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The Fauna of the Cocos-Keeling Islands, Brachyura and Stomatopoda

by

M. W. F. TWEEDIE, M.A., C.M.Z.S.

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By M. W. F. TWEEDIE, *M.A., C.M.Z.S.*

In collecting the reef fauna of the Cocos-Keeling islands Mr. Gibson-Hill paid particular attention to the crabs and stomatopods and presented to the Raffles Museum a very large, well preserved and well documented collection. The material was obtained without recourse to dredging or diving and is probably almost completely representative of the littoral and terrestrial fauna.

The very valuable field and colour notes have been incorporated in the accounts of species, placed in quotation marks. In these notes "seaward reef" indicates the reef on the outer side of the atoll, facing the ocean; "barrier" refers to the areas of reef between the islands which are partly uncovered at low tide and which form a barrier between the ocean and the lagoon. Unusually long series of some of the species were taken and this has enabled me to make some interesting observations which are appended at the end of the paper.

As well as to the collector my thanks are due to Miss I. Gordon and Miss A. M. Buitendijk of the British Museum and the Rijksmuseum van Natuurlijke Historie at Leiden for assistance in identifying some of the species.

The abbreviations cb, acb, mcb (carapace breadth, anterior carapace breadth and maximum carapace breadth) have been used.

Systematic. Three new species are described:

Platypodia keelingi (Xanthidae).

Paraxanthias gibsonhilli (Xanthidae).

Sesarma sigillata (Grapsidae).

Brachynotus harpax Hilgendorf (Grapsidae) is made the type of a new genus, *Thalassograpsus*.

The following forms, which had been relegated to the synonymy of allied species, are restored to specific status:

Chlorodopsis melanodactylus A. Milne Edwards.

Cardisoma frontalis H. Milne Edwards.

BRACHYURA

Family **DROMIIDAE**

Cryptodromiopsis tridens Borr.

BORRADAILE 1906, p. 578.
BUITENDIJK 1950, p. 62.

A male and a female, identified by Miss A. Buitendijk. *C. tridens* has been recorded from the Maldives and Christmas Island in the Indian Ocean and from Waikiki in the Pacific.

"The walking legs and chelae slightly pinkish".

Family **DYNOMENIDAE**

Dynomene hispida Desm.

BALSS 1938, p. 7.

A female.

"Light brown with black markings, the whole of the dorsal surface covered with rufous hairs".

Dynomene praedator A.M.E.

BALSS 1938, p. 7.
BUITENDIJK 1939, p. 227.

Two females.

Family **CALAPPIDAE**

Calappa hepatica (L.).

ALCOCK 1896, p. 142; 144 (*C. spinosissima*).
SAKAI 1937, p. 89.
BALSS 1938, p. 8.

Five males and two females.

"Varies from very pale olive green, almost white, to a full olive grey or olive yellow. It occurs in the shallow, sandy patches all round the south end of the lagoon and is plentiful. Usually it is found buried in the sand, with only the eyes visible, in about nine inches of water. Local name, *Kĕpiting Rumah* (House Crab), from its resemblance to a domed house or hut".

Family **LEUCOSIIDAE**

Actaeomorpha erosa Miers.

MIERS 1878, p. 183.
SAKAI 1937, p. 114.

Two females, 7·7 and 5·3 mm. cb., the smaller ovigerous.

"Off-white with brownish blotchings, taken among seaweeds and ophiurians on the under surface of large coral fragments in shallow pools". The original specimen was dredged in seven fathoms.

Family **MAIIDAE**

Cyclax suborbicularis (Stimpson).

ALCOCK 1895, p. 245.

Three males and four females, the largest a female of 46 mm. cb.

"Taken on the coral *Pocillopora*. Dirty white, grey, yellow and dull crimson, the walking legs with a grey band on each segment".

Menaethius monoceros (Latr.).

ALCOCK 1895, p. 197.
SAKAI 1938, p. 263.
BUITENDIJK 1939, p. 237; 1950, p. 63.

Two specimens.

Perinea tumida Dana.

SAKAI 1938, p. 294.
BUITENDIJK 1939, p. 238.

Two females.

Family **PARTHENOPIDAE**

Daldorfia horrida (L.).

ALCOCK 1895, p. 279 (*Parthenope horrida*).
SAKAI 1938, p. 340 (*P. horrida*).

A large female.

"From the outer edge of the seaward reef; blotched irregularly but symmetrically with dull purple on a very light grey ground, the colour on the under surface of the chelae richer, inclining to orange-red; local name *Kĕpiting Rajungan Batu*".

Eumedonus convictor Bouvier and Seurat.

BOUVIER and SEURAT 1905, p. 629.
MONOD 1938, pp. 111, 112 (*E. pentagonus*).
BUITENDIJK 1950, p. 73 (under *E. pentagonus*).

A male and four females, the largest female with cb. 14, cl. 15 mm., the male, cb. 3·3, cl. 3·6.

The male, although so very small, appears to have the chelipeds and pleopods fully developed. It differs further from the female in having the carapace flatter and evenly punctate, and the eyes visible in dorsal view; in the female the eyes are concealed and the carapace is smooth with two dimple-like depressions on each branchial region. The colour pattern in both sexes is as depicted by Klunzinger (1906, pl. 2, 11).

The curious taxonomic history of this species has been discussed by Monod and Buitendijk (ll. c.) and I agree with the conclusions reached by the latter author.

"Dull crimson purple with two short longitudinal lilac bars on the carapace. It occurs only in the anal opening of the Echinoid *Echinothrix diadema* and is a little over half as plentiful as the urchins. There is never more than one to a host, and where the crab is large the opening may be distorted to accommodate it".

Family **ATELECYCLIDAE**

Kraussia rugulosa (Krauss).

BALSS 1938, p. 27.
SAKAI 1939, p. 431.

One male.

Kraussia integra (De Haan).

BALSS 1938, p. 29.
SAKAI 1939, p. 429.

One male and two females, the larger female 13·8 mm. cb.

Family **PORTUNIDAE**

Carupa tenuipes Dana.

HELLER 1865, p. 27 (*C. laeviuscula*).
LEENE 1938, p. 9 (*C. laeviscula* (sic)).

One female of cb. 8·6 mm.

The type of *tenuipes* has been regarded as an immature specimen of the form described by Heller. Leene advocates recognition of the two as distinct species on the strength of a single small specimen displaying the characters of *laeviuscula*. I prefer to follow De Man, Klunzinger and Balss in regarding the two as identical until series of two distinct forms in various stages of growth are recorded.

"Taken in a pool near the outer edge of the barrier. Limbs ringed and carapace spotted with orange and a purple band round the chelae near its tip".

Neptunus granulatus (H.M.E.).

RATHBUN 1911, p. 205.
WARD 1942, p. 80 (*Cycloachelous granulatus*).

Three males and two females, of which only one, a male of 27·5 mm. cb. is fully grown.

"Parchment white with an irregular pattern of fine greyish or brownish mottlings; found in shallow, sandy, slightly weedy water; local name *Kĕpiting Dayong* (*dayong*, a paddle)".

Charybdis obtusifrons Leene.

LEENE 1938, p. 140.

A male of 32·5 mm. cb.

This specimen agrees with the type of *obtusifrons* in having seven antero-lateral teeth of which the second and fourth are rudimentary.

Thalamita admeta (Herbst).

BORRADAILE 1903, p. 202.
TWEEDIE 1950, pp. 84, 88.

Two small males, both of the typical form, as defined by Borradaile.

Thalamita crenata (Latr.).

ALCOCK 1899, p. 76.

A large male and four small specimens.

"Common round the outer edge of the atoll, occurring under small boulders and in crevices in the coral. Local name, *Kĕpiting Batu*".

Thalamita integra Dana.

BALSS 1938, p. 33.

A female of cb. 20 mm.

Thalamita picta (Stimpson).

ALCOCK 1899, p. 79.
SHEN 1937, p. 135.
SAKAI 1939, p. 417.

Three small specimens.

"Off-white or parchment coloured with thick olive flecking over the dorsal surface and occasionally three dull maroon spots; tips of chelae dark grey. Found in the sand in shallow weedy water in the lagoon".

Thalamita spinimana Dana.

SHEN 1937, p. 131.

Two small specimens.

"Light olive-grey with splashes of light blue and off-crimson on the chelae; plentiful in the shallow sandy, slightly weedy water in the lagoon. Large specimens are grey with the colour on the chelae more subdued; they are much sought for food. Local name *Kĕpiting Rajungan*". Rajungan is generic in Javanese (Batavia) Malay for a Portunid crab, see Delsman and De Man, 1925.

Thalamitoides tridens A.M.E.

BALSS 1938, p. 35.

A male of cb. 18 mm.

"Dark battleship grey, tips of chelae black, of walking legs orange; eyes iridescent bottle green. Found under a coral boulder in shallow water".

Family **XANTHIDAE**

Genus **Carpilius** Leach

Stephensen (1945, p. 155) has figured the male pleopods of *C. convexus* and remarks (p. 224) that they are of the type found in the Menippinae. Those of *C. maculatus* are similarly developed and Miss Gordon's remarks on *Daira perlata* (Gordon 1934, pp. 50–52) apply equally to the present genus. The affinities of these two genera are discussed at the end of this paper.

Both *C. convexus* and *C. maculatus* are in the present collection and were taken in close association with each other. The male copulatory organs are similar in the two but there is a difference in the curvature of the first pleopods; when observed *in situ* the distal part of those of *maculatus* curves outwards, of *convexus* inwards. There is a slight difference in the shape of the distal orifice and in the armature of spinules as well (fig. 1, a, b).

Carpilius convexus (Forsk) Fig. 1, b.

ALCOCK 1898, p. 80.
SAKAI 1939, p. 446.
STEPHENSEN 1945, p. 156.

A male of 77 mm. cb. and a smaller female.

Two small specimens (16·5 and 16 mm. cb.) lack the red spots of *maculatus,* but they may belong to a stage of that species previous to their appearance. The pleopods are not yet developed.

"Ventral surface very light yellow, dorsal a dull, faintly speckled maroon brown with irregular subsymmetrical darker markings. Occurs in the same habitat as Kepiting durias (*C. maculatus*) and has the same habits, but is less common. It is not considered edible".

Carpilius maculatus (L.) Fig. 1, a.

ALCOCK 1898, p. 79.
SAKAI 1939, p. 445.

A female and a large male (cb. 134 mm.) the latter dry,

"Ventral surface primrose yellow, dorsal olive grey with eleven purplish brown spots on the carapace, the two pairs external to the orbit surrounded by a light primrose yellow halo. Occurs along the outer edge of the seaward reef, hides by day but moves about by night when it is mostly easily taken. It is considered edible and called *Kĕpiting Durias*".

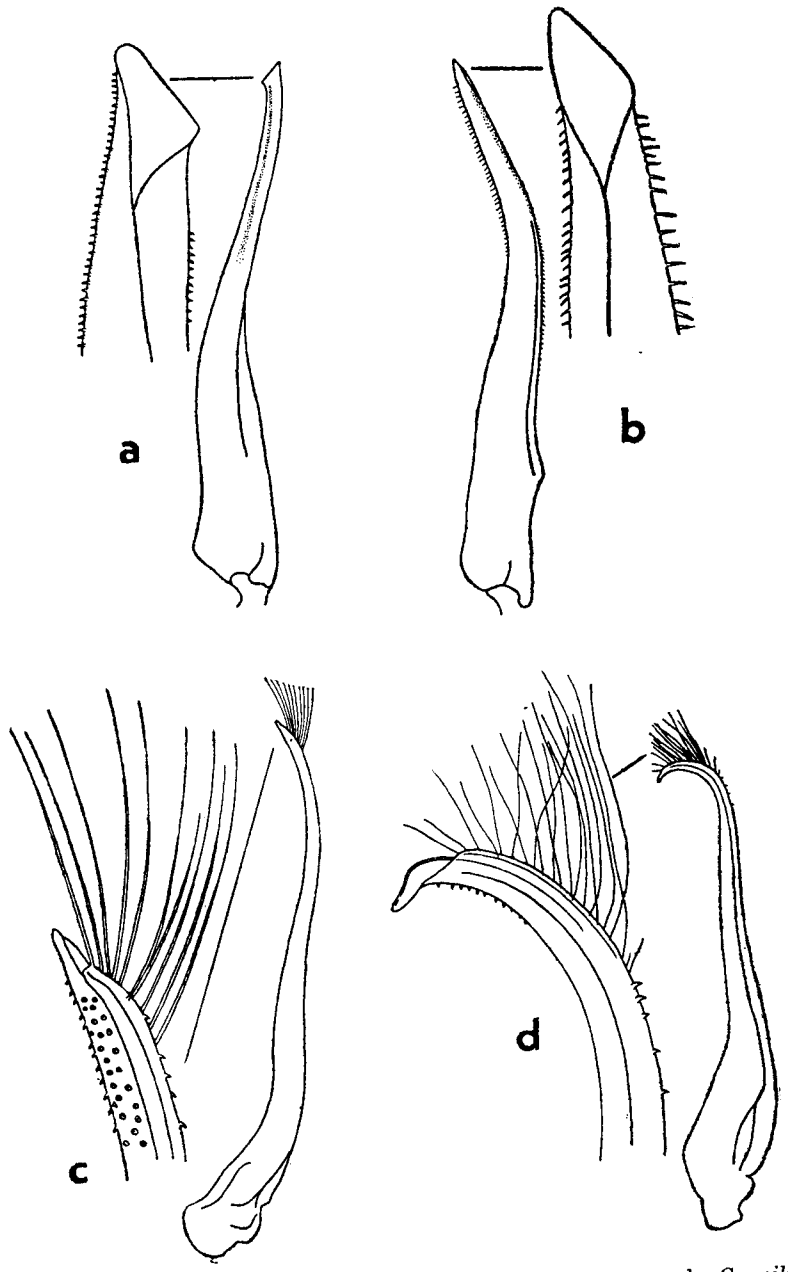


Fig. 1. Right first male pleopods of a, *Carpilius maculatus;* b, *Carpilius convexus;* c, *Zoozymus aeneus;* d, *Neoxanthias impressus.*

The spots turn to red in preserved specimens and have always been recorded as being of this colour.

Pseudoliomera granosimana (A.M.E.).

A. MILNE-EDWARDS 1865, p. 222 (*Liomera granosimana*), New Caledonia.
RATHBUN 1911, p. 213 (*L. granosimana*), Seychelles.
ODHNER 1925, p. 79.
? WARD 1934, p. 11; 1942, p. 84 (*P. natalensis*), Christmas Island, Indian Ocean and Chagos Archipelago.
TWEEDIE 1947, p. 30, Christmas Island.

A male of 37 mm. cb.

I am not wholly convinced that Ward's *natalensis* is specifically distinct from *granosimana*. He does not claim to have compared the (very small) specimens from Christmas Island on which he founded the species, with Pacific material, and, in his second record (1942), says that "it would be of interest to compare the material with specimens from New Caledonia". I agree and maintain that it is better to regard the Indian Ocean form (well figured by Rathbun, 1911, pl. 17, fig. 6) as conspecific with the Pacific one until comparison of adult specimens proves them distinct.

On the other hand Dr. H. Balss examined Ward's type and, in a letter dated 15 October, 1937 wrote to me as follows: "*Pseudoliomera natalensis* Ward habe ich mit Exemplaren von *P. granosimana* von Roten Meere verglichen und finde Ward's Unterschiede alle bis auf dem letzten (Gestalt der Schreitfusse) richtig. Die Wardsche art bleibt also". It is not stated whether specimens of similar size were compared, and the locality (the Red Sea) of Dr. Balss' material of *granosimana* lends no support to the idea of two distinct forms inhabiting the Pacific and Indian Oceans.

The present specimen and those recorded by me from Christmas Island (the type locality of *natalensis*) agree well with Milne Edwards' description except that the chelipeds are equal, whereas he described those of *granosimana* as subequal. His measurements suggest that he described a single specimen and the subequality of its chelipeds may be due to an accident followed by regeneration.

"Dull purplish umber, the tubercles on the chelae white, fingers very dark brown, white tipped; dactyli of walking legs blue".

Carpilodes bellus (Dana).

ODHNER 1925, p. 16.

Thirty-five specimens, the largest a male of 14 mm. cb.

"Dull crimson with black eyes and the tips of the chelae black; in crevices in soft coral rock and under stones on the seaward reef".

Carpilodes caelatus Odhner.

ODHNER 1925, p. 21.

A single male of cb. 8·9 mm.

This specimen agrees well with Odhner's description and figure except that 2 M is more completely divided, so that one looks for it at first in section 18 of the key instead of section 5. Miss A. M. Buitendijk has examined the specimen and identifies it with *caelatus*.

It was found, with other *Carpilodes* species on the reef; previous specimens of *caelatus* have all been taken in deeper water and Odhner remarks on it as "Keine Riff-form sondern in einiger Tiefe lebend".

Carpilodes laevis A.M.E.

ODHNER 1925, p. 13.

A single male of 9·4 mm. cb.

This is the typical form illustrated at fig. 2 of Odhner's plate 1.

Carpilodes pallidus Borradaile.

ODHNER 1925, p. 20.

Seven specimens, the largest a male of 7·1 mm. cb.

"Dorsal surface of carapace and dactyli of walking legs white, otherwise dull crimson".

Carpilodes stimpsoni A.M.E.

ODHNER 1925, p. 17.

A single male of 14 mm. cb.

Carpilodes tristis Dana.

ODHNER 1925, p. 12.

Fourteen specimens, the three largest males of almost exactly the same size, 26·5–27 mm. cb.

"Reddish brown or purplish grey, the colour deeper on the anterior part of the carapace and the chelae; tips of fingers black; walking legs banded dark red and white. Fairly plentiful under stones and coral fragments on the barrier".

Lachnopodus subacutus (Stimpson).

ALCOCK 1898, p. 91 (*Lioxantho tumidus*).
BALSS 1934A, p. 509; 1938, p. 36.

Eight specimens, the largest a male and an ovigerous female respectively 26 and 24·5 mm. cb.

"Carapace and chelipeds white or light reddish brown, fingers black, walking legs dull red. Found under stones on the barrier".

Lachnopodus tahitensis De Man.

DE MAN 1889, p. 418.
BALSS 1938, p. 36.
GORDON 1941, p. 127.

A female of cb. 60 mm.

De Man's comparison with *L. rodgersii* Stimpson and Miss Gordon's description of material from Samoa leave no doubt of the identity of this specimen, which extends the range of the species from the Pacific (Fiji, Tahiti, Samoa) to the Indian Ocean. The present specimen is the largest recorded, the type, a male, having cb. 54 mm.

"Umber, slightly purplish towards the posterior border of the carapace; fingers black; walking legs covered with fine greenish yellow bristles. From a cavity in coral rock near the edge of the seaward reef".

Platypodia cristata (A. M.E.). Plate 16, b.

BUITENDIJK 1941, p. 302.

Four specimens, the largest a female of 36 mm. cb.

"Dull orange brown with purplish blotching over the carapace, excluding the tubercles, fingers black. Found under coral boulders in pools on the barrier".

Platypodia keelingi sp. n. Plate 16, a.

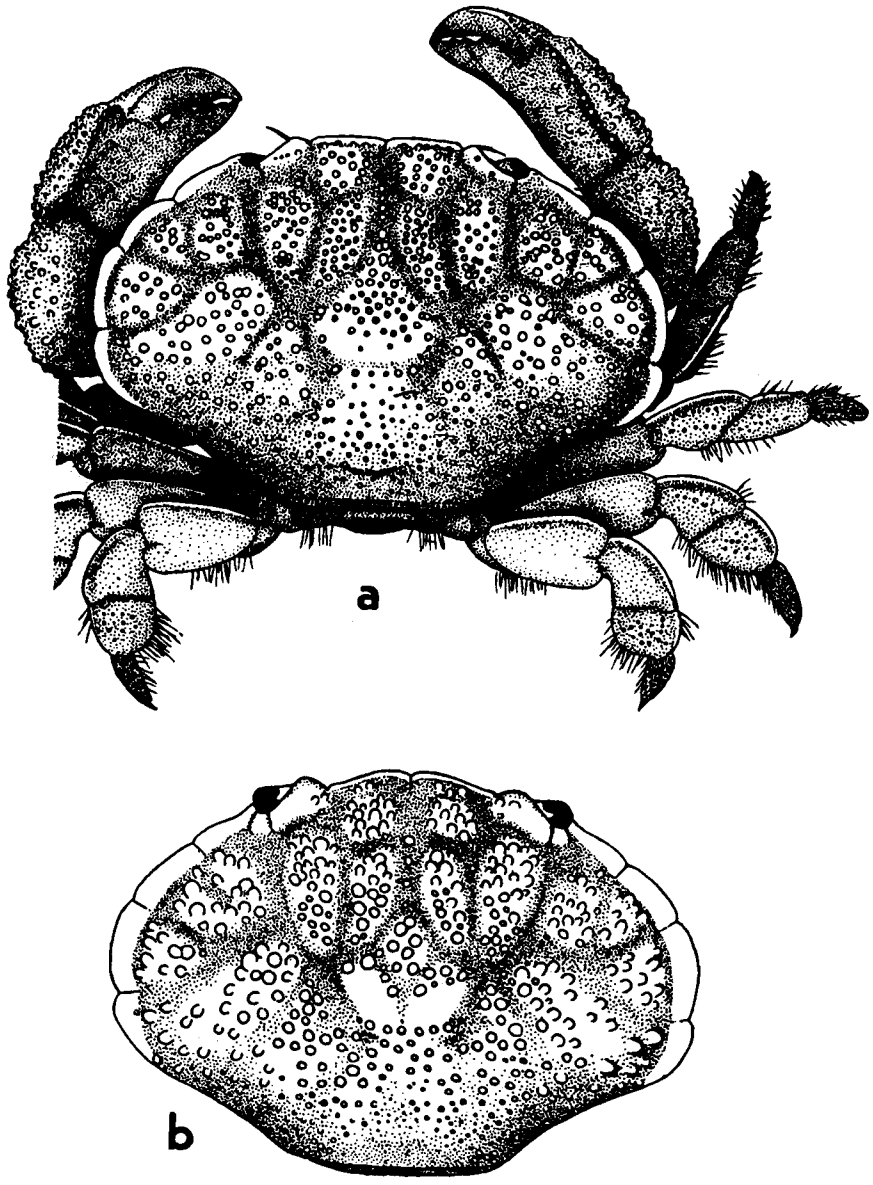
Type, a female of cb. 29·5 mm., cl. 19·5 mm.

Material, a small male (15·1 × 10 mm.) in addition to the type.

This species is very close to *P. cristata.* The two differ chiefly in the shape and granulation of the carapace; in *keelingi* the fronto-orbital region is less prominent than in *cristata* and the granules ornamenting the carapace much smaller, each granule being perfectly round, like a tiny pearl. In *cristata* the granules are coarse, sometimes partly confluent and tend to be squamiform towards the peripheral parts of the carapace. The cristate border of the carapace is narrower in *keelingi.*

The granulation of the chelipeds is similarly distinct and the crest on the upper margin of the chelar dactylus carries in *keelingi* a row of sharp, evenly spaced granules which are not present in *cristata.* In all the specimens of *cristata* before me, four from Cocos Keeling Islands and two from Djeddah collected in 1880 the fingers are black. In both specimens of *keelingi* they are light brown, hardly darker than the palm.

The species is named after Captain William Keeling, who discovered the islands.



Cocos-Keeling Brachyura (M. W. F. Tweedie).

a, *Platypodia keelingi* sp.n.
b, *Platypodia cristata.*

Zoozymus aeneus (L.). Fig. 1, c.

ODHNER 1925, p. 83.
SAKAI 1939, p. 450.

Twelve specimens, the largest a female of 83 mm. cb.

"White with the carapace and dorsal surface of the limbs marked with a complex pattern of dark umber or very dark sienna blotches; occasionally the white ground is suffused with pale purple. Hides in crevices in the day and moves about in the open at night. Local name *Kĕpiting Batu Bĕlang*. (Striped Stone Crab).

Zoozymodes pumilus (Jacq. and Lucas).

BALSS 1938, p. 39.

Ninety-six specimens, the largest a female of 10·3 mm. cb. most of the adults about 9 mm. cb.

The chelipeds are unequal, and I find that of this sample sixty-six (21 ♂, 45 ♀) have the right one enlarged and thirty (14 ♂, 16 ♀) the left.

"Generally black, with occasionally two white marks on the posterior part of the carapace, sometimes grey with black specks on the chelae. Abundant between tide marks in abandoned worm and mollusc tunnels".

Lophozozymus dodone (Herbst).

BALSS 1938, p. 39.

A male of cb. 14 mm.

Lophozozymus pulchellus A.M.E.

BALSS 1938, p. 40.

A female of 16·7 mm. cb.

"Carapace red brown passing to white posteriorly, with a reticulate pattern of vermilion lines; chelipeds white with the distal two-thirds and a patch on the carpus vermilion and the finger-tips black; legs banded vermilion and white.

Euxanthus exsculptus (Herbst). Fig. 2, a.

BALSS 1938, p. 41.
SAKAI 1939, p. 451.

Seven specimens, the largest a male of 52 mm. cb.

Xantho gracilis (Dana).

BALSS 1938, p. 42 (*Leptodius gracilis*).
SAKAI 1939, p. 465.

Nine specimens, the largest a male of 22·5 mm. cb.

"Dull grey, some darker specimens blotched with maroon brown. Found along the inner border of the seaward reef in similar situations to those frequented by the far commoner *X. sanguineus*".

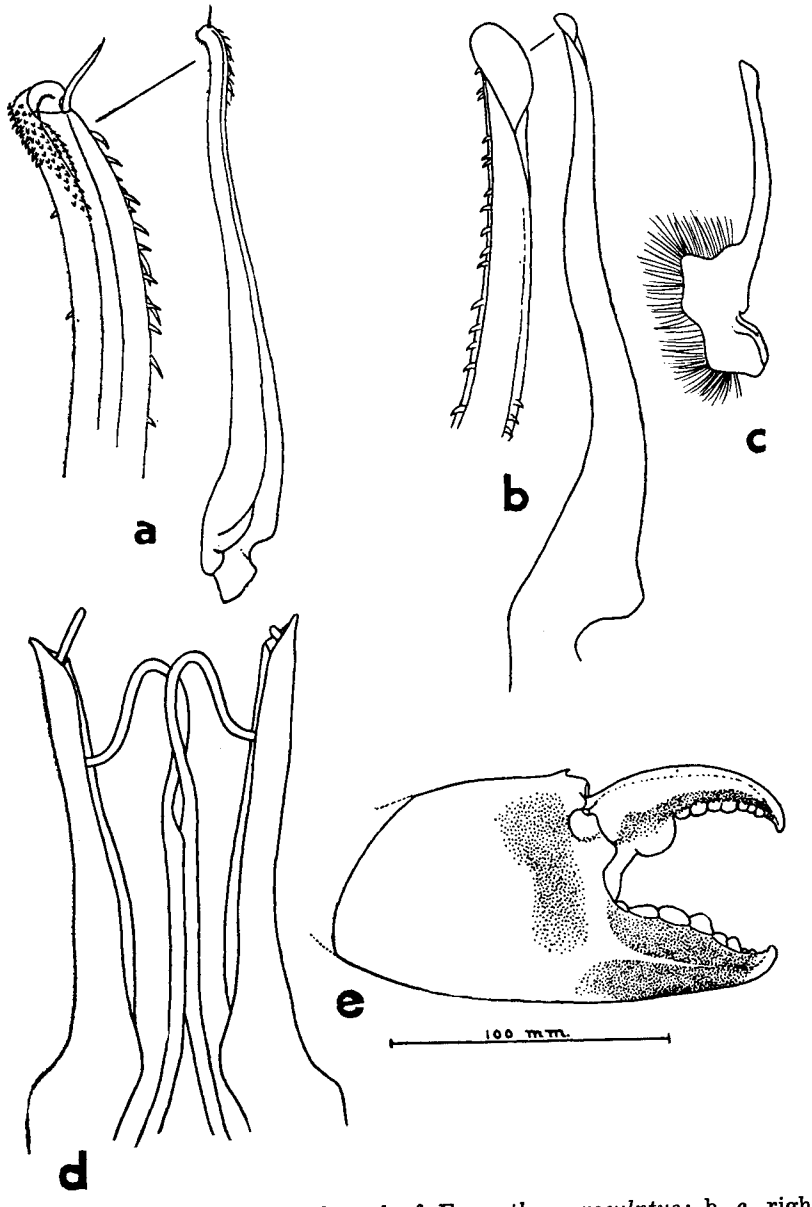


Fig. 2. a, right first male pleopod of *Euxanthus exsculptus;* b, c, right male first and second pleopods of *Pseudozius caystrus;* d, male pleopods of *Ozius tuberculosus* drawn *in situ;* e, chela of a large unidentified (? Xanthid) crab.

Xantho sanguineus.

BALSS 1938, p. 42 (*Leptodius sanguineus*).
SAKAI 1939, p. 464.

Twenty-two specimens, the two largest males 41 and 43 mm. cb., the two largest females each 34 mm. cb.

"Usually grey with brownish or maroon markings, rarely brown with darker markings, occasionally the lighter colour is uniform. I found only one specimen marked with red and white, while on Christmas Island this colouring occurred moderately frequently, especially in young specimens".

X. nudipes is common at Christmas Island, is smaller than *sanguineus*, and one specimen of it was included among the tube containing *sanguineus* from Cocos. On these grounds I consider it likely that red and white coloured specimens belong to that species.

Xantho nudipes (Dana).

ODHNER 1925, p. 80 (*X. danae*).
BALSS 1938, p. 41 (*X. danae*).
TWEEDIE 1947, p. 29, Footnote (*Leptodius nudipes*).

One male.

Neoxanthias impressus (Lam.). Fig. 1, d.

RICHTERS 1880, p. 146 (*Eudora* (*Xantho*) *impressa*).
WARD 1932, p. 249; 1942, p. 91.

A male of 58 mm. cb. The species is well figured by Richters. It ranges widely in the Indo Pacific but appears to be rare wherever it is found.

Medaeus nudipes (A.M.E.).

BALSS 1934B, p. 226.

A male and two females, the larger female 25 mm. cb. If, as Balss (l.c.p. 227) states, this species is generically distinct from *Xantho nudipes* (Dana), I can see no reason for using Odhner's name *danae* (Odhner 1925, p. 80) for Dana's species.

"Carapace indistinctly marked with light fawn and grey and dotted with olive grey; walking legs with olive bands on the distal segments; fingers black. Taken at night walking in a shallow coral pool on the seaward reef".

Atergatopsis signata (Ad. and White).

RATHBUN 1911, p. 214.
BALSS 1935, p. 137.

A female of 31·5 mm. cb. and a dried carapace of 89 mm.

"Carapace pinkish brown with lighter, more orange markings, faintly outlined in white; fingers dark brown. Found in a sheltered pool among coral fragments".

Actaea cavipes (Dana).

ODHNER 1925, p. 68.
TWEEDIE 1950, p. 86.

Seven specimens, the largest a male of 15·3 mm. cb. As I have remarked (1950 l.c.) these specimens are less pitted and corroded and the regions and granulation better defined than in specimens from Aor Island, South China Sea.

Actaea consobrina A.M.E.

ODHNER 1925, p. 67.

A small female.

"Very light fawn brown; found in a hole in soft coral rock".

Actaea rufopunctata (H.M.E.).

ODHNER 1925, p. 60.

A female of 17·3 mm. cb.

Actaea speciosa (Dana).

ODHNER 1925, p. 62.

Six specimens, the largest a female of 15 mm. cb.

"Dirty white with light dull red blotching on carapace and legs and the sulci lined in dark grey".

Actaea superciliaris Odhner.

ODHNER 1925, p. 49.

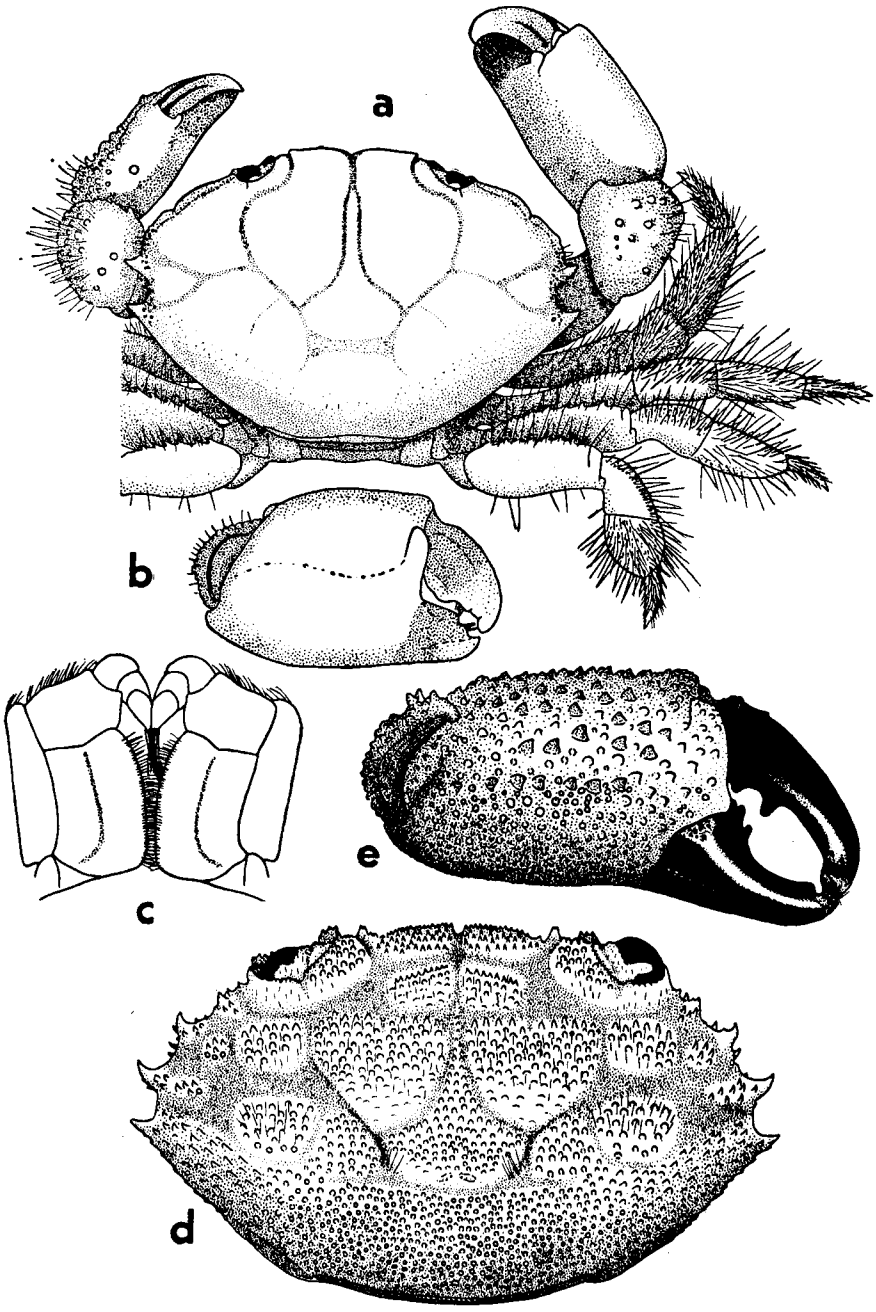
Eleven specimens, the largest a male of 16·5 mm. cb.

"Very light sand colour, almost white, with a series of red blotches, one on each limb and two on the anterior border of the carapace. Taken in a cavity in coral rock".

Paraxanthias gibsonhilli sp. n. Plate 17, a-c.

Unique type, a male of cb. 11·5, cl. 7·6 mm.

Description. Carapace convex fore and aft, nearly flat from side to side; its surface smooth, appearing finely and evenly granular and sparsely punctate only under strong magnification, unbroken by any irregularities except the shallow, narrow grooves which very distinctly define the regions, as follows: 1 M, 2 M and 2 F confluent, 3 M narrow, especially its anterior prolongation, 4 M hardly defined; O and 1, 2 and 3 L confluent, 4 L well defined triangular; 5 and 6 L not defined posteriorly but a very fine and faint groove partly divides them from each other; behind the free end of this groove and behind 4 M the regions are not defined. Front 3·3 mm. wide, "Cupid's bow" shaped, the median notch shallow; a very distinct notch separates the front from the upper orbital margin on each side.



Cocos-Keeling Brachyura (M. W. F. Tweedie).
a, b, c, *Paraxanthias gibsonhilli* sp.n.
d, e, *Chlorodopsis melanodactylus.*

Orbital margin inflated internally to the groove separating 2 M and the antero-lateral region. Antero-lateral margins divided into four parts as follows: the anterior is a lobe formed of a low ridge distinctly marked off from the carapace by a groove; the second has the same form in its anterior half, but posteriorly it consists of a group of two or three sharp granules; the third, standing on the outer border of the triangular region 4 L, is a group of granules surmounted by a small procurved tooth; the last, just behind 4 L, consists of a rather larger procurved tooth with some small granules at its base. Postero-lateral border unarmed, slightly convex, as long as antero-lateral. Posterior border short with a raised border. A few short hairs on the granular part of the antero-lateral border, elsewhere the carapace is quite hairless.

Lower orbital border bluntly produced at its internal and external ends, these ends, but not the median part, visible in dorsal view. Basal antennal joint in contact with the down-turned edge of the front. Outline of external maxillipeds as at pl. 17, c. Abdominal segments narrow except for the third, which is abruptly widened. The whole of the under surface sparsely hairy.

Chelipeds unequal, the right the larger; outer surface of arm finely granular, upper surface of wrist with a few dispersed larger granules and short hairs, its inner angle with a blunt projection. Total length of palm and immovable finger of larger chela 7 mm., its height 4·4 mm.; outer surface of palm smooth with scattered punctae and ill defined rows of punctae on the finger about the middle of the outer surface and near the upper margin; upper surface slightly rugulose and weakly granular near the carpal articulation. Fingers short and bluntly toothed, length of dactylus 3·2 mm., its upper surface with two short longitudinal grooves at the base. Smaller cheliped with upper surface of wrist and of palm in its proximal part beset with sharp granules and rather hairy; outer surface of palm with a row of granules about the middle and some scattered ones above it, below the row of granules it is quite smooth; palm relatively longer than that of the larger chela, both fingers grooved almost to their tips.

Upper surface of meri of walking legs smooth, upper (and to a lesser extent lower) margins hairy and beset with granules and small spinules; carpi and propodi granular and thickly beset with coarse brown hairs; dactyli hairy.

Pleopods not developed.

The characters of the genus as defined by Odhner (1925, p. 84) are quite typically developed. The clearest specific character is afforded by the areolation of the carapace, which is neatly divided into a small number of well defined regions by

shallow, linear grooves, and is without any lobulation. The nature and distribution of granules (which are nowhere spinulate) on the chelipeds is also useful but must be treated with caution as the specimen is young. The dense hairiness of the legs and sparseness of hairs elsewhere is also striking and is not likely to be a juvenile character.

"Carapace and chelae bright purple, walking legs light pinkish grey with light fawn bristles. Taken in a rock cavity on the barrier".

The colour is now dull white; the purple or red colour of such genera as *Carpilodes, Neoliomera* and the present one is very fugitive in alcohol and good field notes are of importance for proper description of the species.

Etisus dentatus (Herbst).

ALCOCK 1898, p. 129.
SAKAI 1939, p. 501.

Seven specimens, the largest a male of 160 mm. cb.

The colour and appearance of this crab changes with age and the young and adult are known to the Cocos Malays under different names.

The young, represented by specimens of about 70 mm. cb. are called *Kĕpiting Kaki Berbulu* (Hairy-legged Crab), and are described as:

"Umber, dropping to dark fawn on the posterior edge of the carapace and to coffee brown on the lower surface of the chelae; tips of the lateral spines of the carapace vermilion; fingers dark brown, the tip of the spoon white; bristles in the spoon and on the walking legs crimson". The adult known as *Kĕpiting Rajungan Merah* (Red Swimming Crab), is represented by specimens from 130–160 mm. cb. It is "dull crimson or deep vermilion, ventrally paler and more orange on the claws; fingers black. Said to be rare but known to the Malays and not considered edible".

Etisus laevimanus Randall.

ALCOCK 1898, p. 131.
SAKAI 1939, p. 497.

Twelve specimens, the largest a male of 55 mm. cb.

"Grey-brown with fine darker specklings or small blackish spots, fingers black. Common among coral boulders of the breakwaters, inside the lagoon".

Chlorodiella laevissima (Dana).

BALSS 1938, p. 53.
SAKAI 1939, p. 508.

Seventeen specimens, the largest a male of 14 mm. cb.

Chlorodiella barbata (Borr.).

BALSS 1938, p. 53.

Two males the larger of 8 mm. cb.

Chlorodopsis areolata (H.M.E.).

BALSS 1938, p. 62.
SAKAI 1939, p. 502.
WARD 1942, p. 97 (*C. a. brandonensis*).

Forty-six specimens, the three largest males 20–21 mm. cb.

In the females the chelae are subequal or equal and the black of the immovable finger does not extend onto the palm as it does in the males, which have the right and left chelae enlarged in about equal numbers.

The main character cited by Ward to separate the subspecies *brandonensis* is quite inconstant in this series, in which the number of teeth on the dactylus of the major chela varies from one to three.

"Uniform dark umber or light fawn sometimes mottled with black, fingers black. Found in hollows in soft rock and under coral fragments on the outer part of the barrier".

Chlorodopsis melanodactylus A.M.E. Plate 17, d, e.

A. MILNE-EDWARDS 1873, p. 229.
BALSS 1938, p. 60 (under *C. pilumnoides*).

Thirty-four specimens of which eight (5 ♂, 3 ♀) have the right cheliped enlarged and twenty-six (17 ♂, 9 ♀) the left.

Balss (1938) with a query reduced this species to the synonymy of *C. pilumnoides*. The present series well shows the characters described by Milne Edwards and is separable from *pilumnoides* on size alone. The largest males measure 13 mm. cb. (15 mm., Milne Edwards), and they are clearly adult; *C. pilumnoides* may exceed 60 mm. cb.

The carapace in *melanodactylus* is very sparsely hairy, so that the sculpture is in no way concealed. The frontal margin is finely and evenly spinulate and the granules on the frontal regions, on the anterior margin of the gastric region and on the tubercles situated on 1, 3 and 4 L are sharp or subspiniform. Elsewhere they are rounded or squamiform, everywhere small and fine, very fine posterior to the cervical groove. Of the four antero-lateral spines the anterior is reduced, the other three sharp and procurved. Some additional spinules are present above and below these but none are of comparable size (Pl. 17, d).

On the anterior border of the arm there are from three to five sharp, curved spines. The outer surface of the palm is rather coarselv granular, some of the granules on the upper part being larger than the rest, conical and darker in colour.

The black colour of the male chelar propodus extends only very little onto the palm (pl. 17, e); this feature distinguishes *melanodactylus* at a glance from *melanochira, granulata, nigrocrinita* and *pilumnoides,* of all of which I have material. The meri, carpi and propodi of the legs are spinulate along their anterior margins the spinules not being concealed by the moderate growth of hair on the legs.

The species is quite recognisable from the original description and I see no reason to doubt the correctness of the records of Lenz, Miers and Calman mentioned by Balss, 1938, bottom of p. 60.

"Greenish-white mottled over the carapace with black, the fingers black. Occurs among small masses of living coral (*Pocillopora* and *Montipora*) in shallow pools on the barrier".

Phymodius monticulosus (Dana).

Gordon 1934, p. 34.

Nine specimens, the two largest males 30 and 31 mm. cb.

Phymodius ungulatus (H.M.E.).

Gordon 1934, p. 37, p. 38.

Thirtv-three specimens, the five largest (2 ♂, 3 ♀) between 21 and 23 mm. c.b.

This species and the last were not satisfactorily distinguishable until Dr. Gordon (1934) analysed their specific characters. They can be separated without difficulty if her criteria are used. They were not separated by the collector and the field note applies to both species.

"The larger specimens black, smaller ones off-white mottled with brown, only the fingers black. Found among dead coral and coral rock and sometimes among living coral (*Pocillopora*)". The difference in colour between young and adult specimens is apparent in the preserved material and is a feature common to both species.

Daira perlata (Herbst).

Alcock 1898, p. 155.
Gordon 1934, p. 50.
Sakai 1939, p. 457.

Thirty-five specimens of which eleven females exceed 35 mm. cb., the largest 57 mm. and the largest male is 30 mm. cb. only three exceeding 20 mm. The series comprises twenty-one females, eleven males and three very small juveniles.

"Dull, deep brown, the colour varying slightly from specimen to specimen. Very common round the outer edge of the atoll under boulders and in crevices in the rock. Local name *Kĕpiting Batu* (Stone Crab).

Cymo andreossyi (Audouin).

ALCOCK 1898, p. 173; p. 174 (*C. melanodactylus*).
STEPHENSEN 1945, p. 153 (*C. a.* var. *melanodactyla*).

Seventeen specimens, fourteen of the white and three of the black fingered (*melanodactyla*) form.

Intermediate forms occur not infrequently, having the fingers more or less deeply pigmented and the male pleopods do not appear to support recognition of two distinct species.

"Carapace greenish, due to growth of algae, the black-clawed variety with red spots on carapace and chelae, eyes red. Found with *Tetralia* and *Trapezia* among the branches of *Pocillopora*".

Cymo quadrilobatus Miers.

ALCOCK 1898, p. 175.
RATHBUN 1907, p. 53.

A female of 19 mm. cb.

The fingers of the larger chela are white with a brown patch at the base of the immovable one, of the smaller chela dark brown with white tips.

Pseudozius caystrus (Ad. and White). Fig. 2, b, c.

BALSS 1938, p. 64.

Sixteen specimens, the largest a male of 25 mm. cb.; ten have the right and six the left chela enlarged.

The male pleopods in this species (fig. 2, b, c) are not of the type found in *Menippe* and used by Balss (1932, p. 510–11) as a character to define the subfamily Menippinae but are similar to those of e.g. *Xantho*, the first pleopod being long and sinuously curved and the second short and slender.

"Off-white with the carapace finely mottled with brown along its anterior border, fingers black, walking legs pinkish purple. The carapace may lack the brown markings and be entirely off white or, occasionally, light orange brown, in which specimens the chelae are faintly suffused with purple. Found only under stones in shallow pools near high tide mark along the landward border of the seaward reef".

Ozius tuberculosus H.M.E. Fig. 2, d.

ALCOCK 1898, p. 183.
SAKAI 1939, p. 517.

A male of cb. 72 mm.

The pleopods are of the Menippine type, the second being long with whip-like ends. Those of this specimen are disposed in a manner which it is of interest to describe, and which is figured.

The distal part of each second pleopod is inserted at a point about 3 mm. short of the tip of the corresponding first pleopod and passes along it, the tip protruding a little from its distal orifice.

Stephensen (1945, p. 213, p. 214) quotes accounts of the copulatory mechanism of *Cancer pagurus* and *Eriocheir sinensis* in both of which the second pleopod is described as being inserted in the first and acting like the plunger of a pump during copulation. In the normal brachyuran type, where pleopod 2 is very small, it is clearly inserted at the base of pleopod 1, where an opening for it can generally be seen, but this is obviously impossible in the Menippine type, where the second often exceeds the first in length. Examination of the first pleopod of this species and also of *Eriphia sebana* shows that the line along which the involuted edges of the appendage meet is not a closed suture but is open to a point near its base, though the edges overlap and form an effective closure of the tube. It would appear that when copulation takes place the distal, whip-like portion of pleopod 2 is pressed laterally into pleopod 1 and is thus able to perform its normal function as a plunger.

"Dull umber to mid-brown with black eyes. Found in a crevice in coral rock near high tide level".

Lydia annulipes (A.M.E.).

De Man 1888, p. 293 (*Euruppellia annulipes*).
Balss 1938, p. 66.
Sakai 1939, p. 521.

Eighteen specimens, the largest a female of 28 mm. cb.; one of 12 mm. is ovigerous. All these have the right cheliped enlarged. De Man (1888 p. 294) mentions that this is the case in his two specimens and Sakai's figure (1939, pl. 64, fig. 3) also shows this condition.

The pleopods are of the Menippine type, the second being much longer than the first.

"Carapace and chelipeds mottled white, grey and fawn, legs white banded with reddish brown. Abundant in holes and crevices in coral rock just below high tide level".

Eriphia laevimana Latr.

Alcock 1898, p. 214.
Sakai 1939, p. 522.

Three specimens, the largest a male of 55 mm. cb.

The variety *smithii* is not represented and is not known to occur at Christmas Island, where *laevimana* is common.

"Dull umber brown with the eyes bright red. Common in crevices in coral rock, comes out and walks about at night. Local name *Kĕpiting Mata Merah* (Red-eyed Crab)".

Eriphia scabricula Dana.

BALSS 1938, p. 66.
SAKAI 1939, p. 523.

Ten specimens, the largest a male of 24 mm. cb.

"Carapace pale fawn blotched with olive and mottled with dark brown, fingers black, legs lightly banded with brown; bristles of carapace brown, of chelae golden brown".

Dacryopilumnus rathbunae Balss.

BALSS 1932, p. 515.
SAKAI 1939, p. 525.
TWEEDIE 1947, p. 31.

Twenty-two specimens, the largest two females 9, the largest male 7·5 mm. cb.

"Colour ranges from greenish fawn to brown or brownish grey. It occurs in abandoned tunnels of molluscs or worms in soft coral rock just below high tide level, so that it may be dry for the greater part of a day; plentiful in suitable situations".

Lybia tesselata (Latr.).

BALSS 1938, p. 71.

Eight specimens, the largest a male of 11 mm. cb.

"Off-white with thin black lines on the carapace forming a reticulated pattern some of whose spaces are filled in with pink or pinkish brown. Limbs light pinkish brown with thin black rings. Found under coral fragments in shallow pools, not very common. Local name *Kĕpiting Hantu* (Ghost Crab).

Polydectus cupulifer (Latr.).

KLUNZINGER 1913, p. 281.
BALSS 1934A, p. 513.

A female of 16·5 mm. cb., 13·7 mm. cl.

"Found under a coral boulder on the middle portion of the barrier; it carries an anemone in each claw".

The specimen has been deposited in the British Museum.

Domecia hispida Eyd and Soul.

BALSS 1938, p. 71.
SAKAI 1939, p. 553.

Fourteen specimens, the largest three females 10–10·5 mm. cb. The three males in the series are much smaller (the largest 6 mm. cb.), pale coloured, and have the inequality of the chelipeds much greater than the females.

"Found among *Pocillopora* in shallow barrier pools".

Tetralia glaberrima (Herbst).

ALCOCK 1898, p. 223.
SAKAI 1939, p. 553.

Five specimens.

"Two colour varieties, one black with the dorsal surface of the carapace white, the other greenish white, the anterior border of the carapace black; walking legs banded with light red and fingers red. Found among *Pocillopora*".

Genus **Trapezia** Latr.

The Raffles Museum material of this genus has been sent to Dr. F. A. Chace for revision. Provisional determinations of the species in the present collection were made and are as follows:

Trapezia areolata Dana.

T. cymodoce (Herbst).

T. digitalis Latr.

T. ferruginea Latr.

T. guttata Ruppell.

T. rufopunctata (Herbst).

Incerta sedis. Fig. 2, e.

A single right hand chela of very large size, found on the shore is in the collection. Its general appearance (fig. 2, e) suggests a Xanthid crab, but I am not familiar with any tropical Indopacific Xanthid to which it can be assigned.

It is incomplete, having been cut off near the base, so its actual length cannot be measured. Its dimensions are: length, in excess of 160 mm.; height, 80 mm.; length of dactylus (from upper base to tip), 72 mm.

It is bleached and worn but shows traces of original coloration: ground colour pinkish-yellow with a reddish reticulate pattern on the upper part and traces of a black patch on the distal part of the palm; immovable finger black with a shallow mesial groove pinkish-white.

Family **OCYPODIDAE**

Ocypoda cordimana Desm.

ALCOCK 1900, p. 349.
CHOPRA 1937, p. 420.
SAKAI 1939, p. 613.

Seven specimens, the largest a female of 41 mm. cb.

"Light, slightly mottled grev in colour. It passes the greater part of the day in deep, slanting spiral burrows, usually

made just below high tide level. These are excavated afresh with each falling tide, and when the crab is in a hurry, can be dug very rapidly. If a crab is caught away from its hole it runs fast in a series of broad sweeps attempting either to return to it or to reach the shallow water at the edge of the lagoon where it disappears quickly in the soft sand. Local name, *Kĕpiting Mata Pendek* (Short-eyed Crab)".

Ocypoda ceratophthalma (Pallas).

ALCOCK 1900, p. 345.
CHOPRA 1937, p. 420.
SAKAI 1939, p. 614.

Eight specimens.

"Deeper, more uniform grey than *O. cordimana*, sometimes slightly olive; usually a splash of yellow on the chelae. Habits similar to those of *O. cordimana*. Local name, *Kĕpiting Mata Panjang* (Long-eyed Crab).

Uca gaimardi (H.M.E.). Fig. 4, c.

DE MAN 1891, p. 39.
PESTA 1911, p. 55.
SAKAI 1939, p. 617.

Thirty-eight specimens; of the nineteen males eleven have the right and eight the left cheliped enlarged. The largest male (21·5 mm. cb.) has an unusual deformation of the larger chela. The tip of the immovable finger has at some time been broken off and there has grown out from its truncated end a finger shaped projection 7·5 mm. in length which is articulated to it in the usual arthropod manner, the axis of articulation being horizontal and allowing vertical movement of the projection through a small arc. Close examination of it shows that it is in fact a small accessory dactylus, inverted, i.e. with an upward curvature, and the result of a kind of perversion of the normal power of regeneration (Fig. 4, c.).

This is the first record of *gaimardi* from the Indian Ocean, unless *chlorophthalmus* is conspecific with it, as suggested by Tesch (1918, p. 40). None of the present series has the short fingers which characterise *chlorophthalmus* and they show little variability in this respect. The small hairy depression on the palm of the enlarged male chela, referred to by Tesch, is present. The pink colour of the male chela is in conformity with descriptions of *gaimardi* but the transverse pattern on the carapace, figured by Pesta (1911 pl. 3, fig. 3) and Sakai (1939, p. 617, fig. 92) for Pacific specimens is wholly wanting in the preserved material and is not described by the collector. I am inclined to think that the Indian Ocean and Pacific forms might be

separated, but access to Pacific material and also to specimens conforming to the description of *chlorophthalmus* would be needed to put their relationship on a sound taxonomic basis.

"White to pale olive with olive grey to dark grey markings; the enlarged male chela pinkish or reddish violet. These crabs occur in considerable numbers on the flat sandy, muddy stretches at the end of the lagoon where the ground is covered only at high tide but always remains damp. They make short, steep burrows and usually spend the greater part of the day at the mouth of them, half in and half outside. Frequently a male and a female are found in one burrow, the former standing at the entrance, the latter inside. Local name, *Kĕpiting Dĕlimah;* Delimah, a pomegranate, having reference to the colour of the enlarged male chela".

Macrophthalmus cf. **telescopicus** (Owen).

TESCH 1915, p. 161.
KEMP 1919, p. 387.
CHOPRA and DAS 1937, p. 423.

Twelve specimens, the largest a male of 20·5 mm. cb.

Kemp (l.c.) describes two specimens from Port Blair and one from the Gulf of Manaar, and figures (pl. 24), the chelae of the smaller one of the first two (fig. 11) and of the Manaar specimen (fig. 10). Although the shape of the chela differs in the two Port Blair specimens, I believe them to be conspecific; the shape of the male chelae alters profoundly almost throughout the period of growth in most species of *Macrophthalmus,* as is clearly seen in the present series.

These specimens from Cocos agree with Kemp's Manaar specimens in lacking the furry patch on the under side of the first ambulatory merus; the chelae of examples of comparable size agree well with his fig. 10, though in the large male from Cocos the fingers gape widely at the base and the dactylus is strongly curved; the dentition of the immovable finger, however, is consistent throughout the Cocos series and in agreement with that shown in Kemp's fig. 10.

There is in the Raffles Museum collection a male *Macrophthalmus* with the characters of *telescopicus* from Senang Island near Singapore. This has a furry patch on the under side of the first ambulatory meri as in Kemp's larger male from Port Blair. Its chelae differ in shape from that portrayed at Kemp's fig. 11, but as the Singapore specimen is 15 mm. cb. and Kemp's 6·7 mm. such a difference is not inconsistent with conspecificity. Here again there is a close correspondence in the form of the tooth on the fixed finger, and I think it likely that the Singapore crab is conspecific with Kemp's two from Port Blair.

The first male pleopods of the series from Cocos all have a prominent slender distal chitinous projection and this is wholly lacking in those of the Singapore male, the difference in the pleopods being so marked as to convince me that two quite distinct species are in question. They differ further in the degree to which the eye stalks project beyond the extra-orbital angles. In the Cocos specimens the part of the eye projecting beyond the extra-orbital angle is one third or more of its total length; in the Singapore specimen only one fifth. The elongation, however, carries the cornea well beyond the extra-orbital angle.

It appears therefore that in the Indian and Malayan regions of the Indopacific there are at least two species of *Macrophthlmus* which fall within the usually accepted specific limits of *M. telescopicus*. They may be distinguished, briefly, as follows:

1. Gulf of Manaar (Kemp) and Cocos-Keeling Islands. No furry patch on the under side of the first ambulatorv merus; eyestalks greatly elongated; dentition of immovable finger of chela as at Kemp 1919, pl. 24, fig. 10; Male first pleopod with a slender distal chitinous projection.
2. Port Blair (Kemp); Singapore (Raffles Museum). A furry patch on the under side of the first ambulatory merus, at least in the male; eyestalks moderately elongated; dentition of immovable finger of chela as at Kemp 1919, pl. 24, fig. 11; Male first pleopod without a slender distal chitinous projection.

At present I have access to neither material nor information which will enable me to decide on which of these (if, indeed, either) Owen based his *Gelasimus telescopicus*, or otherwise to elucidate the accepted synonymy.

Family **GRAPSIDAE**

Grapsus grapsus tenuicrustatus (Herbst).

RATHBUN 1906, p. 838.
TESCH 1918, p. 71 (*G. maculatus*).

Three specimens.

"Very plentiful on the main atoll and at North Keeling, occurring on rocks and in shallow pools between tide marks along the seaward reef where it is backed by land. They are gregarious, collecting in groups of half a dozen or more, and move very quickly when disturbed; they can cross small pools without submerging, skimming over the surface like a flat pebble. Very good eating fried in coconut oil and mildly spiced, or roasted over a slow fire of coconut husks. Local name *Kĕpiting Tĕrelek*".

Grapsus intermedius De Man.

DE MAN 1888, p. 365.
TESCH 1918, p. 71.

Ten specimens the largest a male of 27 mm. cb.

This was not distinguished from the last species by the collector.

Geograpsus grayi (H.M.E.).

TESCH 1918, p. 74.

Four specimens.

"Carapace dark purple, almost black, chelae and legs yellowish white sometimes purple tinged. It is common on most of the larger islands, hiding under piles of coconut husks or in holes; like the other land crabs it comes out only on dull days and at night. Local name, *Kĕpiting Siding*".

Geograpsus crinipes (Dana).

TESCH 1918, p. 74.

Four specimens.

"Usually dull mustard grey; sometimes a purple tinge is present resulting in a superficial similarity to *G. grayi*. The habits of the two species are similar, but *G. crinipes* is less common".

Metopograpsus thukuhar (Owen).

TWEEDIE 1949, p. 469.

Ten specimens, the largest a male of 30·5 mm. cb.

I have referred to this series in my revision of the genus and to the fact that it constitutes the first record outside the Pacific Ocean.

"Mottled with various shades of olive, grey, brown and red, the effect being dull and cryptic, chelae brownish pink, deeper on the under surface. Found among stones and under weed, usually near low water level and never above high water mark.

Pachygrapsus planifrons De Man.

TESCH 1918, p. 77.

Six specimens, the largest a female of 10·2 mm. cb.

Pachygrapsus plicatus (H.M.E.).

TESCH 1918, p. 77.
WARD 1934. p. 25 (*P. natalensis*).
TWEEDIE 1947, p. 32.

Thirty-two specimens, the largest male and female respectively 12.6 and 13.5 mm. cb.

"Very variable in colour ranging from off-white mottled with dark sage green, brown and black to dark green with light olive markings. It is found in cracks and crevices in soft coral rock just below high tide level".

Sesarma lenzii De Man.

DE MAN 1895, p. 193; 1898, pl. 30, fig. 35.

Thirteen specimens the largest a male of 19·5 mm. cb.

These agree closely with De Man's original description of specimens from Atjeh. His subsequent records from Fiji (with a query) and from Halmaheira (variety) are probably of distinct species.

"Carapace with light and dark mottling in various shades of olive and reddish brown, chelae orange, deeper on the fingers, legs olive, or brown with paler bands. Very plentiful with a wide range of habitat under stones and in crevices in rock both on the barrier and on the inner border of the seaward reef".

Sesarma sigillata sp. n. Fig. 3, a-e.

Cotypes. An adult male and female of about the same size, 11 mm. acb.

Cotypes.—An adult male and female of about the same size,

Material.—Forty-three specimens in addition to the cotypes.

Description.—Carapace fairly flat, broader than long, cl.: cb. as 1: 1·4 in the male, 1: 1·5 in the female. Antero-lateral margins entire and somewhat convergent backwards. Front steeply deflexed, its edge slightly everted and visible in dorsal view; from this aspect the edge is straight or slightly emarginate in the middle, seen from the front it curves upwards slightly near the external angles. Orbits oblique, their upper margin sinuous. Surface of carapace smooth except for numerous short squamiform transverse lines and about six or seven oblique raised lines on the hepatic and branchial regions. Regions ill-defined, the only inter-regional grooves being the curved central part of the cervical groove, those defining the narrow anterior mesogastric lobe and those between and external to the post-frontal lobes, the inner and outer of which are about equal in breadth. Carapace with a very few widely scattered hairs and setae.

The male first pleopod and outline of the abdominal segments are figured.

Chelipeds equal; the upper margin of the arm finely denticulate and not ending in a tooth or spine, the inner margin expanded, denticulate, finely in the proximal part, more coarsely distally. Inner angle of wrist blunt, its outer surface, and also that of the arm, ornamented with granular lines. Chela of male

fairly large, its length equal to that of the carapace, and moderately inflated, the outer surface of the palm covered with very fine squamiform granules, arranged in short lines except near the upper margin, where they are irregularly grouped and scattered, most numerous proximally and failing altogether on the immovable finger. Inner surface of palm sparsely punctate with a short row of granules running close and parallel to the margin of the dactylar articulation. Of the two pectinated ridges on the upper surface of the palm the anterior consists of

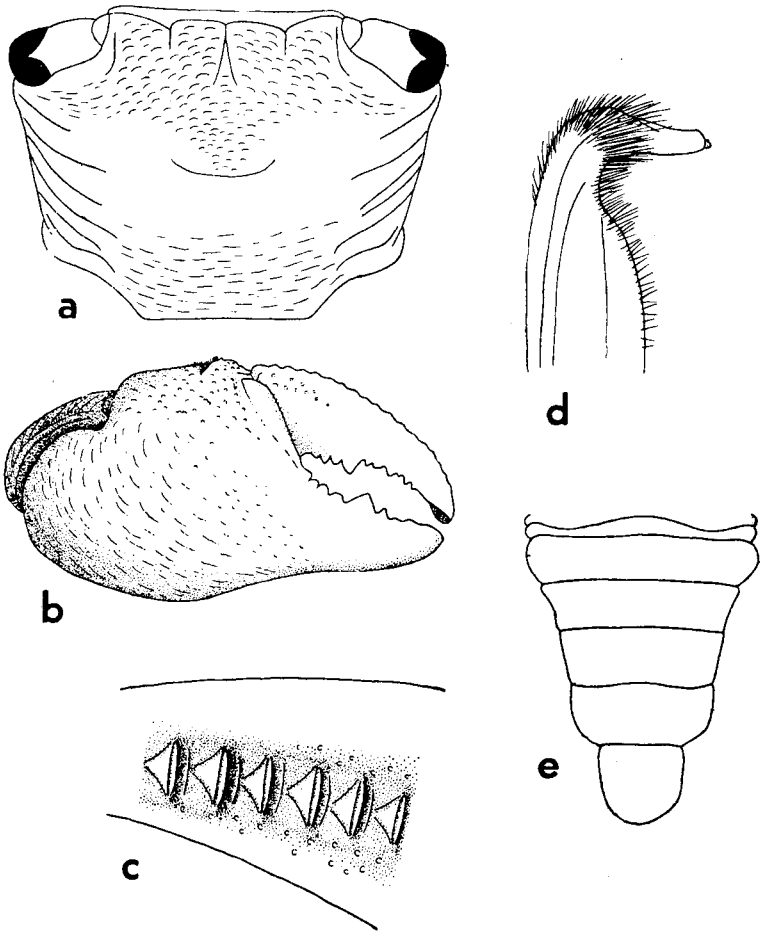


Fig. 3. *Sesarma sigillata* sp.n., male. a, carapace; b, right chela; c, 5th to 10th dactylar tubercles; d, right first pleopod; e, outline of abdominal segments.

16–20 closely set denticles and the posterior of about 12 smaller and more widely spaced ones. Ornamentation of the dactylus highly characteristic; its upper margin carries a row of 15 or 16 low tubercles which increase in size up to the seventh or eighth and then decrease towards the tip. The distal slope of each tubercle is the longer and is triangular in shape the apex directed distally; each tubercle is crossed by three ridges, two, very close together, at its crest and one at the base of the proximal slope (fig. 3, c).

Female chelipeds considerably smaller and lacking both the pectinated ridges and the characteristic dactylar tubercles of the male. Fingers widely spooned in both sexes, their dentition similar (fig. 3, d).

Meri of walking legs nearly half as broad as long with an anterior subdistal tooth, their posterior margins entire. The three distal joints beset with long bristles, dark brown at their bases, paler distally, a few shorter bristles posteriorly on the meri.

Measurements of the cotypes.	*Male*	*Female*
Carapace:		
Anterior breadth	11·1	10·8
Length	7·8	7·5
Breadth of front	6·2	6·4
Chela:		
Length	7·8	7·0
Height	4·6	3·8
Length of dactylus	4·9	4·2
Penultimate walking leg:		
Length of merus	6·2	5·5
Breadth of merus	2·9	2·7
Length of carpodus and propodus	6·4	6·2
Length of dactylus	2·9	2·9

Genus **Thalassograpsus** gen. nov. (Subfamily Varuninae)

Genotype *Brachynotus harpax* Hilgendorf.

HILGENDORF 1892, p. 38.

Allied to *Utica* White, from which (and from other Varunine genera) it differs most conspicuously in the relation of the frontal to the supra-orbital margin; in the new genus these are abnormal in not forming a simple, continuous margin. The inner orbital margin runs down towards the corner of the buccal cavern and the frontal margin (*i.e.* that of the inner frontal lobes which constitute the front in this genus) stops short of it on each side. The condition is complicated by the

presence of a U-shaped ridge on the inner orbital region, the lower arm of which spans the gap between the front and the inner orbital margin but does not give any appearance of continuity between the two (fig. 4, a).

Two other features are characteristic of the genus: the external maxillipeds meet completely in the middle line leaving no gap between them, and there is no raised line on the branchial region cutting off a postero-lateral facet. The latter further distinguishes *Thalassograpsus* from all the species of *Utica* and the former definitely excludes it from *Brachynotus,* since De Man, (1895, p. 122 and 1898, pl. 29, fig. 26 aa) refers to and figures the maxillipeds of the Mediterranean, *B. sexdentatus* (Risso), as having a gap between them and later in the same paper (p. 1895, p. 126) he mentions this feature as characteristic of the other species of *Brachynotus.* In the South Australian *B. spinosus* (M.E.), of which I have specimens, there is a wide rhomboid gap between the maxillipeds.

Tesch (1918, p. 104) includes *harpax* in *Brachynotus,* but if the species is considered in the light of his key to the Varunine genera (p. 82) it comes down to *Utica,* since the merus of the external maxillipeds is certainly broader than long and shorter than the ischium. Sakai (1939) also includes it in *Brachynotus,* and in his key (p. 647) it falls under two successive categories which seem to be contradictory, *viz.* "B. External maxillipeds do not completely close the buccal cavern", and "b[1]. No median hiatus between the external maxillipeds".

I consider that the foundation of a separate genus for *harpax* contributes more towards simplifying the classification of the Varuninae than does the proposal made by Rathbun, 1931, p. 87.

The name of the new genus is chosen to indicate the wide range of the single species in the Indo Pacific Ocean.

Thalassograpsus harpax (Hilgendorf.). Fig. 4, a, b.

HILGENDORF 1892, p. 38 (*Brachynotus harpax*).
DE MAN 1895, p. 124; 1898, pl. 29, fig. 26 (*B. harpax*).
SAKAI 1939, p. 675 (*B. harpax*).

Twenty-three specimens, the four largest males between 12 and 13 mm. mcb. (at the tips of the first lateral teeth).

The peculiar formation of the frontal-orbital region has been described as a generic character. The chelae of the adult males are much enlarged and have the fingers widely gaping (fig. 4, b).

"Colour very variable, usually dark brown or olive, sometimes with paler specks in a regular pattern; light coloured varieties occur. Common under small stones in still, shallow, slightly weedy water".

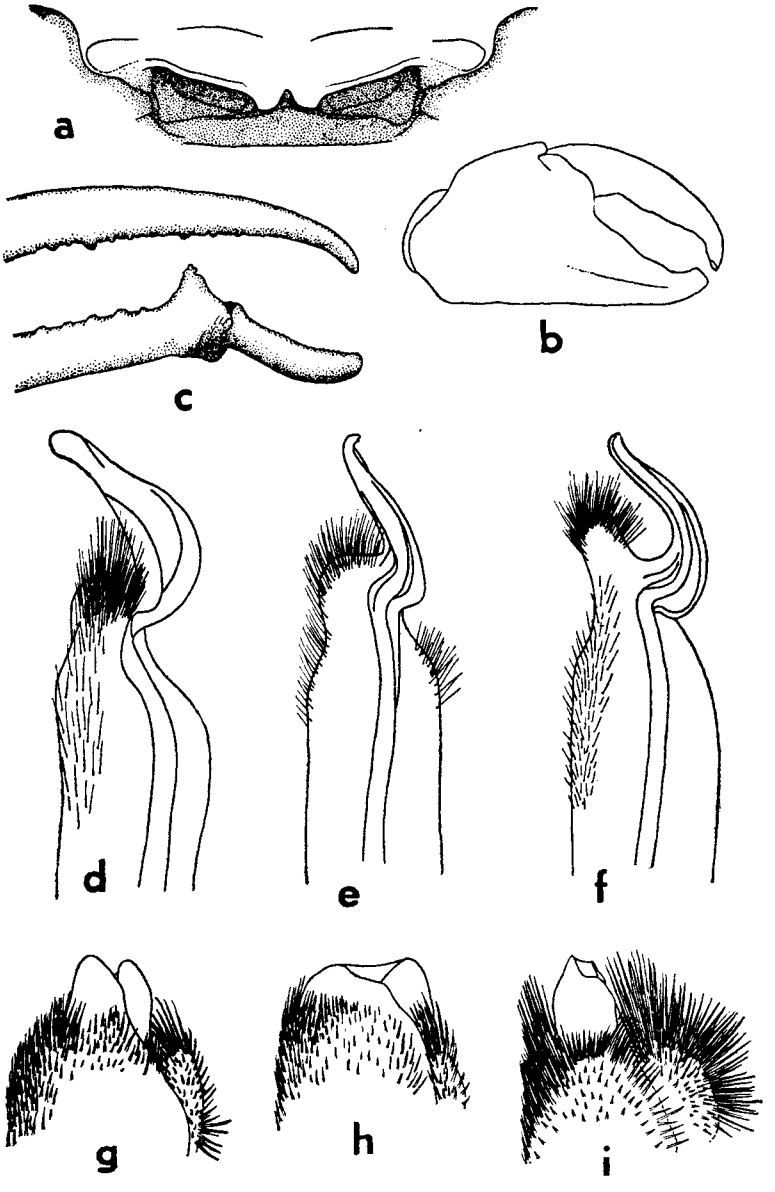


Fig. 4. a, *Thalassograpsus harpax,* fronto-orbital region seen from the front (semi-diagrammatic); b, outline of adult male chela; c, *Uca gaimardi,* tips of the fingers of a male with traumatic "accessory dactylus"; tips of right first male pleopods of d, *Percnon planissimum;* e, *P. pilimanus;* f, *P. abbreviatum;* tips of right first male pleopods, seen in distal end view, of g, *Cardisoma hirtipes* (Christmas Island); h, *C. frontalis* (Cocos-keeling); i, *C. carnifex* (Labuan).

Plagusia depressa tuberculata Lam.

TESCH 1918, p. 128.

An adult and two juvenile specimens.

"Adult, carapace blotched irregularly with olive-grey and brown. Found in groups of two or three among coral rock on the outer edge of the seaward reef. Local name *Kĕpiting Tĕrelek Batu* (Tĕrelek is *Grapsus grapsus*, Batu, a stone). The two juveniles were taken on rotting timber on the lagoon beach".

Genus **Percnon** Gistel

SCHMITT 1939, p. 23.

All the three known Indo Pacific species are represented in the collection. It seems likely that a fourth species exists, that questionably referred to *abbreviatum* by De Man (1902, p. 544) and mentioned by Schmitt (l.c.). As I have pointed out (Tweedie 1947, p. 35) it is not *demani* Ward, which is a synonym of *P. planissimum*.

The male first pleopods of the three species are very distinct and are figured.

Percnon planissimum (Herbst). Fig. 4, d.

SCHMITT 1939, p. 24.
TWEEDIE 1947, p. 34.

Twenty-two specimens: the six largest (four females and two males) are all between 14 and 15 mm. mcb.

"Carapace olive-brown with bright green lines down the centre and another just behind the level of the eyes; ventral surface off-white; limbs olive-brown with ochreous bands. Eyes black, the ventral surface of the stalk bright red, the two colours separated by a thin white line. Found under stones on the seaward reef.

Percnon pilimanus (A.M.-E.). Fig. 4, e.

TESCH 1918, p. 130.
SCHMITT 1939, p. 23.

Four specimens, including a female of 27 mm. mcb. Hitherto known only from the Pacific.

"Carapace light olive with olive-brown or olive grey markings, ventral surface white. Found on the outer edge of the seaward reef".

Percnon abbreviatum (Dana). Fig. 4, f.

TESCH 1918, p. 130.
SCHMITT 1939, p. 23.

Three males, the two larger 12 and 13 mm. mcb.

"Found on the outer edge of the seaward reef".

Family GECARCINIDAE

Gecarcoidea humei natalis (Pocock).

TWEEDIE 1947, p. 37.
GIBSON-HILL 1947, p. 45.

A male and a female.

These are identical with specimens from Christmas Island and there is no doubt that they have been introduced with soil imported from there for cultivation on the northeastern islet of the main atoll, Pulo Tikus.[1] Soil has also been brought in the past to Pulo Selma and Pulo Luar, but it is uncertain whether it came from Christmas Island or Java. The crab is found on Pulo Tikus and Pulo Luar (but not on Pulo Selma or any of the other islets of the main atoll) and on North Keeling Island, which lies fifteen miles north and slightly west of the main atoll.

The prevailing wind and current[1] is from a south-south-easterly direction, from which it varies from about southeast to nearly south.

The crab's distribution is most simply explained by assuming introduction on Pulo Tikus only and dispersion of the free-swimming larvae to Pulo Luar and North Keeling, which are the only pieces of land in the group lying north of Pulo Tikus.

In view of the fact that the early stages are passed in the sea this limited distribution is rather surprising, in spite of the almost invariable southerly wind and current. It can be accounted for, however, by the peculiar breeding habits of the crab, as described by Gibson-Hill (1947, p. 45–48) on Christmas Island. There breeding is almost confined to one occasion yearly (rarely two migrations occur, l.c. p. 46, footnote), and the young crabs leave the water 30–34 days after the spawning. It is improbable that the larvae are adapted for pelagic existence for more than half of this period, and very likely for less. No observations of the habits of the larvae have been made, but it is obvious that at Christmas Island the survival of the subspecies depends not upon dispersal of the larvae but upon their regaining the land inhabited by their parents; selection must therefore tend to cut down the pelagic period of the life of the larva to a minimum. Presumably the same breeding cycle will be observed by the immigrant Cocos crabs, with the single yearly period spent as a pelagic animal equally short, and it is unlikely that this period will coincide with any temporary reversal of the meteorological and hydrological norm which would carry larvae to the southern islets. The presence of the crab on North Keeling demonstrates, however, that the life cycle does include at least a short pelagic phase.

1. Reference should be made to the map on p. 15 and to the remarks on meteorology and hydrology on p. 24 of this journal.

"Bright mid-red, slightly darker on the carapace, with white and very dark red markings on the dorsal surface. It lives in short slanting burrows dug in sandy soil among the trees. It emerges only at night or in very dull weather and is seldom seen. The local name, *Kĕpiting Kiling,* refers to its presence on the island (North Keeling) of that name".

Cardisoma carnifex (Herbst). Fig. 4, i.

TESCH 1918, p. 137.
SAKAI 1939, p. 705.

Four specimens, the largest a female of 77 mm. cb.

"Dark olive purple, the distal segments of the walking legs orange-red and the chelae yellowish. It is a land crab, very plentiful on all the larger islets of the main atoll and also on North Keeling. It is considered edible and is used for bait, especially for a species of Wrasse (*Pseudoscarus*). Local name, *Kĕpiting Balong*".

As there is no adult male in the collection a male from Labuan has been chosen to illustrate the pleopod. Small males in the present collection have the pleopod of the same type.

Cardisoma frontalis H.M.E. Fig. 4, h.

H. MILNE-EDWARDS 1853, p. 204.
DE MAN 1902, p. 548 (under *C. hirtipes*).
TESCH 1918, p. 137 (footnote).
SAKAI 1939, p. 704 (under *C. hirtipes*).

Two males and a female, the larger male 57 mm. cb.

C. frontalis has been regarded hitherto, in the few cases where it has received any recognition, as a subspecies of *C. hirtipes.* As the present specimens display all the distinguishing characters indicated and portrayed by De Man (1902, p. 548, pl. 20, fig. 14) for a specimen from the Loyalty Islands, and as nothing in the distribution of this form suggests subspecific relationship with *C. hirtipes,* I prefer to regard it as specifically distinct. The characters distinguishing it from *hirtipes* are as follows:

In *frontalis* the antero-lateral regions are bounded by strong, almost cristiform, curved and beaded ridges inwardly to which the hepatic regions are rugose-tuberculate, and there is a series of conspicuous raised lines on the outer part of the branchial regions. In *hirtipes* all these features are weakly developed or absent, the antero-lateral ridge being quite obsolete in most of the specimens I have for comparison and at most represented by a fine raised and beaded line. The extra-orbital angle in *frontalis* is broadly dentiform and the small epibranchial tooth is separated from it by a distance equal to half the length of the orbit; in *hirtipes* both these teeth are much smaller, tuberculiform and placed closer together. The chelae are similar

in the two species but the fingers are rather shorter and the palm more inflated in *frontalis*. The meri of the walking legs are generally broader in *frontalis*, ratio, breadth: length being 1: 2·5–2·6 against a normal 1: 2·8–3 in *hirtipes;* a few females of *hirtipes*, however, enter the range of *frontalis* as regards this ratio. In *frontalis* the borders of the ambulatory meri are almost or quite hairless, only a few widely spaced setae being present on the lower borders of those of the smallest specimen (cb. 39 mm.). In *hirtipes* at least the lower two, and generally all three borders of the meri carry a strong fringe of bristles. It appears that the abdomen of the male of *frontalis* is broader; in the single adult specimen the ratio, length: breadth of the sixth segment is 1: 1·35, in *hirtipes* I can find none in which this figures exceeds 1: 1·2 and it is generally less. The chitinous projections of the male first pleopods of the two species are figured together with that of *C. carnifex*. Finally, *frontalis* seems to be a much smaller species. The present male, with cb. 57 mm. appears to be adult and Mr. Gibson-Hill saw no specimens noticeably larger than this. *C. hirtipes* grows to a far larger size, I have before me a specimen from Christmas Island of cb. 113 mm.

The known distribution of *frontalis* is: Loyalty Islands (Milne Edwards); Northern Daitozima, Japan (Sakai) and Cocos Keeling Islands. Re-examination of series identified as *C. hirtipes* would probably extend this range.

"Very dark purplish brown, almost black, bleaching when dead to crimson-purple. It is a land crab, common on Pulo Luar and Pulo Tikus, and moves about mostly at night or in dull, overcast weather the day being spent in short burrows excavated in dampish ground. It is eaten by the Malays. The local name *Kĕpiting Pĕrana'an* (half-caste crab) is bestowed in the belief that this is a hybrid of *C. carnifex* and *Geograpsus*".

STOMATOPODA

Gonodactylus chiragra.

BORRADAILE 1907, p. 211.
KEMP 1913, p. 155.
HOLTHUIS 1941, p. 277.

Ten small specimens, eight of which are typical (= var *incipiens* Lanch.) and two have the inflated median telson keel of *anaucyrus* Borr, but a pair of postero-lateral dimples on the keel indicates a transition to *incipiens*. None has the morphological characters of *smithi* Pocock, nor the purple spot on the inner surface of the merus which characterises that form and which is, curiously enough, not very fugitive in spirit.

"Sage green, paler and sometimes with pinkish markings on the raptorial limbs; the gill plates are yellowish green with a crimson or purple fringe. There is no trace of dorsal ocelli. The local name, which is applied to all the local stomatopods, is *Udang Pĕlatok* (Woodpecker Prawn), no doubt from their ability to strike extremely sharp blows with their raptorial limbs".

Gonodactylus chiragra var. **platysoma** Wood-Mason.

KEMP 1913, p. 162.
HOLTHUIS, 1941, p. 281.

Thirty-six specimens of which the five largest are between 76 and 78 mm. in length. They exhibit the morphological characters described by Kemp with great uniformity and in about one third the pair of dark spots near the middle of the first abdominal somite are still visible.

"This is the largest and most plentiful of the mantis-shrimps, being very numerous under coral boulders and masses of dead coral in shallow pools over the middle and inner portions of the barrier. Large ones are occasionally eaten by the Malays. The colour is slightly variable but there is always one constant feature, *two pairs of dark blue and crimson eye-spots on the dorsal plates of the abdomen* (author's italics), one anterior and one near the tail. The dorsal surface itself may be light fawn, green or dirty white marked with green or olive; the raptorial limbs are fawn or light olive usually with red or blue markings on the dactylus".

These notes are of importance in demonstrating that a conspicuous colour character, the two pairs of dorsal ocelli, distinguishes *platysoma* from typical *chiragra*. The anterior ocelli may disappear wholly in preserved specimens or traces may remain as the pair of black spots noted by Kemp; apparently the posterior ocelli are more fugitive as I can find no trace of them in any of the specimens.

Gonodactylus falcatus (Forsk).

KEMP 1913, pp. 167 and 197 (*G. glabrous*).
HOLTHUIS 1941, p. 284.

Nine specimens, eight small, one of 74 mm. in length.

This species was not distinguished from *G. chiragra* by the collector.

Pseudosquilla ciliata (Fabr.).

KEMP 1913, pp. 96 and 196.
HOLTHUIS 1941, p. 261.

One small specimen.

"Dirty white finely blotched and speckled with grey, darkest posteriorly; the fringes of the uropods pink".

Pseudosquilla oculata (Brullé).

KEMP 1913, p. 102.
HOLTHUIS 1941, p. 266.

Two specimens, the larger 48 mm. in length.

"Fairly uniform light grey, slightly pink at the joints and on the carapace, the spines of the telson bluish green or green".

Pseudosquilla ornata Miers.

KEMP 1913, p. 100.
HOLTHUIS 1941, p. 263.

Two specimens, the larger 38 mm. in length.

"Dark grey, almost black, with pair of prominent black eye-spots, outlined with white, on the carapace".

NOTES ON THE COLLECTION

1. Geographical Distribution

Consideration of the collection from this aspect does little more than emphasize the well known fact that most of the marine inhabitants of coral islands are, from the point of view of zoogeography, pelagic rather than littoral animals and in this area may range over the whole of the tropical Indo Pacific.

This is illustrated by the following table in which the number of species in the collection known to inhabit the Pacific Ocean and eastern part of the Malay Archipelago is tabulated against those only known from the Indian Ocean.

	Distribution Indo Pacific	*Distribution Indian Ocean*
Dromiidae	1	—
Dynomenidae	2	—
Calappidae	1	—
Leucosiidae	1	—
Maiidae	3	—
Parthenopidae	2	—
Atelecyclidae	2	—
Portunidae	9	—
Xanthidae	48	3
Ocypodidae	2 + ?2	?2
Grapsidae	10	4
Gecarcinidae	2	1
Stomatopoda	6	—

The two Ocypodid species which are queried are *Uca gaimardi* and *Macrophthalmus telescopicus*, for reasons which

are made clear in the accounts given of them. The ranges of *Lachnopodus tahitensis, Metopograpsus thukuhar, Percnon pilmanus* and *Cardisoma frontalis* are extended from the Pacific to the Indian Ocean by the present collection.

2. The Xanthid subfamily Menippinae

The subdivision of the Hyperomerista into the subfamilies Menippinae and Pilumninae according to the development of the second male pleopod, was proposed by Balss (1932, p. 510), but seems not to have been followed to its logical conclusion.

This Menippine type of pleopod is highly peculiar. In the majority of Brachyura the second male pleopod is a small, inconspicuous appendage situated near the base of the first. In *Menippe* and its allies it exceeds the first pleopod in length and has a constant and very uniform structure, consisting of a fairly long peduncle surmounted by a coiled, stiff "whip-lash" ("Geissel" of Balss), with a small pectinate process at the junction of the two (Stephensen, 1945, fig. 40; Balss 1932, fig. 1). I know of no Xanthid whose pleopods present a condition intermediate between this and the usual type.

Unfortunately for the purposes of classification this type of pleopod is not always correlated with the development of the palatal ridges which defines the Hyperomerista (Alcock 1898, p. 70). *Daira* (Gordon 1934, p. 50) and *Carpilius* (Stephensen 1945, p. 155 and this paper) do not have the palatal ridges so defined and are classed with the Hyperolissa, while *Pseudozius caystrus,* which has the appearance and the palatal ridges of a Menippine crab, has the more usual Xanthid type of pleopods (this paper).

The distinction between the Hyperolissa and Hyperomerista is not one of the absence or presence of the palatal ridges, but depends upon whether the ridges do or not extend to the anterior margin of the palate, it is, in fact, a character of degree rather than of kind. The development of this feature may be regarded as an adaptation to secure a more efficient exhalent respiratory stream; such a character might be expected to appear as a result of natural selection in different groups inhabiting a similar environment.

The Menippine type of second pleopod appears to represent a mechanism of fertilisation quite distinct from that seen in the Xanthinae and other Xanthid subfamilies and to have no obvious selective advantage. Further, no intermediate condition, within the family, is known.

It would appear to me to be in the interests of a natural classification of the Xanthidae to regard the presence of this type of second male pleopod as the primary character of the

Menippinae and so to include *Carpilius* and *Daira* in the subfamily and exclude *Pseudozius caystrus*. The fact that most of the Menippinae have the hyperomeristous palate may be regarded as evidence that they are among the most advanced and specialised of the Xanthid crabs, but as having no other bearing on their phylogeny.

3. Relative size of the sexes in Brachyura

In most crabs it will be found that the largest specimens in a series are males. Exceptions to this general rule are only apparent when the species is represented by a large series or when males, with their sexual characters fully developed, are found to be very much smaller than the females; three such exceptions appear among the material in this collection.

Eumedonus convictor (Parthenopidae). A single male of cb. 3·3 mm. and four females, all over 10 mm., the largest 14 mm. cb. The male appears to be adult. It seems probable that the males lead a more active and independant life than the females and they may not be internally commensal with the echinoid host.

Daira perlata (Xanthidae). In thirty-five specimens eleven females exceed 35 mm. cb., the largest being 57 mm. Only three males exceed 20 mm., the largest being 30. The series clearly indicates that the female is the larger, and the difference in size between the sexes is much greater than is usual in species where the male is the larger of the two. Nothing known about the habits of *Daira* suggests an explanation of this anomaly.

Domecia hispida (Xanthidae). The largest of three males in a series of fourteen is 6 mm. cb., the three largest females being 10—10·5 mm. The males appear to be adult. *Domecia* is found with *Tetralia* and *Trapezia* among living *Pocillopora* coral.

4. Inequality of the chelipeds in the Xanthidae

This feature in a greater or less degree is a normal character of many species of this family. It is very marked in some members of the Menippinae[1] and Pilumninae and in the genus *Cymo*, where the bulk of the larger chela may be four or five times that of the smaller. In *Xantho, Etisus, Chlorodopsis* and allied genera it is more moderately developed, with the larger chela generally twice or less as massive as the smaller.

In most of these heterodextrous species both right and left handed specimens are found and it is generally assumed that these occur in equal numbers, not because there is positive

1. The development of this feature as well as of the male pleopods is typically Menippine in *Carpilius*.

evidence that they do but because most series examined by taxonomists are too small to provide evidence that they do not.

In the present collection I first noticed an obvious preponderance of right handed specimens in the long series of *Zoozymodes pumilus*, and later the singular fact that every one of a series of eighteen specimens of *Lydia annulipes* was right handed.

This suggested an examination of all the heterodextrous Xanthids in the Raffles Museum collection of which sufficiently long series are available to provide significant figures. The results of this are recorded in tabular form below.

	♂		♀		Total		R/L:L/R
	R	L	R	L	R	L	
Xantho exaratus H.M.E. ..	37	37	64	73	101	110	1:1·09
Chlorodopsis melanochira A.M.E. ..	52	56	43	53	95	109	1:1·15
Glabropilumnus laevimanus (Dana) ..	49	24	52	28	101	52	1:1·94
Zoozymodes pumilus (J. and L.) ..	21	14	45	16	66	30	1:2·2
Cymo andreossyi (Aud.)	25	18	32	8	57	26	1:2·2
Globopilumnus globosus (Dana) ..	40	22	72	21	112	43	1:2·6
Heteropanope glabra Stimp. ..	40	18	59	15	99	33	1:3·0
Sphaerozius nitidus Stimp. ..	20	2	39	2	59	4	1:14·75
Lydia annulipes (H.M.E.) ..	11	0	10	0	21	0	inf. ?

The series of *Z. pumilus* is from the Cocos collection as are 18 of the 21 *L. annulipes*. The other three of this species are specimens mentioned or figured as right handed in the literature and the remaining species are represented mainly by series from Singapore and the Malayan coasts and islands. As populations of littoral animals with pelagic larvae are subject to constant mixing I do not consider that strict localisation is of importance in such a matter as this.

The letters R and L heading the columns stand for right and left and the numbers are of right and left handed individuals, males, females and totals; in the column headed R/L : L/R are figures giving the ratio of right to left or left to right, whichever preponderates, and the species are tabulated in the order in which this figure increases.

In the first two species the figures indicate no departure from equality of the number of right and left handed individuals. In all the rest the number examined and the value obtained for R/L : L/R are significant of a definite preponderance of right handed crabs. In the Cocos series of *Chlorodopsis melanodactylus* twenty-six are left handed and eight right, but these numbers are hardly large enough to be significant and

are not included in the table; this is the only case where a preponderance of left-handed individuals is suggested; it is rendered the more dubious by the result obtained from an adequate series of the closely allied *Ch. melanochira* which, as already noted, does not indicate any departure from equality.

In the two first species the inequality of the chelipeds is not very marked. All the rest belong to the Piluminae and Menippinae except *Cymo*, whose systematic position is generally admitted to be dubious. It is of interest that the last two, in which the preponderance is very marked or (apparently) absolute are Menippine crabs.

I am indebted to Prof. A. Oppenheim and Prof. J. C. Cooke of the Mathematical Faculty of the University of Malaya for giving their opinions on the statistical significance of the figures under discussion.

Explanation of Plates

Plate 16. a, *Platypodia keelingi*, sp. n., type.
b, carapace of *Platypodia cristata*, male of 30.5 mm. cb.

Plate 17. a, *Paraxanthias gibsonhilli* sp. n., type;
b, its larger chela;
c, outline of its third maxillipeds.
d, carapace of *Chlorodopsis melanodactylus*, male of 13 mm. cb.;
e, its larger chela.

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