THE GENUS *CHLORINOIDES* (CRUSTACEA, BRACHYURA, MAJIDAE), 1. A REDESCRIPTION OF *C. TENUIROSTRIS* HASWELL AND THE STATUS OF THE GENUS *ACANTHOPHRYS* A. MILNE EDWARDS

by

D. J. G. GRIFFIN

JOHN S. GARTH
Allan Hancock Foundation
University of Southern California
Los Angeles, California 90007

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The Genus *Chlorinoides* (Crustacea, Brachyura, Majidae). 1. A Redescription of *C. tenuirostris* Haswell and the Status of the Genus *Acanthophrys* A. Milne Edwards

By D. J. G. Griffin

Zoology Department, University of Tasmania, Hobart, Australia

Figs. 1-11

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ABSTRACT

The Indo-West Pacific spider-crab genus *Chlorinoides* is redefined and a key is given to the 12 included species considered to be of good taxonomic standing. The type species, *C. tenuirostris* is shown to be congeneric with several species formerly placed in the genus *Acanthophrys*, which latter genus is now reduced to synonymy with *Hyastenus* White. The genus *Prismatopus* Ward is reduced to synonymy with *Chlorinoides*.

INTRODUCTION

Among the spider crabs of the family Majidae unique to the Indo-West Pacific are the assemblage of species which have been variously referred to the genera *Acanthophrys* and *Chlorinoides*. These small, delicate crabs, with a pyriform carapace set with long spines or flattened plates, or both, and long, slender ambulatory legs, are known from continental shelf depths from Hawaii to South Africa. In the past, while most workers on the group have considered that most of the species belong in a single genus, there has been some difference of opinion on which genus this should be. In this paper the status and relationships of these genera and species are considered.

The genus *Acanthophrys* was set up by A. Milne Edwards in 1865 for two species of majid spider crab, both new to science, *A. cristimanus* from Nuku Hiva in the Marquesas Islands and *A. aculeatus* from the Indian Ocean. Good figures and descriptions of both species were given but no type species was specified. A third species, *A. filholi*, from New Zealand, was later added by the same author (A. Milne Edwards, 1876) and in 1879 a fourth species, *A. paucispina* from the Fiji Islands, was described by Miers (1879a). Shortly afterwards, Miers (1879b) designated *A. cristimanus* as the type species of the genus, which was redefined to include, in addition, only *A. paucispina*.

Haswell (1880) established the genus *Chlorinoides* for a single (new) species from Torres Strait, *C. tenuirostris*, which was considered to be closely related to several species then referred to the genus *Chorinus* Latreille, 1825 by H. Milne Edwards (1834), de Haan (1839) and Adams and White (1848). Following his restriction of the genus *Acanthophrys*, Miers (1884, 1886) transferred to *Chlorinoides* those species of *Chorinus* mentioned by Haswell, together with the remaining species from *Acanthophrys*

and three, formerly referred to *Paramithrax* H. Milne Edwards, 1834, described by himself (Miers 1879a) and by Haswell (1882a, 1882b, 1882c). As thus constituted, *Chlorinoides* was regarded by several subsequent authors including Alcock (1895), as merely a subgenus of *Paramithrax*.

In an important paper some few years after the turn of the century Bouvier (1906) retained the name *Acanthophrys* for the group of species which Miers had included in *Chlorinoides* maintaining that according to a manuscript note left by A. Milne Edwards *A. cristimanus* correctly belonged to the genus *Lahaina* Dana, 1851. Bouvier thus considered *A. aculeatus* A. Milne Edwards to be the type species of *Acanthophrys*. On the other hand Rathbun (1906), in a paper published in the same year, emphasized that any consideration of the possible synonymy of *Acanthophrys* and *Chlorinoides* depended on comparison of *C. tenuirostris* with *A. cristimanus*, not with *A. aculeatus* A. Milne Edwards. Most recent workers, such as Balss (1929), Sakai (1938), Barnard (1950) and Bennett (1964), have followed Bouvier and used the name *Acanthophrys*, while at the same time *A. cristimanus* and *Lahaina ovata* Dana, 1851, have been transferred to the genus *Hyastenus* White, 1847 (see Balss, 1935). The resulting confusion is exemplified by Hale's (1927) short description of the Australian *Paramithrax spatulifer* Haswell as a species of *Chlorinoides*, while the closely related New Zealand species *Acanthophrys filholi* continues to be known under its original generic name (see Dell, 1960); again, while Sakai (1938) and Barnard (1950) describe the widespread *Chorinus longispinus* de Haan, 1839, as a species of *Acanthophrys*, Chhapgar (1957) recently discusses the closely related *Chorinus aculeata* H. Milne Edwards, 1834, under *Chlorinoides* which he regards as a subgenus of *Paramithrax*.

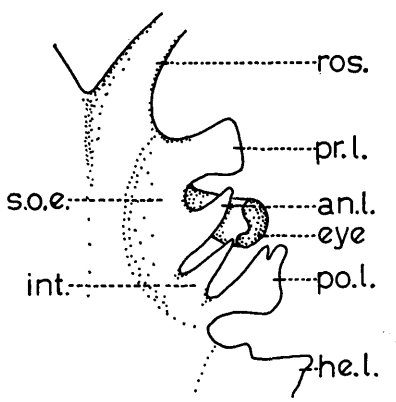


Fig. 1.: Generalized supraorbital detail in the Genus *Chlorinoides*. an.l., antorbital lobe; he.l., hepatic lobe; int., intercalated spine; po.l., postorbital lobe; pr.l., preorbital lobe; ros., rostral spine; s.o.e., supraorbital eave.

Terminology throughout this paper follows that used by Rathbun (1925) and Garth (1958), except for some modifications with respect to the orbit (see fig. 1). Throughout this genus there are four, seldom five, spines or lobes overhanging the orbit. The first two (seldom three) of these, which arise from the supraorbital eave (supraocular eave of some authors), are here named the preorbital (anteriorly) and the antorbital (posteriorly). Behind these and separated from the eave by a deep fissure is the intercalated (intercalary or intermediate) spine. Behind this again, and also separated by a deep fissure, is the postorbital (or postocular) lobe.

The system of measurements follows that used by Garth (1958)

SYSTEMATIC DISCUSSION

Superfamily **OXYRHYNCHA** Latreille, 1803

Family **Majidae** Samouelle, 1819

Subfamily **Majinae** Alcock, 1895; Balss, 1929, restricted

Genus **Chlorinoides** Haswell, 1880

Acanthophrys A. Milne Edwards, 1865: 140 (part: *A. aculeatus* A. Milne Edwards, 1865). Bouvier, 1906: 485. Balss, 1929: 19. Sakai, 1938: 307. Barnard, 1950: 61. Bennett, 1964: 57.

Chlorinoides Haswell, 1880: 442; 1882c: 17. Miers, 1886: 51. Rathbun, 1906: 881.

Paramithrax (*Chlorinoides*) Miers, 1884: 192, 552. Alcock, 1895: 240. Not *Paramithrax* H. Milne Edwards, 1834.

Acantophrys Filhol, 1886: 365 (incorrect subsequent spelling of *Acanthophrys* A. Milne Edwards, 1865).

Prismatopus Ward, 1933: 391; type species, by monotypy: *Prismatopus albanyensis* Ward, 1933.

Description: Carapace subpyriform, inflated, margins and dorsum with a few long spines or lamellate lobes, or both. Rostrum of two long spines, divergent from base. Supraorbital region comprising eave, intercalated spine and postorbital lobe, the three separated by deep fissures; eave with two, usually salient, spines or lamellate lobes; postorbital lobe excavated anteriorly. Eyestalk usually long and slender, almost completely retractile to excavation of postorbital lobe; cornea terminal or subterminal. Basal antennal article leaving orbit incomplete below, longitudinally subrectangular, longer than broad, anterior angles toothed, teeth spiniform or lamellate, lateral tooth directed outwards.

Third maxillipeds with merus as broad as ischium, subquadrate, anterolateral angle not greatly expanded, distal edge notched, a small spine at lateral angle of notch.

Merus, carpus and propodus of cheliped usually with longitudinal ridges or crests. Ambulatory legs slender, longer than carapace, meri usually with one or more distal spines.

Abdomen of seven distinct segments in both sexes.

Range: Indo-west Pacific, including Hawaii, Japan, China, Indonesia, Australia, New Zealand, India, east coast of South Africa.

Type species: Chlorinoides tenuirostris Haswell, 1880, by monotypy; a north-east Australian species. (This species is described below).

List of species: The genus as defined above includes 12 species of good taxonomic standing, as listed below. The approximate relationships of the species are indicated in the form of a key at the end of this paper.

The species are listed here in chronological order of their first description under the specific name by which they are currently known; the original name of the species, of synonymous species and described varieties (if any) are given together with distribution and a reference to the best available description and figure.

Chlorinoides aculeatus (H. Milne Edwards, 1834): *Chorinus aculeata* H. Milne Edwards, 1834; *Paramithrax (Chlorinoides) aculeatus*, var. *armatus* Miers, 1884; Japan, south-east Asia, Indian Ocean, north-east and west Australia; see Miers, 1884: 193, pl. xviii fig. A., and Sakai, 1938: 310, text-fig. 43.

C. longispinus (de Haan, 1839): *Maia (Chorinus) longispinus* (de Haan, 1839); *Paramithrax coppingeri* Haswell, 1882; *Paramithrax (Chlorinoides) longispinus*, var. *bituberculata* Miers, 1884; *Acanthophrys longispinus*, var. *spinossissima* Bouvier, 1906; *Paramithrax (Chlorinoides) longispinus*, var. *bispinosus* Laurie, 1906; Indo-west Pacific from Japan to Mozambique, north-east Australia; see Sakai, 1938: 308, pl. XXI fig. 2.

C. acanthonotus (Adams and White, 1848): *Chorinus acanthonotus* Adams and White, 1848; Borneo; see Adams and White, 1848: 11, pl. I figs. 1, 1a-c.

C. filholi (A. Milne Edwards, 1876): *Acanthophrys filholi* A. Milne Edwards, 1876; New Zealand; see Dell, 1960: 2, figs. 1, 4-6, pl. 1; and Bennett, 1964: 57, figs. 55-57, 124.

C. halimoides (Miers, 1879): *Paramithrax halimoides* Miers, 1879; south-east Asia; see Miers, 1879a: 10; no figure available.

C. tenuirostris Haswell, 1880: north-east Australia; redescribed and figured below.

C. spatulifer (Haswell, 1882): *Acanthophrys aculeatus* A. Milne Edwards, 1865; *Paramithrax spatulifer* Haswell, 1882; *Chlorinoides coppingeri*, Miers, 1886; *Paramithrax (Chlorinoides) coppingeri*, Calman, 1900; not *P. coppingeri* Haswell, 1882; north-east to southern Australia; see Hale, 1927: 137, fig. 138 (as *Chlorinoides spatulifer*).

C. germaini (Bouvier, 1906): *Acanthophrys germaini* Bouvier, 1906; South China Sea; see Bouvier, 1906: 487; no figure available.

C. harmandi (Bouvier, 1906): *Acanthophrys harmandi* Bouvier, 1906; Japan; see Parisi, 1915: 290, pl. 7 fig. 4; or Sakai, 1938: 307, text-fig. 42.

C. goldsboroughi Rathbun, 1906: Hawaii; see Rathbun, 1906: 881, pl. xiv fig. 7.

C. brevispinosa Yokoya, 1933: Japan; see Yokoya, 1933: 159, text-fig. 58.

C. albanyensis (Ward, 1933): *Prismatopus albanyensis* Ward, 1933; north-east Australia; see Ward, 1933: 391, pl. xxiii fig. 3.

Chlorinoides tenuirostris Haswell, 1880

Text-figs. 2-11

Chlorinoides tenuirostris Haswell, 1880: 443, pls. 26 fig. 1; 1882c: 18. Miers, 1886: 51. *Acanthophrys tenuirostris* (Haswell), Bouvier, 1906: 486.

Holotype: Male (?). Macleay Museum, University of Sydney. Only doubtfully still extant (Mr. F. A. McNeill, pers. comm.).

Type locality: Darnley Island, Torres Strait.

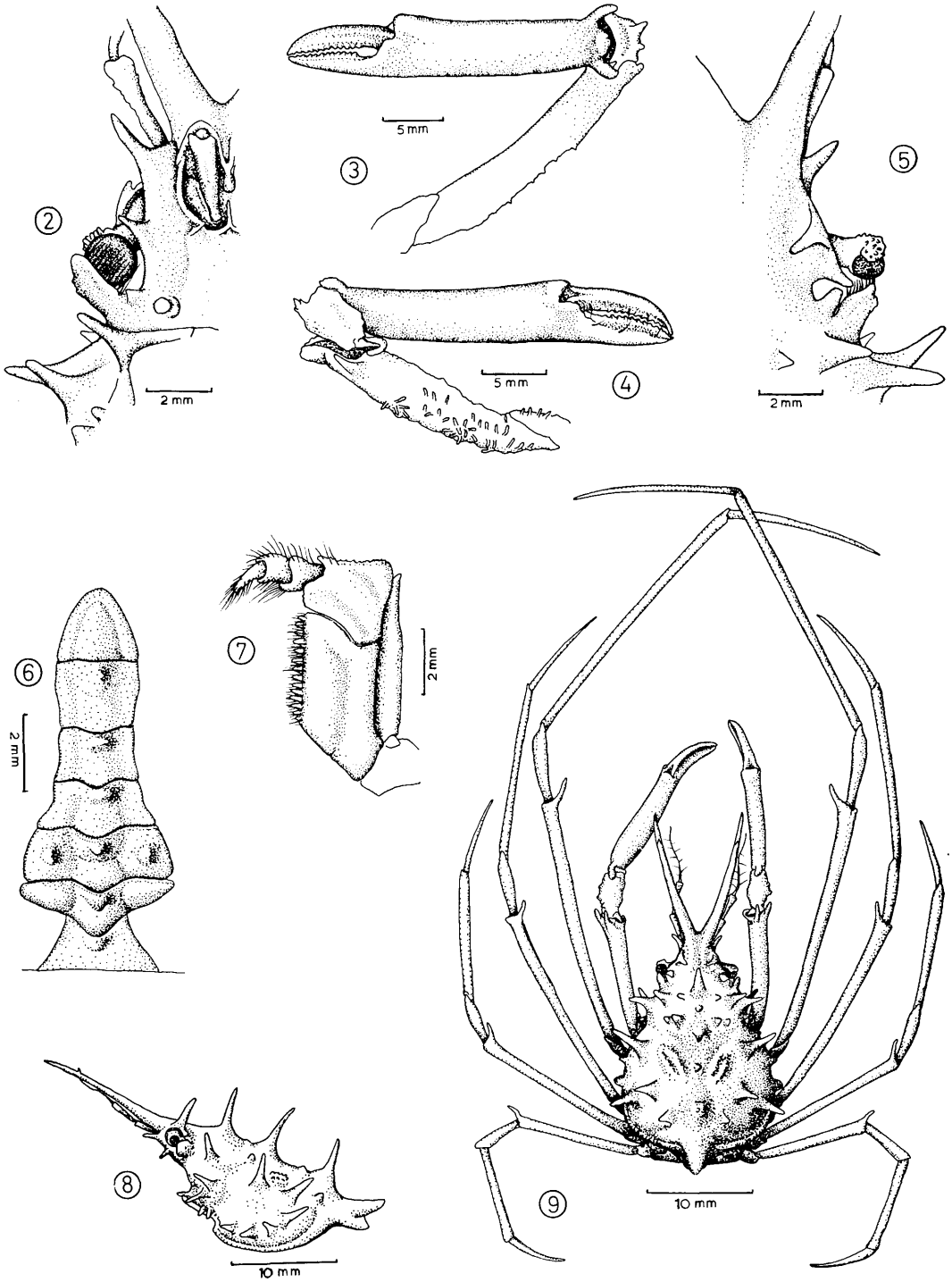
Material examined: Ten specimens as follows:

Macleay Museum, University of Sydney: 1 male, carapace length 22.5 mm, 1 female carapace length 39.5 mm, off Cape Grenville, Cape York Peninsula. [No further data available but Mr. McNeill (pers. comm.) believes the specimens to be over eighty years old.]

Australian Museum, Sydney: 3 males, 5 females, carapace length 18.8-32.8 mm, northern end of Albany Passage, Cape York Peninsula, M. Ward, Aug.-Sept., 1928 (Aust. Mus. No. P. 13941).

Distribution: North-eastern Australia, from Darnley Island to Cape Grenville.

Diagnosis: Rostral spines very long. Preorbital spine directed vertically, simple. A single hepatic spine and a single cardiac spine. Ambulatory legs extremely long, meri with a single distal spine.



Figs. 2-9: *Chlorinoides tenuirostris* Haswell, 22.5 mm male, Cape Grenville (text-fig. 6 only) and 31.7 mm male, Albany Passage. 2, ventral view of orbit; 3, outer view of male cheliped; 4, inner view of male cheliped; 5, dorsal view of orbit; 6, male abdomen; 7, left third maxilliped; 8, lateral view of carapace; 9, dorsal view of whole specimen.

Description: Carapace narrowly pyriform (width slightly less than length), weakly inflated, margins and dorsal surface set with a few long, slender, conical, sharply-pointed spines and short tubercles. All surfaces covered by short simple hairs, closely packed and expanded as " fleshy " lobes, sometimes partly concealing tubercles and spines. Curled hairs in scattered groups on dorsal surface, along posterolateral margin and fringing rostral spines.

Rostrum of two very long (about two-thirds postrostral length of carapace), slender, cylindrical, sharply-pointed spines, separate from close to base and widely divergent, distance between tips almost twice basal width of rostrum, slightly less than half rostral length, a small sharply pointed spine on upper surface about a quarter the length of rostrum from tip.

Hepatic margin with a long, outwardly curved spine, weakly curved backwards distally. Branchial margin with four equidistant tubercles or spines increasing uniformly in length posteriorly, the first a small tubercle, the last a long spine, slightly exceeding hepatic spine, situated subdorsally. Branchial regions bearing more dorsally two additional spines, a posterior one, slightly longer than fourth marginal and opposite third marginal spine and an anterior one, slightly longer again, just forward of second marginal spine; a very small tubercle just in front of this and posteriorly a slightly larger metabranchial tubercle almost opposite fourth marginal spine.

Dorsal surface of carapace with four very long, subequal, subequidistant medial spines, first three slender, sharply pointed, the last stout, somewhat flattened anteroposteriorly, very wide basally, tip rounded: two mesogastric, the first about halfway along that region, the second far back, between hepatic and first marginal branchial spines, a third centrally surmounting tumid cardiac region, fourth almost overlying posterior intestinal margin and directed weakly posteriorly from base. A very small tubercle between mesogastric spines and another, urogastric, behind second mesogastric. Protogastric regions with three small blunt tubercles close to midline and a longer spine lower down, slightly forward of hepatic spine. Several small tubercles in a prominent group at anteromedial corner of branchial regions. Regions of dorsal surface poorly defined.

Orbit consisting above of supraorbital eave, intercalated spine and postorbital lobe, the three separated by wide U-shaped fissures but intercalated spine rather closer to postorbital lobe than to eave; eave narrow, bearing anteriorly a long, acuminate, flattened preorbital spine, directed slightly backward at tip, arising abruptly and vertically from lateral border and a small blunt to sharply pointed, backwardly directed antorbital spine; intercalated spine very short; flattened, subtriangular, broad-based, bluntly pointed; postorbital lobe extending outwards beyond eave, flattened anteroposteriorly, concave anteriorly, margin fringed by long hairs. Eyestalk not very long but reaching postorbital lobe, not concealed in either dorsal or ventral view; cornea subterminal, somewhat ventral, circular, large. Orbit almost circular, incomplete below.

Basal antennal article narrow, but not extremely so, lateral edge straight, medial edge weakly concave, anterolateral angle bearing a long, conical spine directed forwards and slightly outwards, a similar but slightly stouter spine of equal length at posterolateral corner directed outwards and downwards. A large gap between this and base of postorbital lobe only partly occupied by a small suborbital tubercle close to base of lobe. Antennae long, extending almost to tip of rostrum, two subequal basal segments together making up half this length, much stouter than following segments, cylindrical.

Antennular fossae large, longitudinally subovate. Interantennular spine poorly developed, blunt. Anterior process of epistome extremely slender, not quite reaching interantennular spine.

Epistome longer than wide. Mouthfield subrectangular, anterolateral corners produced forwards and outwards as a stout, blunt, slightly flattened spine equal in length to those of basal antennal article. Pterygostomian regions subtriangular, separated by a deep groove from subhepatic regions, bearing close together laterally two short blunt tubercles. Subhepatic regions weakly inflated, a long, conical, bluntly pointed spine arising immediately below hepatic spine, directed downwards, outwards and slightly forwards and visible from above.

Third maxillipeds slightly gaping. Ischium large, subrectangular, longer than broad, medial half of distal edge produced anteriorly, anteromedial corner sharply angled, lateral half straight to bear merus, medial edge very coarsely toothed, overlaid but not concealed by a sparse fringe of long hairs; outer surface excavated medially as a longitudinal groove. Merus subquadrate, slightly wider, but shorter than, ischium, anterolateral edge minutely crenulate, medial edge obtusely crenate, distal edge deeply notched; outer surface excavated as two very shallow longitudinal grooves. Palp arising from notch of, and slightly longer than, merus, cylindrical, the three segments subequal, setose.

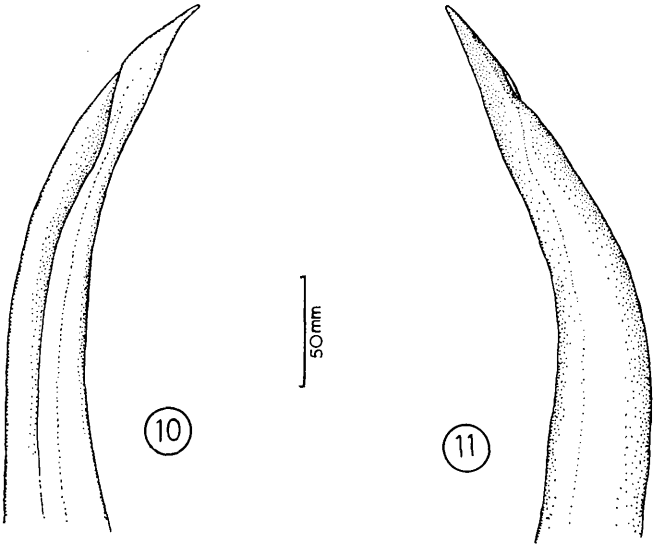
Chelipeds in both sexes of only moderate length, about three-quarters carapace length, very slender, cylindrical except for weakly compressed palm, covered except for most of chela by short simple hairs and scattered longer hairs. Merus long, about two-fifths total length of cheliped, smooth, only a short, curved, sharply pointed spine on dorsal surface distally. Carpus short, smooth except for two small tubercles on dorsal surface, one close to base and one about midway along. Chela long, almost half cheliped, slender, palm weakly expanded distally, dactyl little more than one-third chela; fingers weakly gaping basally, very coarsely toothed along inner edges for distal four-fifths.

Ambulatory legs very long and slender, cylindrical, covered by very short hairs in longitudinal rows, a few scattered long hairs and groups of short, curled hairs on dorsal surface of meri, carpi and propodi; meri bearing distally on dorsal surface a long, weakly curved spine. First leg the longest, almost $2\frac{1}{2}$ times carapace length, following legs descreasing greatly in length, the last only slightly longer than carapace. Meri and propodi very long, subequal, each almost one-third total length of cheliped, dactyli almost half propodi, weakly curved.

Sternum in male extending anteriorly, tapering to a broadly acute spine in midline at posterior border of mouthfield. First three sternites each bearing a small tubercle midway between abdominal fossa and bases of legs, second and third sternites with a second similar tubercle close to outer edge, several smaller tubercles scattered along margin of abdominal fossa; all tubercles hardly discernible, overlain by short hairs.

Abdomen of seven distinct segments in both sexes. Male abdomen narrow, widest at base of third segment, following segments narrowing, abruptly at first, to base of sixth which widens very slightly distally, seventh segment subtriangular, rounded distally. Segments wider than long, subequal in length except for slightly shorter second segment and slightly longer, almost square, sixth segment. Surface elevated in midline as a rounded, longitudinal ridge surmounted distally by a prominent spinous tubercle which decreases in size distally, absent from seventh segment. Third segment with a pair of tubercles laterally, one on each side of midline. Surface of abdomen otherwise smooth. Female abdomen large, covering all of sternum in mature specimen.

Male first pleopod long, stout basally, otherwise very slender, outwardly curved distally, tip very finely pointed, aperture a longitudinal slit on medial surface at end of groove, subterminal; surfaces completely naked except for several stout setae at base laterally and a few very fine setae widely scattered along medial and lateral surfaces for basal third.



Figs. 10, 11: *Chlorinoides tenuirostris* Haswell, 31.7 mm male, Albany Passage, tip of left first pleopod. 10, abdominal aspect; 11, sternal aspect.

Measurements: Largest male: carapace length 31.7 mm, carapace width 15.0 mm, rostral length 14.5 mm, rostral width (basal) 3.3 mm, cheliped 28.5 mm, chelar length 14.5 mm, chelar height 2.5 mm, dactyl 5.4 mm, first ambulatory leg c. 65 mm.

Largest female: carapace length 39.5 mm, cheliped 32.0 mm, chelar length 14.0 mm, chelar height 2.0 mm, first ambulatory leg 84.0 mm.

Remarks: The specimens described here differ little from the type material of *Chlorinoides tenuirostris* according to Haswell's description, although the terminology used in the present paper is slightly different from that used by Haswell. For instance, the large spine on the posterior part of the dorsal surface of the carapace, here called intestinal, is interpreted by Haswell as " cardiac ". The only difference between the present material and that described by Haswell is the presence of a small spinule on the dorsal surface of the rostral spines near the tip, which is not mentioned by Haswell. Reference to Haswell's figures, especially that of the ventral front (Haswell, 1880: pl. xxvi, fig. 1a—" buccal and antennary region "), shows the disposition of the spines and tubercles of the pterygostomian and subhepatic regions to be the same as in the present specimens. Finally, Haswell states that the rostral spines are two-thirds the length of the carapace, by which he presumably means two-thirds postrostral length of carapace. In view of this agreement there can be no doubt as to the specific unity of the specimens described here and the type material of *Chlorinoides tenuirostris* Haswell.

The eight individuals collected by Melbourne Ward in 1928 from Albany Passage are the first well preserved specimens seen since those originally described by Haswell. Although the sample is small numerically some comments can be made on the biology of the species. Most remarkable are the " fleshy " lobes which cover the carapace, including the outer maxillipeds and abdomen. These appear to be simple hairs expanded in some way by intake of water. If the carapace is allowed to dry, these hairs exactly resemble the simple hairs possessed by most other spider crabs. The extremely strong teeth of the chelar fingers and of the outer maxillipeds surely point to this species being a macrophagous feeder.

This species does not appear to mature below a total carapace length of about 25 mm, females smaller than this not having the abdomen fully expanded. There is very little difference in the relative size of the chela in males and females, an unusual feature in this family; the small size of the chela is also uncommon.

The ratio rostral length/carapace length varies from 0.34 to 0.46, all males having a value above 0.40, while only one female has a value greater than this. It must be remembered, though, that the sample is very small, so that such differences may not be consistent.

In the smallest specimen, a male, carapace length 18.8 mm, the intercalated spine appears relatively smaller than in larger specimens, but a much larger series would be needed to show whether this spine does increase in relative size during growth.

This species differs from other species here included in the genus *Chlorinoides* in several features, the most important being the narrow basal antennal article and the shape of the male abdomen. In addition there is almost a complete lack of the flattened " lamellate " or " spatuliform " plates so characteristic of many species of the genus. However, this last character cannot be taken as diagnostic of the genus, and the form of the supraorbital margin with a preorbital, antorbital, intercalated and postorbital lobe, the double rostrum, seven-segmented abdomen, distally spined ambulatory meri, anteriorly toothed basal antennal article, and subquadrate, distally notched merus of the third maxilliped hardly leaves room for disagreement with those previous workers who considered this species to be congeneric with H. Milne Edwards's *Chorinus aculeata*, A. Milne Edwards's *Acanthophrys aculeatus*, de Haan's *Chorinus longispinus* and those other species which over the years have become grouped together within A. Milne Edwards's *Acanthophrys* or Haswell's *Chlorinoides*. Among this group of species *Chlorinoides tenuirostris* undoubtedly stands closest to *C. acanthonotus* (Adams and White, 1848) in the possession of a vertically directed preorbital spine and single long hepatic spine. From the latter species, *C. tenuirostris* is easily distinguished by the simple form of the preorbital spine and the possession of but a single cardiac spine.

Naxiodes robillardi Miers, 1882, at present placed in the subfamily Pisinae, resembles *C. tenuirostris* in the general form of the orit, shape of the basal antennal article, shape of the male abdomen, in the possession of very long rostral spines and of spines on the distal edge of the dorsal surface of the meri of the legs. However, *N. robillardi* grows to a very much greater size than any species here placed in *Chlorinoides* and differs from them also in having many more, somewhat shorter, spines on the carapace.

GENERAL DISCUSSION

The first point to consider is the systematic position of A. Milne Edwards's *Acanthophrys cristimanus*, on which rests the status of the genus *Acanthophrys* A. Milne Edwards, 1865, since that species was validly designated type species of the genus by Miers (1879b). The relationships of *Lahaina ovata* Dana, 1851, type species (by monotypy) of the genus *Lahaina* Dana, 1851, are also important since *A. cristimanus* was stated by Bouvier (1906) to belong to *Lahaina* (*fide* A. Milne Edwards's manuscript note). Comparison of these two species, *A. cristimanus* and *L. ovata* (from the descriptions and figures of A. Milne Edwards, 1865, in the case of the former, and those of Dana, 1852, in the case of the latter), reveals certain important similarities. The two species agree in the form of the upper orbital border (lacking an intercalated spine, consisting only of an unarmed supraorbital eave and a postorbital lobe), of the basal antennal article (narrow, with the anterolateral tooth spinous and forwardly

directed), and of the third maxillipeds (merus laterally expanded and distally unnotched). This agreement is certainly of sufficient importance to warrant the two being considered congeneric. These characters are typical, not of species so far included in *Acanthophrys*, but of species belonging to the genus *Hyastenus* White, 1847. Thus, they should, together with *Acanthophrys paucispina* Miers, 1879, be transferred to the latter genus. [*L. ovata* was first transferred to *Hyastenus* (subgenus *Chorilia*) by Miers (1884: 522)]. *Acanthophrys* is therefore a synonym of *Hyastenus* and unavailable for the group of species which Bouvier (1906), Balss (1929), Sakai (1938) and others have united under that name. Further, Bouvier's grounds for using the name, viz., by rejecting *A. cristimanus* as type species of the genus in favour of *A. aculeatus* A. Milne Edwards, must be regarded as quite invalid. Since *Chlorinoides tenuirostris* Haswell, 1880, has been shown to be congeneric with those species formerly placed in *Acanthophrys*, the name *Chlorinoides* Haswell, 1880, is available and must be used. The separation of *C. tenuirostris* in a distinct genus (by Haswell, 1880: 442) solely on the characters of the greater length of the rostral spines and ambulatory legs has been upheld neither in the past nor by the present study.

The inclusion within this group of species, by Balss (1929), of the Indian Ocean species *Entomonyx spinosus* Miers, 1884 (=*Macrocoeloma nummifer* Alcock, 1895), must now be considered. Balss stated that this species does not belong to the genus *Macrocoeloma* Miers, 1879, because of its possession of an intercalated spine above the orbit. Although the importance of the presence or absence of an intercalated spine has not received as much emphasis in recent years (see Sakai, 1938: 203; Garth 1958: 8) as Balss originally accorded it, it is still very important at the generic level. Therefore Balss's reason for excluding *E. spinosus* from *Macrocoeloma* seems justified. However, the nature of the orbit in this species surely excludes it from *Chlorinoides* for, as may be seen from Miers's original description and figures (Miers, 1884: 526, pl. 47 fig. B,), the supraorbital eave and basal antennal article are laterally expanded, the orbit thereby becoming almost tubular, the carapace thus losing the pyriform shape so typical of species of *Chlorinoides* while the rostral spines are shorter than usually found in the latter genus. Sakai (1938: 309, pl. xxxi, fig. 3) followed Balss in the inclusion of this species in *Acanthophrys*. Although it is clear from his description that the disposition of the spines on the carapace is the same as found in species of *Chlorinoides*, that the ambulatory meri possess a terminal spine and that the spines of the carapace possess terminal knobs, the first two of these do not outweigh the differences in orbital details, while as far as the third is concerned it should be noted that knobbed spines are found in species of other genera, notably several belonging to the genus *Micippa* Leach [see Sakai, 1938: 312, e.g. *M. philyra* (Herbst)]. In orbital characters, *E. spinosus* resembles those species at present placed in the subfamily Mithracinae Balss (see Garth, 1958: 346) and not the Majinae, in which *Chlorinoides* belongs. Consequently, the genus *Entomonyx* Miers, 1844, should be resurrected to contain this single species, *Entomonyx spinosus* Miers, 1884.

The genus *Prismatopus* was set up more than 30 years ago by Melbourne Ward (1933) to contain a (new) species of majid crab, *P. albanyensis* from Albany Passage, north Queensland. Ward related his genus to *Acanthophrys* A. Milne Edwards as defined by Miers (1879b) and gave four points which distinguished *Prismatopus*. In two of these, the laterally directed spine of the basal antennal article, and the notched merus of the third maxillipeds, Ward's species clearly does not belong in *Acanthophrys* A. Milne Edwards as defined by Miers, but in *Chlorinoides* as here defined. The remaining two characters, the trigonal (" triprismatic ") ambulatory legs and the carinate margins of the maxillipeds, are not sufficient to separate this species generically from *Chlorinoides tenuirostris*. Further examination of Ward's description does not produce additional reasons for the retention of a distinct genus. Therefore *Prismatopus* Ward, 1933, is here reduced to synonymy with *Chlorinoides* Haswell.

It seems worthwhile to review now the status of the twelve species included here in *Chlorinoides*. In several cases, forms originally considered distinct species have been later regarded as only varieties of previously described species; in others, specimens differing in a few features have been described as varieties. As Professor Ernst Mayr, in *Animal Species and Evolution* (Harvard University Press, 1963) has recently pointed out, the variety, anything that deviated from the ideal type of the species, was the only subdivision of the species recognized by early taxonomists. The term has no standing under the present zoological nomenclature. It must be decided whether or not any of these varieties should be considered distinct species; so little material is available that the time is not ripe for a consideration of the existence of subspecies. Miers (1884: 182, 193, pl. xviii, fig. A.) described a variety of *C. aculeatus* (H. Milne Edwards, 1834), which he called *Paramithrax (Chlorinoides) aculeatus*, var. *armatus*. The specimens from Queensland, on which this variety was based, differed from the typical form of *C. aculeatus* only in the shape of the postorbital lobe, which was slightly more expanded distally and partially subdivided into two. Miers himself remarked that such a difference is hardly sufficient to warrant specific separation. Four varieties of *C. longispinus* (de Haan) have been described. The first, originally described as a species of *Paramithrax, P. coppingeri*, by Haswell (1882b: 750) was first regarded as a variety of *C. longispinus* by Bouvier (1906). It differs from the typical *C. longispinus*, as understood in Haswell's time, in having none of the supraorbital spines recurved, and two, instead of one, intestinal spine. However, Sakai (1938: 308) describes Japanese specimens of *C. longispinus* as possessing two intestinal spines, Grant and McCulloch (1906) point out that the type specimen of *P. coppingeri* does, in fact, have the antorbital spine recurved, while this, and other species of the genus show some variation as to the degree of curvature of the supraorbital spines (Griffin, unpublished). Therefore, Haswell's species is probably a synonym of *C. longispinus*. Miers (1884: 522) described a variety of *C. longispinus* which he called *P. (C.) longispinus* var. *bituberculata*, from Darros and Providence Islands, which was distinguished from the typical *C. longispinus* by the possession of a tubercle on the fixed finger and dactyl of the chela. Such a difference can almost certainly be regarded as falling within the normal variation of *C. longispinus*. *Acanthophrys longispinus*, var. *spinossissima*, described by Bouvier (1906: 487, 489) from specimens taken near Mozambique, differs from the typical *C. longispinus* in the absence of a preorbital spine and the presence of two distal spines on the ambulatory meri, while the spines of the carapace are longer than in the typical form and the rostrum is depressed towards the base. Of these four differences only the first two warrant consideration. The absence of the preorbital spine at the moment seems important and unique but the presence of a second distal spine on the ambulatory meri was noticed in a single specimen of *C. longispinus* from Queensland by Grant and McCulloch (1906). At present then, Bouvier's variety is not considered to warrant independent specific status. Laurie (1906) described *Paramithrax (Chlorinoides) longispinus* var. *bispinosus* from off Ceylon, which differed from de Haan's species "in the absence of the most anterior of the three supra-ocular spines" (Laurie 1906: 383). This variety appears to be the same as Bouvier's var. *spinossissima* and the remarks just made about the latter apply to Laurie's variety also.

In the past several authors (Alcock, 1895; Bouvier, 1906; Sakai, 1938; Barnard, 1950) have regarded the terminal knobs, so often found on the spines of *C. longispinus*, as being diagnostic of this species. It must be emphasized therefore that these knobs are not present in all specimens of this species (Miers, 1884: 192; Grant and McCulloch, 1906; Yaldwyn, pers. comm.), but are present in some specimens of *C. aculeatus* (H. Milne Edwards) (see Sakai, 1938: 310).

Bouvier (1906: 489) and Grant and McCulloch (1906) independently showed that *Acanthophrys aculeatus* A. Milne Edwards, 1865 (not *Chorinus aculeata* H. Milne Edwards, 1834) was conspecific with *Paramithrax spatulifer* Haswell (see Haswell, 1882a: 540). With the inclusion of *Chorinus aculeata* H. Milne Edwards, in the same

genus, *Acanthophrys aculeatus* A. Milne Edwards becomes a junior homonym of *Chorinus aculeata* H. Milne Edwards and therefore requires a new specific name. As Haswell's *spatulifer* is available it must be used. As pointed out by several authors (Grant and McCulloch, 1906; Bouvier, 1906; and Barnard, 1950), Miers (1886) misidentified *C. spatulifer* and described and figured it under the name *Chlorinoides coppingeri*, thus causing some confusion in locality records, notably by Calman (1900). *C. spatulifer* is mainly southern in distribution, being known mostly from south and south-east Australia, while *C. longispinus* (syn. *C. coppingeri*) is a subtropical and tropical species.

Finally, some comments on the distinctness and relationships of *Chlorinoides* itself are fitting. As noted already, *Chlorinoides* was regarded as a subgenus of *Paramithrax* H. Milne Edwards, 1834, by Miers (1884), Alcock (1895) and several other authors. *Chlorinoides* differs from *Notomithrax* Griffin (formerly *Paramithrax* H. Milne Edwards, in part—see Griffin, 1963) and *Leptomithrax* Miers, the taxonomic descendants of *Paramithrax* as originally set up, in several very noticeable features. First (in *Chlorinoides*) the rostral spines are longer, more slender and more divergent; secondly, there is a strong preorbital lobe; thirdly, the postorbital lobe is excavate and generally lamellate; fourthly, the anterolateral tooth of the gasal antennal article is directed strongly outwards rathern than forwards; fifthly, the carapace is smooth rather than densely spinous or tuberculate; and lastly, the ambulatory meri possess a strong distal spine. Nevertheless, some species of *Leptomithrax* and species of *Chlorinoides* do resemble each other in the form of the postorbital lobe and of the basal antennal article. While several species of *Leptomithrax* possess a preorbital lobe, this structure never reaches the state of development seen in species of *Chlorinoides*, and the postorbital lobe is never lamellate. In general, then, species of *Chlorinoides* may be distinguished from those of *Leptomithrax* by the presence of lamellate lobes on, and by the generally smooth appearance of, the carapace. Examples of species of *Leptomithrax* which approach a *Chlorinoides* facies include the Japanese *L. bifidus* (Ortmann) in which the rostral spines are long, slender and outwardly curved distally, the Australian and New Zealand *L. tuberculatus* (Whitelegge) in which the carapace is smoother than in most other species of the genus, and the New Zealand *L. richardsoni* Dell which possesses a strong preorbital spine. It remains only to say that knowledge so far lacking, in most cases, of the shape of the male abdomen and first pleopod should help substantially in working out precise relationships of species of this and related genera.

A key to the 12 species of *Chlorinoides* recognized here can now be given.

KEY TO THE SPECIES OF THE GENUS CHLORINOIDES HASWELL

1. Preorbital and antorbital lobes spinous, not markedly expanded as lamellate lobes 2
   Preorbital or antorbital lobe, or both, a wide, flattened lamella 9

2 (1) Preorbital spine more than 3 times antorbital in length, vertically directed upward from base. Hepatic margin with a single long spine extending laterally beyond postorbital lobe..... 3
   Preorbital spine never more than $1\frac{1}{2}$ times antorbital in length, outwardly directed at least basally. Hepatic margin with a small bilobate lamella 4

3 (2) Preorbital spine bifid at tip. Branchial margin with two long spines posteriorly. Cardiac spine bifid for about distal half. Posterior intestinal margin with two medial spines, the anterior directed upward, posterior directed backward..... *C. acanthonotus* (Adams and White)
   Preorbital spine simple, acuminate. Branchial margin with one long spine posteriorly, two long spines on branchial regions dorsally. A single acuminate cardiac spine. A single flattened, blunt intestinal spine..... *C. tenuirostris* (Haswell)

4 (2) Branchial margin with a small lamella anteriorly followed by three spines. Intestinal region smooth or with a low spine, cardiac region surmounted by a pair of low, submedial spines 5

Branchial margin lacking a small lamella anteriorly, one or two long spines posteriorly. Intestinal and cardiac regions with long spines.. 6

5 (4) Mesogastric region with a single spine posteriorly. Preorbital lobe an acute spine, antorbital lobe rounded distally.. *C. brevispinosa* Yokoya

Mesogastric region with two medial spines. Pretorbital and antorbital lobes subtruncate distally..... *C. goldsboroughi* Rathbun

6 (4) Two long branchial spines posteriorly. Rostral spines outwardly curved, widely divergent, distance between tips about twice rostral length 7

A single long branchial spine posteriorly. Rostral spines weakly divergent, distance between tips not more than two-thirds rostral length 8

7 (6) A single preorbital spine. A single cardiac spine. Intestinal region with two medial spines..... *C. aculeatus* (H. Milne Edwards)

Two preorbital spines distinct from base. A pair of widely divergent submedial cardiac spines. Intestinal region with a single spine .... *C. longispinus* (de Haan)

8 (6) Cardiac region with a single spine. Postorbital lobe a wide lamella.. ..... *C. halimoides* (Miers)

Cardiac region with a pair of submedial spines. Postorbital lobe narrowly subtriangular..... *C. harmandi* (Bouvier)

9 (1) Posterior intestinal margin with a prominent lamellate lobe. Ambulatory legs cylindrical 10

Posterior intestinal margin with an acuminate spine. Ambulatory legs trigonal..... *C. albanyensis* (Ward)

10 (9) Branchial margin with a single spine posteriorly. Cardiac region with a single acuminate spine. Preorbital and antorbital lobes fused basally as a wide lamella, distinct as two short spines distally .... *C. germaini* (Bouvier)

Branchial margin with two long flattened spines posteriorly. Cardiac region surmounted by a flattened lobe, bifid for distal half. Preorbital and antorbital lobes distinct from base 11

11 (10) Preorbital lobe lamellate, wide, summit truncate or concave, antorbital lobe a short spine. Medial margins of rostrum armed with several short spines. Posterior intestinal lobe widest midway from base, summit rounded..... *C. spatulifer* (Haswell)

Preorbital lobe slender, spinous, acuminate, antorbital lobe lamellate, distally expanded and anteriorly directed. Medial margins of rostrum lacking spines. Posterior intestinal lobe widest at base, summit truncate to concave..... *C. filholi* (A. Milne Edwards)

SUMMARY

1. The status of the genus *Acanthophrys* A. Milne Edwards, 1876, based by the subsequent designation of Miers in 1879 on *A. cristimanus* A. M. Edw., 1865, is briefly reviewed. *A. cristimanus* is shown to belong to *Hyastenus* White, 1847, and is transferred, together with *Lahaina ovata* Dana, 1851, type species of *Lahaina* Dana, 1851, and *Acanthophrys paucispina* Miers, 1879, to that genus. *Acanthophrys* and *Lahaina* are therefore synonyms of *Hyastenus*.

2. The genus *Chlorinoides* Haswell, 1880, based on *C. tenuirostris* Haswell, 1880, is redefined and shown to be a distinct genus most closely related to *Leptomithrax* Miers, 1876. Comparison of those species formerly included in *Acanthophrys* with *C. tenuirostris* shows that the vast majority are congeneric with that species.

3. The monotypic genus *Prismatopus* Ward, 1933, is reduced to synonymy with *Chlorinoides*.

4. The monotypic genus *Entomonyx* Miers, 1884, is resurrected for *E. spinosus* Miers, 1884. This species was first included in *Acanthophrys* by Balss in 1929 but does not belong in *Chlorinoides* as here constituted.

5. Twelve species are included in *Chlorinoides*. Their status and relationships are discussed. None of the varieties so far described are considered to be distinct species. A key to the 12 species is given.

6. *Chlorinoides tenuirostris* is redescribed in detail and figured on the basis of new material. Some brief notes are given on its biology and relationships.

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REFERENCES

Adams, A., and White, A., 1848. Crustacea. *In* Adams, A. (ed.) Zoology of H.M.S. *Samarang* 1843-46. Pp. viii, 66, 13 pls. London.

Alcock, A. W., 1895. Materials for a Carcinological Fauna of India. 1. The Brachyura Oxyrhyncha. *J. Asiat. Soc. Beng.* 64: 157-291, pls. 3-5.

Balss, H., 1929. Decapoden des Roten Meeres. IV. Oxyrhyncha und Schlussbetrachtungen. *Denkschr. Akad. Wiss. Wein. Math-nat. Kl.* 102: 1-30, text-figs. 1-9, pl. 1.

———, 1935. Brachyura of the Hamburg Museum Expedition to South-western Australia, 1905. *J. roy. Soc. W. Aust.* 21: 113-151, figs. 1-3, pl. 13.

Barnard, K. H., 1950. Descriptive Catalogue of South African Decapod Crustacea (Crabs and Shrimps). *Ann. S. Afr. Mus.* 38: 1-837, figs. 1-154.

Bennett, E. W., 1964. The Marine Fauna of New Zealand: Crustacea Brachyura. *N.Z. Dep. sci. industr. Res. Bull.* 153: 1-120, figs. 1-141.

Bouvier, E. L., 1906. Observations sur le genre *Acanthophrys* et Catalogue des *Acanthophrys* du Museum. *Bull. Mus. Hist. nat., Paris* 12: 485-491.

Calman, W. T., 1900. On a Collection of Brachyura from Torres Straits. *Trans. Linn. Soc. Lond. Zool.* 8 (1): 1-50, pls. 1-3.

Chhapgar, B. F., 1957. On the marine crabs (Decapoda: Brachyura) of Bombay State. *J. Bombay nat. Hist. Soc.* 54: 399-439, 503-549, 3 figs. 18 pls.

Chilton, C. and Bennett, E. W., 1929. Contributions for a Revision of the Crustacea Brachyura of New Zealand. *Trans. N.Z. Inst.* 59: 731-778.

Dana, J. D., 1851. Conspectus Crustaceaorum quae in Orbis Terrarum circumnavigatione Carlo Wilkes e Classe Republicae Federate Duce, lexit et descripsit J. D. Dana. VI. *Amer. J. Sci.* (ser. 2) 11: 268-274.

———, 1852. Crustacea. *In* U.S. Exploring Expedition during the years 1838-1842 under the command of Charles Wilkes, U.S.N. 13: xiii, 1618 pp. Atlas (1855), 1-27, 96 pls. Philadelphia: C. Sherman.

Dell, R. K., 1960. Crabs (Decapoda, Brachyura) of the Chatham Islands 1954 Expedition. *N.Z. Dep. sci. industr. Res. Bull.* 139 (1): 1-7, figs. 1-6, pls. 1, 2.

Filhol, H., 1886. Catalogue des Crustacés de la Nouvelle Zélande, des îles Auckland et Campbell. *In* Mission de l'Ile Campbell 3 (2): 349-510. Atlas, pls. 38-55.

Fulton, S. W., and Grant, F. E., 1906. Some little known Victorian Decapod Crustacea, with descriptions of New Species. No. III. *Proc. roy. Soc. Vict.* 19 (1): 5-15, pls. III-V.

Garth, J. S., 1958. Brachyura of the Pacific Coast of America: Oxyrhyncha. *Allan Hancock Pacif. Exped.* 21: 1-854, tables 1-106, text-figs. 1-9, pls. A-Z4, 1-55.

Grant, F. E., and McCulloch, A. R., 1906. On a collection of Crustacea from the Port Curtis District, Queensland. *Proc. Linn. Soc. N.S.W.* 31: 2-53, pls. 1-4.

Griffin, D. J. G., 1963. *Notomithrax* gen. nov. and the Status of the Genus *Paramithrax* H. Milne Edwards (Crustacea, Brachyura, Majidae). *Trans. roy. Soc. N.Z., Zool.* 3(22): 229-237.

Haan, W. de, 1839. Crustacea. *In* Siebold, P. F. von (ed.) Fauna Japonica. Pp. i-xvii, i-xxxi, 1-244, pls. 1-55, A-Q. Amsterdam: Müller.

Hale, H. M., 1927. The Crustaceans of South Australia. Pt. 1: 1-201, figs. 1-202. Adelaide: Govt. Printer.

Haswell, W. A., 1880. On the Australian Brachyura Oxyrhyncha. *Proc. Linn. Soc. N.S.W.* 4: 431-458, pls. 25-27.

———, 1882a. On some new Australian Brachyura. *Proc. Linn. Soc. N.S.W.* 6: 540-551.

———, 1882b. Descriptions of some New Species of Australian Decapoda. *Proc. Linn. Soc. N.S.W.* 6: 750-763.

———, 1882c. Catalogue of the Australian Stalk- and Sessile-eyed Crustacea. 326 pp., 4 pls. Sydney: Australian Museum.

Laurie, R. D., 1906. Report on the Brachyura collected by Professor Herdman, at Ceylon, in 1902. *Rep. Pearl Oyster Fish.* 5: 349-432, pls. I, II.

Miers, E. J., 1879a. Descriptions of New or little known species of Maioid Crustacea (Oxyrhyncha) in the collections of the British Museum. *Ann. Mag. nat. Hist.* (ser. 5) 4: 1-28, pls. 4, 5.

———, 1879b. On the Classification of the Maioid Crustacea or Oxyrhyncha, with a synopsis of the families, subfamilies and genera. *J. Linn. Soc. Lond. (Zool).* 14: 634-673, pls. 12, 13.

———, 1884. Report on the Zoological Collections made in the Indo-Pacific Ocean during the Voyage of H.M.S. *Alert* 1881-2: 178-322, 513-575, pls. XVIII-XXXIV, XLVI-LII. London: British Museum.

———, 1886. Report on the Brachyura collected by H.M.S. *Challenger* during the years 1873-1876. *Rep. Voy. Challenger, Zool.* 17: 1-362, pls. 1-29.

Milne Edwards, A., 1865. Descriptions de quelques Crustacés nouveaux, appartenant a la tribu des Maiens. *Ann. Soc. entom. Fr.* 4 (5): 133-147, pls. 3-5.

———, 1876. Note sur deux Nouvelles espèces de Crustacés provenant de la Nouvelle Zélande (*Trichoplatus huttoni* et *Acanthophrys filholi*). *Ann. Sci. nat. Zool.* (ser. 6) 4, Art. 9: 1-5, pl. 10.

Milne Edwards, H., 1834. Histoire Naturelle des Crustacés, comprenant l'anatomie, la physiologie et la classification de ces animaux. I: i-xxv, 1-468 pp., atlas. Paris: Lib. Roret.

Parisi, B., 1915. I Decapodi giapponesi de Museo di Milano. III. Oxyrhyncha. *Atti. Soc. Ital. Sci. nat.* 54: 281-296, 4 text-figs., 7 pls.

Rathbun, M. J., 1906. The Brachyura and Macrura of the Hawaiian Islands. *Bull. U.S. Fish. Comm.* 23 (3): 827-930, text-figs. 1-79, pls. 3-25.

———, 1918. 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. *Biol. Res. Endeavour* 5 (1): 1-29, figs. 1-3, pls. 1-15.

———, 1925. The Spider Crabs of America. *Bull. U.S. Nat. Mus.* 129: 1-613, figs. 1-153, pls. 1-283.

Richardson, L. R., 1949. A Guide to the Oxyrhyncha, Oxystoma and lesser crabs. *Tuatara* 2 (2): 58-69, figs. 37-51.

Sakai, T., 1938. Studies on the Crabs of Japan. III. Brachygnatha, Oxyrhyncha: 193-364, text-figs. 1-55, pls. I-XLI. Tokyo: Yokendo Co.

Ward, M., 1933. New genera and species of marine Decapoda Brachyura. *Aust. Zool.* 7: 337-394, pls. 21-23.

White, A., 1847. Descriptions of new Crustacea from the Eastern Seas. *Proc. zool. Soc. Lond.* 1847: 56-58.

Yokoya, Y., 1933. On the Distribution of Decapod Crustaceans inhabiting the Continental Shelf around Japan, chiefly based upon the Materials collected by S.S. *Sôyô-Maru*, during the Year 1923-1930. *J. Coll. Agric. Tokyo Imper. Univ.* 12 (1): 1-226, text-figs. 1-71.

Sydney: V. C. N. Blight, Government Printer—1966