E. of Gloucester Head, Queensland; 19-35 fathoms.

2. *Aseraggodes haackeanus.*

Solea (*Achirus*) *haackeana*, Steindachner, Anz. Akad. Wiss., XX, 1883, p. 95; Sitzber. K. Ak. Wiss., LXXXVIII, Abt. 1, 1884, p. 1104, pl. I, fig. 3.

Solea (*Aseraggodes*) *textilis*, Ramsay and Ogilby, Proc. Linn. Soc. N. S. Wales (2), I, 1887, p. 6.

Aseraggodes haackeana, McCulloch, Mem. Queensland Mus., V, 1916, p. 59; Waite, Rec. S. Austral. Mus., II, 1921, p. 160, fig. 262; Fishes S. Australia, p. 184, fig. (1923).

Hab.—St. Vincent Gulf, South Australia.

3. *Aseraggodes melanostictus.*

(Fig. 12.)

Solea (*Achirus*) *melanosticta*, Peters, Monatsber. K. Preus. Akad. Berlin, 1876, p. 845.

Depth of body $2\frac{1}{4}$ to $2\frac{2}{3}$ in the length, length of head $4\frac{1}{6}$ to $4\frac{1}{4}$. Snout short, its tip a little below level of lower eye. Upper eye somewhat in advance of lower; diameter more than $\frac{1}{2}$ length of snout, twice or more than twice interorbital width, and $4\frac{1}{2}$ to $5\frac{1}{3}$ in length of head. Maxillary extending a little beyond anterior edge of eye. No dilated nostril on blind side. Scales of ocular side ctenoid, those of blind side weakly ctenoid or cycloid; 68 to 72 in a longitudinal series, 25 to 26 between lateral line and highest point of dorsal profile. Lateral line of blind side with an accessory branch running backwards from snout just below dorsal fin and extending as far as the sixteenth to nineteenth rays. Dorsal 64-68; anterior ray inserted level with upper eye, preceded by a series of filaments. Anal 50-52. No pectoral fins. Right pelvic fin a little longer than left, with which it may be partly joined posteriorly; both pelvics connected by a membrane with the urinogenital papilla, which is similarly joined to first anal ray. Caudal with 2/14/2 rays; rounded. Depth of caudal peduncle $1\frac{3}{5}$ to $1\frac{2}{3}$ in length of head. Anus somewhat displaced on to blind side. Greyish brown, with numerous small black dots, and traces of some lighter markings on head and body; some of the scales with darker edges; sometimes one or two indistinct dusky blotches near lateral line; fins with a few dark dots.

Hab.—Solomon Islands; east coast of Queensland.

Not recorded previously from Australia.

Described from three specimens, 130-142 mm. in total length.

E.2870.—Off Gladstone, Queensland.

E.2860.—(2) Locality unknown.

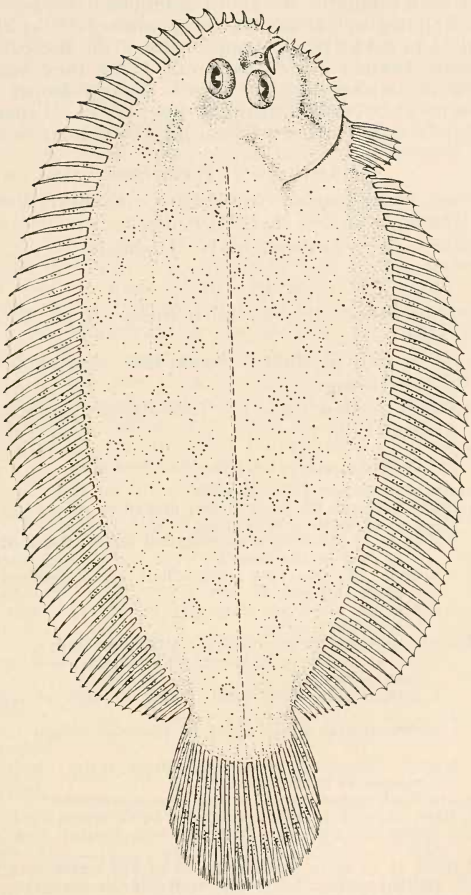

Fig. 12.—*Aseraggodes melanostictus* Peters. A specimen (E. 2870) from off Gladstone, Queensland. Slightly enlarged. W. C. P. Tenison *del.*

I have compared the above examples from Australia with a photograph of the type of *A. melanostictus* kindly supplied to me by Dr. P. Pappenheim of the Zoologisches Museum, Berlin; as far as I can judge they seem to represent that species, but have a slightly deeper body and somewhat fewer dorsal and anal rays. *A. ramsayi*, Ogilby, from Lord Howe Island may be this species.

4. *Aseraggodes jaubertensis.*

Achirus jaubertensis, Rendahl, K. Svensk. Vet.-Ak. Handl., LXI, No. 9, 1921, p. 16.

Hab.—Cape Jaubert, N. W. Australia.

4. Brachirus.

Brachirus, Swainson, Nat. Hist. Fish., II, pp. 187, 303 (1839).

Synaptura, Cantor, Journ. Asiat. Soc. Bengal, XVIII, 1849, p. 1204.

Several species from the Indo-Pacific; nine known from Australia.

Synopsis of Australian Species.

I. Interorbital region distinct, scaly.
  A. Right pectoral fin longer than diameter of eye.
    1. Scales of blind side ctenoid.
      a. 65 to 78 scales in a longitudinal series; depth of body $1\frac{1}{5}$ to 2 in the length ..... 1. *orientalis*
      b. About 97 scales in a longitudinal series; depth of body $2\frac{3}{4}$ in the length ..... 2. *salinarum*
    2. Scales of blind side cycloid; 98 to 115 scales in a longitudinal series ..... 3. *aspilos*
  B. Right pectoral fin shorter than diameter of eye.
    1. 77 to 81 scales in a longitudinal series; body without dark cross-bars.
      a. Interorbital width nearly twice diameter of eye .... 4. *selheimi*
      b. Interorbital width equal to diameter of eye .... 5. *breviceps*
    2. 92 to 96 scales in a longitudinal series; body with numerous dark cross-bars ..... 6. *fasciata*

I. Interorbital region naked, or the eyes contiguous.
  A. Head $4\frac{3}{8}$ to 5 in the length; 70 to 81 scales in a longitudinal series; body without well defined dark cross-bars ..... 7. *muelleri*
  B. Head $6\frac{1}{4}$ to $6\frac{1}{2}$ in the length; 90 to 130 scales in a longitudinal series; body with well defined dark cross-bars.
    1. 112 to 130 scales in a longitudinal series; less than 20 cross-bars ..... 8. *cancellatus*
    2. 90 scales in a longitudinal series; 20 or more cross-bars ..... 9. *craticulus*

Jordan (quoted by McCulloch, Mem. Queensland Mus., V, 1916, p. 60) regards the name *Brachirus* (Swainson, 1839, p. 303) as antedated by *Brachyrus* (Swainson, 1839, p. 264). A reference to the original work, however, shows that *Brachirus* is previously mentioned on page 187, and is there sufficiently defined to be recognised. In accordance with the existing rules of nomenclature, the name *Synaptura,* which is in general use, must be replaced by *Brachirus.*

Brachirus zebra, Bloch, has been recorded from Port Jackson by Castelnau (Proc. Linn. Soc. N. S. Wales, III, 1879, p. 392), and *B. (Zebrias) zebrinus,* Schlegel, has been included in the fauna of New South Wales by Stead (Edible Fish. N. S. Wales, p. 107, 1908). As suggested by McCulloch (Austral. Zool., II, 1921, p. 46), both these identifications are probably incorrect.

I have been unable to identify *B. fitzroiensis* (De Vis, Proc. Linn. Soc. N. S. Wales, VII, 1883, p. 319) from the somewhat inadequate description. It is known only from the type, which was taken at the mouth of the Fitzroy River, Queensland. If this is a *Brachirus,* it apparently differs from all the remaining Australian species in having no visible nostril; the dorsal fin commencing on the occiput, opposite the angle of the upper opercle; and in having 145 scales in the lateral line.

1. *Brachirus orientalis.*

[Black Sole.]

Pleuronectes orientalis, Bloch, Schneider, Syst. Ichth., p. 157 (1801).

Brachirus orientalis, Swainson, Nat. Hist. Fish., II, p. 303 (1839).

Solea foliacea, Richardson, Rep. Brit. Assoc., 1845 (1846), p. 279.

Synaptura foliacea, Günther, Cat. Fish., IV, p. 481 (1862).

Synaptura cinerascens, Günther, *t.c.* p. 482.

Synaptura orientalis, Day, Fish. India, p. 429, pl. XCIII, fig. 4, and pl. XCIV, fig. 2 (1877).

Synaptura nigra, Macleay, Proc. Linn. Soc. N. S. Wales, V, 1881, p. 49; *ibid,* VI, 1882, p. 137; Tenison-Woods, Fish. Fisheries N. S. Wales, p. 77 (1882); Ogilby, Cat. Fish. N. S. Wales, p. 33 (1887); Saville-Kent,

Proc. Roy. Soc. Queensland, VI, 1889, p. 240; Ogilby, Edible Fish. N. S. Wales, p. 160, pl. XXXIX (1893); Waite, Mem. Austral. Mus., IV, 1899, p. 125, pl. XXX; Stead, Fish. Austral., p. 181, pl. VI (1906); Edible Fish. N. S. Wales, p. 106, pl. LXXIII (1908); Ogilby, Proc. Roy. Soc. Queensland, XXI, 1908, p. 25; Roughley, Fish. Australia, p. 172, pl. LIX (1916); McCulloch, Austral. Zool., II, 1921, p. 46.

Synaptura cinerea, De Vis, Proc. Linn. Soc. N. S. Wales, VIII, 1884, p. 288.

Hab.—From the west coast of India, through the Indian Ocean and Archipelago to Australia; China Seas; Australia; Coasts of New South Wales and Southern Queensland; Port Darwin (Saville-Kent).

Comparison of ten examples of *B. nigra* with specimens of *B. orientalis* from Indian Seas leaves little doubt that the two species are synonymous. The Australian specimens, however, appear to have (generally) a slightly deeper body, and often a somewhat different coloration. Day has examined the type of *B. orientalis,* and regards it as identical with Richardson's *B. foliacea* from China.

2. *Brachirus salinarum.*

Brachirus salinarum, Ogilby, Proc. Roy. Soc. Queensland, XXIII, 1910, p. 35.

Synaptura salinarum, McCulloch, Mem. Queensland Mus., V, 1916, p. 64, figs. 2-3.

Hab.—Saltpans at Kimberley, Northern Queensland.

Known only from the types.

3. *Brachirus aspilos.*

Synaptura aspilos, Bleeker, Nat. Tijdschr. Ned. Ind., III, 1852, p. 74.

Brachirus aspilos, Ogilby, Proc. Roy. Soc. Queensland, XXIII, 1910, p. 36.

Hab.—Indo-Australian Archipelago from Singapore to Northern Australia; Ogilby records a single example from Croker Island, Northern Territory.

4. *Brachirus selheimi.*

Synaptura selheimi, Macleay, Proc. Linn. Soc. N. S. Wales, VII, 1883, p. 71.

Known only from the types from Palmer River, Queensland.

5. *Brachirus breviceps.*

Brachirus breviceps, Ogilby, Proc. Roy. Soc. Queensland, XXIII, 1910, p. 36.

Synaptura breviceps, McCulloch, Mem. Queensland Mus., V, 1916, p. 63, fig. 1.

Known only from the type from Rockhampton, Queensland. Perhaps identical with *B. selheimi,* but appears to have a somewhat shallower body and narrower interorbital region.

6. *Brachirus fasciatus.*

Synaptura fasciata, Macleay, Proc. Linn. Soc. N. S. Wales, VII, 1883, p. 14; Ogilby, Cat. Fish. N. S. Wales, p. 33 (1887); Waite, Mem. Austral. Mus., IV, 1899, p. 126, pl. XXXI; Stead, Edible Fish. N. S. Wales, p. 107 (1908); McCulloch, Mem. Queensland Mus., V, 1916, p. 61, pl. VIII, fig. 2; Austral. Zool., II, 1921, p. 46, pl. XIII.

Hab.—Coast of New South Wales.

7. *Brachirus muelleri.*

Synaptura muelleri, Steindachner, Denk. K. Ak. Wiss. Wien, XLI, 1879, p. 4; Klunzinger, Sitzber. K. Ak. Wiss. Wien, LXXX, Abt. 1, 1880, p. 408.

Synaptura arafurensis, Günther, Shore Fishes "Challenger," p. 49 (1881).

Depth of body $2\frac{1}{5}$ to $2\frac{1}{3}$ in the length, length of head $4\frac{3}{5}$ to 5. Eyes contiguous, raised above head, the upper a little in advance of lower, subequal in size, their diameter about $1\frac{1}{2}$ in snout and 5 to $5\frac{1}{2}$ in head. Mouth extending to below anterior part of eye. Lower lip of ocular side fringed. Both nostrils of ocular side tubular, simple, the anterior the longer. Dorsal 61-70; anal 48-57; caudal 14-15; the posterior rays of dorsal and anal completely joined to the caudal, which is obtusely pointed. Right pectoral shorter than diameter of eye, upper rays not produced; left pectoral smaller, the upper ray somewhat produced. Pelvics subsymmetrical, free from anal. Scales 70 to 78 $\frac{28 \text{ to } 32}{33 \text{ to } 37}$, ctenoid, those of ocular side somewhat more strongly denticulated than those of blind side; extending on to basal part of vertical fin-rays and on to the membrane between them; those on the blind side of head mostly produced into barbel-like processes; a

number of similar processes on ocular side of head in the region of the snout, chin, eyes, and gill-opening. Ocular side of body with a number of strong filamentous processes, which tend to form irregular groups, of which one on the middle of the lateral line and two or three near the bases of the vertical fins are most prominent. Brownish; the groups of dermal filaments on ocular side black; vertical fins dusky in their outer parts on both sides of body, with paler margins; right pectoral dusky.

Hab.—Arafura Sea; Australia; eastern coast of Queensland.

Described from six specimens, 106-195 mm. in total length, including the type of *B. arafurensis*.

E.2782.—(4) 4-20 miles N.E. of Gloucester Head, Queensland; 19-35 fathoms.

E.2532.—7 miles N.N.E. of Bowen, Queensland; 16 fathoms.

8. *Brachirus cancellatus.*

Synaptura cancellata, McCulloch, Mem. Queensland Mus., V, 1916, p. 60, pl. VIII, fig. 1.

Hab.—Neighbourhood of Fremantle, Western Australia.

9. *Brachirus craticulus.*

Synaptura craticula, McCulloch, Mem. Queensland Mus., V, 1916, p. 62, pl. IX, fig. 1.

Hab.—Near Bowen, Queensland.

5. Phyllichthys.

Phyllichthys, McCulloch, Mem. Queensland Mus., V, 1916, p. 66.

Two species known from Australia.

Synopsis of Australian Species.

I. Diameter of eye 4·6 in head; dorsal with 84 rays, anal with 71 ..... 1. *sclerolepis*

II. Diameter of eye 6·6 to 7·3 in head; dorsal with 69-71 rays, anal with 61-63 ..... 2. *punctatus*

1. *Phyllichthys sclerolepis.*

Synaptura sclerolepis, Macleay, Proc. Linn. Soc. N. S. Wales, II, 1878, p. 363, pl. X, fig. 4; *ibid*, VI, 1882, p. 137.

Phyllichthys sclerolepis, McCulloch, Mem. Queensland Mus., V, 1916, p. 66, pl. IX, fig. 2, text-fig. 4.

Hab.—Port Darwin, Northern Territory.

2. *Phyllichthys punctatus.*

Phyllichthys punctatus, McCulloch, Mem. Queensland Mus., V, 1916, p. 67.

Hab.—Busselton, south-western Australia.

Family V. CYNOGLOSSIDÆ.

Synopsis of the Australian Genera.

I. Lips fringed ..... 1. PARAPLAGUSIA
II. Lips not fringed.
A. Two or three lateral lines on ocular side .. 2. CYNOGLOSSUS
B. No lateral lines on ocular side ..... 3. SYMPHURUS

Paraplagusia and *Cynoglossus* have been further subdivided into several genera, based on the form of the nostrils and the number of lateral lines on the ocular side. I am not convinced that these genera are valid, and, pending a revision of the family, have retained the genera *Paraplagusia* (*Plagusia*) and *Cynoglossus* as defined by Günther (Cat. Fish., IV).

1. PARAPLAGUSIA.

Paraplagusia, Bleeker, Ned. Tijdschr. Dierk., II, 1865, p. 274; Atl. Ichth., VI, p. 26 (1866).

Several species from the Indo-Pacific; three known from Australia.

Synopsis of Australian Species.

I. A single lateral line on ocular side ..... 1. *acuminata*
II. Two or three lateral lines on ocular side.
A. Two lateral lines on ocular side; fringes on lower lip generally arborescent ..... 2. *unicolor*
B. Three lateral lines on ocular side; fringes on lower lip short, stout, generally unbranched ..... 3. *guttata*

1. *Paraplagusia acuminata.*

Plagusia acuminata, Castelnau, Researches Fish. Australia, p. 44; Macleay, Proc. Linn. Soc. N. S. Wales, VI, 1882, p. 138.

Hab.—Western Australia.

This species, which is known only from the type, differs from all other members of the genus in having a single lateral line on the ocular side.

2. *Paraplagusia unicolor.*

[Tongue Sole, Lemon Sole.]

Plagusia unicolor, Macleay, Proc. Linn. Soc. N. S. Wales, VI, 1882, p. 138; Ogilby, Cat. Fish. N. S. Wales, p. 33 (1887).

Symphurus unicolor, Stead, Fish. Australia, p. 182 (1906); Edible Fish. N. S. Wales, p. 107, pl. LXXIV (1908).

Paraplagusia unicolor, McCulloch, Austral. Zool., II, 1921, p. 47, pl. XIII; Lord, Papers Proc. Roy. Soc. Tasmania, 1922, p. 66; McCulloch and Whitley, Rec. Austral. Mus., XIV, 1925, p. 353, fig. 4.

Depth of body $3\frac{3}{5}$ to 4 in the length, length of head $4\frac{1}{3}$ to 5. Snout rounded, a little longer than head behind lower eye; rostral hook rather long, its posterior edge $2\frac{2}{5}$ to 3 in length of head, ending below or a little behind posterior edge of lower eye; interorbital width equal to or less than diameter of eye, which is 8 to 11 in length of head; upper eye in advance of lower; angle of mouth below posterior part of eye, much nearer gill-opening than end of snout. Fringes on lower lip usually strongly arborescent. Dorsal 105-112. Anal 81-87. Scales ctenoid, those of ocular side somewhat more strongly denticulated than those of blind side; 89 to 95 in a longitudinal series; two lateral lines on ocular side, separated by 14 to 16 series of scales; no distinct lateral line on blind side. Brownish, sometimes spotted and marbled with darker.

Hab.—Coasts of New South Wales and southern Queensland; Tasmania (?).

Described from thirteen specimens, 210-245 mm. in total length.

E.1405.—Off Hervey Bay, 17-20 miles N.W. of Lady Elliot Island, Queensland; 18 fathoms.

E.1662.—(3) 5 miles S.E. of Boomerang Hill, Frazer Island, Queensland; 15 fathoms.

E.1673.—(2) Mouth of Wide Bay, South Queensland.

E.1677.—(2) Mouth of Wide Bay, South Queensland.

E.6705.—Southern Queensland.

E.1753.—(2) Northern New South Wales.

This species may prove to be identical with *P. marmorata*, Bleeker, but appears to have a longer rostral hook, larger scales, and somewhat fewer dorsal and anal rays.

3. *Paraplagusia guttata.*

Plagusia guttata, Macleay, Proc. Linn. Soc. N. S. Wales, II, 1878, p. 362; *ibid*, VI, 1882, p. 137.

Plagusia japonica, Klunzinger, Sitzber, K. Ak. Wiss. Wien, LXXX, Abt. 1, 1880, p. 409.

Plagusia notata, De Vis, Proc. Linn. Soc. N. S. Wales, VIII, 1884, p. 288; Kent, Proc. Roy. Soc. Queensland, VI, 1889, p. 240.

? *Rhinoplagusia australis*, Rendahl, Nyt. Mag. Nat. Krist., LX, 1922, p. 190.

Rhinoplagusia japonica, McCulloch and Whitley, Rec. Austral. Mus., XIV, 1925, p. 350, fig. 3.

Depth of body $3\frac{2}{3}$ to $3\frac{1}{3}$ in the length, length of head ($3^{9}/_{10}$) $4\frac{1}{3}$ to $4\frac{1}{2}$. Snout rounded, a little longer than head behind lower eye; rostral hook rather long, its posterior edge $2\frac{1}{3}$ to $2\frac{3}{4}$ in length of head, ending behind lower eye; interorbital width $\frac{2}{3}$ to $\frac{4}{5}$ diameter of eye, which is 9 to 11 in length of head; upper eye in advance of lower; angle of mouth below posterior edge of eye, much nearer gill-opening than end of snout. Fringes on lower lip short, stout, generally unbranched. Dorsal 105-107. Anal 83-86. Scales ctenoid, those of ocular side more strongly denticulated than those of blind side; 88 to 92 in a longitudinal series; three lateral lines on the ocular side, the lower sometimes rather indistinct in places; 16 to 17 scales between upper and middle lateral lines; no distinct lateral line on blind side. Brownish, with some indistinct and irregular lighter and darker markings; most of the scales of ocular side and some of those on blind side with darker edges; vertical fins with small brown spots.

Hab.—Roebuck Bay, N.W. Australia (? *R. australis*); Port Darwin, Northern Territory (*R. guttata*); coast of Queensland.

Described from five specimens, 212-260 mm. in total length.

E.1401-2.—20 miles N.E. of Bustard Bay, Queensland; 20 fathoms.

E.2811-2.—Southern Queensland.

E.6706.—Southern Queensland.

I have compared the specimens collected by the "Endeavour" with examples of *P. japonica,* Schlegel, from Japan, and, although the two species are undoubtedly very closely related, they appear to be distinct. *P. guttata* differs from *P. japonica* chiefly in having a longer head, somewhat smaller mouth, longer nasal papilla on the blind side, in the form of the scales, and in the coloration.

Apart from the form of the labial fringes and the number of lateral lines on the ocular side, *Paraplagusia unicolor* and *P. guttata* are remarkably similar, the proportions, fin-ray and scale counts, etc., being almost identical. The form of the fringes is apparently not constant, since among thirteen specimens with two lateral lines (*unicolor*), one or two have these fringes rather feebly branched, and in one example they are short, stout, and unbranched. Of the five specimens with three lateral lines (*guttata*) one example has the fringes distinctly arborescent. The number of lateral lines on the ocular side may perhaps prove eventually to be of doubtful value as a specific character. Jordan and Starks (Proc. U.S. Nat. Mus., XXXI, 1906, p. 240) have noted that in *Cynoglossus* (*Areliscus*) *interruptus* the lower lateral line "is broken at irregular intervals, and often, especially in the smaller examples, it is entirely absent . . ." Until this character has been investigated throughout the family, however, these species may be kept separate.

2. Cynoglossus.

Cynoglossus, Hamilton (Buchanan), Fish. Ganges, p. 32 (1822).

Numerous species from West Africa and the Indo-Pacific; seven known from Australia.

Synopsis of Australian Species.

I. Two lateral lines on both sides of body.
  A. 14 to 15 interlinear scales on ocular side .... 1. *bilineatus*
  B. 19 to 20 interlinear scales on ocular side .... 2. *sindensis*

II. Two or three lateral lines on ocular side, none on blind side.
  A. Two nostrils; rostral hook not extending to below eye; 7 to 13 interlinear scales.
    1. Interorbital width $\frac{1}{2}$ to $\frac{2}{3}$ diameter of eye; each scale of ocular side with 2 to 5 strong denticulations ..... 3. *broadhursti*
    2. Interorbital width $\frac{1}{6}$ to $\frac{1}{4}$ diameter of eye; scales of ocular side with numerous small denticulations.
      a. Scales ctenoid on both sides of body; 9 to 13 interlinear scales.
        * Two lateral lines on ocular side; eye 9 in head ..... 4. *maculipinnis*
        ** Three lateral lines on ocular side; eye 7 in head ..... 5. *maccullochi*
      b. Scales cycloid on blind side; 7 or 8 interlinear scales ..... 6. *ogilbyi*
  B. A single nostril in front of lower eye; rostral hook extending to below eye; 17 to 18 interlinear scales ..... 7. *macrophthalmus*

1. *Cynoglossus bilineatus.*

Achirus bilineatus, Lacépède, Hist. Nat. Poiss. IV, pp. 659, 663 (1802).

Plagusia quadrilineata, Bleeker, Nat. Tijdschr. Ned. Ind., I, 1850, p. 412; Verh. Bat. Gen., XXIV, 1852, Pleuron. p. 21.

Arelia quadrilineata, Kaup, Archiv. Naturgesch., 1858, p. 107.

Cynoglossus quadrilineatus, Günther, Cat. Fish., IV, p. 497 (1862); Bleeker, Atl. Ichth., VI, p. 32, Pleuron. pl. XIV, fig. 3 (1866); Day, Fish. India, p. 435 (1877); Klunzinger, Sitzber. K. Ak. Wiss. Wien, LXXX, Abt. 1, 1880, p. 409.

Cynoglossus bilineatus, Ogilby, Proc. Roy. Soc. Queensland, XXIII, 1910, p. 39.

Depth of body $3\frac{3}{4}$ to $3\frac{7}{8}$ in the length, length of head $4\frac{1}{2}$ to 5. Snout rounded, length $2\frac{1}{2}$ to $2\frac{2}{3}$ in head; rostral hook short, its posterior edge about $5\frac{1}{2}$ in length of head; interorbital width almost equal to diameter of eye, which is $10\frac{1}{2}$ to 11 in length of head; upper eye in advance of lower; angle of mouth below posterior edge of eye, a little nearer gill-opening than end of snout. A simple nostril between the eyes, and a tubular one in front of lower eye. Dorsal 111-114. Anal 87-91. Scales ctenoid

on ocular side, cycloid on blind side; 92 to 94 in a longitudinal series; two lateral lines on each side of body, separated by 14 scales. Uniform brownish; fins lighter.

Hab.—Seas of India through the East Indian Archipelago to the Pacific; Australia; Coast of Queensland.

Described from two specimens, 330-410 mm. in total length.

E.2533.—7 miles N.N.E. of Bowen, Queensland; 16 fathoms.

E.2791.—4-5 miles N.W. of Gloucester Head, Queensland; 19-35 fathoms.

2. *Cynoglossus sindensis.*

Cynoglossus sindensis, Day, Fish. India, p. 434, pl. XC, fig. 6 (1877); Jordan and Richardson, Bull. U.S. Bur. Fish. XXVII (1907), 1908, p. 281; Ogilby, Proc. Roy. Soc. Queensland, XXIII, 1910, p. 37.

Hab.—From the coast of Sind to the Philippines and Northern Australia; Australia; recorded by Ogilby from Croker Island, Northern Territory.

3. *Cynoglossus broadhursti.*

Cynoglossus broadhursti, Waite, Rec. Austral. Mus., VI, 1905, p. 73, pl. VIII, fig. 2.

Hab.—Western and southern Australia.

E.752.—Off mouth of Murray River; 20 fathoms.

E.10358.—Off mouth of Murray River; 20 fathoms.

4. *Cynoglossus maculipinnis.*

Cynoglossus maculipinnis, Rendahl, K. Svensk. Vet.-Ak. Handl., LXI, No. 9, 1921, p. 17.

Hab.—Cape Jaubert, N.W. Australia.

5. *Cynoglossus maccullochi*, sp. n.

(Fig. 13.)

Depth of body $3\frac{2}{3}$ in the length, length of head about 5. Snout rounded, length 3 in head; rostral hook short, its posterior edge about 5 in head, not extending to below eye; interorbital width very narrow, about $\frac{1}{6}$ diameter

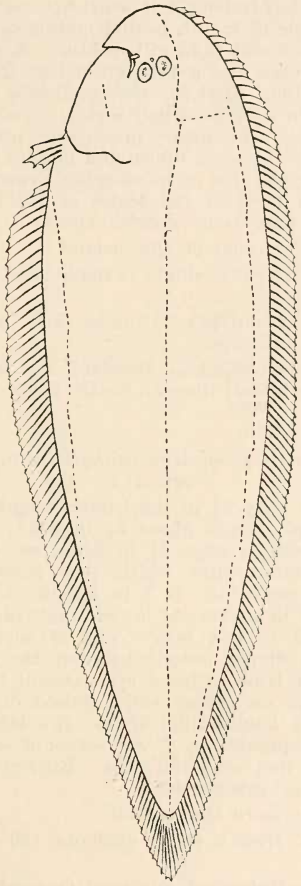

Fig. 13.—*Cynoglossus macculloch*i sp. nov. Holotype (E. 2693) from 7-10 miles N.W. of Hummocky Island, Queensland. About ¾ nat. size. W. C. P. Tenison *del.*

of eye, which is 7 in length of head; upper eye in advance of lower; angle of mouth behind middle of eye, slightly nearer end of snout than gill-opening. A single nostril between the eyes and a tubular one in front of lower eye. Dorsal 106. Anal 80. Scales ctenoid on both sides of body; 78 in a longitudinal series; three lateral lines on ocular side, the lower incomplete posteriorly; 13 series of scales between upper and middle lateral lines; no distinct lateral line on blind side. Brownish; a small dark spot on most of the scales of the lateral lines; vertical fins with some greyish spots.

Hab.—East coast of Queensland.

Described from a single example, 190 mm. in total length.

E.2693.—(Holotype) 7-10 miles N.W. of Hummocky Island; 14-16 fathoms.

Near *C. maculipinnis*, Rendahl, but with a larger eye and three lateral lines on ocular side.

6. *Cynoglossus ogilbyi*, sp. n.
(Fig. 14.)

Depth of body $3\frac{3}{4}$ in the length, length of head $5\frac{1}{4}$. Snout rounded, length about $3\frac{1}{2}$ in head; rostral hook short, its posterior edge $4\frac{1}{2}$ in head, not extending to below eye; interorbital width very narrow, about $\frac{1}{6}$ diameter of eye, which is 7 in length of head; upper eye somewhat in advance of lower; angle of mouth below posterior half of eye, nearer end of snout than gill-opening. A simple nostril between the eyes, and a tubular one in front of lower eye. Dorsal 114. Anal 95. Scales ctenoid on ocular side, cycloid on blind side; about 70 in a longitudinal series; two lateral lines on ocular side, separated by 7 or 8 series of scales; no distinct lateral line on blind side. Brownish; posterior parts of vertical fins greyish.

Hab.—Southern Queensland.

Described from a single example, 190 mm. in total length.

E.2796.—(Holotype) Southern Queensland.

Near *C. brachycephalus*, Bleeker, differing chiefly in the presence of a nostril between the eyes, and in the cycloid scales on the blind side.

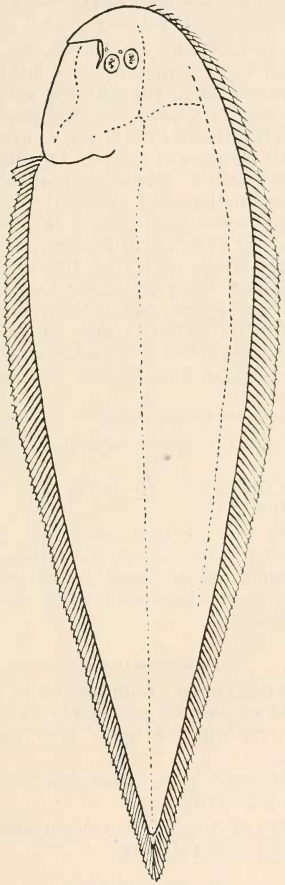

Fig. 14.—*Cynoglossus ogilbyi* sp. nov. Holotype (E. 2796) from southern Queensland. About ¾ nat. size. W. C. P. Tenison *del.*

7. *Cynoglossus macrophthalmus*, sp. n.
(Fig. 15.)

Depth of body $3\frac{5}{6}$ in the length, length of head 4. Snout rounded, about equal to head behind lower eye; rostral hook rather long, its posterior edge $3\frac{1}{4}$ in length of head, extending to below posterior part of lower eye; interorbital width about $\frac{1}{3}$ diameter of eye, which is 7 in length of head; upper eye a little in advance of lower; angle of mouth below posterior half of eye, slightly nearer gill-opening than end of snout. Apparently only one nostril on ocular side, short, tubular, in front of lower eye. Dorsal 111. Anal 90. Scales rather weakly ctenoid on both sides of body; 102 in a longitudinal series; three lateral lines on ocular side; 17 or 18 series of scales between upper and middle lateral lines; no distinct lateral line on blind side. Brownish; most of the scales dark-edged, and frequently with a dark brown central spot; vertical fins darker, with a narrow light margin.

Hab.—Southern Queensland.

Described from a single example, 270 mm. in total length.

E.1978.—(Holotype) 20 miles off Bustard Head Light; 20 fathoms.

Apparently related to *C. marleyi*, Regan, and *C. capensis*, Kaup; it differs from the former chiefly in the larger scales and smaller number of dorsal and anal rays, and may be distinguished from the latter by the long rostral hook.

Cynoglossus sp.

The following young examples are in poor condition and the species cannot be accurately determined. They appear to be very similar to *C. interruptus*, Günther, from Japan.

E.3074.—Moreton Bay, Queensland, 8 miles S.W. of Cowan Light; 8-18 fathoms.

E.2866.—(2) Moreton Bay, Queensland, 8 miles S.W. of Cowan Light; 8-18 fathoms.

3. SYMPHURUS.

Symphurus, Rafinesque, Indice d'Ittiol. Siciliana, p. 52 (1810).

Aphoristia, Kaup, Arch. Naturgesch., 1858, p. 106.

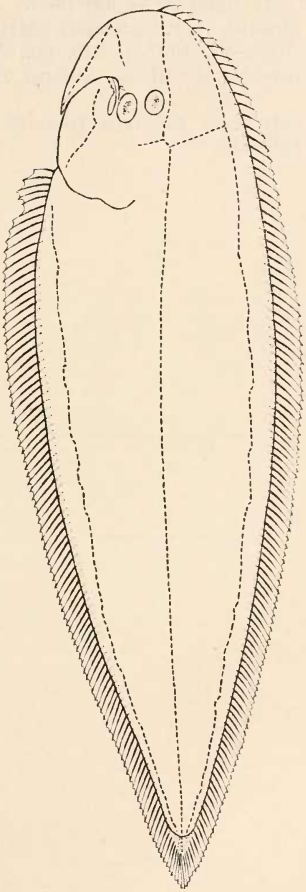

Fig. 15.—*Cynoglossus macrophthalmus* sp. nov. Holotype (E. 1978) from 20 miles off Bustard Head Light, Queensland. Slightly more than ½ nat. size. W. C. P. Tenison *del.*

1. *Symphurus australis.*

Symphurus strictus, var. *australis*, McCulloch, Rec. Austral. Mus., VI, 1907, p. 349, fig. 55.

Symphurus australis, McCulloch, Austral. Zool., II, 1921, p. 47.

Known only from the type from 35 miles E. of Sydney; 800 fathoms.

THE AUSTRALASIAN MEDICAL PUBLISHING COMPANY LIMITED

Report on the Crustacea Macrura (Families Peneidæ, Campylonotidæ and Pandalidæ) Obtained by the F.I.S. "Endeavour" in Australian Seas.

With notes on the species of "*Penæus*" described by Haswell and contained, in part, in the collections of the Macleay Museum, at the University of Sydney.

BY

WALDO L. SCHMITT.

U.S. National Museum.

Plates lvii.-lxviii. and one Map.

Corrigenda et Addenda.

p. 311, line 9.—for *Penæus* read *Peneus*.

p. 320, line 3.—*for* periopods *read* pereiopods.

p. 320, 2nd par., line 7.—*for* the *read* this.

p. 320, 2nd par., line 11.—*for* lére *read* 1ère.

p. 324, 1st par.—*add* Though the single specimen of "*Parapeneus*" *rectacutus* in the U.S. National Museum collection (received from the Indian Museum) is in very poor condition, small scale-like exopodites certainly seem to be present on the thoracic legs; for this reason and because of the absence of sutures on the carapace this species is transferred to the genus *Penaeopsis*.

p. 333, below *Penaeopsis macleayi* (Haswell) insert sub-heading.—"*Penæus macleayi*." (*Note*:—This is not a species collected by the F.I.S. "Endeavour," and should be sub-headed, like other such species in this report, under the original name given by Haswell.)

p. 352, 2nd par.—*add* As in the preceding species, only the third legs are provided with epipodites.

p. 352, footnote 40.—*add* Dr. Schmitt has since proved that minute spines are present on the telson in *T. granulosus*. An adult female "Endeavour" specimen (79·5 mm. long) from the collection of the United States National Museum was sent specially for our examination. This proved to possess two pairs of very minute spines on the telson in advance of the subterminals, which were almost lost to view among the fringes of hair adorning the edges of the telson.

A further microscopic examination of the figured specimen in the collection of the Australian Museum verifies the previous statement, but with the assistance of the United States National Museum specimen there may be detected two pairs of most minute indentations on the edges of the telson above the subterminal spines, which mark the position where minute spines occurred. They have apparently become rubbed off, as suggested by Dr. Schmitt (*in lit.*).

p. 352, last par., line 3.—*for* does *read* do.

p. 356, line 9.—*for* part *read* par.

p. 358, line 12.—*delete* possible.

p. 358, 3rd par., last line.—*for* Stimpson *read* (Stimpson).

p. 366, 8th par., line 1.—*for* pestasma *read* petasma.

p. 369, 4th par., line 9.—*after* Bate *insert* ("Challenger" Rept. Zool., xxiv., Macrura, 1888, pl. xxxii., fig. 3).

p. 372, line 5.—*for* subtribe Hoplophorida *read* superfamily Oplophoroida.

p. 372, lines 12, 13 and 26.—for *Hoplophorida* read *Oplophoroida*.

p. 372, line 18.—for *Hoplophoridæ* read *Oplophoridæ*.

p. 372, line 37.—for *Anchistiella hani* read *Anchistiella hahni*.

p. 373, line 15.—*for* Bright *read* Bight.

p. 377, 3rd par., line 11.—*for* Hoplophoridæ *read* Oplophoridæ.

p. 377, footnote 61.—*add* In working over a check-list of crustacean genera, I find that *Gonatonotus* M. Edw. is preoccupied by *Gonatonotus* Adams and White (in White, Proc. Zool. Soc., London, XV., 1847, p. 57). For *Gonatonotus* M. Edw., therefore, *Eugonatonotus* is proposed.

p. 380, line 20.—*for* Baljan *read* Batjan.

Plate lix., Explanation.—for *Panaeopsis endeavouri* read *Penaeopsis endeavouri*.

This first part of a report upon the Macrura and Anomura collected by the Australian Fisheries Investigation Steamer "Endeavour" covers the macruran families Peneidæ, Campylonotidæ and Pandalidæ. The first, and most important economically of these families comprises the bulk of the shrimps taken, both in point of numbers and species.

Three apparently new species are described for the first time: *Penæopsis endeavouri, Penæus maccullochi,* and *Campylonotus rathbunæ.* In all, thirteen species of Peneids, the one new Campylonotid, and two Pandalids, are represented. A complete list includes:

PENEIDÆ.

CAMPYLONOTIDÆ.

PANDALIDÆ.

Through the kind offices of the authorities of the Australian Museum, Sydney, I have been enabled to examine co-types of most of the Peneids described by Haswell in his Catalogue of the Australian Crustacea,[1] and others which have been critically compared with the holotypes in the Macleay Museum at the University of Sydney. Thus it has been possible to determine the

[1] The Australian Museum, Sydney, 1882, pp. I.-XXIV., and 1-324, pls. I.-IV.

rightful status of several of Haswell's species, which, for some time, have been considered of doubtful value, owing to the insufficiency of their original descriptions. It is also interesting to note that the true *Trachypeneus anchoralis* has been found for the first time since it was taken originally by the "Challenger" and described by Spence Bate.

An attempt at a complete key to the Australian and Indo-Pacific species of the genus *Peneus* has been introduced in connection with the systematic discussion of the "Endeavour" representatives of that group.

The principal synonymical references have been cited under each species dealt with in this paper and in addition to the local occurrence the general distribution is given. Re-descriptions of a few species have been deemed necessary, and in nearly all cases measurements and remarks considered pertinent have been added. The sections of the text dealing particularly with Haswell's specimens examined in connection with this report are subheaded by the names under which the species were described by Haswell. These are: *Penæus mastersii* [= *Penæopsis monoceros*] (p. 325); *Penæus* [= *Penæopsis*] *macleayi* (p. 333); *Penæus* [= *Penæopsis*] *novæguineæ* (p. 338); and *Penæus palmensis* [= *Penæopsis novæ-guineæ*] (p. 338). Haswell's *Penæus granulosus* is *Trachypeneus granulosus* (p. 351).

My best thanks are due to Dr. Mary J. Rathbun for most helpful guidance in the preparation of this paper, and to the late Allan R. McCulloch for his kindness in furnishing me with notes upon Haswell's types. Also to the authorities of the Australian Museum and the United States National Museum, the former for the opportunity of studying the collection upon which this report is based, and the latter for the extensive use of its laboratory and research facilities.

The photographs were taken by Mr. Clarence R. Shoemaker, of the United States National Museum.[1]

[1] Certain specimens in the Australian Museum collection which were not seen by Dr. Schmitt exhibit various features which have enabled Mr. F. A. McNeill to supplement in some small degree a few of the author's observations. These are recorded in their proper places as brief footnotes under Dr. Schmitt's observations upon the several species concerned.—EDITOR.

Order DECAPODA.

Suborder NATANTIA.

Tribe PENEIDES.

Family PENEIDÆ.

Subfamily ARISTEINÆ.

Genus ARISTÆOMORPHA, *Wood-Mason.*

ARISTÆOMORPHA FOLIACEA (*Risso*).[2]

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

Peneus foliaceus, Risso, Hist. Nat. Europe Mérid., v., 1826, p. 69, pl. ii., fig. 6.

Aristeus ? foliaceus, Smith, Proc. U.S. Nat. Mus., viii., 1885, p. 188.

Aristæomorpha giglioliana, Wood-Mason, Ill. Zool. "Investigator," Crustacea, 1892, pl. ii., fig. 2.

Aristæomorpha foliacea, Senna, Soc. Ent. Italiana, Bull., xxiv., 1902, p. 235, pls. iv.-xviii. Bouvier, Rés. Camp. Sci. Monaco, xxxiii., 1908, p. 53, pl. iii., fig. 1, pl. xi., figs. 1-5. Kemp and Sewell, Rec. Indian Mus., vii., 1912, pp. 18, 19, pl. i., fig. 5. Pesta, Archiv f. Naturg., 1915, Abt. A, Heft 1, p. 101.

Occurrence.—Ten specimens of this species were taken: Off Gabo Island, Victoria, 200 fathoms; two males and five females (Reg. Nos. E. 6621, E. 6707, E. 6708 and E. 6709). 40 miles S.S.E. of Genoa Peak, Victoria, 200 fathoms; two males and one female (Reg. No. E. 6125).

Distribution.—Also known from the Mediterranean; East Atlantic.—Bay of Biscay and off the coast of

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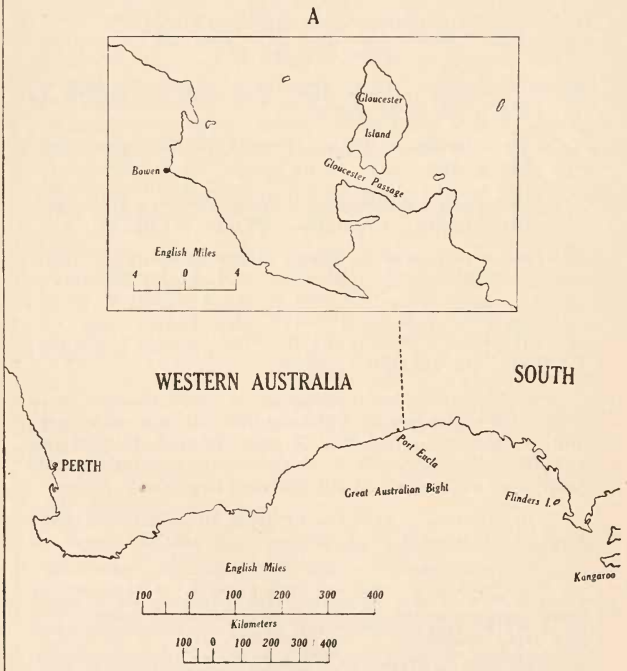
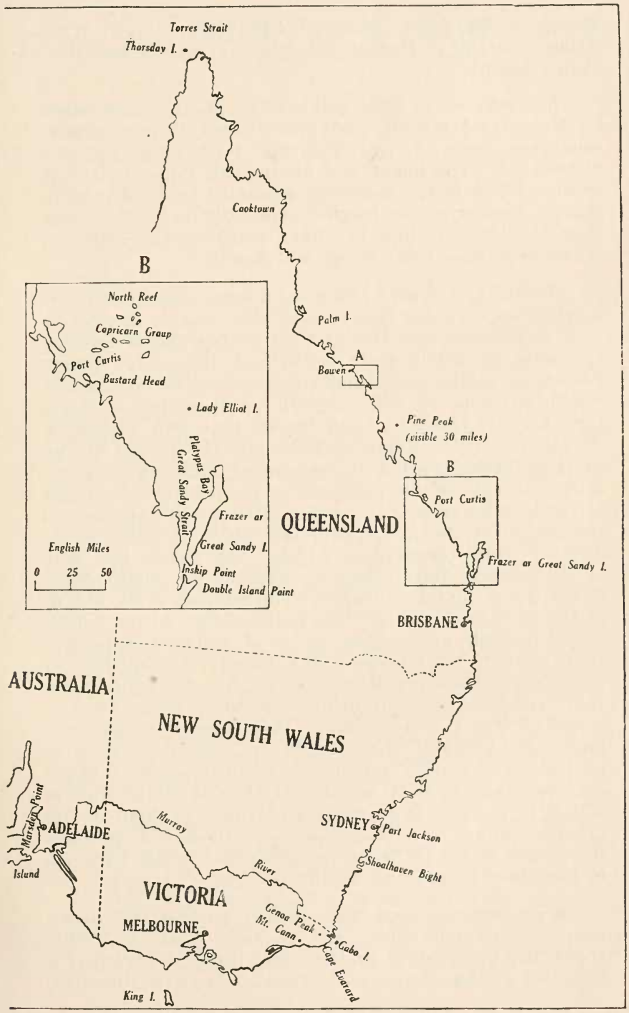
[2] The "Endeavour" specimens being damaged, the figure showing a lateral view of this species has been prepared from a perfect female specimen in the collection of the Australian Museum (Reg. No. P. 4695). It was trawled east of Sydney, New South Wales, May, 1920; 150 fathoms.

The figure of the rostrum is based upon an "Endeavour" specimen (Reg. No. E. 6621) from off Gabo Island, Victoria.—F. A. MCNEILL.

MAP SHOWING LOCALITIES REFERRED TO IN THIS REPORT




Torres Strait
Thursday I.
Cooktown
B
North Reef
Capricorn Group
Port Curtis
Bustard Head
Lady Elliot I.
Platypus Bay
Great Sandy Strait
Frazer or
Great Sandy I.
Inskip Point
Double Island Point
English Miles
0 25 50
Palm I.
A
Bowen
Pine Peak
(visible 30 miles)
B
Port Curtis
Frazer or Great Sandy I.
QUEENSLAND
BRISBANE
AUSTRALIA
NEW SOUTH WALES
SYDNEY
Port Jackson
Shoalhaven Bight
Murray
River
Murray Point
Island
ADELAIDE
VICTORIA
MELBOURNE
Genoa R.
Mt. Cann
Cape Everard
Gabo I.
King I.

Morocco, 500-1,300 meters (Bouvier); and West Atlantic.—Gulf of Darien, 155 fathoms; "Albatross" Stn. 2143 (Smith).

Remarks.—The finer points of distinction elaborated by Kemp and Sewell, and upon which this species is separated from *A. rostridentata* hold good for the "Endeavour" specimens and distinguish them from that species. The latter, however, seems to be hardly more than a variety of the former, especially in view of any lack of differentiation in either petasma, thelycum, or oral appendages (*vide* Kemp and Sewell).

Smith's *Aristeus ? foliaceus*, a form somewhat intermediate between the two, is most like, and no doubt is a true *A. foliacea* (see lateral view photograph of Smith's specimen, a small male, on Plate lvii.). Its pterygostomian region is but 3·33 times as long as its greatest width, as compared with a length not exceeding 2·5 times for *A. rostridentata*, and more than 3·5 times in *A. foliacea* (*vide* Kemp and Sewell—the length of the pterygostomian region is "measured from the antero-lateral margin of the carapace to the postero-dorsal end of the hepatic groove"). In the "Endeavour" specimens, the length of the pterygostomian region is from 3·5 to about 4 times its greatest width. The telson, like that of *A. foliacea*, falls about one-fifth of its length short of the tip of the inner uropod. The relation of the length of the dactyls of the last two pairs of legs to the length of the propodi, approaches that of *A. foliacea*, being less than one-half their length. The dactyls of these legs in Smith's specimen are now wanting, but fortunately his very complete measurements included their various lengths. In *A. rostridentata* they appear to measure more than half the length of their respective propodites. Unlike either of these species, Smith's specimen has a more slender sixth abdominal somite, which is a little more than 1·75 times as long as its greater depth. In both *A. rostridentata* and *A. foliacea* the length of the sixth abdominal somite varies from 1·5 to 1·66 times its greatest depth.

Measurements.—Of six of the "Endeavour" specimens enumerated above, and the one (Cat. No. 7264, U.S.N.M.) upon which Smith's description of *Aristeus ? foliaceus* was based; the measurements are in millimetres.

	Australian Museum, Reg. No. E. 6125.			Australian Museum, Reg. No. E. 6621, etc.			U.S. Nat. Mus., Cat. No. 7264.
Sex	♂	♂	♀	♀	♀	♂	♂
Total length	144	?	125	145	132[1]	114[1]	110
Length of rostrum	38	broken	34	42.5	38[1]	31[1]	31.3
Length of carapace	37	32	30	34	33.2	26.3	24.7
Length of pterygostomian region	15.5	14	13.2	15.5	15	11.1	10.2
Greatest breadth of pterygostomian region	4	4	3.4	4	3.5	3.2	3.1
Ratio of length to breadth of pterygostomian region	3.8	3.5	3.8	3.9	4.2	3.5	3.3
Length of sixth abdominal somite	15.5	14	13.8	15	14	12.5	13
Greatest depth of sixth abdominal somite	9.8	9	8	9	7	7.5	7
Ratio of length to depth of sixth abdominal somite	1.58	1.55	1.72	1.66	1.55	1.66	1.87
Rostral formula..	9 / 0	broken	8 / 0	8 / 0	7 / 0	9 / 0	9 / 0

[1] Estimated; tip of rostrum and telson broken off.

Sub-family PENEINÆ.

Genus HALIPORUS, *Bate*.

HALIPORUS SIBOGÆ, *de Man*.[3]

Haliporus sibogæ de Man, Notes Leyden Museum, xxix., 1907, p. 138; "Siboga" Exped., xxxix*a*, Decapoda, pt. i., Penæidæ, 1911 (plates, 1913), p. 38, pl. iii., figs. 10, 10*a*-10*b*, pl. iv., figs. 10*c*-*q*.

Occurrence.—Thirty-one specimens of this distinct and well-characterized form were taken by the "Endeavour" as follows:

[3] Additional specimens of this species are in the Australian Museum from the following localities:

35 miles east of Sydney, 800 fathoms; seven males and eight females (Reg. No. G. 6049, Austr. Mus.).

East of Sydney, 150 fathoms; May, 1920; two females (Reg. Nos. P. 4696-7, Austr. Mus.).

Those from 800 fathoms were dredged during the Expedition of the "Woy Woy" in 1906, and are the specimens "reserved for further consideration" by McCulloch, Rec. Austr. Mus. vi. 5, 1907, p. 353. They range from 19-53½ mm. in length from the tip of the rostrum to the end of the carapace, and the largest female from 150 fathoms measures 52 mm.—F. A. McNEILL.

South of Gabo Island, Victoria, 180-150 fathoms; seven females (Reg. No. E. 4393).

Off Gabo Island, 200 fathoms; five males and seven females (Reg. No. E. 4828).

30 miles south of Gabo Island, 200 fathoms; two males and three females (Reg. No. E. 6269).

From Gabo Island to Cape Everard grounds, Victoria, 200-250 fathoms; one male and two females (Reg. No. E. 6126).

40 miles S.S.E. of Genoa Peak, Victoria, 200 fathoms; two males and two females (Reg. No. E. 6124).

Distribution.—Also known from East Indian Archipelago: Flores Sea, Straits of Makassar, Banda Sea, and near Kei Islands, 397-521 metres (de Man).

Remarks.—The rostral formula for such of these specimens as have complete, or virtually complete, rostra, ranges from $^{7}/_{1}$ to $^{9}/_{2}$; but only one individual had the latter count, $^{8}/_{2}$ being the number of rostral teeth found in most of the specimens.

Genus Solenocera, *Lucas.*

Solenocera melantho, *de Man.*

Solenocera melantho, de Man, Notes Leyden Museum, xxix., 1907, p. 137; "Siboga" Exped., xxxix*a*, Decapoda, pt. i., Penæidæ, 1911 (plates, 1913), p. 48, pl. v., figs. 12-12*i*.

Occurrence.—12 miles N.N.E. of Bowen, Queensland, 19-25 fathoms; one male (Reg. No. E. 6617).

Distribution.—Otherwise known only from the East Indian Archipelago: near Rotti Island, Lobetobi Strait, Saleh-bay, north coast of Sumawa, 216-274 meters (de Man).

Remarks.—The single example is evidently this species, though the inner, anterior pair of lobes of the petasma are less truncated and more rounded than in the typical *S. melantho* figured by de Man. The rostrum has nine teeth on the upper margin, of which four are on the carapace and the fifth above the orbital margin. The carapace is much broken and the antennules are missing beyond the second joint of their peduncle. In general, however, this specimen agrees with de Man's description so closely that I have no doubt as to its identity.

Genus PENÆOPSIS, *Bate*.

Penæopsis (A. Milne Edwards, M.S.) Bate, Ann. Mag. Nat. Hist. (5), viii., 1881, p. 182 (*P. serratus* A. Milne Edwards, M.S.). *Id.* Kemp, Mem. Indian Museum, v., 3, 1915, p. 320. *Id.* A. Milne Edwards and Bouvier, Mem. Mus. Comp. Zool., xxvii., 3, 1909, p. 220.

? Metapenæus Wood-Mason, Ann. Mag. Nat. Hist. (6) viii., 1891, p. 271 (*Penæus affinis* H. Milne Edwards).

Though Bate's definition of *Penæopsis* (A. Milne Edwards, MS.) is worthless, as noted by Kemp (*loc. cit.*), his citation of an existing type "*P. serratus* (A. Milne Edwards, MS.), length about 4 inches,"[4] together with Milne Edwards's and Bouvier's subsequent careful description of that type, must be accepted as validating the name. But I am not entirely satisfied that *Penæopsis* Bate and *Metapenæus* Wood-Mason, are synonymous as is stated by Kemp. There seems to be a small "*P. serratus*" group of species within the genus *Penæopsis* in its broader sense, having characters which, if constant, may separate them from the rest of the "Metapenei." These characters, as exhibited by various species, are discussed in the following pages.

As Milne Edwards and Bouvier believe *Parapenæus megalops* Smith[5] to be the same as *Penæopsis serratus*, Smith's types have been carefully re-examined. Prof. Smith failed to mention the peculiar modification of the basal portion of the inner antennular flagellum of the male. This forms a flattened semicircular loop ending distally in a more or less backwardly directed blunt knob or tubercle, which is the butt of the straight, distal portion of the flagellum; this loop is about one-fourth or fifth of the total length of the flagellum. A very similar structural modification exists in *Parapenæus rectacutus* (Bate) as figured by Alcock,[6] only Smith's species has the loop annulated like the rest of the flagellum, and not unsegmented as is shown in Alcock's figure.

[4] The type locality is wrongly given as "Gulf of Mexico," probably as a result of a misapprehension as to the scene of the "Blake's" operations.

[5] Proc. U.S. Nat. Mus., viii., 1885, p. 172.

[6] Cat. Indian Decapod Crust., 1906, pt. iii., fasc. i., pl. vi., fig. 19.

De Man,[7] together with other significant observations on the species, has called attention to the fact, "that in *Parap. rectacutus* all the periopods are provided with very small exopods and that there is an epipod on the legs of the 3rd pair." *Parapenæus megalops*, Smith, also has small, inconspicuous scale-like exopodites on all of the thoracic legs and epipodites on the third and preceding, but not on the last two pairs of legs. As in *rectacutus*, there are no suture lines in evidence on the carapace. The telson is armed on either side with two movable spines in advance of an immovable one; this is one pair of movable spines less than Alcock assigns to his *rectacutus*, but corresponds to the number de Man (*op. cit.*, p. 82) observed on his "Siboga" specimen of that species.

The specimens identified as *Penæopsis serratus* by A. Milne Edwards and Bouvier from the "Blake" collections were all more or less mutilated and included but one male of the typical species, and one of a varietal form. If they were specifically identical with *megalops*, either the antennular flagella of these males were wanting, or the secondary male character was overlooked. All the specimens had small scale-like exopodites on the thoracic legs—"Tous ces appendices [pattes] sont munis de court . . . [exopodites] en forme d'écailles qui se réduisent progressivement de la 1ére paire á la derniere paire" (*op. cit.* p. 223).

The branchial formula given for *P. serratus*, and said to be common to all representatives of the genus except as regards the number of exopodites, differs from that given by Alcock under "*Metapeneus*" in having one podobranch, one arthrobranch and one pleurobranch, instead of one podobranch and two arthrobranchs on the second maxillipeds, and in omitting mention of the vestigial anterior arthrobranch found on the penultimate pair of legs of all the "Metapenei" examined by Alcock. It may not be easy to determine the exact attachment of the two gill plumes of the second maxillipeds, other than the podobranch, but from a close inspection of *P. megalops*, I should say that both were arthrobranchs. There is no vestigial anterior arthrobranch on the penultimate pair of legs. The second maxilliped carries a rudimentary arthrobranch, as noted by Smith in the branchial

[7] Siboga Exped., xxxix.*a*, Decapoda, pt. i., Penæidæ, 1911, p. 78.

formula he gives for "*Parapenæus,*" and this branchial member is probably also to be found in *P. rectacutus,* even though Alcock grouped that species with forms lacking it.

In addition to a re-examination of some of the Metapenei examined by Alcock, and *Penæopsis endeavouri* described below, a number of other species in the collection of the United States National Museum have been examined. These are *acclivis* (Rathbun), *akayebi* (Rathbun), *dalei* (Rathbun), *incisipes* (Bate), *intermedius* (Kishinouye), *goodei* (Smith), *mobilispinis* (Rathbun), *mogiensis* (Rathbun), *velutinus* (Dana) (Rathbun), and *lamellatus* (de Haan.). Only the latter appears to have no trace of the vestigial arthrobranch so easily made out on the penultimate pair of legs of all the other species, and which, but for the inclusion of this species, I should have regarded of great generic value. *P. lamellatus* has a very hairy lobule on the posterior border of the articulating membrane of each penultimate thoracic leg, but it is neither in the position of, nor of the same character as, the vestige found in the other species, and does not represent an anterior arthrobranch. I find no other characters to separate this species generically from its fellows.

In seeking other characters that might possibly differentiate *Penæopsis* from *Metapeneus,* I noticed that *P. megalops* and *P. rectacutus* had antennular flagella as long as or longer than their peduncle, while all the other "Metapenei" except "*Metapeneus coniger*" and its variety "*andamanensis*" had quite short antennular flagella, noticeably shorter than their peduncles. These two exceptions, of which the United States National Museum fortunately possesses a male and female of the typical species, and a male of the varietal form, have antennular flagella which are about as long as their peduncle, and what is more remarkable, the males have the inner flagellum somewhat flattened proximally with "its inner border concave . . . up to a small conical denticle" (Alcock, *op. cit.* p. 25), being thus constituted strikingly like the corresponding flagella in *P. megalops* and *P. rectacutus.* Moreover, the exopodites of "*Metapeneus coniger*" are quite small, tending to approach the scale-like ones of *P. megalops* in their degree of reduction. They are quite incorrectly figured by Alcock (*op. cit.*,

pl. iv., fig. 12), who represents them as moderately long and flagelliform; this, however, is their appearance in the variety *coniger andamanensis*, in which their tips fall a little short of the middle of the ischial joints of the thoracic legs. In both of these forms the vestigial arthrobranch on the penultimate pair of legs is present as in all the other "metapenei" except *lamellatus*. The telson of each of the specimens of *coniger* at hand has three pairs of movable spines in advance of the fixed spines, as described and figured by Alcock (*op. cit.*, p. 25, pl. iv., fig. 12).

On the whole there seems to be a small "*Penæopsis serratus*" group within the genus in its broader sense, the members of which have the inner antennular flagellum of the male modified to form a more or less flattened loop proximally and terminated by a knob or conical denticle, which is situated at the base of the straight portion of the flagellum; the antennular flagella in both sexes are as long as or longer than their respective peduncles. The species of this group, *P. serratus*, Milne Edwards (= *megalops*, Smith), *rectacutus* (Bate), *coniger* and *coniger* var. *andamanensis*, Wood-Mason, have usually short, more or less scale-like exopodites on the thoracic legs (except in *P. coniger* var. *andamanensis*), epipodites on all the legs except the last two pairs, and no vestigial anterior arthrobranch on the penultimate pair (except in *P. coniger* and *coniger* var. *andamanensis*). The telson is laterally armed with two or three pairs of movable spines in addition to the distal, immovable pair. If Milne Edwards and Bouvier are correct in stating that *Penæopsis serratus* has an arthrobranch and one pleurobranch on the second maxillipeds instead of two arthrobranchs, and if this character be present in the other members of this small group, it might prove a more valid feature to separate them from the rest of the "Metapenei" than any other here set forth.

Subdivision of the Genus *Penæopsis*.

The species of *Penæopsis* are usually subdivided into two groups on the basis of the absence or presence of lateral marginal spines on the telson.[8] Of the first

[8] Alcock, Cat. Indian Decapod Crust. 1906, pt. iii., fasc. i., p. 49. *Id.* De Man, "Siboga" Exped. xxxix.*a*, Decapoda, pt. i., Penæidae, 1911, pp. 8, 54. *Id.* Pesta, Archiv f. Naturg. 1915, Abt. A. Heft 1., p. 103.

group, characterised by the absence of lateral marginal spines, all the species, so far as known, have the fifth pair of legs without exopodites, while the merus joint of the same legs in the male has a notch and a spine or tooth near its proximal end. A single exception is *P. deschampsi* Nobili[9] from Pondicherry and Mahé, which species Alcock thinks "may possibly be the non-adult form of *M. monoceros*" (Alcock, *loc. cit.*, p. 49). This has no notch or spine on the merus of the fifth pair of legs. Of the species belonging to this first group, only *P. monoceros* appears among the "Endeavour" specimens.

The second group is represented by a new species, and the familiar *P. stridulans*, which proves to be the long neglected *P. norœ-guineœ* of Haswell. *Penœopsis macleayi* Haswell[10] also belongs here. Of this species I have been able to examine a cotype and several other specimens, male and female. It belongs to that section of this second group in which the males have the meri of the fifth legs notched, as they are in *P. monoceros*. The adult male of our new species possesses such a notch, while in *P. norœ-guineœ* Haswell it is lacking.

Note on Some Species of *Parapenœus*, and the Characters of the Genus.

I take this opportunity of supplying a few brief comments upon some species of *Parapenœus* available to me in the United States National Museum. These were examined, both for the purpose of determining the correct generic position of the species assigned to *Parapenœus* by Smith, and to ascertain some information not hitherto published regarding them.[11]

It would seem that the genus *Parapenœus* should be restricted to those forms possessing characteristic suture lines described by Alcock[12] as "*a longitudinal suture . . . on either side extending from the orbital to the posterior border of the carapace*, and also a vertical suture extending across the branchiostegite at

[9] Boll. Mus. Torino, xviii., 1903, No. 452, p. 2, fig. 1.

[10] Haswell, Proc. Linn. Soc. N.S.W., iv., 1, 1879, p. 40; Cat. Austral. Crust. 1882, p. 201.

[11] *Cf.* De Man, "Siboga" Exped. xxxix.*a*, Decapoda, pt. i., Penæidæ, 1911, p. 78.

[12] Cat. Indian Decapod Crust., 1906, pt. iii., fasc. i., p. 30.

the level of the 2nd pair of chelipeds." There are no exopodites on any of the legs, the telson is without movable spines, and the branchial formula is as given by Alcock (*loc. cit.* p. 30), though his "somite VII (2nd maxillipeds)" should read somite VII (1st maxillipeds). Epipodites are on the first two or three pairs of the thoracic legs.

Parapenæus politus Smith[13] is a characteristic representative of the genus. The diagnostic longitudinal and vertical suture lines are present on the carapace, the thoracic legs are without exopodites—there are epipodites on the third legs, however—and the telson is without movable spines. There is no rudimentary arthrobranch associated with the first maxilliped, as is the case with *Penæopsis*, nor is there any vestige of an anterior one on the penultimate pair of legs. In these several respects, the species is like *P. longirostris* Lucas[14] from the Mediterranean. But I am unable to understand Bouvier's tabulation of the branchial formula of the first maxillipeds of *Parapenæus* as "0 (ou 2?)," unless the "2" be a misprint for "r" (= rudimentary). If this be so, I should say the rudiment was suggested only to enable him to accommodate doubtful or aberrant species of Parapenæids in the generic definition. Unfortunately, I have but a single specimen of *P. longirostris* at hand.

As noted by De Man (*op. cit.*, pp. 78-82), *P. fissurus* (Bate), *P. investigatoris* Alcock & Anderson, and *P. longipes* Alcock have the characteristic suture lines, no movable spines on the telson, no exopodites on the thoracic legs and no epipodites on the third or following pairs of legs. *P. americanus* Rathbun,[15] from Porto Rico, exhibits the same features.

Parapenæus paradoxus (Bouvier)[16] perhaps does not belong to this genus, as the description makes no mention of the vertical suture across the branchiostegite above the second pair of legs. If this is present, however, the species would certainly be a true *Parapenæus*, and the above suggested definition of the genus would have to be modified to include exopodites on the first

[13] Proc. U.S. Nat. Mus. iii., 1881, p. 444 and v., 1885, p. 172.

[14] *Cf.* Bouvier, Rés. Camp. Sci. Monaco xxxiii., 1908, p. 102.

[15] Bull. U.S. Fish. Comm. for 1900, xx. (1901), pt. ii., p. 102, pl. ii.

[16] *Cf.* Mem. Mus. Comp. Zool. xxvii., 1909, No. 3, p. 220.

legs. In *Parapenæus paradoxus*, also, the epipodites on the third legs may be well developed, or reduced, or absent. It may be recalled in this connection that Bouvier[17] himself originally instituted a new genus, *Neopenæopsis*, for this species, but later referred it to *Parapenæus*.

The inclusion by De Man[18] of such a peculiar form as his *Penæopsis challengeri* (nom. n. for *Penæus serratus* Bate) within that already rather heterogeneous assemblage of species, *Penæopsis* (*sensu lato*), leads me to suggest the placing of this doubtful Parapenæid within that genus at least temporarily. *Parapenæus africanus* Balss,[19] which not only lacks the very important suture lines on the carapace, but has exopodites on the first pair of legs, was made the type of a new genus, *Macropetasma*, by Stebbing,[20] on the basis of several males from Mossel Bay, Cape Colony. It is to be regretted that Stebbing did not verify the branchial formula given by Balss (*loc. cit.*), for if the species is definitely without podobranchs on the second pair of maxillipeds, it is most peculiar, in view of the forms to which it seems most nearly related.

Penæopsis monoceros (*Fabricius*).

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

Penæus monoceros, Fabricius, Entomol. Syst., Suppl., 1798, p. 409. *Id.* Haswell, Cat. Austr. Crust., 1882, p. 200.

Penæus mastersii, Haswell, Proc. Linn. Soc. N.S.W., iv. 1, 1879, p. 42; Cat. Austral. Crust., 1882, p. 203.

Penæus sp., Whitelegge, Proc. Roy. Soc. N. S. Wales, xxiii., 1890, p. 225; Whitelegge, in Ogilby, Ed. Fish and Crust. N. S. Wales, 1893, p. 203.

Penæus incisipes, Kishinouye, Jour. Fish. Bur. Tokyo, viii., 1900, p. 18, pl. iv., fig. 2, pl. vii., fig. 6.

Metapeneus monoceros, Alcock, Cat. Indian Decapod Crust., 1906, pt. iii., fasc. i., p. 18, pl. iii., figs. 7-7*c*, and synonymy. *Id.* McCulloch, Rec. Austr. Mus., vii. 4, 1909, p. 313.

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[17] C. R. Acad. Sci. cxli., 1905, p. 747.

[18] "Siboga" Exped. xxxix.*a*, Decapoda, pt. i., Penæidæ, 1911, p. 76.

[19] *In* Schultze, Zool. Anthrop. Ergebn. Forschungsreise west. zent. Südafrica, 1903-1905, v., 1913, Lief. ii., p. 105, figs. 1-6.

[20] Ann. South African Mus. xv., 1914, p. 22, pl. lxxii.

Penæopsis monoceros, De Man, "Siboga" Exped., xxxix.*a*, Decapoda, pt. i., Penæidæ, 1911 (plates 1913), p. 55, pl. vi., figs. 14*a-c*. Pesta, Archiv f. Naturg., 1915, Abt. A, Heft I., p. 104. Stebbing, Ann. South African Mus., xv., 1915, p. 70. Kemp, Mem. Indian Mus., v., No. iii., 1915, p. 321; Mem. Asiatic Soc. Bengal, vi., 1918, p. 294. Balss, Abh. der K. Bayer. Akad. Wiss., II., Math.-phys. Klasse, Suppl., 9 Abh., 1919, p. 7.

Occurrence.—Sixteen specimens of this rather well-known and widely distributed species were taken off Southern Queensland (Reg. Nos. E.6612, 6614, 6616, and P.3584, 3586-8); seven males and eight females.

Seven miles N.N.E. of Bowen, Queensland, 16 fathoms (Reg. No. E.6620); one female.

Distribution.—According to Alcock, this is one of the commonest of the Indian prawns, and its distribution, as given by De Man, is: "Along the coasts of India from the Indus Delta to Hongkong (Alcock); East Indian Archipelago (Atjeh; Makassar; fresh water of the river at Maros; Pare-Pare; brackish water of the river Tjenrana at Palima, Celebes) (de Man); Philippine Islands (Spence Bate) and at the coasts of Japan (Kishinouye). Haswell records this species from the Endeavour River, Queensland, and, according to Hilgendorf, it should also occur at Quelimane [on the east coast of Africa]." Pesta extended its range southward along the East African coast as far as Delagoa Bay, whence he had a single female specimen, while Stebbing, in addition to two further specimens from the same locality, lists a third from even a little farther south, "off South Head of Tugela River, in depth between 12 and 14 fathoms." Kemp records *Penæopsis monoceros* as very abundant in the Chilka Lake, Orissa Coast, Bengal, and numerous in the Tale Sap Lake on the east coast of peninsular Siam.

Remarks.—With this species I identify a cotype of Haswell's *P. mastersii* from the collection of the Macleay Museum; it is an immature male from Port Darwin. Also, three immature male and female specimens from Finche's Bay, Cooktown, Queensland, from the Australian Museum (Reg. No. P.4287); these were collected by the late Allan R. McCulloch and identified by him as *P. mastersii*.

"PENÆUS MASTERSII."
(Plate lviii., figs. 1-2.)

Alcock correctly inferred that this species probably belonged either to the *P. affinis* or *P. deschampsi* group; an examination of the cotype shows that it belongs to the former, or *P. monoceros* group, as it is sometimes also designated. Haswell's cotype is immature, the two halves of the petasma being separate, undeveloped and simple, but a faint notch and tubercle on the merus of the left fifth leg—the right is missing—gives unmistakable evidence as to its true position. The dactyl of this leg is missing, but apparently it would not have reached the tip of the antennal scale.

This cotype is 71 mm. long from the tip of the telson to the end of the damaged rostrum. The carapace, excluding the rostrum, is 16 mm. long, and the rostrum, from which the tip is gone, measures 10 mm. in length. The only feature in Haswell's description of *P. mastersii* which could differentiate that species from *P. monoceros* is the "smooth carapace" but on the carapace of this immature male, there are ample evidences or traces of tomentum, which seems to have been largely rubbed off. In some of the depressions on the abdomen also there are traces of former pubescence, particularly on the fifth and sixth somites. When wet, this rather scanty pubescence is not very noticeable, which evidently explains why the carapace was originally described as smooth.

The other three specimens from Finche's Bay, Cooktown (Reg. No. P.4287) are all small and more or less immature. The smallest, 47 mm. long, is a female, and its thelycum resembles that of an immature *P. monoceros*. The median anterior grooved "tongue" is rather wider posteriorly than anteriorly, which is the reverse of what is usual in larger specimens of *P. monoceros*; in a large female of 160 mm. from Mauritius, however, this "tongue" is widest at the middle of its length. The ear-like lobes bounding the postero-lateral angles of the thelycum are rather more medial than one would expect to find in a *monoceros*, but an examination of a series of females, the smallest of which is a specimen from Formosa about 62 mm. long, indicates that their position varies with growth. In the course of development or growth of the thelycum, the ear-like lobes change from a transverse medial position to an almost wholly lateral one; further,

from being more or less flattened out, the "salient free edge" becomes strongly incurved. The typical adult thelycum is better figured by de Man than by either Alcock or Kishinouye.

The fifth legs of this smallest "*mastersii*" female reach about four-ninths the length of the antennal scale, while the third maxillipeds fall just short of its proximal third. In this specimen any pubescence that may have been present seems to have become rubbed off.

The intermediate of the three Cooktown specimens is an immature male of 51 mm., and resembles the cotype in having the lobes of the petasma still rudimentary and entirely separate. The tips of its fifth legs reach a little beyond the middle of the antennal scale, and the third maxillipeds extend only as far as the proximal three-tenths of the length of the scale. On the abdomen there are very evident traces of pubescence.

The largest specimen, also a male, measures 74 mm. in length. The two halves of its petasma are considerably more developed than in the smaller specimen, and joined. Superficially, this petasma somewhat resembles that of *P. brevicornis*, as figured by Alcock, but the similarity seems to be due to the immaturity of the Cooktown specimen. The "gargoyles," as they are designated by Alcock, apparently have not attained their adult or mature condition. The median, dorsal lobes are prominent, and not hidden by the "gargoyles" as occurs in full grown specimens. The petasma of the adult of *P. monoceros* is rather better figured by de Man and Kishinouye than by Alcock. The relative length and the evident meral notch of the fifth legs, together with the shape and dentition of the rostrum, seem to definitely preclude any confusion as to the identity of this immature male.

The fifth legs of this specimen extend seven-eighths the length of the scale, and the third maxillipeds but four-elevenths of its length. There is even more pubescence on the abdomen than in the smaller male.

The rostrum of this large male from Finche's Bay is identical in proportion, general shape and trend with those of several specimens of *monoceros* 100 mm. long, from Formosa. The smaller male and the female have

slightly more curved rostra, but they are well within the limits of variation common to any fair series of the species. According to Alcock, the number of rostral teeth in *P. monoceros* varies from 9-12; Haswell counted 8-9 in his *mastersii*, but two of the Cooktown specimens have nine, and the third, the smaller male, has ten. As stated before, the rostrum of the cotype lacks its tip, and ends at about the middle of the second segment of the antennular peduncle. On it eight teeth are to be counted. Of the "Endeavour" specimens, eight have ten teeth above, four have nine, and one has eleven teeth; in the others the rostra are incomplete.

PENÆOPSIS ENDEAVOURI, *new species*.
(Plate lix., figs. 1-3. Plate lxviii., fig. 4.)

Occurrence.—11-14 miles N.W. of Pine Peak, Queensland, 24-26 fathoms; one female (Reg. No. E.6613).

Southern Queensland coast; nine males and four females (Reg. Nos. E.3198-9, E.6687-8, P.3583, P.3585, P.3589); E.3199 is the female holotype.

Description.—A very pubescent species, so closely related to *P. intermedius* (Kishinouye)[21] that the two are difficult to differentiate without recourse to the shapes of the petasma and thelycum. There are also some differences in the arrangement of the pubescent areas on the body.

The lateral pubescent areas of the carapace are much larger in *P. endeavouri*, occupying the greater part of the branchial region, which is for the greater part bare in *P. intermedius*. Similarly, the roughly circular pubescent areas on all but the first of the abdominal epimera in *P. intermedius* are never more than half the width of the corresponding epimeron, and usually scarcely more than a third of its width; in *P. endeavouri* the similarly placed, irregularly triangular patches always occupy more than a half, and usually two-thirds of the epimera. The two pubescent patches on the epimeron of the first somite in *P. intermedius* are separated by an interval considerably wider than either patch, while in *P. endeavouri* each patch is more than twice as wide as the interval between them.

[21] Kishinouye, Journ. Fish. Bur. Tokyo, viii., 1900, p. 21.

The only portion of the dorsum of the second abdominal somite of *P. endeavouri* which is not pubescent is a smooth and often rather narrow hastate area; this is perhaps the trace of an anterior extension of the prominent carina of the fourth, fifth and sixth somites, which also is apparently indicated along the median line of the dorsum of the third by a longitudinal non-pubescent area. In *P. intermedius* on the other hand the dorsum of the second abdominal somite is smooth and shining, except for two narrow transverse lines of pubescence, of which the posterior is indicated, laterally only being incomplete for quite a wide interval over the middle of the back; the smooth dorsum of the third somite extends on to the epimera, being interrupted laterally by only a few small pubescent patches on each side; the fourth somite is carinated only in its posterior half, while the fifth and sixth are much as in *P. endeavouri*. The carina of the sixth somite ends posteriorly in a tooth in both species.

The rostrum is distinctly ascending and extends as far as, or slightly beyond, the distal border of the second joint of the antennular peduncle, which in turn is as much exceeded by the spine of the antennal scale. Only in one specimen, a large female of 175 mm. in length, does it equal the peduncle in length. The rostrum is armed with ten to twelve teeth above; eleven are present in ten of the fourteen specimens. The post-rostral carina is distinct almost to the posterior margin of the carapace.

The third maxillipeds and the first legs both reach about as far forward as the end of the antennal peduncle, and the second legs exceed that point by the length of the hand. The third legs and fifth legs seem to be variable in length. In the figured female holotype the former reach to about the end of the spine of the antennal scale, as do also those of a male specimen taken with the holotype; in another male specimen from the same source the third legs reach to, or slightly exceed the tips of the scale. In another male specimen the fifth legs extend along five-sevenths of the length of the scale, while in the holotype they reach to about the middle of the scale. In another female in which they might have been lost and later regenerated, though there is no evidence that this is the case, they extend only to the end of the first third of the scale. The first legs are bispinose beneath, the second and third pairs unispinose.

The petasma is symmetrical and, though relatively of a somewhat heavier build, is in general much like that of *P. intermedius*. As seen from below, the antero-lateral spine of the terminal portion of each moiety is quite strong and prominent, and considerably over-reaches the rounded protuberance of the inner distal angle. The spine is as long as the anterior margin of the terminal piece. Adjacent to the spine on its inner side, is a smaller spine-like projection of which there is no counterpart in *P. intermedius*; in this latter species also the antero-lateral spine is subequal to, or a little shorter than the median protuberance. In *P. intermedius* there is an indication of a small point on the outer proximal margin, which is not found in *P. endeavouri*; on the other hand, the proximo-lateral angle of the terminal portion of *P. endeavouri* is prominently produced backward and outward in a slightly flattened, twisted lobe, while in *P. intermedius* the same angle is merely rounded off.

The thelycum lacks the posterior median point, or tubercle characteristic of *P. intermedius* which is so well shown by Balss,[22] and the lateral plates are not bent to form a right angle about the middle of their length; nor do they form so sharp a ridge, being very blunt and more or less evenly rounded off in ventral aspect. They are also separated by a wider interval on the median line. Furthermore, the posterior extensions of the fourth pair of legs of *P. intermedius* not only overhang the lateral plates of the thelycum, but they much surpass them in prominence and conspicuousness. In *P. endeavouri* on the other hand, they are quite subordinate in size and position to the lateral plates. The median anterior plate of the thelycum, like that of *P. intermedius*, is labiate, but not so broadly so anteriorly, and, in direct contrast to that species, is slightly emarginate in the middle of the anterior margin. At this point in *P. intermedius* there is a small blunt tooth or prominence.

Size and Measurements.—This species appears to attain a larger size than *P. intermedius*. Of three specimens of the latter before me, two females measure 120 mm. in length and a male is 110 mm. long. Kishinouye's

[22] Balss, Abh. der K. Bayer. Akad. Wiss., ii., Math.—phys. Klasse. Suppl., 9 Abh., 1914, p. 8, fig. 2.

only specimens of *P. intermedius* were both 120 mm. long. The largest female of *P. endeavouri* is 175 mm. long, and the largest male 140 mm.

The rostrum of the female holotype is 20·5 mm. long, the carapace 35·5, and the abdomen and telson together about 101 mm. long, making a total length of about 157 mm., though the extreme tip of the telson is lacking. The telson is about 21 mm. long, and the sixth abdominal somite 21 mm. to the tip of the posterior median spine. The height of this somite, measured at the middle of its length, is 17 mm., and its greatest width at the same point is 9·5 mm.

Remarks.—*P. endeavouri* belongs to that group of Penæopsi having lateral spines on the telson, symmetrical petasmas, and no exopodites on the last pair of legs, which in the adult male have a notch and a tooth or spine near the proximal end of their meral joints, such as is characteristic of *P. monoceros*.[23]

To this group belong *P. ensis* (de Haan),[24] *P. intermedius* (Kishinouye),[25] *P. stebbingi* (Nobili),[26] *P. macleayi* (Haswell),[27] and doubtfully *P. cognatus* (Nobili),[28] the male of which is still unknown.

De Man[29] has recently given a few differential characters tending to separate *P. ensis* (de Haan) from *P. intermedius* (Kishinouye). "*Penœopsis ensis* (de Haan) from Japan differs from both the typical *Pen. intermedia* and the variety *anchista* by an obtuse crest which from the hepatic spine runs backward to the posterior margin of the carapace, and furthermore by the stronger carination of the abdomen; the posterior half of the 2nd tergum is crested, there is a distinct *flattened* keel on the 3rd, while the 4th to the 6th terga are sharply carinated. In *Pen. ensis* the rostrum is slightly turned upward, the two posterior spinules of the telson are rather long like

[23] *Cf.* Alcock, Cat. Indian Decapod Crust., 1906, pt. iii., fasc. i., p. 50.
[24] *Cf.* De Man, Zool. Medd. Rijks. Mus. Nat. Hist. v., 1920, p. 104.
[25] Jour. Fish. Bur. Tokyo viii., 1900, p. 21.
[26] Bull. Mus. Hist. Nat., Paris, 1909, No. 5, p. 229; Ann. Sci. Nat. (9), Zool. iv., 1906, p. 15, pl. i., fig. 2. Tattersall, Jour. Linn. Soc. London, xxxiv., 1921, p. 365, pl. xxvii., figs. 7-10 and pl. xxviii., fig. 13.
[27] Proc. Linn. Soc. N.S.W. iv., 1, 1879, p. 40; Cat. Austral. Crust., 1882, p. 201.
[28] Bull. Mus. Hist. Nat., Paris, 1904, No. 5, p. 229; Ann. Sci. Nat. (9), Zool. iv., 1906, p. 14, pl. i., fig. 1.
[29] Zool. Medd. Rijks. Mus. Nat. Hist., v., 1920, p. 104.

in typical *intermedia*, but, like in the variety *anchista*, the anterior spinule is only half as long as the posterior. In *Pen. ensis*, finally, the peræopods of the 1st pair are also bispinose. (These characters of *Pen. ensis* were communicated to me by Dr. Horst of the Leiden Natural History Museum, who kindly did examine the only still existing type specimens of this species)." His *P. intermedia*, variety *anchista* I have not seen.

Though *P. endeavouri* has the pereiopods of the first pair bispinose, and the rostrum a little more ascendant than *P. intermedius*, I am disinclined to identify it with *P. ensis* as characterized by de Man, without knowing more about the sexual organs of that species. I should hardly designate the central non-pubescent patch on the dorsum of the second abdominal somite as a crest, nor any of the bare intervals between the lateral pubescent areas of the carapace as an "obtuse crest which from the hepatic spine runs backward to the posterior margin of the carapace."

P. cognatus, also a very pubescent species, differs in having all the abdominal segments carinated. Further, the postocular (orbital) tooth is an insignificant blunt angle in *P. endeavouri*, but is said to be spiniform in *P. cognatus*, and the antero-lateral angle of the carapace, which is sharp in the latter, is rounded in *P. endeavouri*. The thelycum, too, as described by Nobili, seems to have a different form.

Apart from the number of their rostral teeth, which in *P. stebbingi* is 8-10 and in *P. macleayi* 5-7, both these species differ from *P. endeavouri* in that the postrostral carina does not extend backward on to the posterior third of the carapace. Furthermore, both these species are much less pubescent than *P. endeavouri*.

Penæopsis macleayi (*Haswell*).

(Plate lx., figs. 1-5.)

Penæus macleayi Haswell, Proc. Linn. Soc. N. S. Wales iv., 1, 1879, p. 40, and Cat. Austr. Crust., 1882, p. 210. *Id.* Ogilby, Ed. Fish. and Crust. N. S. Wales, 1893, p. 204. *Id.* Whitelegge, Mem. Austr. Mus. iv., 2, 1900, p. 197.

Metapenæus macleayi Alcock, Cat. Indian Decapod Crust., pt. iii., fasc. 1, 1906, p. 17.

Penæus macleayi Phillipps, Austr. Zool., iv., 1, 1925, p. 3, pl. ii., fig. 1.

Penæus haswelli Phillipps, *tom. cit.*, 1925, p. 3.[30]

Through the kindness of the authorities of the Australian Museum, I am able to record here some notes upon a female cotype, and some other specimens of this species forwarded to me through Mr. Allan McCulloch.

The rostrum of the Port Jackson cotype is broken and shows but five teeth. Another female specimen in the Australian Museum from Port Jackson (Reg. No. P. 1438) has seven teeth above, as did apparently the specimens from Sydney, upon which de Man[31] commented. Of three mature males before me, the largest, of about 101 mm. long over all, has six teeth above of which but one is on the carapace, just behind the orbital margin. The epigastric tooth, which ordinarily is situated almost over the hepatic spine, is completely wanting. The two smaller males have six and seven teeth respectively above, as have two immature males, in which the halves of the petasma are not yet united. Hence the number of dorsal rostral teeth becomes from 5-7, rather than from 5-6 as given by Haswell. As noted by de Man, the more or less styliform terminal portion is usually shorter than half the length of the free portion of the rostrum. In the Port Jackson female specimen with a complete rostrum, two teeth, counting the epigastric, are on the carapace, four on the basal half of the free portion of the rostrum, and one, the seventh, just before its middle. The rostrum is 20 mm. long and the tip of the last rostral tooth is 8·25 mm. from the tip of the rostrum. In the largest male specimen, the penultimate rostral tooth is at the middle of the free portion of the rostrum, as it also is in two

[30] In this paper Phillipps deals with the commercial aspect of New South Wales prawns imported into New Zealand. He found that the specimens he examined and identified as *Penæus macleayi* differed from Haswell's description of that species in the dentition of the rostrum, and proposed the provisional name "*Penæus haswelli*" in the event of the differences being substantiated.

The characters enlarged upon by Phillipps are negligible, as the question of the rostral variation of Haswell's *P. macleayi* has received detailed attention in the present report by Dr. Schmitt.

Unfortunately the editor of the "Australian Zoologist" has further complicated the nomenclature of *Penæopsis macleayi* by including some misleading statements in an *erratum* notice which appeared in the following issue of that journal (iv., pt. 2, 1925, p. 111). He states that the prawn belongs to the genus *Metapenæus*, and that the provisional name *haswelli* is preoccupied. Both these remarks are incorrect.—F. A. McNeill.

[31] Notes Leyden Mus. xii., 1890, p. 124.

other male specimens, one mature and the other immature; in two other males, and an additional female, with unbroken rostra the last dorsal tooth is just about the middle of the free portion of the rostrum. As described by Haswell, the post-rostral carina is quite thick and low, and becomes broadened out and flattened behind, losing itself before reaching the posterior third of the carapace. It extends about as far behind the point where the continued cervical groove would cross the dorsum of the carapace as the first rostral (epigastric) tooth is in front of that point. At this point, moreover, the post-rostral carina is noticeably pinched in or narrowed, broadening out behind to form an elongate triangular area, and showing a more or less distinct longitudinal pit or depression, which is less marked in the male than in most female specimens. The grooves of the carapace carry more or less pubescence. The pubescence is thicker at the upper end of the cervical groove, and on either side of the narrowest part of the post-rostral carina, in the angle made by the ridge with the general surface of the carapace. Otherwise the carapace and abdomen are smooth and shining. The posterior orbital margin shows an orbital spine quite contrary to Haswell's statement "supra-orbital spine absent." De Man, whose specimens were a little over three inches (about 81 mm.) long, suggests that possibly the orbital spine disappeared in the adult. Though Haswell's cotype is only about 88 mm. (about 3·37 inches) long, the other specimen before me is 126 mm. (about 4·87 inches) long; in both specimens, the orbital spine is distinct. The orbital spine, here so called, is a produced sharp angle in the orbital margin, forming in lateral view an apparent flattened spine.

The legs of the cotype extend about as far forward as in de Man's specimens. The first and fifth legs are a little shorter, the former attaining but the proximal third of the terminal joint of the antennal peduncle, and the latter just aboue five-sevenths the length of the scale; the second legs exceed the antennal by a little more than the length of the fingers; the third pair is the longest, and "extends with the fingers beyond the antennal scale;" and the fourth pair only reaches the end of the antennal peduncle. The third maxillipeds exceed the antennal peduncle by the greater part of the length of their terminal joint.

In the other and larger female of *P. macleayi* (Reg. No. P.1438), the first, second, and fifth legs are proportionately about as long as in the cotype; the third legs are shorter, scarcely reaching the base of the notch between the spine and blade of the antennal scale, while the fourth legs instead of reaching only the end of the antennal peduncles, slightly exceed the second pair in length. The third maxillipeds extend beyond the antennal peduncle by one-half the length of their terminal joint.

The legs of the largest male are relatively not unlike those of the two preceding specimens; the first legs only reach one-third the length of the distal segment of the antennal peduncle, attaining thus about the middle of the penultimate joint of the third maxillipeds; the fifth pair five-sevenths the length of the scale; the second pair of legs is regenerating; the third legs about reach the tip of the spine of the antennal scale; the fourth scarcely to the end of the antennal peduncle. The third maxillipeds reach about half the length of the spine of the antennal scale, and exceed the peduncle by about the length of their terminal joint.

As in *P. monoceros*, the symmetrical petasma "consists of the two rigid segments tightly folded in all their length, interlocked all along their anterior margin, and in close apposition along the greater part of their posterior margin, so as to form a compressed tube. Distally the tube ends in a pair of large gargoyles, the posterior lips of which are convoluted like the mouth of a personate corolla." The softer, more or less, fleshy terminal flaps of the petasma forming the "gargoyles," represent, as it were, the produced inner margins of the basal elements, twisted forward and upward (from a ventral point of view), so that the produced horns of the externo-distal angles of the basal pieces are concealed except for their tips in ventral view. In *P. macleayi* these terminal flaps or "gargoyles" appear to represent the continued growth of the medial two-thirds of the anterior margin and the inner margin of the basal elements together, bent over to form domed, "billowed" caps or hoods over the extremities of the basal pieces, about meeting, but not obscuring the blunt, moderately produced externo-distal angles. In some respects the petasma is not unlike that of *P. affinis*, as figured by

Alcock, of which, unfortunately, I have no male specimen for comparison.

The thelycum is quite striking and characteristic. On either side of the anterior median plate, which is medially sulcate and anteriorly hastate, the coxæ of the fourth legs have developed prominent quadrangular plates, somewhat rolled or turned up on their inner edges. These coxal plates rather overshadow the median anterior plate of the thelycum. Posteriorly from the level of the hinder margin of each coxal plate, the somewhat curved flattened ear-like lateral plates with raised outer margins, extend inward toward the median line, where they are more or less separated from one another by a quite prominent median, and smoothly rounded tubercle. Just posterior to the inner posterior angle of each coxal plate of the fourth legs is situated a similar more prominent and conspicuous rounded tubercle, one in each antero-lateral angle of the median depressed area of the thelycum enclosed by the lateral ear-like lobes. Behind these, in line with the coxæ of the fifth pair of legs, is a thickened, rounded, transverse bar, somewhat swollen on either side of the middle. Near either end the hinder margin of this bar is indented, or rather excavated to accommodate a large raised and rounded oblique lobe. The median anterior plate described as anteriorly hastate above, has a somewhat rounded posterior extension connected with it by a narrower portion of the same plate, in effect giving the plate in its entirety a somewhat "dumb-bell"-shaped outline. This posteriorly rounded portion of the plate is flush with the anterior slope of the depressed portion of the thelycum: the anterior more or less free end is narrower and more pointed than the posterior embedded portion, being as already described, hastate in outline.

The fourth abdominal somite is dorsally carinated for the posterior two-thirds of its length, but not so sharply as the fifth and sixth, which are carinated throughout their length. The telson has four pairs of lateral marginal spinules, including the subterminal pair. In the female cotype the carina on the fourth abdominal somite, though no longer, is sharper and more prominent than in the other female specimen from Port Jackson.

Distribution.—This species has so far been found only off the coast of New South Wales. I have seen

specimens from the collections of the Australian Museum collected at Fullerton Cove Bay, April 18, 1910; Hawkesbury River, September 29, 1923 (A. R. McCulloch, coll.); and Port Jackson (type locality).

Miers had a specimen from the Richmond River; de Man two from Sydney; Ogilby records it from the Sydney market; and Whitelegge examined two from off Shoalhaven Bight, in 15-18 fathoms ("Thetis" Sta. 50).

PENÆOPSIS NOVÆ-GUINEÆ (*Haswell*).
(Plate lxi., figs. 1, 2*a-b*. Plate lxviii., fig. 2*a-b*.)

Penæus Novæ-Guineæ Haswell, Proc. Linn. Soc. N.S.W., iv., 1879 (1880), p. 43, and Cat. Austral. Crust., 1882, p. 203. *Id.* Alcock, Cat. Indian Decapod Crust., 1906, pt. iii., fasc. i., p. 55. *Id.* de Man, "Siboga" Exped., xxxix.*a*, Decapoda, pt. i., Penæidæ, 1911, p. 11.

Penæus Palmensis Haswell, Proc. Linn. Soc. N.S.W., iv., 1879 (1880), p. 43, and Cat. Austral. Crust. 1882, p. 204.

Metapeneus palmensis Alcock, Cat. Indian Decapod Crust., 1906, pt. iii., fasc. i., p. 51.

Metapeneus stridulans Alcock, Cat. Indian Decapod Crust., 1906, pt. iii., fasc. i., p. 27, pl. v., figs. 14-14*d*.

Penæopsis palmensis de Man, "Siboga" Exped., xxxix.*a*, Decapoda, pt. i., Penæidæ, 1911, pp. 8, 55, 73.

Penæopsis stridulans de Man, "Siboga" Exped., xxxix.*a*, Decapoda, pt. i., Penæidæ, 1911 (plates, 1913), p. 65, pl. vii., figs. 20*a*, 20*b*. *Id.* Balss, Denkschrift., Math.-naturwissen. Klasse, K. Akad. Wissen., xci., 1915, pl. 10. *Id.* Pesta, Archiv f. Naturg., 1915, Abt. A., Heft 1, p. 104. *Id. Tattersall,* Jour. Linn. Soc. London, xxxiv., 1921, p. 366. *Id.* Balss, Kongl. Svenska Vetens. Handl., lxi., No. 10, 1921, p. 6.

Occurrence.—Great Sandy Strait, off Point Inskip, Queensland, 10 fathoms; one male and one female (Reg. No. E.3182).

Great Sandy Strait, Queensland; two females (Reg. No. P.3568).

Seven miles N.N.E. of Bowen, Queensland, 16 fathoms; one female (Reg. No. E.3102).

Distribution.—This species proves to be rather widely distributed. Heretofore it has been recorded from: Japan—Osima and Yokohama (Pesta); Hongkong (Alcock and Pesta); Dutch East Indies (Alcock); Australia—Cape Jaubert, West Australia (Balss), Sydney?, New South Wales (Pesta), and Palm Island, Queensland (Haswell); New Guinea—Katow (Haswell); Orissa coast, Andamans, Ganjam coast, Vizapatan coast, Madras coast, Palk Strait, Gulf of Martaban (Alcock); Red Sea, Suez, Shubuk and Kunfunda (Pesta, Tattersall, Balss).

Remarks.—At last it is possible to raise Haswell's *Penæus novæ-guineæ* from obscurity among "species the systematic position of which is doubtful" (de Man), and to restore it to the status of a good species. However, in so doing it is perhaps unfortunate that so well known a species as *Penæopsis stridulans* becomes relegated to the position of a synonym. Likewise the *Penæus palmensis* of Haswell becomes a synonym of *Penæopsis novæ-guineæ.*

I have been able to examine one male and three female Peneids from Gloucester Passage, Queensland (Reg. No. P.412, Austr. Mus.), which Mr. McCulloch identified with *novæ-guineæ* with this comment: "The male has been closely compared with the holotype of *P. novæ-guineæ,* which is of about the same size. The females exhibit some variation in the length of the rostrum and include characters of both *novæ-guineæ* and *palmensis*; the spines between the bases of the second chelipeds are always well developed in the females, but may be rudimentary in the males." Mr. McCulloch adds, "The unique holotype, a male from Katow, New Guinea, measures 17 mm. from the tip of the rostrum to end of carapace. It is in a bad state of preservation and its characters are difficult to observe even with a modern binocular microscope. It differs from Haswell's description in having the gastro-hepatic sulcus just as in *palmensis*; hepatic spines are present though imperfect. The palp of the external maxillipeds is similar to that of *palmensis*; the second joints of the second chelipeds bear spines similar to those of the first."

"A most careful comparison of the holotypes of *novæ-guineæ* and *palmensis* fails to reveal any differences between them other than the length and armature of the

rostrum, it being slightly longer and having fewer teeth in *novæ-guineæ*."

I have also been enabled to examine several specimens of Haswell's "*Penæus Palmensis*" from the Macleay Museum. Regarding these Mr. McCulloch wrote, "I identify as this species a large female 29 mm. long from tip of rostrum to end of carapace, together with two smaller females and two small males, all from Darnley Island, which are forwarded for examination. These were confused with *P. granulosus* by Haswell, and the notes upon the males at the end of his description of that species are based upon these specimens. I have critically compared one of the smaller females, 11·5 mm. long from tip of rostrum to end of carapace, with the holotype of *P. palmensis*, which is of about the same size, and find it agrees in all details."

In a brief key to the Peneids described by Haswell, which the late Allan R. McCulloch was kind enough to prepare for my convenience, he considered *palmensis* a variety of *novæ-guineæ*, but I feel certain that, together with *P. stridulans*, they represent but one species. The range of variation which was observed by de Man in his "Siboga" series of 23 males and 29 females is sufficient to include the differences Haswell detected between his *novæ-guineæ* and *palmensis*. In a survey of his material de Man remarked: "The examination of these numerous specimens, though mostly of young or of medium size, proved that *Penæopsis stridulans* (W.-Mas.) is a very variable species. At first, indeed, the specimens did appear to me to belong to two different species, but the existence of several transitional forms led me to the conclusion that all ought to be referred to one and the same species. The variability bears upon the toothing of the rostrum, the more or less distinct development of the branchiostegal spine, the form of the stridulating organ and the number of its ridges.[32] the shape of the carina on the 3rd abdominal tergum, of the thelycum and of the thoracic legs, as also the length of the telson." The rostra of de Man's specimens carried from 5 or 6 to 8

[32] For want, possibly, of sufficient specimens showing the short, straight, high placed stridulating organ, and the longer, curved, lower placed form, I have been unable to detect any noticeable or really appreciable differences in the epimera of the first abdominal somites, which play upon the several different types of stridulating organs in this species.

teeth in addition to the epigastric; the stridulating organ was composed of from 11 to 20 ridges; and the thelycum varied between the form figured by Alcock (*l.c.*) and that figured by de Man (*l.c.*).

"Penæus Novæ-Guineæ."

(Plate lxi., fig. 2*a-b*. Plate lxviii., fig. 2*a-b*.)

Of the four specimens of *P. novæ-guineæ* received from the Australian Museum (Reg. No. P.412), the largest is a female about 64 mm. long; its rostrum is about 8 mm. long, and reaches nearly to the middle of the third or terminal joint of the antennular peduncle. Including the epigastric tooth, which is not much in evidence on the badly broken carapace of this specimen, there are eight rostral teeth. The harshly tomentose carapace is about 16 mm. long and shows no post-rostral carina. The stridulating apparatus consists of nine ridges transversely placed on the naked curved band near the postero-lateral angle of the carapace; the antero-lateral angle is spined. The third maxillipeds of this specimen are nearly as long as the antennal scale, which is exceeded by the third chelipeds by the length of their fingers; the first legs exceed the antennal peduncle by the length of their fingers, and are exceeded by the second by the length of their hands; and these fall short of just reaching to the ends of the carpus of the third legs. The fourth legs are wanting, and the left fifth, its mate being lacking, reaches through five-eighths the length of the antennal scale.

There is no carina on the first abdominal somite. On the second, however, there is a faintly sulcate, blunt carina on the posterior two-thirds of the somite. Narrowing posteriorly and becoming more flattened, this carina merges with the narrow naked area paralleling and forming the posterior margin of the somite.

The third somite has likewise a low, blunt, faintly grooved carina, narrowest at a point a little in advance of the middle of its length. Posteriorly the carina is wider and more flattened, so that the rather broad sulcus appears to become obliterated. The carinæ of the fourth, fifth and sixth somites are high, narrow and prominent; the fifth somite is about one-half the length of the sixth, and the postero-lateral angle of the latter ends in a small

spine. The sixth somite is a little shorter than the telson, which is as long as the inner branch of the uropods.

The other females of this lot (Plate lxi., fig. 2*a-b*, Plate lxviii., fig. 2*a-b*) are about of a size, being 49 and 50 mm. long respectively. The rostrum of the larger is 7 mm. long and runs to the end of the second segment of the antennular peduncle; it is armed with eight teeth, including the epigastric tooth on the carapace, which is as far from the second as the second is from the fourth; the second tooth is just in advance of the orbital margin; otherwise the rostral teeth are rather evenly spaced. The stridulating organ is much as in the preceding specimen and has but nine ridges. Behind the epigastric tooth the carapace is not carinated. The carination of the abdomen is as in the largest specimen; the inner branches of the uropods slightly exceed the tip of the telson.

The smaller of these two females, the one of 49 mm. length, exhibits some differences which seem to be of no great or specific importance. The chief reason for figuring these females (Plate lxviii., fig. 2*a-b*) was to portray their rostral variation. In any good series of *P. stridulans*, or as we now know it, *P. norœ-guineœ*, the rostrum is somewhat variable, ranging from fairly slender, straight, and uptilted ones as in the larger of the two females described above, to those more or less sinuous in general outlines and of greater depth as shown in the smaller; in some specimens of "*stridulans*" the upper margin appears quite concave, as in a 71 mm. female from the Indian Museum.

The rostrum of the 49 mm. female has but seven teeth, of which the first, or epigastric tooth on the carapace is as far from the second as it is from the fourth, which in turn is farther from the third than this is from the second; as a result the teeth appear quite unequally spaced. The stridulating organ of this same specimen is placed much lower than in the other specimens, and is much less conspicuous; about eleven transverse ridges can be counted. The carina of the second abdominal somite shows no trace of a sulcus, and that of the third somite is only faintly grooved, and hardly that, for in its breadth dorsally it is just very slightly depressed medially for a small fraction of its length near the anterior end.

The thelycum in all of these specimens is much as that figured for the Darnley Island specimen of *P. palmensis* (= *novæ-guineæ*) below (Plate lxi., fig. 1), and seems to be intermediate between those figured by Alcock and de Man.

The male, and smallest specimen, is about 48 mm. long, of which length the carapace and rostrum together equal 17 mm. This is the identical length given by McCulloch for the holotype for the same interval (see previous pages). This, of course, indicates some error in Haswell's original measurement given as "2·5 inches," a length which would be some 15 mm. greater than the compared specimen before me "which," as Mr. McCulloch distinctly states above, "is of about the same size" as the holotype.

The rostrum has six teeth on its free portion, all before the orbital margin, not counting the epigastric tooth on the carapace, thus giving a total count of seven teeth, or one more than in the holotype. The first or epigastric tooth is about as far from the second as this is from the fourth; beginning with the second tooth, the interval between the successive teeth becomes greater until the sixth is reached. The distance from the sixth to the seventh is but half that between the fifth and sixth; the seventh is situated at three-fifths the distance from the sixth to the tip. The rostrum is 7·5 mm. long and reaches about two-thirds the length of the last segment of the antennular peduncle, which is about as long as the antennal scale. As in *P. stridulans* (= *P. novæ-guineæ*) there is an inconspicuous postocular notch, or denticle; a strong antennular spine, and a small but well-formed and distinct hepatic spine. In this particular, Haswell's holotype, as well as the foregoing specimens, are at variance with his description, which states that the hepatic spine is absent. The stridulating organ is quite inconspicuous, but plainly seen with a glass, and composed of 11 or 12 little quadrangular, tuberculiform ridges on a slightly raised, non-pubescent, curved band. The third maxillipeds extend nearly four-fifths the length of the antennal scale; the first pair of legs easily attain the end of the antennal peduncle, as do also the fourth legs; the second legs exceed the first by the length of their hands, and the third legs in turn exceed the second by their hands and

reach about as far forward as the third maxillipeds; the fifth legs are wanting, or broken. A further discrepancy in Haswell's description is also to be noted. He has it that the "under surfaces of the second and third pairs [of legs are] devoid of spines." This is true with respect to the third pair of legs, but the second pair in all of the specimens before me, as well as in the holotype, has the basis spined as in the first pair of legs, which in addition has the ischial joint spined as well.

As in the females, there is no indication of a carina on the first abdominal somite; that on the second is hardly more than a narrow, smooth, median area, scarcely raised above the general surface of the dorsum; just before the middle, the carina shows a small inconspicuous punctation. On the third somite, the carina is more prominent, dorsally flattened and without any noticeable trace of a groove; the carinæ on the fourth, fifth and sixth somites are narrow and prominent. The sixth somite is very slightly more than twice as long as the fifth and subequal to the telson, which falls scarcely little more than a seventh of its length short of the tip of the inner branch of the uropod.

The petasma is in very close agreement with the one figured by Alcock for *P. stridulans*, for though the outer "lobule" of the left lobe lacks the so-called "crown of stiffish filaments," these are suggested by very slight crenulations of the tip of the "lobule."

"Penæus Palmensis."

(Plate lxi., fig. 1.)

The small female specimen which has been critically compared with the holotype of *palmensis* is certainly a small *Penæopsis novæ-guineæ*, as McCulloch supposed.

The tip of the rostrum attains the distal margin of the second segment of the antennular peduncle, and, counting the epigastric, carries ten teeth of which all but the epigastric are before the posterior orbital margin. The antennular peduncle reaches as far forward as the antennal scale. There is an obscure post-ocular tooth, and the antero-lateral angle of the carapace is dentiform. The stridulating organ has from 13 to 14 ridges. The third maxillipeds reach forward nine-tenths of the length of the antennal scale, the extremity of

which is about reached by the third pair of legs; the first legs exceed the antennal peduncle by one-half the length of the fingers; the second and fourth pairs are wanting; the left fifth leg just surpasses the point of articulation of the antennal scale; this is unusually short as compared with the other specimens in the same lot, as well as more typical specimens of *P. stridulans* (= *novæ-guineæ*). The carina on the second abdominal somite is rather small; that of the third somite is distinctly grooved. From the tip of the telson this specimen is about 32 mm. long, a little shorter than the holotype.

The large female is 80 mm. long from tip of rostrum to end of telson, the carapace and rostrum together are 29 mm. long, and the rostrum alone about 11·5 mm. long. The rostrum is distinctly upcurved, and extending nearly half the length of its free portion beyond the eyes, reaches well to the end of the second segment of the antennular peduncle. Post-ocular, antennal, and hepatic spines proportionately well developed, and antero-lateral angle of the right side of the carapace spined; on the left side, however, rounded. The stridulating organ of this specimen is placed much like the one figured by Alcock (*op. cit.*, 1906, pl. v., fig. 14*b*) and of the same shape; either organ has twenty-one or twenty-two transverse ridges. The third maxillipeds extend along nine-tenths of the antennal scale; the fifth legs are missing. As in typical *P. novæ-guineæ* the first and second legs are spined beneath. The carina on the second abdominal somite is very short and insignificant, on the third well developed and distinctly grooved.

The two small males, McCulloch informed me, are those which Haswell confused with "*Penæus granulosus*" and referred to at the end of his description of that species. The larger of these is about 50 mm. long. Its rostrum is straight and uptilted, and carries eight teeth including the epigastric, which is the only one situated on the carapace; there are eleven ridges to the stridulating organ; the antero-lateral angles are spiniform and the third maxillipeds reach not quite nine-tenths the length of the antennal scale.

The carina of the third abdominal somite is grooved for only the posterior half of its length. The petasma is like that of the male *novæ-guineæ above* in having the fringes on the "lobule" of the left lobe faintly indicated.

The smaller male has the carina on the third abdominal somite grooved throughout. Its external maxillipeds are comparatively as long as those of the larger male. If anything, the fringes on the petasma are more distinctly indicated in this specimen than in its fellow, or even the male of *novæ-guineæ* above.

The smallest female of this "*palmensis*" lot is something else. There is no stridulating organ present. The rostrum has eight teeth above, counting the epigastric, of which all but the latter are in front of the posterior margin of the orbit. The small carina on the second abdominal somite is blunt and ungrooved, as is also the carina on the third somite. The specimen has all the ear-marks of a true *P. mogiensis*. The thelycum is very close to, if not identical with, the one figured by de Man[33] as the *Penæopsis* sp. for which he suggests the name *hilarulus*. Though I have not seen any *P. mogiensis* identified by Alcock, I am unwilling to concede the identity of de Man's specimen with Alcock's *mogiensis* to the exclusion of Miss Rathbun's species of that name. Alcock's description fits Miss Rathbun's species, and his figure of the thelycum is nearer the typical species than is the one given by de Man. Between the four pairs of legs, the median teeth, as Alcock calls them, might well be described as platelets. These usually diverge only at their tips, as is shown by Alcock, rarely so pronouncedly as in the case of Miss Rathbun's figured type from Mogi, Japan.[34] The more usual, and possibly less mature type, of a specimen 82 mm. long from Minato, Satsuma, Japan, is shown in fig. 4 of Plate lxi. The anterior of the two parallel transverse plates lying between the fifth legs are in both figures, Miss Rathbun's and Alcock's, cut into two laminæ, each of which may again be cut into two teeth. In the specimens in the collection of the U.S. National Museum, these teeth are more as delineated by Miss Rathbun, and not at all so sharply dentiform as Alcock has them in his figure, which I take to be a variational extreme. It is in the case of this very plate that de Man's[35] *Penæopsis* sp. (or *P. hilarulus*) differs from both the *mogiensis* of Alcock and Rathbun, inasmuch as it is all in one piece

[33] "Siboga" Exped., xxxix*a*, Decapoda, pt. i., Penæidæ, 1911 (plates 1913), p. 70, pl. vii., figs. 22*a*-22*d*.
[34] Rathbun, Proc. U.S. Nat. Mus., xxvi., 1903, p. 40, fig. 8.
[35] "Siboga" Exped., xxxix*a* Decapoda, pt. i., Penæidæ, 1911 (plates, 1913), p. 70, pl. vii., figs. 22*a*-22*d*.

and raised into blunt teeth only at the outer angles. Such a specimen is this small Darnley Island, Torres Strait, female from the Macleay Museum, Sydney (see Plate lxi., fig. 3).

When it is borne in mind that Alcock in commenting on the pair of divergent median teeth between the fourth pair of legs, says: "In the young female the most conspicuous part of the thelycum is the last-mentioned pair of teeth," cannot it be that what on the whole seem to be minor differences between de Man's specimens and the typical species, are due to immaturity of the former? Though his largest females, of which the figured specimen is one, are of no mean size, 60 mm. long, de Man regrets that "the specimens collected by the 'Siboga' are unfortunately all young. . . . ."

The Macleay Museum specimen is scarcely 33 mm. long, but closely approximates de Man's figure in the shape of the thelycum and its component plates. The spines between the second pair of legs are like those of typical *mogiensis*, and resemble de Man's representation of them, but differ slightly in being a little more slender and more widely spaced. The fifth legs of this specimen are broken, and the third maxillipeds are gone entirely. The right first leg exceeds the antennal peduncle by about the length of the fingers, the second exceeding the first by nearly the entire length of the hand; the third leg of the right side is longer than the antennal scale by about the length of the fingers, while the fourth legs reach about as far forward as the first.

All in all there hardly seems to be sufficient ground to justify the separation of either de Man's or Alcock's specimens from the true *P. mogiensis* of Miss Rathbun. I also find that this same opinion was expressed by Balss[36] in his "Ostasiatische Decapoden." De Man's male specimens, by the way, show no characters at all tending to separate them from the true *mogiensis* of Rathbun.

The juvenile thelycum figured by Balss[37] as that of *P. mogiensis* is surely not that species. It is not unlike Tattersall's[38] drawing of that organ of *P. stebbingi*. The

[36] Abh. der K. Bayer. Akad. Wissen., II., Math.-phys. Klasse, Suppl., 9 Abh. 1914, p. 9.
[37] Denkschr., math.-naturwissen. Klasse, K. Akad. Wissen., xci., 1915, text-fig. 6.
[38] Jour. Linn. Soc. London, Zool., xxxiv., 1921, pl. xxvii., fig. 9.

original description of the sternal armature, and the arrangement of the spines at the bases of the legs of *P. stebbingi* also fit Balss's figure very nicely. It is to be regretted that Balss did not otherwise characterise his juvenile *mogiensis* females.

Genus Trachypeneus, *Alcock*.

Trachypeneus anchoralis (*Bate*).

(Plate lxii., figs. 1-3. Plate lxviii., fig. 3.)

Penæus anchoralis, Bate, Ann. Mag. Nat. Hist. (5), viii., 1881, p. 181, and "Challenger" Rept. Zool. xxiv., Macrura, 1888, p. 258, pl. xxxv., fig. 1 (part: only female from the Arafura Sea). Not the *T. anchoralis* of other authors.

Occurrence.—7 miles N.N.E. of Bowen, Queensland, 16 fathoms; one male, one female (Reg. No. P.3528), and three females (Reg. No. E.6618).

12 miles N.N.E. of Bowen, Queensland, 19-25 fathoms; six females (Reg. Nos. E.6611 and E.6615).

Distribution.—Otherwise known only from the type locality: Arafura Sea, south of Papua, 28 fathoms ("Challenger" Sta. 188, lat. 9° 59′ S., long. 139° 42′ E.).

Description.—Of female: rostrum usually distinctly recurved or bent upward distally; occasionally, however, quite straight and tilted, but little above the line of the dorsum of the carapace; armed above with eight to nine teeth not counting the isolated epigastric tooth; post-rostral carina usually quite distinct, especially so in younger specimens, tending, however, in older specimens to become broader and less distinct toward the posterior margin of the carapace which it very nearly reaches.

Carapace otherwise very much as described by Alcock[39] for his *T. asper*, except that there is a faint indication of what appears to be the lower end of a short cervical groove on either side, and that the antero-lateral angle is blunt, and not "distinctly dentiform." In fact, all the Pacific representatives of this genus,

[39] Cat. Indian Decapod Crust., 1906, pt. iii., fasc. i., p. 43, pl. ix., fig. 28, 28*a*, *b*.

as regards abdomen, carapace, and in general, rostrum, are so very much alike within reasonable variational limits as to render detailed descriptions of their appearance rather superfluous.

The presence and absence of epipodites on the thoracic legs of some species is both significant and diagnostic, but the thelycum and petasma furnish, so far as I am aware, the best clues to the species. The relative lengths of the fifth pair of legs and the third maxillipeds as compared with the antennal scale are often helpful, though of somewhat doubtful value specifically.

The fifth pair of legs in this species exceeds the tip of the antennal scale by from one-third to one-half the length of the propodal joint, while the third maxillipeds reach to a third or a fourth of the length of the scale from its tip. A basal spine is present on the first two pairs of thoracic legs, and epipodites are present only on the third pair.

The thelycum is as figured by Bate, and except for the inclusion of the male of *curvirostris*, it is strange that his very distinctive figure should have been confused with other species. The transverse posterior plate is broadly U-shaped, and encloses a more or less circular depressed area. Anteriorly the circumference of this area is somewhat indented by the convex posterior margin of the median anterior plate, which is medially sulcate to the extent of rendering it a broad, very shallow V-shaped trough.

The fifth abdominal somite is about three-fourths the length of the sixth, which in turn is nine-tenths the length of the telson. On either side the telson has a small subterminal marginal spine, in advance of which on either margin there are one or two scarcely perceptible spinules. The second abdominal tergum, as seems common to all the members of the genus *Trachypeneus*, carries a median compressed tubercle. The third to sixth terga are sharply carinated.

The *single male* found in the same bottle with a female of this species from seven miles N.N.E. of Bowen, Queensland, in sixteen fathoms (P.3528 part), I am inclined to consider the male proper to the species. There

is, of course, the possibility that it might prove to be the male of *T. granulosus*, of which females in three instances were associated with females of *T. anchoralis* (Reg. Nos. E.6618, 6615 and 6611).

This lone male is approximately 54 mm. long, of which length the carapace and rostrum together represent 19·5 mm., and the rostrum alone 7 mm. It agrees in most particulars quite closely with the female. The rostrum is fairly straight, but no more than in some of the females. It is armed above with eight teeth exclusive of the epigastric. The post-rostral carina is evident nearly to the hinder margin of the carapace, though becoming broader and less distinct posteriorly. The antero-lateral angle is blunt and not produced.

Likewise the abdomen is much as in the female, the fifth somite being about three-fourths the length of the sixth. The telson is broken.

The petasma is of the same general type as that of *T. salaco*, symmetrical, and reaching as in that species the coxæ of the fourth legs; the lateral hooks with which it is provided, however, attain the coxæ of the preceding pair of legs. The two branches are united on their anterior or dorsal surface, but leave below or posteriorly a narrow fissure between them. Distally the petasma ends in two apparently truncated "horns." The truncation is produced by the upward-turned and forward-twisted, and in part outwardly rotated slender extremities of these "horns," which form the lateral hooks, so-called above. Just short of the rounded end of these slender processes or hooks there is an upward-cut notch, making the end of the hook resemble much the tip of a crochet needle. The transverse lamina on the anterior margin of each "horn" of *T. salaco* is represented in this species by a platelet placed just about as far laterally, as seen in ventral view, as is possible without touching the lateral hook of the corresponding horn. Medially there are two joined, ventrally curved lobes which have their counterparts in *T. salaco* and correspond to the submedian teeth in *T. curvirostris*. Much as in *T. salaco* also, there is developed on the posterior surface of the petasma, at the level of the middle of the laterally directed portions of the "horns," a suggestion of a tooth on either margin of the median fissure.

The specimen is somewhat longer than de Man's two largest males. As in that species, it has epipodites only on the third of the thoracic legs. Though the rostral toothing is the same, and the third maxillipeds and antennules are relatively the same length—the fifth legs are comparatively a little longer—the shape and direction of the hooked and twisted tips of the lateral horns of the petasma are so unlike *T. salaco* that this male cannot be identified with that species.

Measurements.—As stated above, the single male specimen is about 54 mm. long. The smallest of the eight females is possibly 67 mm. long and the largest about 84 mm. Three specimens better than average are 79, 80 and 81 mm. long respectively.

Remarks. — "Challenger" specimens from Japan (Yokohama) identified as *Penæus anchoralis* by Bate and determined by Alcock as *T. curvirostris*, are referred to under the last-named species further on.

Trachypeneus granulosus (*Haswell*).

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

Penæus granulosus, Haswell, Proc. Linn. Soc. N.S.W., iv., 1879 (1880), p. 41, and Cat. Austral. Crust., 1882, p. 202 (part: female only). Not the *T. granulosus* of other authors.

Occurrence.—7 miles N.N.E. of Bowen, Queensland, 16 fathoms; three females (Reg. Nos. P.3521, P.3527 and E.6622).

12 miles N.N.E. of Bowen, Queensland, 19-25 fathoms; three females (Reg. Nos. P.3529 and E.3116).

Distribution.—Also known from Darnley Island, Torres Strait—the type locality.

Description of female.—Rostrum a little up-tilted and very slightly recurved, not quite reaching the distal extremity of the second segment of the antennular peduncle, armed above with from eight to ten teeth in addition to a small epigastric tooth situated at the anterior two-sevenths of the carapace. The rostrum is carried as a prominent, though blunt post-rostral carina quite to the posterior margin of the carapace. Orbital, antennal and hepatic spines as with the other members of the genus; antero-lateral border of the carapace

angled, but not acute or spined. The antennular flagella are about two-thirds to five-sevenths the length of their peduncle.

The fifth pair of thoracic legs extend about as far forward as the third pair and exceed the tip of the antennal scale by from one-fifth to nearly one-third the length of their propodal joints. There are spines at the bases of the first and second pair of legs.

The telson shows on each margin in advance of the readily discernible pair of subterminal spines, one or two pairs of minute, scarcely perceptible spines.[40]

The thelycum has anteriorly the more or less cordiform plate seemingly typical of the females of this genus. In this particular species, however, this plate has a median posterior extension or tongue, which overlaps what ordinarily in most of the related species is a centrally depressed portion of the posterior plate, and fuses with the hinder margin of that plate, so as to form a pair of lateral depressions, one under each outer angle of the "cordiform" plate. Anteriorly this "cordiform" plate is itself medially slightly depressed or excavated; posteriorly its tongue-like extension rises to a bluntly indicated, transverse ridge about in line with the lateral pits or depressions of the posterior plate of the thelycum. Behind this prominence or swelling the "tongue" is posteriorly rounded off; before it the sloping portion of the "tongue" shows a faint median ridge which rapidly fades out on the "cordiform" plate before it reaches its depressed portion.

Measurements.—Of the "Endeavour" specimens listed above, the largest is 95 mm. long from tip of rostrum to end of telson, and the two smallest 82 mm. long; the three others are respectively 86, 89 and 89 mm. long.

Remarks.—The male of this species has not yet been seen. It is possible that it might prove to be the same as de Man's *salaco*, as there does not seem to be any exclusive characters. On the other hand, however, until more is known of both species, it seems better to consider them as distinct.

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[40] These spines have been carefully searched for by three members of the Australian Museum staff, but could not be distinguished. They are, therefore, not shown in the illustration on plate xlix., prepared at the Australian Museum.—F. A. McNeill.

Through the Australian Museum I received for examination a paratype 72 mm. long, said to be of about the same size as the female holotype,[41] and another smaller paratype 45 mm. long. Type locality—Darnley Island, Torres Strait. The carapace and rostrum of the larger paratype measure 28·5 mm. as compared with 31 mm. for the holotype. The rostrum alone is 9·5 mm. long and fails to reach the last segment of the antennular peduncle. Above, it is armed with eight teeth in addition to the epigastric spine, as is also the 6·3 mm. rostrum of the smaller specimen. The post-rostral carina is distinct practically to the posterior margin. The third maxillipeds reach to a point a little in advance of the middle of the antennal scale. The fifth legs are wanting in both specimens, and the telson of each appears to have two pairs of tiny marginal spinules in advance of the subterminal pair (see footnote[40]).

Trachypeneus curvirostris (*Stimpson*).

(Plate lxiii., fig. 3.)

Penæus curvirostris, Stimpson, Proc. Acad. Nat. Sci. Phila., xii., 1860, p. 44 [113].

Penæus curvirostris, Miers, Proc. Zool. Soc. London, 1878, p. 307. *Id.* Ortmann, Zool. Jahrb. Syst., v., 1890, p. 451, pl. xxxvi., fig. 4 *a*, *b*. *Id.* Kishinouye, Jour. Fish. Bureau, Tokyo, viii., 1900, p. 23, pl. vi., fig. 4, pl. vii., fig. 10, 10 *a-c*. *Id.* Doflein, Abh. K. Bayer. Akad. Wissen., 1902, II. Klasse, xxi., Abt. iii., p. 631.

Penæus anchoralis, Bate, Ann. Mag. Nat. Hist. (5), viii., 1881, p. 181, and "Challenger" Rept. Zool., xxiv., Macrura, 1888, p. 258, pl. xxxv., fig. 1″ (part: except female from the Arafura Sea).

Penæus granulosus, Miers, Zool. "Alert," 1884, p. 295.

Parapenæus curvirostris, Rathbun, Proc. U.S. Nat. Mus., xxvi., 1902, p. 38.

Trachypeneus curvirostris, Alcock, Ann. Mag. Nat. Hist. (7), xvi., 1905, p. 523.

Trachypeneus asper, Alcock, Ann. Mag. Nat. Hist. (7), xvi., 1905, p. 531, and Cat. Indian Decapod Crust., 1906, pt. iii., fasc. i., p. 43, pl. ix., fig. 28, 28 *a*, *b*.

[41] The late A. R. McCulloch, of the Australian Museum, examined Haswell's specimens of "*Penæus granulosus*" and selected a specimen with 10 teeth above the rostrum, which he regarded as the holotype of the species.—F. A. McNeill.

Metapenæus curvirostris (?), Nobili, Ann. Sci. Nat., Zool. (9), iv., 1906, p. 20.

Trachypenæus curvirostris, de Man, Trans. Linn. Soc. London, (2), Zool., ix., 1907, p. 436, pl. xxxiii., fig. 56-58. *Id.* Balss, Abh. der K. Bayer. Akad. Wiss., Math.-phys. Klasse, Suppl., 10 Abh., 1914, p. 11.

Trachypenæus anchoralis, de Man, "Siboga" Exped., xxxix.*a*, Decapoda, pt. 1., Penæidæ, 1911 (plates 1913), p. 88, pl. viii., fig. 28. *Id.* Tattersall, Jour. Linn. Soc. London, xxxiv., 1921, p. 367.

Trachypenæus asper, Balss, Denkschr. math.-naturwissen. Klasse k. Acad. Wissen., xci., 1915, p. 12.

Occurrence.—Off Frazer Island, Queensland, 32-33 fathoms; one male and two females (Reg. No. E.4472).

Distribution.—Previously known from:

Japan, Hakodate to Kagoshima and Nagasaki, to a depth of 150 m. (Stimpson, Ortmann, Rathbun, Doflein, Balss); Inland Sea (de Man); Formosa.

Dutch East Indies, Halmaheira Sea, off Salawatti Island, south of Timor, Molo Strait, 18 to 141 fathoms (de Man); Arafura Sea, south of Papua, 28 to 49 fathoms (Bate).

Australia, Port Darwin, North Australia, 12 fathoms (Miers); Cape Jaubert, West Australia, 54-140 feet (Balss); Thursday Island, Torres Strait, 4 to 6 fathoms (Miers).

Indian Ocean, Andaman Islands, 25 to 35 fathoms; Ganjam coast, Bay of Bengal, 20 to 35 fathoms (Alcock).

Persian Gulf (Alcock); ? Red Sea, Massaouah (Nobili).

Remarks.—Pesta in his revision of the "Penæidæ" of the Vienna Museum, separates his specimens of *Trachypeneus* into the two species, *asper* and *curvirostris*, on the basis of difference in direction and shape of the rostrum, and the distinctness of the post-rostral carina. The rostral distinctions he sets forth are entirely inadequate, being included in any good series of *T. curvirostris*; and, too, his second diagnostic character is subject to some variation.

In the three "Endeavour" specimens which are here assigned to *T. curvirostris*, as regards the indistinctness of the post-rostral carina and the tendency toward longer

legs, they approach the species designated as *T. asper* by Alcock; the thelycum, however, fits into the series of *T. curvirostris* before me, while the petasma of the single male specimen is like that figured by Bate for *anchoralis* and referred to by de Man under the same name. The fifth legs of the "Endeavour" specimens vary from one-third the length of the dactylus short of the tip of the antennal scale in the largest, to exceeding the scale by not quite one-third of the length of the dactylus in the smallest specimen of 37 mm. length.

The count of the rostral teeth in the lone male and the one female with a complete rostrum, totals seven, exclusive of the epigastric tooth, being thus coincident in number with the count, which was found to be remarkably constant for a series of more than thirty Japanese specimens of *T. curvirostris* in the collections of the U.S. National Museum. Among these there were but four deviations; other than the epigastric, one had eight teeth, one six teeth, another five, with, however, a blunt hump indicative of a possible former sixth tooth; and the fourth specimen with but three teeth, all confined to the basal half of the free portion of the rostrum and clearly an abnormality, possibly the result of regeneration, though not apparent as such on examination.

With respect to the rostral count and the length of the fifth pair of legs, de Man's specimens of *T. anchoralis* also approach Alcock's *T. asper*, but here again the thelycum stands within a *curvirostris* series, as does also the somewhat variable character and development of the post-rostral carina of his specimens. The rostrum of *T. asper* is dorsally armed with nine or ten teeth, not including the isolated epigastric tooth. In de Man's *T. anchoralis*, so-called, the rostral count of the three specimens for which it is given, not including the epigastric, is eight, nine and ten. Bate's *anchoralis* males, which surely are true *T. curvirostris*, had from six to eight rostral teeth in addition to the epigastric.

De Man's statement that his *anchoralis* differs from *T. curvirostris* by virtue of the non-projection of the submedian teeth of the petasma beyond the lateral lobes, is a distinction of very doubtful value. Even Kishinouye's three views of the same petasma are not wholly in agreement with regard to the relative length, or projection, of the submedian teeth beyond a line connecting the

distal margins of the lateral lobes. The size of these median teeth seems to vary with age, in young small specimens being possibly a little below the most distal points of the lateral lobes of the petasma; and in older, larger, more mature specimens, rising above or beyond that level. In a male 70 mm. long from Kagoshima, Japan, these teeth do project slightly; in two males from Aomori, Rikuoku, Japan, they are about on a part with the lateral lobes; while in the lone male taken by the "Endeavour," they are if anything possibly a little shorter. The lateral lobes of the petasma figured by Bate are represented as being much bowed up, and for that reason only may exceed the median teeth. The petasma portrayed by Alcock, I feel sure is a misrepresentation on the part of the artist; it is not unlike, in appearance, the sketch given by Ortmann. Unfortunately Alcock makes no written comment on either the petasma or his figure of it.

I believe that until more valid differences are brought forward to distinguish *T. asper* and de Man's *anchoralis* from *T. curvirostris,* they had better be united.

Though it might later appear that Alcock's specimens ranging in size up to 3·5 inches (nearly 90 mm.) in length, represent an Indian Ocean variety or subspecies —*asper*—with longer fifth legs, a much fainter post-rostral carina and sharper antero-lateral angles of the carapace, it should be borne in mind that de Man's comparatively immature specimens of 52 mm. and less, with legs and rostral teeth much as in *T. asper,* and quite distinct post-rostral carina nearly to the posterior margin of the carapace, have the thelycum and petasma much as in *T. curvirostris*; while the three "Endeavour" specimens, from 37 to about 50 mm. in length, which also exhibit a tendency toward comparatively longer legs, have straighter rostra, and have in the two specimens with complete rostra the exact number of rostral teeth of typical *T. curvirostris,* and though carinated for a longer or shorter distance following the tip of the epigastric tooth, in none of the three specimens does the carina run on to, if as far as, the posterior half of the carapace.

Otherwise, the only *small* specimens of *T. curvirostris* I have seen are two females from northern Japan 33 and 41 mm. long. They have the fifth legs longer than

usual for other and larger specimens of the species from that region, reaching nearly to the tip of the spine of the antennal scale. The rostral count of these specimens is typical, and the post-rostral carina can be traced to near the posterior margin of the carapace.

Of the species here grouped together as *T. curvirostris*, the comparative length of the antennular flagella likewise seems to be too variable to have any value as a diagnostic character. The antennular flagella of de Man's *anchoralis* range in length from three-fourths the length of their peduncle in the largest female, of 64 mm., to "but little shorter than it" in two other much younger specimens. Of his two *curvirostris* females from the Inland Sea of Japan, the antennular flagella are "only one-third shorter than their peduncle," which is just about the length given by Alcock in describing the female of *T. asper*—"the antennular flagella [are] . . . about two-thirds the length of their peduncle." The length of the antennular flagella of about twelve females of the U.S. National Museum series of *T. curvirostris* from Japan, varies from four-fifths, and nine-tenths, to nearly as long as the peduncle. In the larger of the two females taken by the "Endeavour" the antennular flagella are ten-elevenths the length of the peduncle and in the smaller of 47 mm. they are just about as long as the peduncle. The single 37 mm. male has the flagella one-sixteenth longer than the peduncle.

The telson of these three "Endeavour" specimens is spined as in *curvirostris*, the spining of which has been set forth in detail by de Man. The several spines, however, are relatively somewhat longer and more slender than is usual with most representatives of *T. curvirostris*, a possible indication of youth or immaturity, except the third, or pair immediately adjacent to the fourth or subterminal pair of spinules. This third pair of spinules is very small, inconspicuous and hard to see, but when quite dry plainly shows on the right side of the detached telson of the smaller female. On the left side the former presence of the corresponding spine is indicated by a tiny pit or punctation. In the other two specimens the evidence is less conclusive. The larger female has a similar pit discernible on the left side of the telson close upon the base of the subterminal spine; on the right side both the third and fourth spines are wanting. The position

of each is indicated by a blunt hump as though the spine had been accidentally destroyed at some time during the life of the individual, and the injury subsequently overcome without regenerating the spines. The telson of the male specimen is somewhat damaged. Alcock speaks of but three pairs of very small, obscure and hardly perceptible spinules. In *T. curvirostris* too, all the spines are fairly small. There always has been much confusion regarding the number of marginal spinules in the several species of *Trachypeneus* as described (*cf.* Bate, Ortmann, Haswell). Therefore is it not possible that Alcock may have overlooked a possible tiny pair close upon the bases of the subterminal pair?

Further, de Man's intermediates, if you will, have the antero-lateral angles of the carapace "rather obtuse," on the basis of which they tend to stand nearer true *curvirostris* than *asper* as described by Alcock. Alcock has remarked that among other features, *T. asper* differs from *T. curvirostris* in that "the antero-inferior angles are sharper," but in occasional specimens of *T. curvirostris* the anterior-inferior angles of the carapace appear quite as prominent and sharp as shown in Alcock's figure, even though they could not be described as what he designates in *asper*, "distinctly dentiform."

The specimens which Miers listed as *T. granulosus* in his "Alert" report are said by Alcock to be the same as *anchoralis* Bate. Consequently on the basis of what that species was heretofore supposed to be, such an identity would render them synonymous with *T. curvirostris* Stimpson.

Balss has more recently listed *T. asper* from Western Australia, 45-46 miles W.S.W. of Cape Jaubert, 50-140 feet. From his citations I take it he follows Pesta in the separation of his material from *T. curvirostris*. It seems, therefore, as regards the post-rostral carina that his specimens are much like those taken by the "Endeavour." But in all this discussion even though these "Endeavour" specimens might some time be determined as a distinct species, the fact should not be overlooked that Alcock described the post-rostral carina of his species as "low, broad and faint; nearly reaching the posterior border of the carapace." The several specimens Pesta determined as *asper* are, by the way, listed as juvenile by him.

Genus Peneus, *Weber, Alcock.*

Key to the Species of Peneus (s.s.) known from Australia and the Indo-Pacific.

I. Lateral grooves on the carapace extending practically the entire length of the carapace, rostrum with only one tooth on inferior margin.

A. Telson with three pairs of lateral spines.

1. Lateral grooves on carapace paralleling medially sulcate post-rostral carina to posterior margin of carapace.

a. Rostrum without a secondary or accessory pair of lateral rostral sulci.

i. Thelycum tubular (oval in cross-section), the two lateral plates being indistinguishably united on the median line to form a single large plate. Petasma with submedian teeth or "horns" bent over, so as to overhang the distal margin of the side plates of the petasma.

japonicus, Bate.

ii. Thelycum composed of two distinct plates, juxtaposed, but not united on the median line. Petasma with submedian teeth or protuberances but slightly bent over, and not overhanging the distal margin of the side plates of the petasma.

latisulcatus, Kishinouye (p. 365).

b. Rostrum with a secondary pair of lateral carinæ subtending an accessory pair of lateral sulci on the sides of the upper blade of the rostrum, not extending backward behind the last rostral (gastric) tooth. Thelycum and petasma much as in *P. latisulcatus*.

plebejus, Hess (p. 367).

2. Lateral grooves on carapace posteriorly confluent, uniting behind the sulcated post-rostral carina and crossing over to form an X-shaped depression.

maccullochi, new species (p. 370).

B. Telson laterally unarmed.

canaliculatus (Olivier).

II. Lateral grooves on the carapace not extending posterior to the last rostral (gastric) tooth; rostrum with two to five teeth on inferior margin. Telson laterally unarmed.

A. Carapace with a more or less prominent subhepatic crest.

1. No exopodites on the fifth pair of legs; subhepatic crest a prominent longitudinal ridge extending posteriorly for about one-third its length behind the angle formed below the hepatic spine by the meeting of the antennal sulcus with the ridge which terminates anteriorly in the antennal spine. Post-rostral carina usually more or less sulcate.

carinatus, Dana.

2. Fifth pair of legs with small but well-formed exopodites.

a. Post-rostral carina sulcate; subhepatic crest formed by the lower margin of an oblique "incision"

beginning a little behind and above the angle formed below the hepatic spine by the meeting of the antennal sulcus with the ridge which terminates in the antennal spine, and extending forward and downward to an angle of about 30° to the longitudinal axis of the carapace toward its antero-lateral angle.

semisulcatus, de Haan.

b. Post-rostral carina not sulcate or grooved.

i. Subhepatic crest formed by the lower margin of a straight, longitudinal "incision" extending posteriorly scarcely as far as the angle formed below the hepatic spine by the meeting of the antennal sulcus with the ridge which terminates anteriorly in the antennal spine; rostrum with five to seven, usually six teeth above, and most often three, rarely four teeth below.

esculentus, Haswell (p. 362).

ii. Subhepatic crest longitudinal and arcuate; extending for some distance behind the angle formed below the hepatic spine by the meeting of the antennal sulcus with the ridge which terminates anteriorly in the antennal spine; rostrum with nine teeth above and two below.

gracilirostris, Thallwitz.

B. Carapace without a subhepatic crest.

1. Rostrum exceeding the antennal scale by one-third to two-fifths the length of its free portion.

a. Last or anterior dorsal rostral tooth at most placed over the last or terminal segment of the antennular peduncle, often not so far forward.

indicus var. *longirostris*, de Man (adult and juvenile).

b. Last, or anterior dorsal rostral tooth invariably placed in advance of the last, or terminal segment of the antennular peduncle.

merguiensis, de Man (juvenile).

2. Rostrum about as long as antennal scale, rarely and then only slightly exceeding it; often shorter than the antennal scale.

a. Dactyl of third or external maxillipeds of adult male about as long as or markedly shorter than propodus.

i. Dactyl of third maxilliped of adult male about as long as propodus. Rostral crest, in both sexes, only of moderate height.

indicus, M. Edw.

ii. Dactyl of third maxilliped of adult male, scarcely half as long as propodus. Rostral crest proximally conspicuously high and of broad triangular form in both sexes.

merguiensis, de Man (adult).

b. Dactyl of third or external maxilliped of adult male from one and one-half to two and three-fourth times the length of the propodus. Rostral crest high but not forming a decided triangle.
indicus var. *penicillatus*, Alcock.

The distinction of true *Peneus indicus* from its near relatives and varietal forms is by no means satisfactory. De Man,[42] in saying that "in young individuals both of *P. indicus* [*longirostris*][43] and of *P. merguiensis* the rostrum projects beyond the antennal scales and is more or less conspicuously curved upward, in many cases these young specimens may, however, be distinguished by the teeth of the upper margin, which in *P. merguiensis* usually occur till near the tip, while in *P. indicus* [*longirostris*] the foremost tooth is situated opposite the terminal joint of the antennular peduncle, so that the distal unarmed part of the upper border appears comparatively longer," seems to leave the typical form of *P. indicus* without its younger stages, especially as he cites both Alcock's figure[44] of the juvenile and his own[45] in illustration of his remarks. Can it be that Alcock had no young forms of typical *P. indicus*, and that the lone specimen which Pesta[46] had with an *indicus*-like rostrum, but short, is the true young of *P. indicus?* Nevertheless one feels that Kemp[47] is nearer the correct solution of the difficulty when he says "the variety *longirostris* described by de Man, is based entirely on the length of the rostrum and the great degree of variation that Indian specimens exhibit in this respect leads me to believe that the varietal name cannot be retained." Stebbing,[48] however, more recently, in spite of admitting, in connection with the possible relation of the species to "*Palæmon longicornis*," Olivier,[49] that "Its great variability, explained by Alcock and de Man, makes the study of it rather perplexing. Especially the elongation and slenderness of the rostrum in the younger and smaller specimens give them a very different appearance from

[42] "Siboga" Exped., xxxix*a*, Decapoda, pt. i., Penæidæ, 1911, p. 105.
[43] De Man, though he does not use the varietal name *longirostris* in the immediate quotation given here, has reference only to the variety, as is shown by the citation in his "Siboga" Report; *cf.* footnote above.
[44] Cat. Indian Decapod Crust., 1906, pt. iii., fasc. i., pl. i., fig. 3*a*.
[45] *In* Max Weber's Zool. Ergebn., ii., 1892, pl. xxix., fig. 53.
[46] Archiv f. Naturg., 1915, Abt. A., Heft 1, p. 117.
[47] Mem. Indian Mus., v., 1915, No. iii., p. 319.
[48] Ann. Durban Mus., i., 1917, pt. v., p. 443.
[49] Encycl. Méth., viii., 1811, p. 662.

that of the large forms," still lists the var. *longirostris* as distinguishable from the species proper.

PENEUS ESCULENTUS, *Haswell.*
(Plate lxiv., figs. 1-4.)

Penæus esculentus, Haswell, Proc. Linn. Soc. N.S.W., iv., 1879 (1880), p. 38, and Cat. Austral. Crust., 1882, p. 200.

Penæus monodon, Whitelegge, Jour. Roy. Soc. N.S.W., xxviii., 1889, p. 224. *Id.* Ogilby, Edible Crust. N.S.W., 1893, p. 203, not including synonymy.

Penæus esculentus, de Man, "Siboga" Exped., xxxix.*a*, Decapoda, pt. I., Penæidæ, 1911, p. 96.

Occurrence. — Port Curtis, Queensland, 14-16 fathoms; one female (Reg. No. P.2399). Bustard Bay, Queensland, 11-16 fathoms; one male and one female (Reg. Nos. P.2400 and P.2401).

4-5 miles S.W. of Bustard Head Light, Queensland, 11-16 fathoms; four males and two females (Reg. No. E.2054).

Platypus Bay, Queensland, 7-9 fathoms; two females (Reg. No. E.3162).

Platypus Bay, Queensland, No. 1, haul 2, 28.7.10; one male and one female (Reg. Nos. P.3550 and P.3551).

11-14 miles N.W. of Pine Peak, Queensland, 24-26 fathoms; three males and fourteen females (Reg. Nos. E.3200, E.3202, E.3204, E.3205 and E.3206).

S. 29° E. Pine Peak, Queensland; three males and three females (Reg. Nos. P.3590, P.3591, P.3592, P.3593, P.3594 and P.3595).

Southern Queensland; five males and seven females (Reg. Nos. P.3596, P.3597, P.3598, P.3599, P.3600, P.3601, P.3602, P.3603, P.3604, P.3605, P.3606 and P.3607).

11-14 miles N.W. of Pine Peak, Queensland, 24-26 fathoms; two males and six females (Reg. Nos. E.3201 and E.3203).

Distribution. — Apparently found only off the northern and eastern coasts of Australia: other than the localities enumerated above, known from the type locality, Port Jackson, New South Wales, and Port Darwin, Northern Territory of South Australia (Haswell). Ogilby states that: "This is the 'Tiger Prawn' of the Sydney fishermen. . . . This species is

at times common in the Sydney market, but is irregular in its appearance; during the summer and autumn of 1891-92 it was exceptionally plentiful, since which time but few specimens have been observed; Dr. Haswell is mistaken in saying that this species is 'the common edible Prawn of Sydney, Newcastle, etc.'

"This is a marine species and is taken principally, if not entirely, on clean, sandy beaches. It does not mix with other Prawns, but from its preference for the same class of ground sometimes occcurs in company with *P. canaliculatus* [=*P. plebejus*]."

Remarks.—De Man takes this species "to be closely related to *P. carinatus* (as described by him, *loc. cit.*, 1911, p. 101), but to differ by its very short antennular flagella." However, just as he notes an apparent discrepancy in the length of the antennular flagella between Dana's description of *P. carinatus*, and the specimen he takes to be that species, so I find a similar difference between Haswell's description of *P. esculentus* and the "Endeavour" specimens before me. In a co-type from Port Jackson, which I have been enabled to examine through the courtesy of the Australian Museum, but one of the four antennular flagella are present, the right outer one, and of this but its basal portion, which, lacking the slender, thread-like terminal filament, is just as long as the last two joints of its peduncle. In fact, in none of the species of *Peneus* (*sensu strictu*) which I have examined in connection with this paper are the antennular flagella shorter than the last two segments of their peduncle.

Aside from the presence of a small but well-developed exopodite on the fifth pair of legs, there are other more or less striking differences, though possibly of less diagnostic value, separating *P. esculentus* from *P. carinatus*.[50] (1) The midrib of the rostrum in the former is quite straight throughout its length except for a slight upturning of the tip; in the latter there is an evident rise in the midrib just before reaching, and above, the orbit, which with its ascending extremity gives the rostrum its "distinct double curve" (described by Alcock[51] for his *P. semisulcatus*, = *P. carinatus*); (2) as a result of

[50] De Man, *loc. cit.*, 1911, p. 101.
[51] Cat. Indian Decapod Crust., 1906, pt. iii., fasc. i., p. 10, pl. i., fig. 2.

this convexity above the orbit, the upper blade of the rostrum of *P. carinatus* is quite narrow, only about half the width of that of specimens of *P. esculentus* of the same size; (3) also in specimens of the same size, the carapace of *P. esculentus* is shorter and much stouter than in *P. carinatus*; (4) the cervical groove of *P. carinatus* is quite short (much as in Alcock's figure), being often more or less obscure, or even obsolescent at times; likewise the antennal sulcus is very short anteriorly, both of these grooves being only a third as long, relatively, as they are in *P. esculentus*; (5) a further difference between the two species is to be found in the prominence, position and length of the subhepatic crest or ridge; in fact all the species of *Peneus* having subhepatic ridges, three or more teeth on the lower border of the rostrum and no lateral spinules on the telson, differ with respect to this character: (a) in *P. esculentus* it is more the slightly turned-up or bent outward lower margin of a straight, longitudinal incision which extends posteriorly scarcely as far as the angle formed by the meeting of the antennal sulcus with the ridge which terminates anteriorly in the antennal spine, situated below the hepatic spine; (b) in *P. carinatus* it is a strongly raised, prominent, longitudinal ridge extending posteriorly for about one-third its length behind the angle corresponding to the one defined above; (c) in *P. semisulcatus* (de Man, *loc. cit.*, 1911, p. 99) the crest is formed much in the same manner as that in *P. esculentus*; or, as de Man states: "The subhepatic 'crest' appears as a narrow, linear groove and hardly may be described as a crest," but in contrast to the subhepatic crest in *P. esculentus* it is oblique, and at an angle of nearly 30 degrees to the longitudinal axis of the carapace, beginning behind and a little above the antennal sulcus-ridge angle, below the hepatic spine, and running downward toward the antero-lateral angle of the carapace.

The petasma in the male is anteriorly (distally) much as in *P. latisulcatus*, but posteriorly (proximally) has no lobes forming a bifurcation below, being evenly rounded on each side of a median notch.

The thelycum of *P. esculentus* has the medial margins of the lateral plates very prominent, raised as high as half the width of the remaining portion of either lateral plate. These raised margins are juxtaposed and

distinctly crenulated, the crenulations being the continuations of ridges on their opposed surfaces. The concave median plate of the thelycum ends anteriorly in two more or less contiguous though laterally placed knobs, with a median knob lying between and behind these two in the notch formed by the incurving of the anterior margins of the lateral plates toward the median line.

In the Macleay Museum co-type received through the Australian Museum, the anterior median plate of the thelycum is but little more than a slightly concave surface with raised edges, which though approximating, do not at all attain the prominence and thickening necessary to quite warrant designating the anterior extremities of these edges as "knobs."

This specimen is about 190 mm. in length; carapace and rostrum together, 70 mm. over all. The 26 mm. rostrum has six teeth above and three below. The subhepatic ridge distinctly fails to reach the angle formed below the hepatic spine by the meeting of the antennal sulcus with the ridge which terminates anteriorly in the antennal spine.

From the specimens at hand it appears that, above, the rostral teeth may vary from five to seven, and below, from three to four. Of the specimens with complete rostra, forty had $^{6}/_{3}$; seven, $^{7}/_{3}$; two, $^{6}/_{4}$; one, $^{7}/_{3}$; one, $^{5}/_{3}$; one specimen with an obviously regenerated rostrum had but four teeth above and one below. The typical count given by Haswell was six above and three or four below.

Size.—The late Allan R. McCulloch wrote me that this species "occasionally reaches a large size. Our largest specimen measures 12·25 inches (about 310 mm.) from tip of rostrum to end of telson, and comes from Port Jackson," the same locality as that of the 190 mm. co-type mentioned above. The length of the greater number of specimens ranges between 150 and 206 mm. Most of the specimens, however, are about the size of the co-type.

Peneus latisulcatus, *Kishinouye.*

Penæus latisulcatus, Kishinouye, Jour. Fish. Bureau, Tokyo, viii., 1900, p. 12, pl. ii., fig. 2, pl. vii., fig. 2.
Id. Rathbun, Proc. U.S. Nat. Mus., 1902, xxvi., p. 27.

Penæus latisulcatus, de Man, "Siboga" Exped., xxxix*a*, 1911 (plates, 1913), Decapoda, pt. i., Penæidæ, p. 108, pl. ix., figs. 35*a-b*, and synonymy. *Id.* Balss, Abh. der K. Bayer. Akad. Wiss., II., Math.-phys. Klasse, Suppl., 10 Abh., 1914, p. 13. Pesta, Archiv f. Naturg., 1915, Abt. A., Heft 1, p. 111, fig. 3.

Occurrence.—12 miles N.N.E. of Bowen, Queensland, 19-25 fathoms; one male (Reg. No. E.3157).

Off Marsden Point, Kangaroo Island, South Australia, 17 fathoms; two males and three females (Reg. Nos. E.797, E.798, E.4501, E.4502 and P.2308).

South Australia; four males and twenty-three females (Reg. Nos. E.3196, E.3197, P.3575, P.3576, P.3577, P.3578, P.3579, P.3580,, P.3581, P.3582, P.3608, P.3609, P.3610, P.3611, P.3612, P.3613).

Distribution.—Previously known from Japan, Nagasaki to Yokohama (Kishinouye, Rathbun, Balss); Pescadores Islands, Formosa, Sandakan Bay, Borneo, Dutch East Indies, Batjan, Ceram, Nusa Sant, Tiur and Saleyer Islands (de Man), Straits Settlements, Penang (Lanchester), Red Sea (de Man).

Remarks.—The teeth on the upper margin of the rostrum vary from 8-11 in number, but usually the number is 9 or 10. In this species the post-rostral carina, inclusive of the median sulcus which it bears, generally appears to be narrower than the width of the lateral grooves, while in the related *P. japonicus* of Bate it seems wider than the lateral grooves. However, the form of the thelycum and petasma will always separate the two.

The thelycum in *P. latisulcatus* is composed of two plates separated from one another on the median line by a narrow fissure; in *P. japonicus* the two plates composing the thelycum are indistinguishably fused on the median line to form a single large plate.

The pestasma has two very short submedian teeth or "horns," hardly more than mere protuberances. These are but slightly bent over and do not tend to overhang the distal margin of the side plates of the organ.

In *P. japonicus* (*cf.* Pesta, *op. cit.*, figs. 1-2) the similarly placed protuberances or "horns" are bent over,

overhanging "cap-like" almost the whole distal margin of the side plates of the petasma.

Size.—The "Endeavour" specimens of this species range from 120 to about 190 mm. in length, thus exceeding in maximum size the largest hitherto recorded, so far as I am aware, Kishinouye's of 150 mm.

Peneus plebejus, *Hess.*

(Plate lxv., figs. 1-4. Plate lxviii., fig. 1.)

Penæus plebejus, Hess, Archiv f. Naturg., 1865, i., p. 168, pl. vii., fig. 19.

Penæus canaliculatus, Haswell, Proc. Linn. Soc. N.S.W., iv., 1879 (1880), p. 38, and Cat. Austral. Crust., 1882, not including synonymy.

Penæus canaliculatus, var. *australiensis*, Bate, "Challenger" Rept., Zool., xxiv., Macrura, 1888, p. 248, pl. xxxii., fig. 3.

Penæus canaliculatus, Ogilby, Edible Crust. N.S.W., 1893, p. 202, not including synonymy. *Id.*, Stead, Zoologist (4), ii., London, 1898, p. 209.[52] *Id.*, Whitelegge, Mem. Austral. Mus., iv., 1900, pt. 2, p. 197.

Penæus plebejus, de Man, "Siboga" Exped., xxxix*a*, Decapoda, pt. i., Penæidæ, 1911 (plates, 1913), pp. 96 and 108-111, pl. ix., fig. 36a; and references there given. *Id.*, Pesta, Archiv f. Naturg., 1915, Abt. A., Heft 1, p. 112, text-figs. 4, 5.

Occurrence.—13 miles N.E. of North Reef, Queensland, 70-74 fathoms; one male and one female (Reg. Nos. P.3614 and E.3208).

18 miles S. by W. of Lady Elliott Island, Queensland, 18 fathoms; six females (Reg. No. E.2056).

18 miles S.W. by S. of Lady Elliott Island, Queensland, 18 fathoms; three males (Reg. Nos. P.2403, P.2404 and P.2405).

9 miles E. of Frazer Island, Southern Queensland, 24-26 fathoms; eight females (Reg. Nos. P.2402, P.3615, P.3616, P.3617 and E.2055).

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[52] The three following localities were given by Stead: Port Jackson; Botany Bay; Japan. Specimens from the two former were the basis of his identification. The "Japan" locality, like other extra-Australian localities in the same paper, were taken from literature.—F. A. McNeill.

11-14 miles N.W. of Pine Peak, Queensland, 24-26 fathoms; four males (Reg. No. E.3207).

13 miles N. by W. of Double Island Point, Queensland, 25-26 fathoms; one male and four females (Reg. No. E.2057).

Distribution.—Otherwise *P. plebejus* is known from the type locality, Sydney (Hess and Pesta), and Port Jackson, Australia, 2-10 fathoms (Bate); also Auckland, New Zealand (Pesta). Ogilby gives the common name of "Sand Prawn" to this shrimp and says: "This Prawn is taken in large numbers by small-meshed nets on sandy beaches near the mouths of our [Australian] rivers, the principal supply coming from George's and Cook's Rivers.

"They are delicious food, and grow to five inches in length."

Remarks.—This species can readily be distinguished from other related species, bearing three pairs of lateral spinules on the telson, and but one spine on the lower border of the rostrum, by the presence "at either side of the rostrum, about midway between the lateral rostral carinæ and the tips of the teeth, another carina that commences near the base of the first rostral tooth and that, gradually narrowing, is continued to the foremost tooth where it passes into the upper margin of the rostrum. This second carina is wanting in *P. latisulcatus*" (de Man, *op. cit.*, p. 110). These secondary, lateral, rostral carinæ subtend or rather define distinct secondary, lateral, rostral sulci easily seen in the dorsal view.

Concerning the type specimen of *P. canaliculatus*, var. *australiensis* Bate, which de Man refers to as *P. plebejus*, Dr. Calman wrote de Man (*op. cit.*, p. 111): ". . . . .The accessory carinæ are present just as you describe them in *P. plebejus*, but the groove which defines each on the inner side of the rostral teeth becomes distinct in front of the fourth tooth, so that, on the rostrum itself, the accessory ridges are only a little better defined than the slight ridges occupying the same position in *P. canaliculatus*. Posteriorly, however, the accessory ridges are quite distinct and end just behind the first tooth. . . . ."

As first called to our attention by de Man (*loc. cit.*) and later figured by Pesta (*loc. cit.*), "there are

two loops, instead of one [as in *P. latisulcatus* and *P. japonicus*], between the posterior part of the post-ocular ridge and the rostral crest; of the two loops that are separated from one another, from the rostral crest and the post-ocular ridge, by deep, though narrow sulci, the inner is a little shorter than the outer."

The rostrum in thirteen of the "Endeavour" specimens of *P. plebejus* was armed, as in Hess's type, with ten teeth above, and one below, while eleven others were provided with a further or eleventh tooth above.

The males are much like those of *P. latisulcatus*, though of relatively frailer build. The petasma, of which Pesta gives a sketch in lateral view, is not unlike the figure given for Kishinouye for *P. latisulcatus*, the protuberances at the end of the inner "blade" of the petasma being well developed though small, and not overhanging the anterior margin of the outer "blade" to any extent. Often, these protuberances or knobs at the anterior ends of the inner blades of the petasma are very small or obsolescent, no doubt due to the relative stage of maturity attained by the specimen in question.

The thelycum as de Man has it, "has a somewhat different form from that of *P. latisulcatus*. The two lateral plates or lobes come in contact with each other at the median line, as in *P. latisulcatus*, the distal third or fourth excepted, but their form is semi-elliptical and their lateral margins that are slightly curved run nearly parallel, whereas in *P. latisulcatus*, they distinctly diverge backward. The lobes show about the form figured by Bate except that in this figure the lobes are not in contact. In *P. latisulcatus* the two lobes are therefore broader at their base than in the middle, whereas in the Australian species they are a little broader in the middle than posteriorly. The median protuberance differs likewise. Both in *P. latisulcatus* and in *P. plebejus* it consists of a posterior part, bounded at either side by a small ridge and an anterior portion that terminates anteriorly in two horns. In the female of *P. latisulcatus* this posterior part is shorter than the anterior, and the two horns are comparatively large and separated by a broad interspace. In *P. plebejus*, however, the posterior part is larger than the anterior, and the two horns are very small and almost contiguous. This protuberance has been quite wrongly figured by Spence

Bate: as a plate not in contact with the lobes." In occasional, possibly not fully mature, specimens of *P. latisulcatus* the horns of the anterior part of the median protuberance of the thelycum are rather small and close together, approaching those of *P. plebejus* in size and shape; in this latter species they also show some variation, being in some cases almost absent, merely suggested (knobs) but most often of a size equalling those in such variants as *P. latisulcatus* that have the small horns described by de Man for *P. plebejus*.

Size.—The type of this species, which de Man recently (*op. cit.*, p. 110) re-examined is "nearly 15 cm. long," but most of the "Endeavour" specimens are quite a bit larger, ranging from 14·3 to 20·5 cm. in length, the average of the 28 specimens being about 17·2 cm.; but one specimen was less than 15 cm. long.

Peneus macculloch,[53] *new species.*
(Plate lxvi., figs. 1-3.)

Type locality.—13 miles N.E. of North Reef, Queensland, 70-74 fathoms; one male, holotype (Reg. No.E.6619).

Description.—This species appears to be closely related to *P. plebejus* Hess, in possessing a secondary or accessory pair of lateral rostral carinæ, and having a double "loop" at the posterior end of the post-ocular ridge. Laterally as in that species, the telson is armed with three pairs of spinules.

The post-rostral carina extends backward nearly to the posterior margin of the carapace and is sulcate posterior to the last rostral tooth. The latter is situated a little in front of the middle of the carapace. However, distinguishing this species from all others is the interruption of the post-rostral carina at the middle of the posterior third of the carapace by a running together or crossing over of the lateral rostral grooves to form an X-shaped depression; before, this embraces the posterior end of the anterior portion of the sulcated post-rostral carina, and behind, it embraces likewise the sulcate, cut off, posterior end of the dorsal carina. The cervical

[53] Named for the late Allan R. McCulloch, formerly Zoologist at the Australian Museum.

groove ends below the posterior end of the accessory rostral carina, one-third the distance from the level of the hepatic spine to the rostral crest above.

Dorsally the rostrum is armed with eleven teeth, of which the first four are on the carapace, while the fifth has its base above the posterior margin of the orbit. The first tooth is about the size of the sixth, and the second is intermediate in size between the fourth and fifth. Anterior to the third, and largest tooth, the dorsal rostral teeth gradually decrease in size to the last one, which is about two-sevenths the length of the free portion of the rostrum removed from the tip. The rostrum extends as far forward as the spine of the antennal scale, a little in advance of the last segment of the antennular peduncle. The antennular flagella are shorter than their peduncle, but longer than the last two joints, being as long as the second, third, and about half the first joint taken together.

The petasmæ of this species, *P. plebejus*, and *P. latisulcatus*, are very much alike, and Kishinouye's figure of the petasma of the latter would do quite well for either of the other two. There is enough variation in the size of the median protuberances in each of these species, no doubt in direct ratio to the age of any particular specimen, to render it impossible to separate them on the basis of this character alone. However, the carination of the rostrum and the character of the lateral sulci will always serve to differentiate them.

Except for the peculiar crossing over of the lateral grooves on the carapace, the male of *P. maccullochi* might be mistaken for the male of *P. plebejus*. As in the latter, the last three somites of the abdomen are sharply carinated.

Measurments.—From the tip of the rostrum to the end of the telson the holotype measures 155 mm. in length; the carapace and rostrum together equal 58 mm., and the abdomen and telson 97 mm.; the free portion of the rostrum, 21 mm., and the telson alone 23 mm. The spine of the antennal scale is 23 mm. long and falls 2·5 mm. short of the extremity of the blade. The third legs are about 50 mm. long, and fail to reach the tip of the antennal scale by about 10 mm.

Tribe CARIDES.

Family CAMPYLONOTIDÆ.

Though the genus upon which this family is based was first described by Bate,[54] it was never well understood or properly appreciated until studied by Sollaud,[55] who instituted the present family in 1910. He has given a useful key to the families of the subtribe Hoplophorida, erected by Borradaile[56] in 1907—of which the Campylonotidæ must now be recognized as one—as well as a key to the known species of the typical and only genus included in the family. These keys have been introduced below; the new Campylonotid taken by the "Endeavour" has been added to the key of species.

Key to the Families of the Hoplophorida.

I. Marine Hoplophorida; fingers of chelæ neither spoon-like nor ending in tufts of bristles.

A. Exopodite of the first maxilliped foliaceous, not provided with a lash, or distal flagelliform portion. Exopodites on all the legs.

Hoplophoridæ.

B. Exopodite of the first maxilliped composed of a basal foliaceous portion and distally provided with a lash, or "flagelliform portion."

a. Exopodites on the first four pairs of legs.

Nematocarcinidæ.

b. Legs without exopodites.

Campylonotidæ.

II. Fresh-water Hoplophorida; fingers of chelæ spoon-like and ending in tufts of bristles.

Atyidæ.

Key to the Species of Campylonotus.

I. Anterior margin of antennal scale broad and rounded; rostrum distally bent upward and exceeding the antennal scale, teeth $^{4-5}/_{3}$.

A. Abdomen armed with tubercles or spines on mid-dorsal line.

rathbunæ, new species.

B. Abdomen dorsally unarmed.

semistriatus, Bate (*Anchistiella hani*, M. Edwards, 1891).[57]

II. Antennal scale narrowing gradually toward anterior end and terminating in a point; abdomen dorsally unarmed.

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[54] "Challenger" Rept. Zool., xxiv., Macrura, 1888, p. 767.

[55] Bull. Mus. Hist. Nat., xvi., 1910, pp. 185-190, text-figs. 1-2, *Ibid.*, xix., 1913, pp. 377-383, text-figs. 1-3.

[56] Ann. Mag. Nat. Hist. (7), xix., 1907, p. 471.

[57] *Cf.* Crust. Mission Sci. Cap Horn (1882-1883), i., 1891, pp. F. 37-F. 43, pls. iii., iv.

A. Rostrum strongly up-curved distally.

a. Rostrum exceeding the antennal scale; teeth $\frac{8\text{-}9}{4+2}$ (small ones near tip)

vagans Bate (*A. hyadesi*, M. Edw., 1891).[57]

b. Rostrum falling short of the distal extremity of the antennal scale; teeth $\frac{5}{4}$.

capensis, Bate.

B. Rostrum straight, much shorter than the antennal scale; teeth $\frac{3}{4}$.

seneuli, M. Edw.[57]

Genus Campylonotus, *Bate.*

Campylonotus rathbunæ,[58] *new species.*

(Plate lxvii., figs. 1-5.)

Occurrence.—South of Eucla, Great Australian Bright, long. 129° 28′ E., 250-450 fathoms, type locality; four males and four ovigerous females (Reg. Nos. E.3681, E. 6631, E.6632, E.6633, E.6634 and E.6635); E.3681 is the female holotype.

S.W. of Eucla, Great Australian Bight, long. 126° 45·25′ E., 190-320 fathoms; one male (Reg. No. E.3692).

S.E. of Eucla, Great Australian Bight, long. 130° 50′ E., 250-300 fathoms; two ovigerous females (Reg. No. E.3687).

East of Flinders Island, Great Australian Bight, 200-300 fathoms; two males (Reg. No. E.4808).

Description.—With respect to the shape and toothing of the rostrum, the configuration of the carapace and the form of the antennal scale, the species stands near Bate's *C. semistriatus.*[59] From the latter, however, it is strikingly distinguished by the prominent, dorsally flattened tubercle on the middle of the third abdominal somite, and the prominent compressed spines projecting backward from the posterior median border of the third, fourth and fifth somites.

The carapace is about as long as the first two, and half the third somite of the abdomen taken together. Dorsally it is carinated to within a short distance of the

[57] *Cf.* Crust. Mission Sci. Cap Horn (1882-1883), i., 1891, pp. F.37-F.43, pls. iii., iv.

[58] Named for Dr. Mary J. Rathbun, Associate in Zoology, United States National Museum.

[59] Bate, "Challenger" Rept., Zool., xxiv., Macrura, 1888, p. 768, pl. cxxvii., figs. 1, 2.

posterior margin. The carina ends in an evident, though not very conspicuous tubercle, corresponding to the one similarly placed in *C. semistriatus*, shown in Bate's figure of that species. Anteriorly this carina is continued forward, as the prominent, strongly laterally compressed, up-curved rostrum. As in *C. semistriatus*, the carapace laterally has two strong, but short carinæ. Of these the upper one, terminating anteriorly in the long prominent antennal spine, becomes posteriorly obsolescent and fades out at about the level of the second of the posterior rostral teeth; while the lower one, though prominent for a somewhat greater distance posteriorly, fades out more abruptly than the upper, so that in effect it extends backward for no greater distance. Anteriorly the lower carina terminates in a strong branchiostegal (Bate's second antennal) spine. This spine, arising a short distance behind the anterior border of the carapace extends a little outward and forward beyond it; there is a short, shallow groove extending back from the orbit, and a conspicuous indentation of the hepatic region between the two lateral carinæ.

The rostrum above is uniformly armed with four teeth, below with three, except in one young male from off Flinders Island, Great Australian Bight, with what certainly is an abnormally toothed rostrum. In this specimen the anterior dorsal tooth is twinned and the second obsolescent, being represented by only an obscure lobe. Typically the first two rostral teeth, of which the second is the larger, are situated at about the middle of the carapace, the second before, and the first just behind the mid-point. The last two teeth are smaller and rather widely spaced. The third tooth is placed over the eye, and the fourth at about half the distance between the third tooth and the acuminate tip of the rostrum.

The eyes are as described by Bate for *C. semistriatus*. The antennal scale has the blade broad and rounded anteriorly; the spine is much flattened and at the middle of its length is wider than the adjacent portion of the blade.

The third maxillipeds are of the same general shape and structure as those of *C. semistriatus*, though relatively stouter and shorter, scarcely reaching past the middle of the antennal scale. In *C. semistriatus* they reach forward more than two-thirds the length of the scale.

The first pair of legs exceed the third maxillipeds by two-thirds the length of their fingers and attain the proximal third of the palm of the second legs. In turn, these exceed the tips of the antennal scales by about three-fifths the length of their hands. The third, fourth and fifth pairs of legs all reach forward about equally far, to about or a little beyond the tip of the antennal scale. Between the bases of the second pair of legs there is a pair of long, slender, anteriorly directed, curved spines; a similar, much smaller pair occurs between the bases of the first pair of legs; between the third legs is a pair of thickened, blunt, forwardly inclined plates, corresponding in position to the spines between the two preceding pairs of legs.

The striking abdominal armature of this species is unusual for the genus as known heretofore. Medially on the third somite there is a thickened raised ridge which arises near the anterior margin and running backward attains its maximum elevation just behind the anterior third of the somite. Here, in lateral view, it appears to end in a backwardly directed point; viewed dorsally this is seen to be a truncated, tongue-shaped, backward extension of the ridge. The posterior margin of this somite is produced to form a sharp median spine. Similarly placed, but larger, bent, and more laterally compressed spines occur on the fourth and fifth somites. Each of these last-named spines is continuous with a median carina beginning near the anterior third of its respective somite. Anterior to the carina on the fourth somite is a faint impressed line and the carina itself is medially sulcate for slightly less than one-fifth its length. This sulcus begins at about half its own length behind the origin of the carina, and is not connected or continuous with the impressed line preceding it. The carina on the fifth somite is not sulcate, nor is there any impressed line on the somite in advance of it. The sixth somite is dorsally smooth and rounded. Its posterior margin is medially concave and is armed on either side with a spine which projects over the adjacent anterolateral angle of the telson. Other than the spines just mentioned only the fifth somite is laterally armed. Each of its epimera tapers to an acute spine-like posterolateral angle, above which there is a second spine situated a little below the articulation of the fifth with the sixth somite. The telson is longer than the sixth somite and

a little shorter than the inner branch of the uropods. On either side of its acute tip there is a much longer, movable, subterminal spine, and in juxtaposition to each of these another small external spinule, the most posterior of a series of six paired spines on the dorsum of the telson.

The male is of slighter build and comparatively smaller in size than the female. Otherwise, they are very much alike. The posterior median spines on the fourth and fifth abdominal somites seem to be comparatively longer than in the females; and between the fourth pair of legs there is a pair of plates, similar to, though smaller than, those between the bases of the third pair. These plates have no counterpart in the female.

The first pair of pleopods in the male differs from the corresponding more foliaceous appendages of the female. The outer branch in the male, though soft and flexible, is quite styliform; the inner branch is a flattened, slightly double curved, remotely "S"-shaped plate, medially more or less thickened, and terminating distally in a soft, blunt, flat-margined, recurved tip. Where the flattened inner margin of the "blade" of the inner branch of the pleopod would join the corresponding flattened margin of the tip, there is a small notch subtended proximally by a small tooth or tubercle.

Measurements.—The carapace of the female holotype is 27·5 mm. long, the rostrum 38·5 mm., the abdomen and telson 84 mm., and the telson alone 22 mm. The spine of the antennal scale on the right side is 19·5 mm., and on the left 21 mm. long; the anterior border of the blade in either case is but slightly in advance of the tip of the spine. The antennal peduncle, measured from the anterior border of the carapace in line with the branchiostegal spine, is 13 mm. long. The third maxillipeds are about 30 mm. long and reach by 5 mm. of the length of their terminal joint beyond the antennal peduncle. The first legs are between 35 and 36 mm. in length (the right palm 6·25 mm., fingers 8 mm., carpus 4 mm.), and exceed the third maxillipeds by two-thirds the length of the fingers. The right second leg is 55·5 mm. in length (palm 11·5 mm., fingers 9 mm., carpus 6 mm.), and it exceeds the corresponding third maxilliped by the length of the hand, and the blade of the antennal scale by the length of the fingers and the distal 3 mm. of the palm together.

The fifth legs exceed the antennal scale by about the length of the dactyl, the fourth by not quite half the length of the dactyl, while the third legs reach just about to the anterior border of the scale. Of the right fifth leg, which is about 58 mm. long, the dactyl measures 2·5 mm., the propodus 14 mm., and the carpus nearly 13 mm.

The several females are about the same size as the holotype, varying not more than a millimetre in the length of the rostrum, carapace and abdomen, or telson. The rostrum of the male specimens varies from 23 to 34·5 mm. in length, the carapace from 17 to 24 mm., and the abdomen and telson together from 52 to 71 mm. in length.

Remarks.—Certain differences in the tuberculation of the third abdominal somite between *Campylonotus* and *Gonatonotus* remarked by Bate[60] are rendered of no significance by the present species, and therefore his diagnosis of the former genus needs to be amended. Aside from a slight superficial resemblance, the two genera are fundamentally quite distinct, belonging to different families. The exopodite of the foliaceous first maxilliped in the *Campylonotus* is provided with a lash or flagellum, and the thoracic legs are without exopodites; while in the Hoplophoridæ, to which the genus *Gonatonotus* belongs, just the reverse is true.

Incidentally the carina on the third abdominal somite of *Gonatonotus* (*i.e.*, *crassus* M. Edw.[61]) ends in a spine, while the posterior margin of the same somite is provided with a pair of submedian spines instead of a single median one. The fourth somite has a median spine with a submedian one on either side, while the fifth again has only a submedian pair of spines. Laterally each of the epimera of the first to the fifth somites is armed with a spine.

Family PANDALIDÆ.

Genus Plesionika, *Bate.*

Plesionika martia (*M. Edw.*)

Pandalus martius, Milne-Edwards, Recueil de Figures de Crustacés nouveaux ou peu connus, 1883, pl. 21. *Id.*, McCulloch, Rec. Austral. Mus., vi., 1907, pt. 5, p. 355.

[60] "Challenger" Rept., Zool., xxiv., Macrura, 1888, p. 768.
[61] Ann. Sci. Nat. (6), Zool., xi., 1881, Art. 4, p. 10.

Pandalus (Plesionika) martius, Alcock, Desc. Cat. Indian Deep-Sea Crustacea, 1901, p. 95. *Id.*, Lloyd, Rec. Indian Mus., i., 1907, p. 4.

Plesionika martia, Kemp, Fisheries, Ireland, Sci. Invest., 1908 (1910), 1, p. 93, pl. xii., figs. 1-4. *Id.*, Balss, Abh. der K. Bayer. Akad. Wiss., II., Math.-phys. Klasse, Suppl., 10 Abh., 1914, p. 30. *Id.*, De Man, "Siboga" Exped., xxxix*a*,[3] Decapoda, pt. iv., 1920, p. 116, and synonymy.

Occurrence.—Off Gabo Island, Victoria, 280 fathoms; one small female (Reg. No. E.4802).

40 miles S.S.E. of Genoa Peak, Victoria, 200 fathoms; one small male and one small ovigerous female (E.6146).

40 miles S.S.E. of Genoa Peak, 222 fathoms; two males and two females (E.6147).

S. of Eucla, Great Australian Bight, long. 129° 28′ E., 250-450 fathoms; ten females (E.3680).

S. of Eucla, Great Australian Bight, long. 129° 28′ E., 250-450 fathoms; three females (E.3677).

Distribution.—This rather widely distributed species has already been recorded off Australia, Sydney, 800 fathoms, by McCulloch. Otherwise, it has been "dredged in plenty" in the Andaman Sea, 194-405 fathoms, in the Bay of Bengal, off Ceylon, 224-284 fathoms, and in the Arabian Sea, 142-430 fathoms (Alcock) (Lloyd), and having been first described from the East Atlantic, 400-1,200 fathoms (Milne Edwards), is well known from off the coasts of Ireland, 250-627 fathoms (Kemp), the Bay of Biscay, 400-500 metres (Caullery), off the Spanish Coast (Wolfenden), and in the Mediterranean, 533-875 m. (Adensamer, Riggio, Senna).

It also was taken in considerable numbers by the "Albatross" about the Hawaiian Islands in from 165 to 684 fathoms (Rathbun).

Measurements.—The "Endeavour" specimens of *Plesionika martia*, in length of body from the posterior margin of the orbit to the tip of the telson of the extended abdomen, range up to 90, 95 and 105 mm., though the specimens with complete rostra do not exceed 66 mm. in length exclusive of the rostrum; of these latter the smallest is 47 mm. long.

Remarks.—To the varietal form of this species, *semilævis*, de Man assigns the "Challenger" material from between the Philippines and Borneo, 250 fathoms, off Sydney Harbour, Australia, 1,200 fathoms, off the Kermadec Islands, 520 fathoms, and off Matuka, Fiji Islands, 315 fathoms (Bate), as well as McCulloch's Sydney specimens (mentioned under *Distribution* above). De Man also cites this variety as occurring at Lion's Head, South Africa (Stebbing), probably also in Sagami Bay, 800 metres (Balss); and at the Hawaiian Islands (Rathbun; also mentioned under *Distribution* above).

An examination of the "Albatross" Hawaiian material reported on by Dr. Mary J. Rathbun shows it definitely to be the species proper. Measurements of thirteen specimens with complete rostra give a variation of rostral length to length of body (from orbit to end of telson) of from fifty to sixty-six per cent.

De Man's designation of McCulloch's Sydney specimens as the varietal form may likewise be in error, for McCulloch speaks of his specimens as "agreeing well with Alcock's detailed description." Regarding the species observed by Alcock, de Man remarked that whether it belongs to the variety appears doubtful, because according to the measurements mentioned by this author, the rostrum should be as long as in the typical species.

Furthermore, even though some of Bate's material came from the same general locality as McCulloch's, off Sydney, measurements of the only three of the twenty specimens taken by the "Endeavour" that had complete rostra—a fourth had the rostrum entire except for the extreme tip—showed that these further specimens from Australian waters—off Gabo Island and elsewhere in the Great Australian Bight—are like the typical species.

The rostra of these several specimens represented more than fifty per cent. of the length of the body measured from the back of the orbit to the end of the telson. In the variety *semilævis*, according to de Man, the rostrum is from thirty-four to forty-seven per cent. the length of the body.

It is not at all unlikely that Bate himself had both forms represented in the material he worked over. For, although a comparison with Milne Edwards' figure showed the rostrum of the latter to be relatively longer,

Bate[62] noticed and remarked that the specimens taken near the Kermadec Islands "are generally more slender, the legs rather longer and the rostrum longer and more rigidly straight . . . " than the specimens he considered typical of *semilævis*. No doubt, at least, his Kermadec Island specimens are very close to, if not identical with typical *Plesionika martia*.

Genus Heterocarpus, *Milne Edwards*.

Heterocarpus sibogæ, *de Man*.

Heterocarpus sibogæ, de Man, Zool. Medd. Mus. Nat. Hist. Leiden, iii., 1917, afl. 4, p. 283. *Id.*, "Siboga" Exped., xxxix*a*[3], Decapoda, pt. iv., 1920, p. 169, pl. xiv., figs. 42-42i.

Heterocarpus ensifer, Alcock, Desc. Cat. Indian Deep-Sea Crustacea, 1901, p. 107.

Occurrence.—30 miles S.W. of Gabo Island, Victoria, 240 fathoms; one female (Reg. No. E.6142).

Distribution.—Otherwise known from the Andaman Sea, 188-220 fathoms (Alcock): and the Dutch East Indies; north of the Island of Baljan, 397 metres, the Kei Islands, 397-560 metres, west of Saleyer, 462 metres, the southern entrance of the Straits of Makassar, 450 metres (de Man).

Measurements.—The carapace is 23 mm. long—the rostrum is wanting—the abdomen and telson together are 48 mm., and the telson alone is 14 mm. in length. The spine of the antennal scale slightly exceeds the blade and measures 15 mm. in length.

Remarks.—The distinguishing characters of this species are such as to permit ready determination by means of the "Key to the Indo-Pacific Species of the Genus Heterocarpus," prepared and published by de Man in his "Siboga" report.

In the same key de Man diagnoses *H. signatus* Rathbun[63] with an added footnote to the effect that "the length of the dactyli of the three posterior legs is not

[62] "Challenger" Rept., Zool., xxiv., Macrura, 1888, p. 645.
[63] Bull. U.S. Fish Comm., 1903, xxiii., 1906, pt. iii., p. 918, pl. xxi., fig. 6.

mentioned in the description and cannot be ascertained from the photograph." I, therefore, avail myself of the present opportunity to supply that information. The dactyls in the third and fourth legs are about one-fifth the length of their respective propodi, a little more in the case of the third legs and a little less in the fourth legs. The length of the dactyls of the fifth pair of legs is contained from five and one-third to five and three-fourths times in their propodi. These proportions are based on the specimen photographed and figured in Miss Rathbun's report. In another larger specimen of the type lot, the third and fourth pairs of legs are wanting, and the dactyls of the fifth pair are contained five and three-fourths times in their propodi.

Heterocarpus longirostris MacGilchrist,[64] the species alternative with *H. signatus* in de Man's key cited above, as figured,[65] appears to have the dactyls about one-fourth the length of the propodus in the case of the third and fourth legs to about one-sixth the length of the propodus in the case of the fifth legs.

[64] Ann. Mag. Nat. Hist. (7), xv., 1905, p. 237.

[65] Illus. Zool. "Investigator," 1905, pl. lxxi., fig. 2, 2*a*.

EXPLANATION OF PLATE LVII.

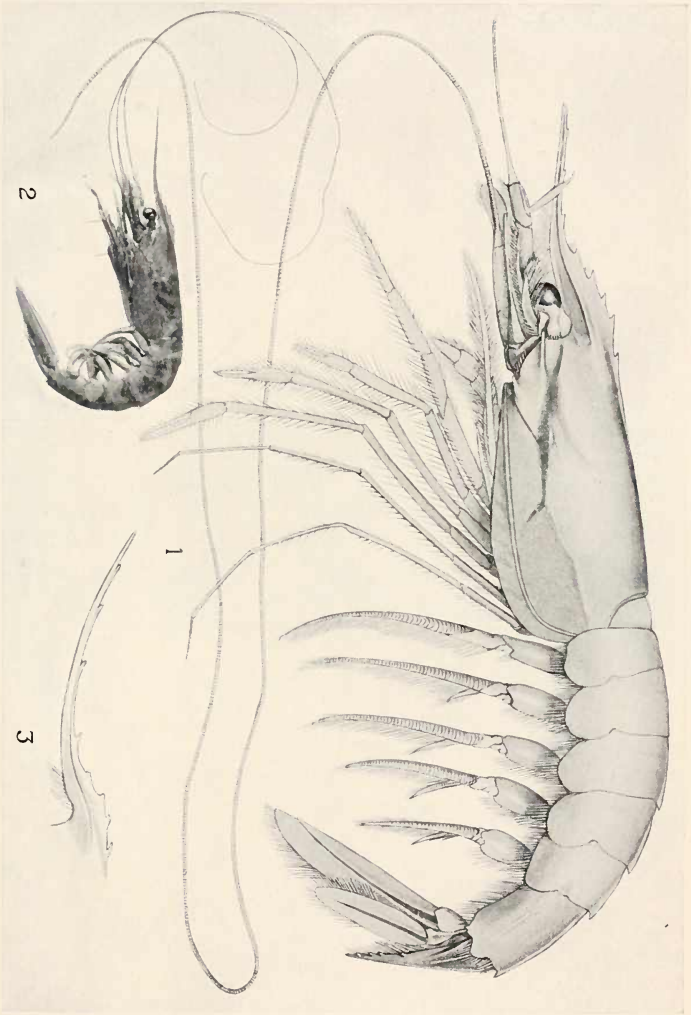
Aristæomorpha foliacea (Risso).

Fig. 1. Lateral view of a female in the collection of the Australian Museum (Reg. No. P.4695),[1] measuring 70 mm. from the tip of the rostrum to the end of the carapace.

Fig. 2. Lateral view of Smith's *Aristeus? foliaceus*, a young male in the collection of the United States National Museum, Washington (Cat. No. 7264, U.S.N.M.). Carapace and rostrum 56 mm. long.

Fig. 3. Rostrum of a female specimen (Reg. No. E.6621) measuring 73 mm. from the tip of the rostrum to the end of the carapace.

[1] Specimen not examined by Dr. Waldo Schmitt; see footnote in text.—F. A. McNeill.



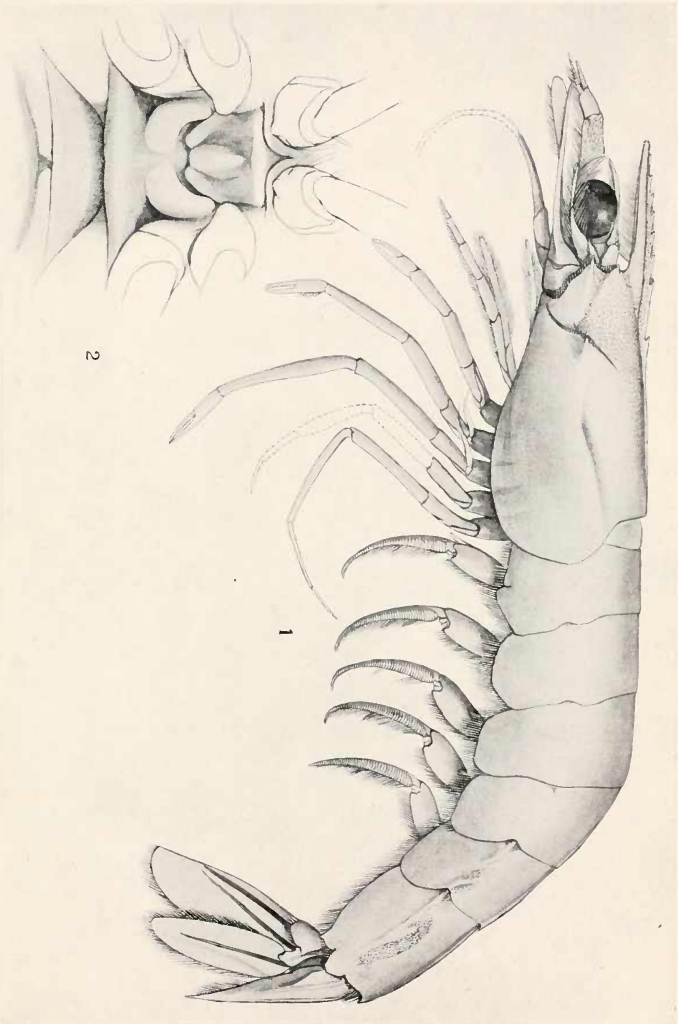
MISS E. A. KING, del. (1, 3).
C. R. SHOEMAKER, photo. (2).

EXPLANATION OF PLATE LVIII.

Penæopsis monoceros (Fabricius).

Fig. 1. Lateral view of an immature male cotype of Haswell's "*Penæus mastersii*" in the collection of the Macleay Museum, University of Sydney. Carapace and rostrum 26 mm. long (rostrum slightly damaged at tip).

Fig. 2. Thelycum of a young female in the collection of the Australian Museum (Reg. No. P.4287 *part*), measuring 17 mm. from the tip of the rostrum to the end of the carapace.



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EXPLANATION OF PLATE LIX.

Panœopsis endeavouri sp. nov.

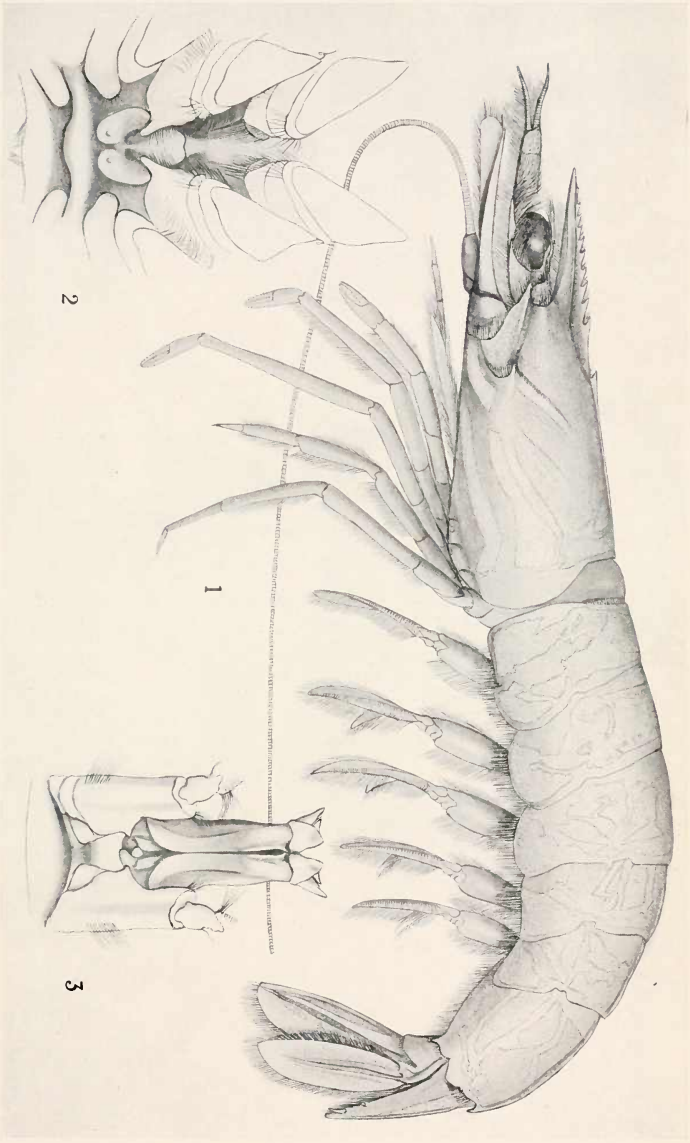
Fig. 1. Lateral view of the female holotype. Carapace and rostrum 56 mm. long.

(Note.—Antennular flagellum drawn from another specimen.)

Fig. 2. Thelycum of female holotype.

Fig. 3. Petasma of a male specimen (Reg. No. E.6687), measuring 48·5 mm. from the tip of the rostrum to the end of the carapace.

(Note.—Prepared from the same male specimen as illustrated on Plate lxvi.)



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EXPLANATION OF PLATE LX.

Penæopsis macleayi (Haswell).

Fig. 1. Lateral view of a female cotype[1] in the collection of the Macleay Museum, University of Sydney, from Port Jackson, New South Wales. Carapace and rostrum 39·5 mm. long.

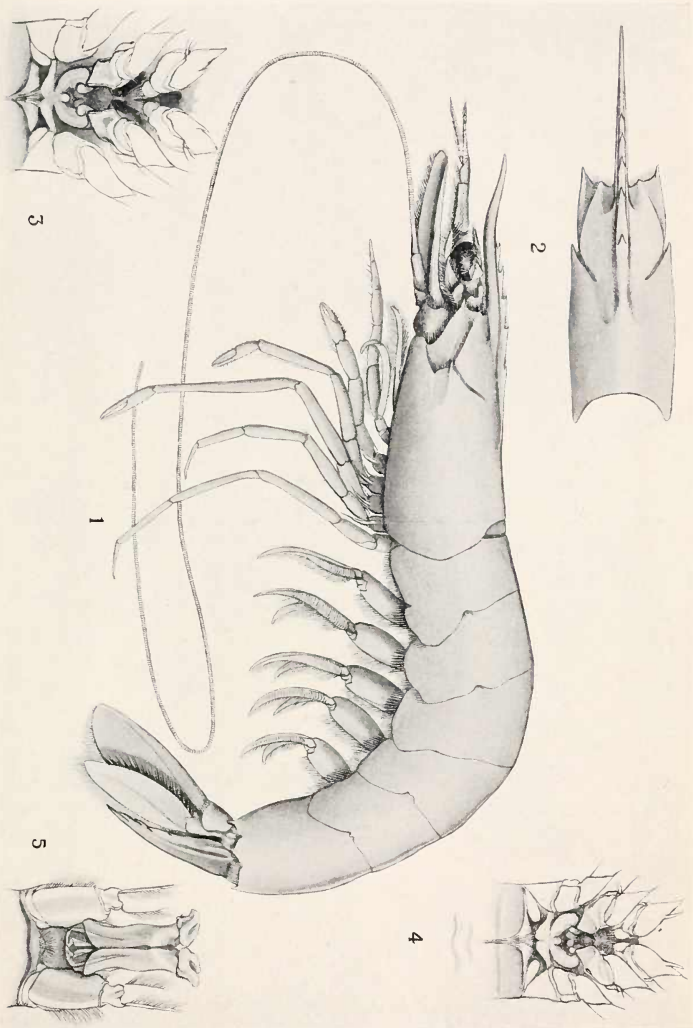
Fig. 2. Dorsal view of carapace and rostrum of same specimen.

Fig. 3. Thelycum of same specimen.

Fig. 4. Thelycum of a female specimen in the collection of the Australian Museum (Reg. No. P.1438). Carapace and rostrum 46·5 mm. long.

Fig. 5. Petasma of an adult male specimen[2] in the collection of the Australian Museum (Reg. No. P.3639), from near Sydney, New South Wales. Carapace and rostrum 43 mm. long.

[1] This cotype is not the one examined by Dr. Waldo Schmitt, but another more perfect duplicate of about the same size.—F. A. McNeill.
[2] Not examined by Dr. Waldo Schmitt.—F. A. McNeill.



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EXPLANATION OF PLATE LXI.

Penæopsis novæ-guineæ (Haswell).

Fig. 1. Thelycum of an adult female in the collection of the Macleay Museum, University of Sydney, from Darnley Island, Torres Strait. Carapace and rostrum 29 mm. long.

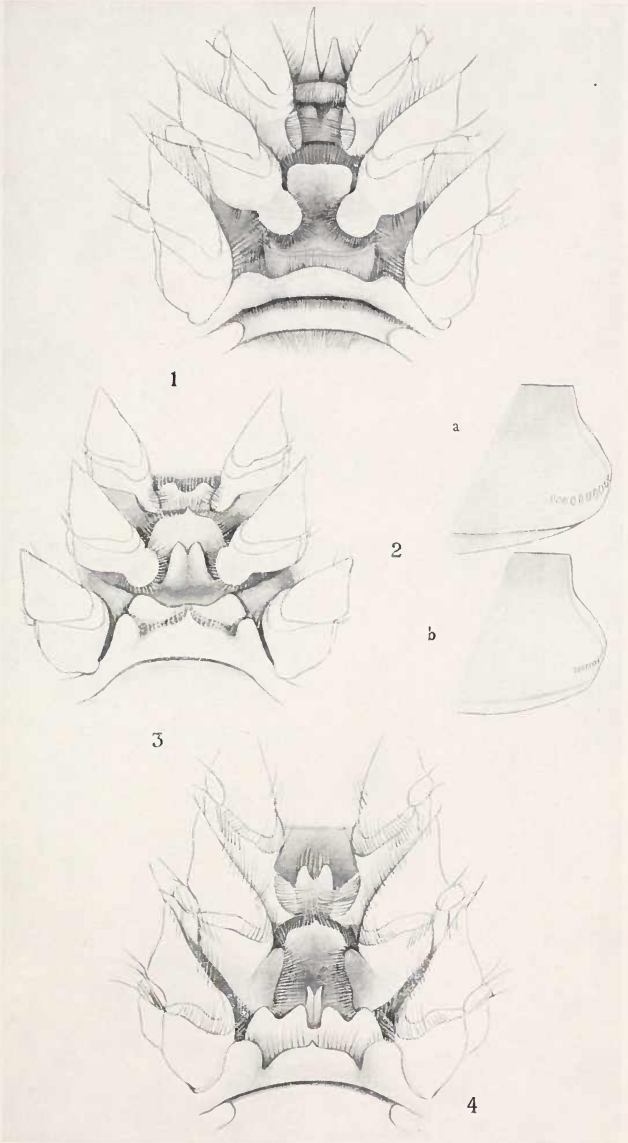
Fig. 2a-b. Stridulating organs on the posterior margins of the carapaces of two small females in the collection of the Australian Museum (Reg. No. P.412 *part*). The carapace and rostrum of each specimen measures 17 mm.

(NOTE.—These drawings were prepared from the two specimens illustrated on Plate lxvi.)

Penæopsis mogiensis (Rathbun).

Fig. 3. Thelycum of a young female in the collection of the Macleay Museum, University of Sydney, from Darnley Island, Torres Strait. Carapace and rostrum 11·5 mm. long.

Fig. 4.—Thelycum of a female specimen in the collection of the United States National Museum, Washington (Cat. No. 49273, U.S.N.M.). Carapace and rostrum 28·5 mm. long.



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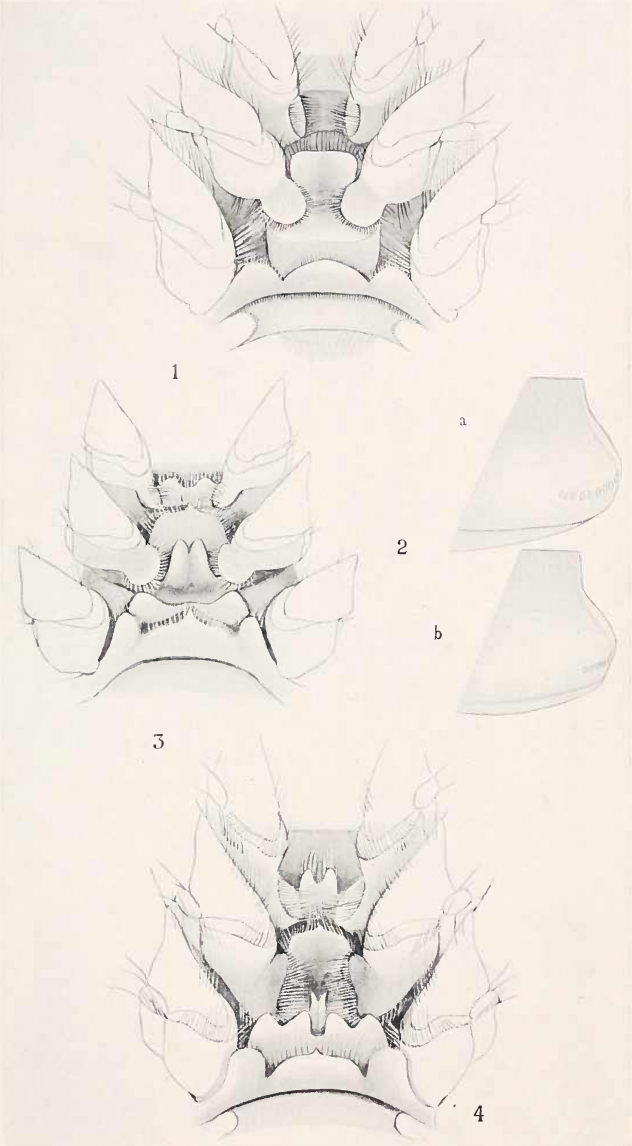

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EXPLANATION OF PLATE LXII.

Trachypeneus anchoralis (Bate).

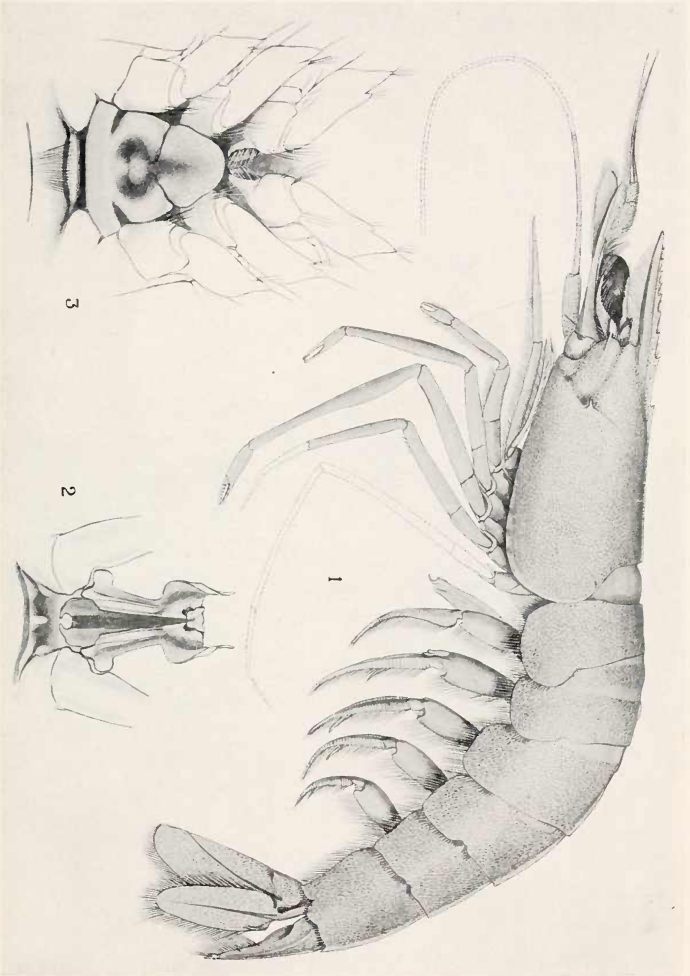
Fig. 1. Lateral view of a male specimen (Reg. No. P.3528 *part*), measuring 19·5 mm. from the tip of the rostrum to the end of the carapace.

(Note.—Tip of telson, fifth legs and portion of fourth legs missing, and drawn from a female specimen about the same size.)

Fig. 2. Petasma of same specimen.

Fig. 3. Thelycum of a female specimen (Reg. No. P.3528 *part*), measuring 29·5 mm. from the tip of the rostrum to the end of the carapace.

(Note.—Prepared from the same female specimen as illustrated on Plate lxvi.)



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EXPLANATION OF PLATE LXIII.

Trachypeneus granulosus (Haswell).

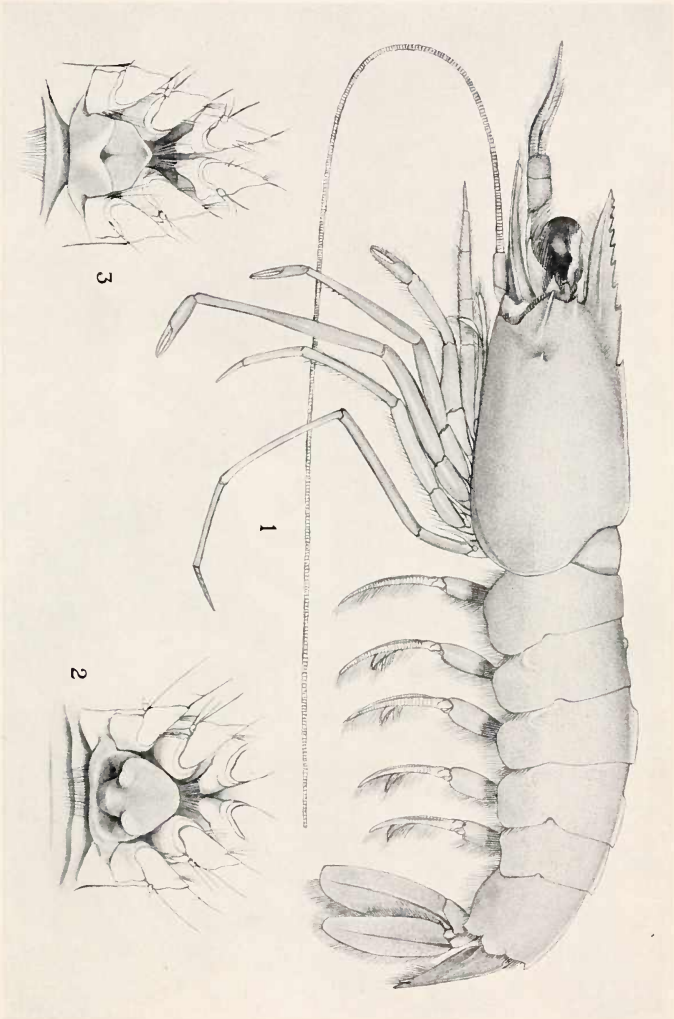
Fig. 1. Lateral view of a female specimen (Reg. No. P.3527), measuring 33·5 mm. from the tip of the rostrum to the end of the carapace.

(NOTE.—Pleuron of first abdominal somite drawn from the other side. Antennular flagellum and dactyls of fourth legs missing, and drawn from other specimens about the same size.)

Fig. 2. Thelycum of same specimen.

Trachypeneus curvirostris (Stimpson).

Fig. 3. Thelycum of a female specimen (Reg. No. E.4472 *part*), measuring 18 mm. from the end of the incomplete rostrum to the hinder margin of the carapace.



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EXPLANATION OF PLATE LXIV.

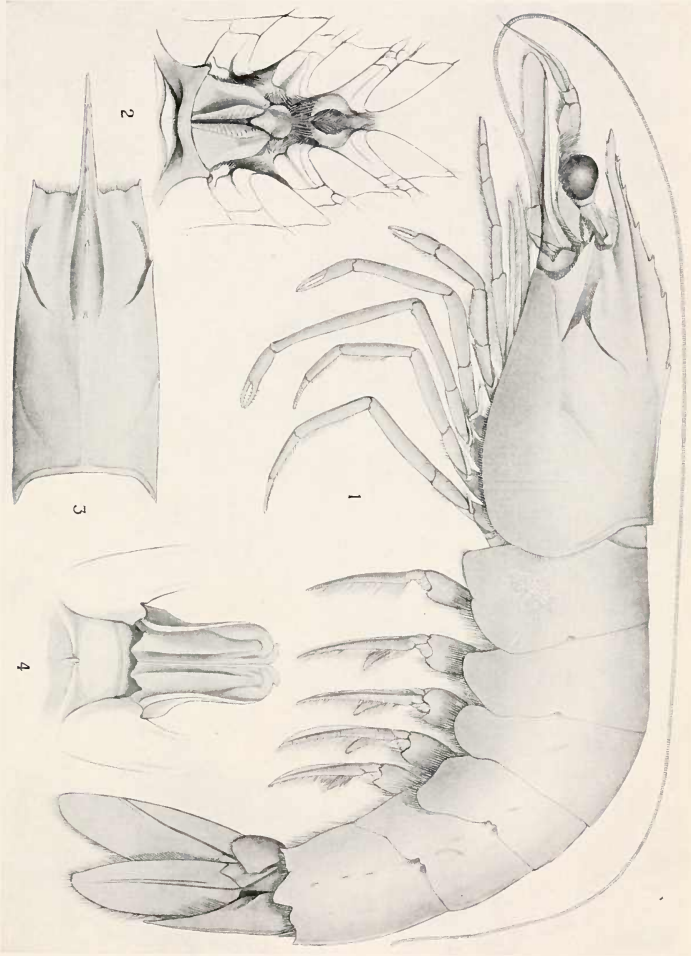
Peneus esculentus Haswell.

Fig. 1. Lateral view of a female specimen (Reg. No. P.2399), measuring 75·5 mm. from the tip of the rostrum to the end of the carapace.

Fig. 2. Thelycum of same specimen.

Fig. 3. Dorsal view of carapace and rostrum of same specimen.

Fig. 4. Petasma of a male specimen (Reg. No. P.3606), measuring 58 mm. from the tip of the rostrum to the end of the carapace.



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EXPLANATION OF PLATE LXV.

Peneus plebejus Hess.

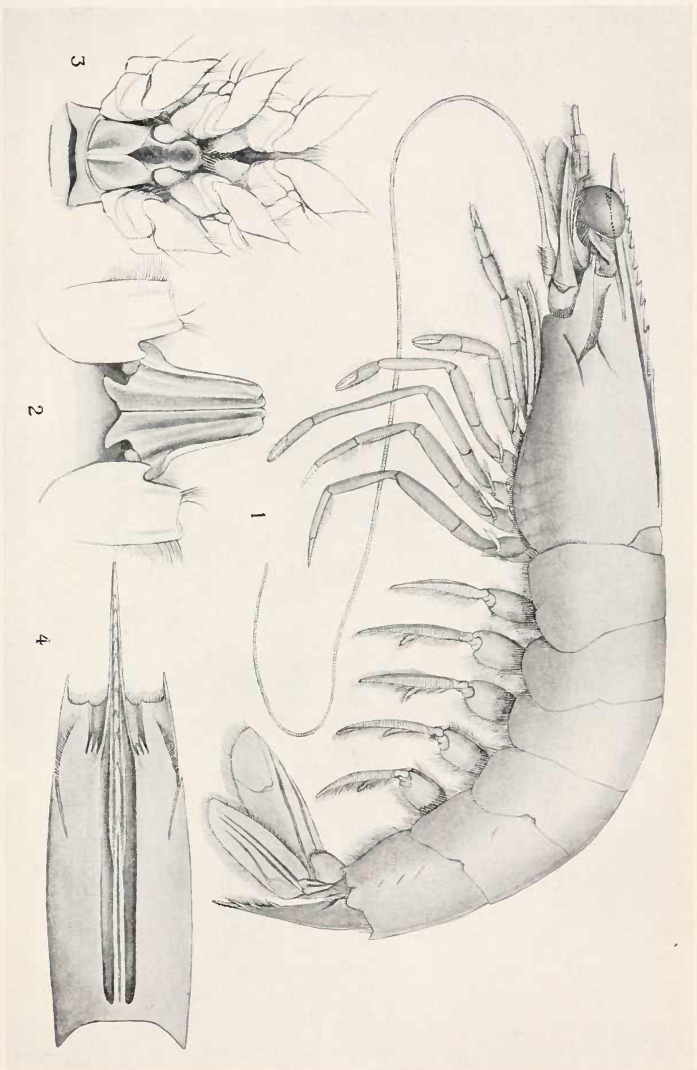
Fig. 1. Lateral view of a male specimen (Reg. No. P.2404), measuring 62·5 mm. from the tip of the rostrum to the end of the carapace.

Fig. 2. Petasma of same specimen.

Fig. 3. Thelycum of a female specimen (Reg. No. P.2402), measuring 76 mm. from the tip of the rostrum to the end of the carapace.

(NOTE.—This drawing was prepared from the same specimen as illustrated on Plate lxvi.)

Fig. 4. Dorsal view of carapace and rostrum of same specimen.



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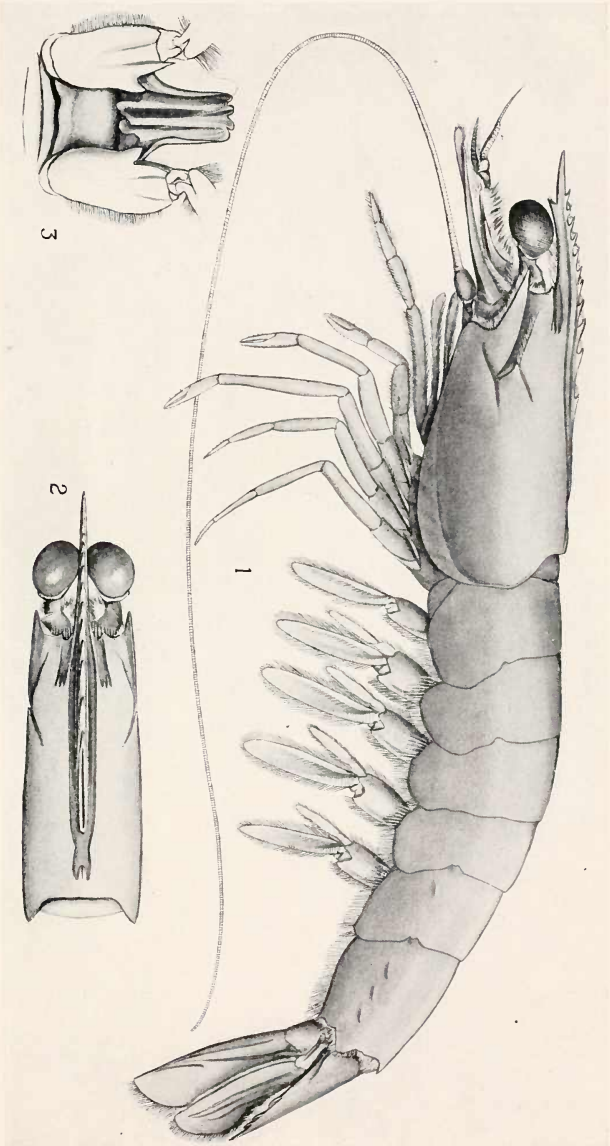
EXPLANATION OF PLATE LXVI.

Peneus maccullochi sp. nov.

Fig. 1. Lateral view of the male holotype. Carapace and rostrum 58 mm. long.

Fig. 2. Dorsal view of carapace and rostrum of male holotype.

Fig. 3. Petasma of male holotype.



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EXPLANATION OF PLATE LXVII.

Campylonotus rathbunæ sp. nov.

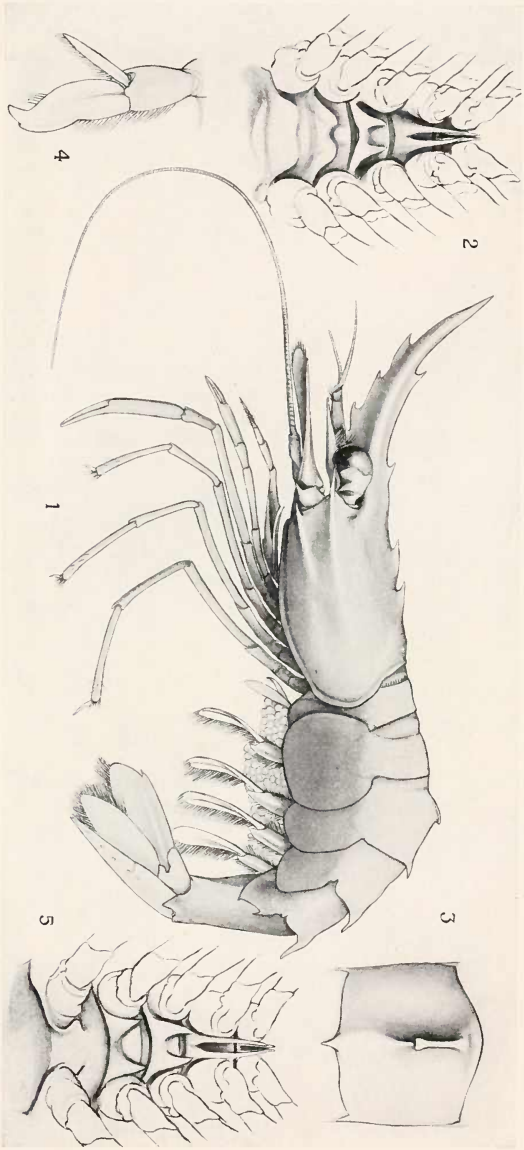
Fig. 1. Lateral view of the female holotype. Carapace and rostrum 61·5 mm. long (measured in a direct line from the tip of the former to the end of the latter).

Fig. 2. Thoracic sterna of female holotype (denuded).

Fig. 3. Dorsal view of third abdominal somite of female holotype.

Fig. 4. Front view of right anterior pleopod of a male specimen (Reg. No. E.6633), measuring 61 mm. in a direct line from the tip of the rostrum to the end of the carapace.

Fig. 5. Thoracic sterna of same male specimen (denuded).



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EXPLANATION OF PLATE LXVIII.

Peneus plebejus Hess.

Fig. 1. Lateral view of a female specimen (Reg. No. P.2402), measuring 76 mm. from the tip of the rostrum to the end of the carapace.

Penæopsis novæ-guineæ (Haswell).

Fig. 2a-b. Lateral view of two small females, showing variation in the shape of the rostra. Specimens in the collection of the Australian Museum (Reg. No. P.412 *part*). Carapace and rostrum of each measures 17 mm. long.

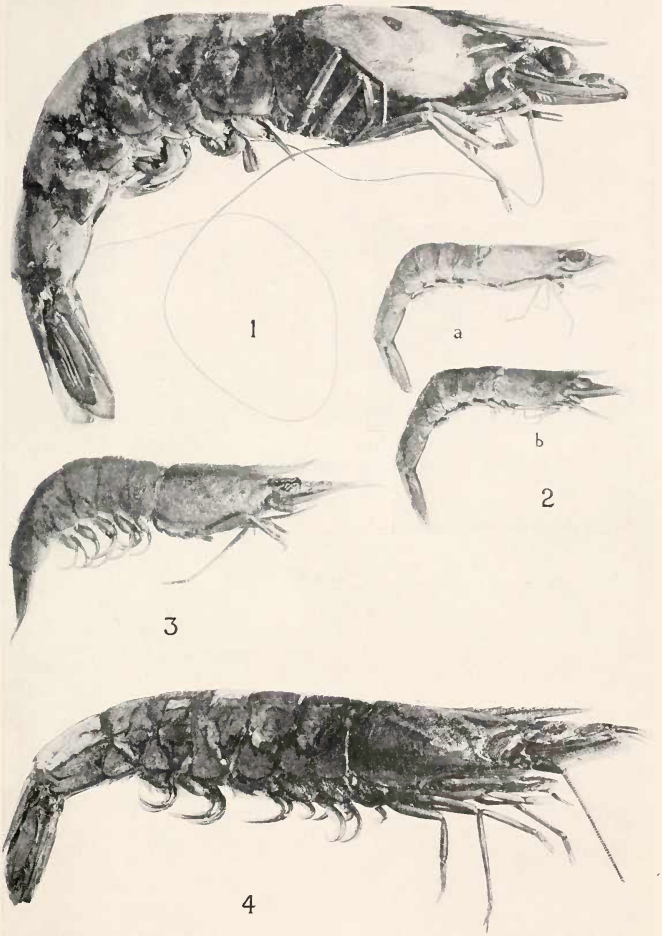
Trachypeneus anchoralis (Bate).

Fig. 3. Lateral view of a female specimen (Reg. No. P.3528 *part*), measuring 29·5 mm. from the tip of the rostrum to the end of the carapace.

Penæopsis endeavouri sp. nov.

Fig. 4. Lateral view of a male specimen (Reg. No. E.6687), to show pubescent areas. Carapace and rostrum 48·5 mm. long.

(NOTE.—The fifth pair of legs is missing from this specimen.)



C. R. SHOEMAKER, photo.

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H. C. Dannevig,
Commonwealth Director of Fisheries.

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CONTENTS.

INDEX.

D

LIST OF CONTRIBUTORS.

1921

Commonwealth of Australia

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FISHERIES

Biological Results of the Fishing Experiments carried on by the F.I.S. "Endeavour," 1909-14

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