surface oblique, *i.e.* sloping downwards and outwards, forming a shallow smooth groove bordered above (actual upper margin of fingers: Stimpson's "crenulate carina") and below by a series of

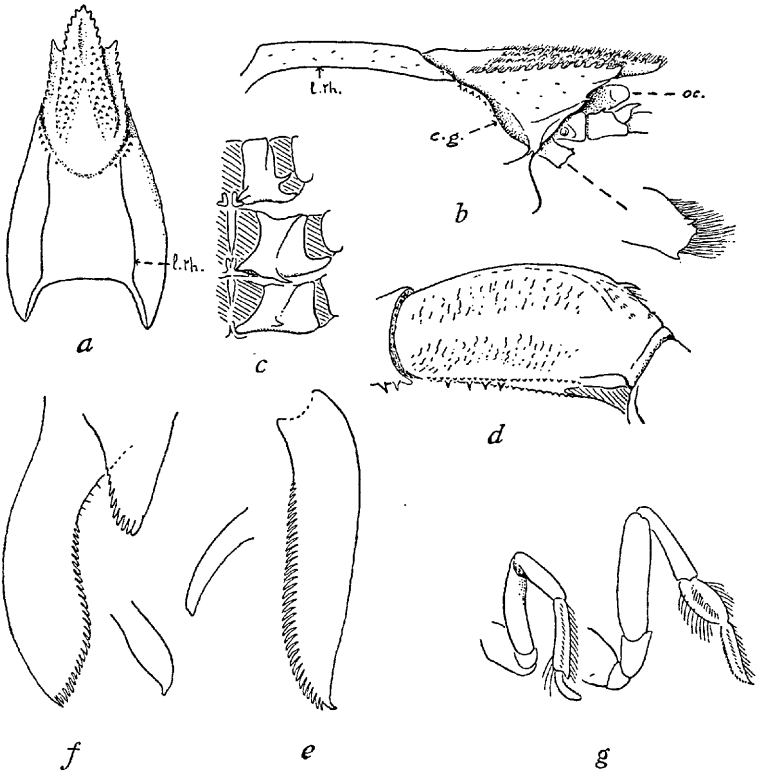

FIG. 96.—*Upogebia capensis* (Krauss). *a*, dorsal view of carapace, showing *linea thalassinica* (*l.th.*), pile omitted. *b*, lateral view of anterior part of carapace, showing *linea thalassinica*, cervical groove (*c.g.*), eye (*oc.*), with lateral lobe of epistome further enlarged. *c*, bases of 1st–3rd legs ♂, membranous areas cross shaded. *d*, outer surface of 4th joint of 1st leg. *e*, dactyl of 3rd (and 4th) leg, setae omitted. *f*, apex of 6th joint and dactyl of 5th leg, setae omitted. *g*, 4th and 5th legs of right side *in situ*, to show torsion of distal three joints of 5th leg.

denticles or serrulations. 4th joint of 2nd leg with (usually) a spine (curved or adpressed) on upper margin near apex, 5th joint with a spine on upper apex and a smaller one external to it. 3rd–5th legs without spine on upper margin of 4th and 5th joints. Dactyls of 3rd and 4th legs ensiform, front margin setose, unguis distinct and curved forwards, hind margin closely and strongly pectinate, the spines curving outwards so that hind surface is concave; with a backward

sweeping motion of the limb this joint acts as a scoop. 6th joint of 5th leg subchelate, with its (true) lower apex produced as a thumb-like process, hollowed on side opposite dactyl, with stout apical spine and graduated marginal spines; dactyl curved and hollowed on its lower surface, its (true) outer margin pectinate to the blunt apex, no distinct unguis; as the 5th joint does not articulate in the normal manner with the 4th joint (*i.e.* with movement in the same vertical plane) but is folded sideways against the 4th joint (their true outer surfaces being thus contiguous), the lower margins of the 6th joint and dactyl face outwards, the dactyl acting as a scoop in the opposite direction to that of the dactyls of 3rd and 4th legs; its true outer margin (pectinate) is now next to the body (fig. 96, *g*). Coxal joints of 1st–3rd legs with a sharp spine: on 1st coxa situated on the distal margin, on 2nd and 3rd coxae near middle of hind margin; all three spines distinct in ♂, but the 3rd one in ♀ is reduced to a blunt tubercle on outer rim of genital opening, or obsolete. A single gill on base of 5th leg. Pleopod 1 in ♀ styliform with blunt apex; in ovigerous ♀ setose. Pleopods 2–5 with outer ramus ovate-lanceolate, inner ramus considerably smaller, oval. Both rami of uropod broadly subtriangular. Eggs small and numerous.

Length up to 80 mm. (carapace 26 mm.). Smallest specimen examined 15 mm. (Stebbing, 8 mm.), and a post-larva 4 mm. Bluish green.

Localities.—Luderitzbucht (Balss); Saldanha Bay (S. Afr. Mus.); Table Bay (Krauss, and S. Afr. Mus.); Simon's Bay (Stimpson, Lenz and Strunck, and S. Afr. Mus.); St. James and Kalk Bay (west side of False Bay) (S. Afr. Mus.); Mossel Bay (S. Afr. Mus.).

Remarks.—The extension of this west coast species around the south-west corner of the Cape to Mossel Bay is curious; further collecting may prove its existence at intermediate localities, although it is significant that it seems to be confined to the *western* part of False Bay, where ships touch. Mossel Bay is also a port of call.

Although Balss (1913) says upper margin of 4th joint of cheliped is quite smooth, his fig. 8 gives a very strong suspicion of the presence of an *adpressed* spine.

The differences between Stimpson's description of the finger of the cheliped and de Man's description (1928, p. 51) are merely verbal; both are correct, though de Man's is the better.

The denticulation of the inner margin of the thumb is a juvenile character, which does not persist in the adult.

A post-larva, 4 mm. in length, from Table Bay (Oct. 1913) is

identifiable as *Upogebia*, but is too badly preserved for detailed description.

This species appears to prefer, as a rule, deeper water than *africana*.

Upogebia africana (Ortmann)

1894. Ortmann, Semon's Austral. Reise, v, p. 22, pl. 2, fig. 4, *a*, *b* (cheliped).

1900. Stebbing, Mar. Invest. S. Afr., i, p. 45 (*capensis*, non Krauss).

1910. *Id.*, *l. c.*, p. 370 (*capensis*, non Krauss).

1928. de Man, *l. c.*, pp. 37, 51.

1947. Barnard, Ann Mag. Nat. Hist. (xi), 13, p. 380.

Differs from *capensis* only in its smaller size, and the absence of the coxal spines and the spine near upper apex of 4th joint of cheliped. The granules on outer surface of hand of cheliped near the thumb are more distinctly spiniform, and 1 or 2 or 3 of them are definitely enlarged, especially in ♂. A spine on upper apex of 4th joint of 2nd leg, or on 2nd joint of ant. 2, is never present, and the lateral lobe of epistome is less distinctly quadrate. The 4th joint of cheliped is less strongly convex along upper margin.

Length up to 65 mm., smallest specimen examined 14 mm., smallest ovig. ♀ 27 mm. Pale yellowish or brownish, eggs yellowish.

Localities.—Port Elizabeth (Ortmann) and Zwartkops River estuary, Algoa Bay (Stebbing); Gordon's Bay, east side of False Bay (Stebbing); Somerset Strand and Gordon's Bay, estuary of the Breede River (Port Beaufort), Knysna lagoon, Keurbooms River estuary (Plettenberg Bay), Zwartkops estuary, Nahoon River estuary (East London), Port St. Johns and Durban Bay (S. Afr. Mus.).

Remarks.—de Man's (1928, p. 51) criticism of Ortmann's description does not seem justified; Ortmann describes one spine at base of thumb and one near base of finger, which is in agreement with his figure, and is perfectly correct.

Although opinions may differ as to whether this form should be regarded as merely a variety of *capensis*, the two forms appear to be localized, one in the colder water, the other in the warmer water; and they should be kept separate in order to work out in detail their distribution.

This form appears to be more strictly estuarine in habitat than *capensis*, though the species which Dr. Gilchrist informed Stebbing (1900, p. 46, and 1910, p. 370) was abundant in "vleis" (lagoons) is more likely to have been *Callianassa kraussi*.

A single ♂, 35 mm. in length, from Durban Bay, although without the coxal spines, has the spine on the 4th joint of cheliped. It also has one of the spiniform granules near base of thumb on outer surface enlarged. It would seem, therefore, that the decisive specific or diagnostic character separating the two forms is the presence or absence of the coxal spines.

A ♀ of a Bopyrid parasite, *Pseudione* species, was found in the branchial chamber of a specimen from Gordon's Bay, but in too poor condition for specific identification.

Upogebia assisi Brnrd.

Fig. 97, *a–d.*

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 381.

Front scarcely tridentate, the lateral lobes scarcely projecting beyond base of rostrum, which is shorter than its basal width, with 8 tubercles on its rounded margin, and a slight medio-dorsal groove, no tooth on lower surface. Carapace anteriorly with scattered granules, with tufts of setae; lateral ridge tuberculate; cervical groove deeply incised laterally; no spinule on antero-lateral margin above ant. 2. Eyes well pigmented. Acicle distinct, ending in a single spine. Cheliped robust compared with size of animal, upper margin of 4th joint with a minute adpressed spinule near apex, lower margin without spines, 5th joint with a small spine on lower apex and a smaller one on upper apex, 6th joint smooth, without spines, granules, or dorsal grooves; thumb denticulate on inner margin proximally; finger with one or two blunt denticles basally and a broad low tooth or swelling just beyond middle, upper margin distally with 4–5 long low lobes or crenulations. 4th joint of 2nd leg without spinule on upper margin, 5th joint with tooth on lower apex. Dactyl of 3rd and 4th legs slender, tapering, rather abruptly narrowed in distal third, outer margin with several blunt tubercles, inner margin (except the distal third) pectinate. The thumb-like projection of 6th joint of 5th leg rather slender, ending in a stout blunt spine, dactyl elongate, spoon-shaped, unguis small but distinct, outer margin (see under *capensis*) serrulate. No gill on base of 5th leg. Telson broader than long, hind margin rounded-truncate, very slightly less than basal width. Both rami of uropod broadly subtriangular. Eggs small and numerous, ·5 mm. diameter, relatively larger than in *capensis* and *africana*.

Length (ovig. ♀) 16 mm.

Locality.—St. Francis Bay (S. Afr. Mus.).

Remarks.—Described from a single ovigerous ♀ returned unidentified by Stebbing, and appendages of another specimen mounted on a slide by Stebbing.

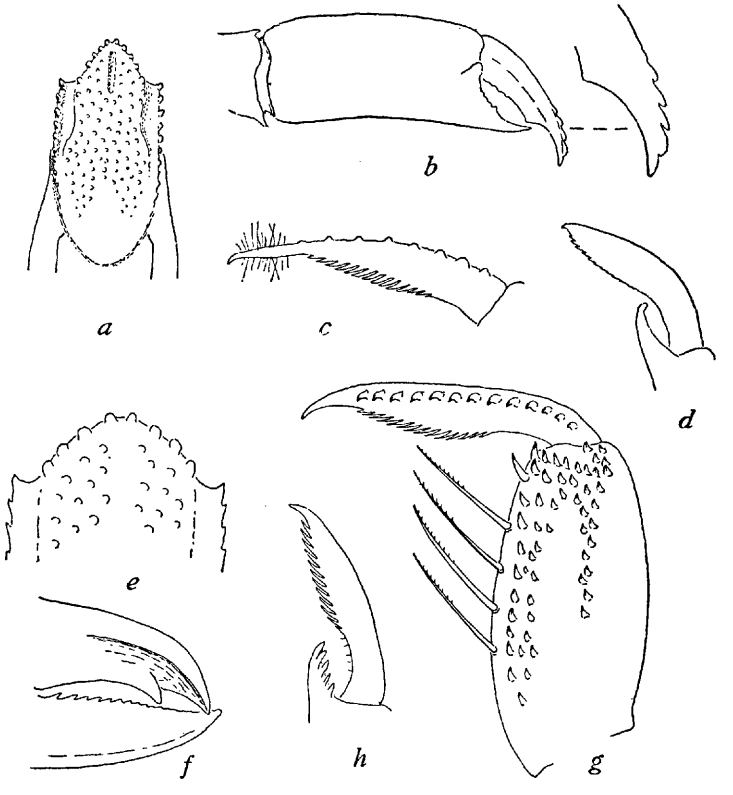

FIG. 97.—*Upogebia assisi* Brnrd. *a*, anterior part of carapace. *b*, outer side of hand of chela, setae omitted, with apex of finger further enlarged. *c*, dactyl of 3rd (and 4th) leg, only apical setae shown. *d*, apex of 6th joint and dactyl of 5th leg, setae omitted.

Upogebia (*Calliadne*) *savignyi* Strahl. *e*, front of carapace. *f*, inner view of apices of finger and thumb of chela. *g*, 6th joint and dactyl of 3rd (and 4th) leg, setae omitted. *h*, apex of 6th joint and dactyl of 5th leg, setae omitted.

Apparently resembles *balssi* de Man 1927 (Red Sea), which has 4 *sharp teeth* on upper distal margin of finger of cheliped. It agrees with *osiridis* Nobili (Red Sea) in having no spinules on antero-lateral border of carapace; thus being one of the species which are intermediate between *Upogebia* s.s. and *Calliadne*.

Subgen. *Calliadne* Strahl

1910. Stebbing, *l. c.*, p. 370.

1928. de Man, *l. c.*, pp. 35, 47 (key to species).

Stebbing regarded it as a matter of personal opinion whether *Calliadne* be given separate generic rank. The distinction (antero-lateral border of carapace without spine, and finger and thumb of cheliped subequal) from *Upogebia* s.s. breaks down, as remarked under the last species, in *osiridis* and *assisi*. And the eggs of the last species are, relatively to the size of the animal, intermediate between those of *capensis* and the very large eggs of *savignyi*.

Most species of *Calliadne* are found in sponges.

Upogebia (*Calliadne*) *savignyi* Strahl

Fig. 97, *e–h*.

1910. Stebbing, *l. c.*, p. 371.

1921. Tattersall, J. Linn. Soc. Lond., xxxiv, p. 395.

1927. de Man, *l. c.*, p. 5, pl. 1, fig. 1 (rostrum).

1928. *Id.*, *l. c.*, pp. 37, 47 (in key).

1937. Gurney, *l. c.*, p. 98, pls. 5, 6 (larval stages).

Rostrum broadly rounded, projecting very slightly, if at all, beyond the level of eyes, with 8–10 granules around margin, separated by a rather wide smooth groove from the lateral serrulate ridges, which project only slightly in front. Dorsal surface of rostrum and carapace anteriorly setose and rather sparsely granulate; no spinule on antero-lateral margin above ant. 2; no spinules on hind margin of cervical groove. Eyes well pigmented. Acicle not distinct. Cheliped robust, lower margin of 4th joint with 5–6 denticles, sometimes obscure, no denticle on upper apex, 5th joint with a small spine on upper and lower apex, 6th joint smooth, upper and lower margins rounded, unarmed, thumb serrulate on inner margin, finger curved, crossing on inside of apex of thumb, its inner surface concave, with tooth on inner margin near middle or nearer the apex. 4th joint of 2nd leg without spinule on upper apex, 5th joint with spine on lower apex. 6th joint of 3rd and 4th legs with 2 bands of strong conical tubercles on outer surface, one near middle and one near lower margin, lower margin with 4 elongate serrulate spine-setae (in addition to other setae), dactyl with a row of strong more or less uncinate tubercles, lower margin pectinate. Thumb-like process of 6th joint of 5th leg with large apical spine and 4 graduated spines, dactyl with lower margin (*in situ*: the

front margin) pectinate. No gill at base of 5th leg. Telson slightly broader than long, not widening distally, hind margin rounded-truncate. Both rami of uropod subtriangular. Eggs large, 1·5–1·75 mm. diameter.

Length 18–19 mm.

Localities.—Off East London (Stebbing); Plettenberg Bay (identified but not recorded by Stebbing), and further specimens from galleries in sponges off East London, 20–50 fathoms (S. Afr. Mus.).

Distribution.—Red Sea.

Remarks.—The Plettenberg Bay specimens do not show the denticles on lower margin of 4th joint of cheliped, and the tooth on the finger is nearer the apex than it is in the East London specimens.

The Bopyrid parasite *Aporobopyroides upogebiae* Nobili 1906 has been recorded in Red Sea examples.

Upogebia (*Calliadne*), cf. *rhadames* Nob.

1904. Nobili, Bull. Mus. d'Hist. Nat. Paris, no. 5, p. 235.
1906. *Id.*, Ann. Sci. Nat. (9), iv, p. 100.
1927. de Man, *l. c.*, p. 6, fig. 2 (rostrum).
1928. *Id.*, *l. c.*, p. 47 (in key).
1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 381.

Rostrum triangular, projecting only slightly beyond eyes, with 5 sharp tubercles on each margin, considerably larger than the granules on dorsal surface, separated by a moderately wide groove from the rather strongly serrate lateral ridges of carapace, the anterior tooth of which is prominent. No spinule on antero-lateral border of carapace; no denticles on cervical groove. Eyes well pigmented. Acicle minute. Cheliped stout, 4th joint denticulate on lower border, 2–4 spines on upper border near apex, 5th with median tooth on lower apex and 2–3 denticles external to it, 6th joint denticulate on lower and on upper margins, the denticles on latter increasing in size distally, cutting-edge of thumb smooth, finger with 2 denticles on upper margin near hinge (more distinct in ♂ than ♀), cutting-edge with tooth near base on inner surface. 2nd leg with tooth on lower apex of 5th joint, lower basal corner of 6th joint distinctly quadrate. 6th joint of 3rd and 4th legs with strong conical tubercles near inner distal apex and near distal half of inner margin, dactyl with a row of strong uncinate tubercles (much larger than in *savignyi*), inner margin pectinate. Thumb-like process of 6th joint of 5th leg with numerous spines on its margin, dactyl pectinate. No gill at base of 5th leg.

Telson about as broad as long, distal margin slightly less than basal width, rounded-truncate. Both rami of uropod broadly subtriangular. Eggs rather numerous, 1 mm. diameter.

Length up to 36 mm. (ovig. ♀). Pale pink.

Locality.—Natal coast, in sponges washed up on beach (S. Afr. Mus.).

Distribution.—Red Sea.

ASTACURA.

1907. Borradaile, Ann. Mag. Nat. Hist. (7), xix, pp. 473, 475.

1917. Bouvier, Res. Sci. Camp. Monaco, fasc. 50, p. 9 (*Homaridae*).

Carapace free from epistome; posterior margin not gripped by processes of 1st abdominal segment. Rostrum well developed. Body cylindrical. Inner lobes of mx. 2 and mxp. 1 not reduced. First 3 pairs of legs chelate, or (in *Enoplometopus*) only first 2 pairs. No appendix interna on pleopods. Outer ramus of uropod divided by a suture (except *Nephropsis suhmi*).

No *Zoea*-stage; the larvae of the marine forms hatch in the Schizopod (Mysis) stage, with natatory exopods on the legs. The Freshwater Crayfishes have a direct development, the young immediately on hatching being almost exactly like the adults.

Remarks.—The Northern Freshwater Crayfishes, *Potamobiidae*, are palaearctic; the Southern Freshwater Crayfishes, *Parastacidae*, are found in Australasia, South America, and Madagascar. The Cape representatives belong to the marine family *Astacidae*.

Family ASTACIDAE.

Lobsters, Norway Lobsters, Homards (Fr.).

1910. Stebbing, *l. c.*, p. 378.

1916. de Man, Siboga Exp. monogr., xxxix*a*, 2, p. 95 (*Nephropsidae*).

1917. Bouvier, *l. c.*, pp. 12–24 (*Homaridae*).

1933. Balss, Mitt. Zool. Mus. Berlin, xix, p. 86 (*Homaridae*).

Last thoracic segment fixed, fused with the preceding segment. Legs 7-jointed, but in the enlarged 1st pair no independent motion between 2nd and 3rd joints. Large foliaceous epipods on first 4 pairs of legs independent of the podobranchs; 4 pleurobranchs. Pleopod 1 uniramous, weak in ♀, but strong, rigid, and more or less channelled in ♂ (without coupling-hooks); pleopod 2 ♂ with rigid appendix masculina; pleopods 2–5 biramous.

Key to the South African Genera.

1. First 3 pairs of legs chelate.
   - *a.* Antennal scale present, more or less foliaceous. Eyes pigmented (figs. 98, 99, *a*).
     - i. Antero-lateral angle of carapace not sharply projecting (*i.e.* no outer orbital spine) . . . *Astacus.*
     - ii. Antero-lateral angle of carapace sharply projecting . . . . . *Nephrops.*
   - *b.* Antennal scale absent. Eyes feeble, not pigmented (fig. 99, *b*) . . . . . *Nephropsis.*
2. First 2 pairs of legs chelate . . . . . *Enoplometopus.*

Gen. ASTACUS Borlase

1758. Borlase, Nat. Hist. Cornwall, p. 274.

1760. Gronovius, Acta Helv., iv, p. 23.

1795. Weber, Nomencl. Ent. Fabric., p. 94 (*Homarus*).

1813–14. Leach, Edin. Encycl., vii, p. 398.

1900. Stebbing, Mar. Invest. S. Afr., i, p. 33 (references).

1910. *Id.*, *l. c.*, p. 378 (with reference to Borlase).

1911. Herrick, Bull. U.S. Bur. Fish., xxix, 1909, pp. 149–408, text-figs. and pls. 28–47 (Nat. Hist. Amer. Lobster, *Homarus*).

1928. Opinion 104. Intern. Comm. Nomencl., Smiths. Misc. Coll., lxxiii, 5, pp. 25, 27 (*Homarus*).

Carapace compact, subcylindrical, cervical groove distinct, antero-lateral angles (outer orbital angles) not prominent. First pair of legs large, sometimes very robust, with strong chelae (pincers).

Remarks.—Three species of marine Lobsters are known: the European *gammarus* (*marinus* or *vulgaris*), the American *americanus*, and the Cape species.

In Opinion 104 the Rule of Priority was suspended and *Astacus* and *Homarus* placed in the official list of generic names: *Astacus* Pallas 1772 * for the river crayfish (*Potamobius*), and *Homarus* Fabr. for the marine lobster. It is thus proposed to condone and "officially" recognize a century of injustice done not only to Leach but to the still earlier author Borlase.

The reason given for this is to avoid confusion. But the confusion for the most part is due to the writers of text-books, who usually are not taxonomists, and who lag behind the advances of taxonomy. In

* Not quoted in Sherborne's Index Anim., 1902 ; Prussian Academy's Nomencl., i, 2, 1926; nor in Neave's Nomencl., i, 1939!

deference to these writers, taxonomists have to suspend their own Rules! Is there any reason why some future "International" Commission should not review and rescind Opinion 104, for surely the Rule of Priority is more fundamental than the opinion of eleven of the eighteen members of the temporary personnel of a Commission?

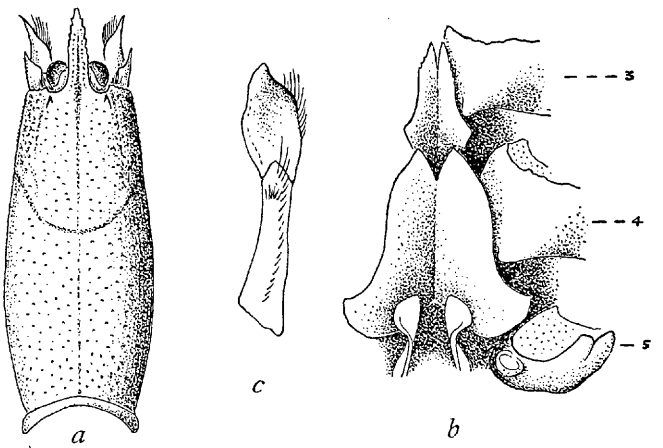

FIG. 98.—*Astacus capensis* Herbst. *a*, carapace. *b*, sternal plates, 3rd–5th coxae, and apices of 1st pleopods ♂. *c*, inner (median) view of left 1st pleopod ♂.

Astacus capensis Herbst

Cape Lobster.

Fig. 98.

1900. Stebbing, *l. c.*, p. 34, and p. 237 (corrigenda).

1902. *Id.*, Mar. Invest. S. Afr., ii, p. 83 (corrigenda repeated).

1910. *Id.*, *l. c.*, p. 378.

1912. Herrick, Science, New York, xxxvi, p. 58 (*Homarus c.*).

1918. Gilchrist, Mar. Biol. Rep., iv, p. 44, fig. (*Homarus c.*).

1918. Barnard in Gilchrist, *ibid.*, p. 48 (*Homarus c.*).

1946. Holthuis, Dec. Macrura Snellius Exp. Temminckia, vii, p. 87 (*Homarus c.*).

Carapace smooth and pitted dorsally, granulate laterally, with scattered setae (obsolete in largest specimen); rostrum dorso-ventrally flattened, no ventral tooth, apex subacute, lateral costate margin with 5–10 serrations, hinder ones very feeble, dorsal surface granulate between costate margins and the median groove; a small post-orbital tooth. Abdomen pitted, with scattered setae, mainly on hinder

segments; telson squamosely sculptured, with numerous setae; a small medio-ventral denticle on segments 2–5 in ♂ (not on 5th segment in largest specimen) and a series of 6–8 denticles on hind margin of 6th sternum. Chelipeds subequal, or one of them slightly the larger, 4th joint granulate and furry below, 5th joint squamose-granulose and hairy, 6th joint with outer margin finely, inner margin strongly, serrate (outer serrations obsolete in largest specimen), lower surface squamose-granulose, chiefly near the margins, and becoming obsolete in largest specimen, upper surface including base of thumb furry, but feebly so in largest specimen; opposed margins of finger and thumb thickly furry in smaller, less so in larger, chela. 5th leg with tuft of setae at apex of 6th joint.

Length ♂ up to 102 mm., carapace 47 mm., cheliped 82 mm. Dark olivaceous (*fide* Gilchrist).

Localities.—Table Bay, Algoa Bay (Stebbing, and S. Afr. Mus.); washed up on beach at Gt. Fish Point (Bathurst Division) (Albany Mus.).

Remarks.—In the register book (in the handwriting of the late Dr. W. F. Purcell) the South African Museum is said to have had a ♂ from Port Elizabeth (no. 1315), a ♀ from Table Bay (no. 1430), and a ♂ and ♀ from Table Bay (no. 1431). The Port Elizabeth ♂ is the largest specimen, referred to above; no. 1430 is a small ♂, and no. 1431 are both ♂♂. In addition there is a ♂ found on Sea Point beach (Table Bay) in July 1936. The Gt. Fish Point specimen, belonging to the Albany Museum, Grahamstown, is also a ♂. I have seen no ♀. According to information received from Dr. Gordon, Stebbing's ♂ specimen is in the British Museum, but not the ♀.

Gen. Nephrops Leach

1813–14. Leach, Edin. Encycl., vii, pp. 398, 400.

1901. Alcock, Ind. Deep-sea Crust., p. 153.

1916. de Man, Siboga Exp. monogr., xxxix*a*, 2, pp. 96, 97 (key to Indo-Pacific species).

1925. Balss, D. Tiefsee Exp., xx, p. 207 (distribution of species).

1938. Gurney, "Discovery" Rep., xvii, p. 294 (larva, sed?).

Carapace more or less laterally compressed, cervical groove distinct, antero-lateral angles prominent and sharp. Eyes large. Antennal scale foliaceous. 1st pair of legs longer and stouter than the other legs, but not heavy and robust, nearly symmetrical. Gills 20 plus

7 epipods (Alcock), but Bouvier (1917, p. 19) gives 19 for *N. norwegicus*, the podobranch on mxp. 2 being absent as in *Nephropsis*.

Remarks.—*N. norwegicus*, the Norway Lobster, is found in the N. Atlantic and Mediterranean; there is one species in Brazilian waters, and the other six species (de Man, 1916) are Indo-Pacific.

Nephrops andamanica Wood-Mason

Fig. 99, *a*.

1894. Wood-Mason, Ann. Mag. Nat. Hist. (6), xiii, p. 226.

1892. *Id.*, Illustr. Zool., R.I.M.S. "Investigator," pl. 4, and 1894. *Ibid.*, pl. 8, fig. 5.

1901. Alcock, *l. c.*, p. 153 (*thomsoni* var. *a.*).

1916. de Man, *l. c.*, p. 99, pl. 3, fig. 15.

1925. Calman, Fish. Mar. Biol. Surv., iv, Spec. Rep. 3, p. 22.

1925. Balss, *l. c.*, p. 207.

1926. Barnard, Trans. Roy. Soc. S. Afr., xiii, p. 127.

Carapace smooth, finely pubescent; rostrum with 1 tooth on each lateral margin and 1 median tooth ventrally; submedian keels each with 3 teeth; behind cervical groove 2 small teeth followed by an irregularly double row of denticles, 3 lateral keels (excl. lower costate margin of carapace) each ending in front in a small denticle. Abdominal segments distinctly sculptured, transverse groove on segment 1 uninterrupted, on segments 2–4 interrupted, the grooves and depressed areas pilose; segment 6 with a spine in middle of lateral margin and a median one on hind margin; telson with a pair of spines proximally, and one at each postero-lateral corner. Chelipeds with 6th joint strongly fluted, the prominent keels serrate or squamose-tuberculate.

Length of carapace incl. rostrum up to ♀ 81 mm. Pinkish or reddish, eggs sky-blue (Balss).

Localities.—Natal coast (off Durban), 220–230 fathoms (Calman); Portuguese East Africa (25° 28′ S., 33° 31′ E.) and off Delagoa Bay, 420 metres and 275 fathoms (Barnard); several localities off Durban and Tongaat River, Natal, 102–460 fathoms (Barnard, *fide* Gilchrist).

Distribution.—Andaman Sea and East Indies.

Remarks.—I have only seen one ♀ (from 25° 28′ S., 33° 31′ E.); the other records given by me in 1926 rested on identifications by the late Dr. Gilchrist.

Gen. NEPHROPSIS Wood-Mason

1902. Stebbing, Mar. Invest. S. Afr., ii, p. 33.

1910. *Id.*, *l. c.*, p. 379.

1916. de Man, *l. c.*, pp. 97, 110 (list of species, key to Indo-Pacific species).

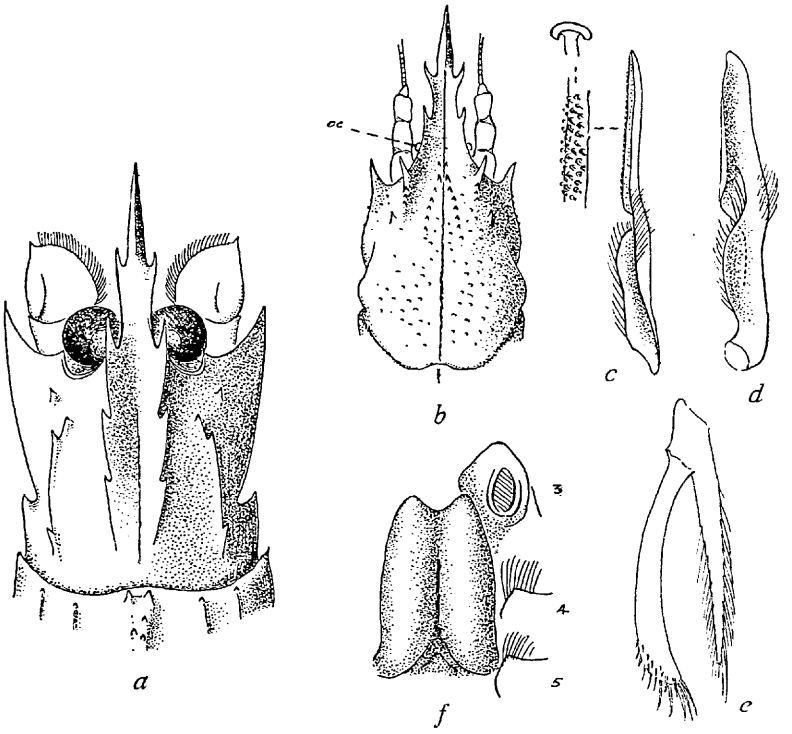

FIG. 99.—*Nephrops andamanica* Wood-Mason. *a*, anterior part of carapace with antennal scales.
Nephropsis atlantica Norman. *b*, anterior part of carapace with eyes (*oc.*) and 2nd antennae. *c*, ventral view of left pleopod 1 ♂ with coupling-hooks further enlarged. *d*, inner (median) view of same. *e*, endopod with appendix masculina of pleopod 2 ♂. *f*, thelycum ♀ and 3rd–5th coxae.

1917. Bouvier, *l. c.*, p. 19 (key to species).

1925. Balss, *l. c.*, p. 208 (distribution of species).

Similar to *Nephrops*, but eyes small, unpigmented, and scarcely differentiated from the eye-stalks; no antennal scale; gills 19 plus 7 epipods, the podobranch on mxp. 2 being absent.

Key to the South African Species.

Outer ramus of uropod with transverse suture in both species.

1. Abdominal segments faintly keeled. A second pair of small spines behind the larger pair at base of rostrum. A spine near middle of anterior border of pleura of 2nd abdominal segment . . . . . *atlantica.*
2. Abdominal segments without any median keel. No second pair of spines behind rostrum . . . *stewarti.*

Nephropsis atlantica Norman

Fig. 99, *b–e.*

1910. Stebbing, *l. c.*, p. 379.

1916. de Man, *l. c.*, p. 112 (in key).

1917. Bouvier, *l. c.*, p. 22, pl. 1, figs. 1–5 (fig. 1 coloured).

1918. Barnard in Gilchrist, Mar. Biol. Rep., iv, p. 48.

1923. Stephensen, Dana Exp. Rep., vii, p. 79.

? 1932. C. von Bonde, Fish. Mar. Biol. Surv. Rep., ix, pp. 59, 61, 63.

Rostrum with usually 2 pairs of lateral teeth, sometimes $2\frac{1}{2}$ or 3, or only $1\frac{1}{2}$ pairs (one being absent from one side or the other). Carapace and chelipeds squamose-granulose, the former finely pilose, the latter tomentose. Abdomen also pilose, but the faint median keel bare. The pair of small spines behind the pair of large ones behind base of rostrum usually distinct, but sometimes obsolescent on one or both sides. 2nd–5th pleurae produced in a sharp spine; anterior margin of 2nd with a denticle (rarely obsolescent), and usually smaller subsidiary denticles (serrations) above it. Coxa of 3rd leg with a hook-like spine projecting backwards, and some denticles nearer the middle line. Pleopod 1 ♂ long, extending forwards between the coxae to the gap between the 1st and 2nd coxae, channelled on its median side, the dorsal edge of the distal half with a series of coupling-hooks; pleopod 1 ♀ slender and feeble. Pleopod 2 ♂ with stout, ensiform appendix masculina, tipped with graduated spines. Eggs large, moderately numerous, 1·5 mm. diameter.

Length of carapace up to ♂ 30 mm., ♀ 33 mm. (total length resp. 68 and 75 mm.). Orange-red.

Localities.—Off Cape Natal (Durban), 440 fathoms (Stebbing, and S. Afr. Mus.); Natal coast, 29° 44′–29° 50′ S. lat., 158–202 fathoms (von Bonde).

Distribution.—N. Atlantic, Arabian Sea.

Remarks.—Stebbing had 4 specimens, and there are 8 others in the South African Museum. I have not seen the specimens identified as this species by von Bonde.

Nephropsis stewarti Wood-Mason

1873. Wood-Mason, J. Asiat. Soc. Bengal, xlii, p. 40, pl. 4.
1896. Alcock, Illustr. Zool. "Investigator," pl. 27, figs. 1, 1, *a*.
1901. *Id.*, *l. c.*, p. 159.
1916. de Man, *l. c.*, p. 112, pl. 3, fig. 17.
1925. Balss, *l. c.*, p. 208.
1925. Calman, Fish. Mar. Biol. Surv. Rep., iv, Spec. Rep. 3, p. 21.
1938. Ramadan, John Murray Exp., v, p. 124, fig. 1 (spermatheca).

Rostrum with one pair of lateral teeth. Carapace, abdomen, and chelipeds with scattered granules, finely pilose. Abdomen without trace of median keels. A single pair of spines behind base of rostrum; a small median gastric tubercle, and another on hind margin of carapace. No denticle on 2nd abdominal pleura. Coxae of 2nd–4th legs in ♂ tuberculate, 3rd coxa with a hooked spine.

Length (total) up to ♂ 147 mm. (Alcock), ♀ 113 mm. (Calman).

Locality.—Off Natal coast (Durban), 230 fathoms (Calman).

Distribution.—Indian Seas, Kei Islands.

Remarks.—Only a single ♀ has been recorded from South African waters.

Gen. ENOPLOMETOPUS M. Edw.

1862. Milne Edwards, Ann. Sc. Nat. (4), xvii, p. 362, and in Maillard, Notes sur l'Île de la Réunion, p. 14.
1894. Ortmann, Semon's Austral. Reise, v, p. 21.
1897. *Id.*, Zool. Jahrb. Abt. Syst., x, p. 274.
1916. de Man, *l. c.*, p. 96 (list of species).
1917. Bouvier, *l. c.*, pp. 12–17.
1922. de Man, Siboga Exp. monogr., xxxix*a*, 4, p. 50.
1933. Balss, Mitt. Zool. Mus. Berlin, xix, p. 87.
1938. Gurney, "Discovery" Rep., xvii, pp. 296–299 (larval stages).
1946. Holthuis, Dec. Macrura Snellius Exp. Temminckia, vii, p. 72 (key to species).
1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 381.

Carapace compact, somewhat compressed from side to side, cervical groove obsolescent, antero-lateral angles not prominent. Only the first two pairs of legs chelate, 1st pair large, with strong pincers.

Thelycum in ♀ present. Appendages present on 1st abdominal segment in both ♂ and ♀; no appendix interna on pleopods 2–5, but an appendix masculina on pleopod 2 ♂.

Remarks.—de Man (1922, *l. c.*, p. 51, and also 1921, Zool. Med., vi, p. 94), examining 1 young ♀ of *occidentalis*, and 2 specimens of *longirostris* (all about 23 mm. long), found that appendages were absent on the 1st abdominal segment, and that an appendix interna was present on pleopods 2–5. It is a little ambiguous whether this statement applies to all three specimens. The specimen of *occidentalis* was definitely stated to be a young ♀, yet de Man said he "did not succeed in detecting genital apertures in one of the 3 specimens before me." Does "one" mean "*one* of the three" (and that in the *other two* he *did* find genital apertures; or does it mean he could not find the apertures in "any" of the three? The description and figure of the appendix interna refers to the *longirostris* specimen from Siboga St. 37.

Gurney (1938) has accepted this statement as applying to both species, and hence to the genus. He uses de Man's observations on the abdominal appendages, together with the erroneous statement that only the first pair of legs is chelate, to suggest the exclusion of *Enoplometopus* (and *Eutrichocheles*) from the Lobster family and its inclusion in the *Axiidae* (*Thalassinidea*).

My observations show that *E. occidentalis* is a Lobster as regards the pleopods and the presence of a thelycum. Holthuis (*l. c.*, p. 84) retains *longirostris* de Man as a species, while recognizing it as a post-larval stage, possibly of *occidentalis*. Hence there are probably only three species in the genus, or only two if *dentatus* Miers from St. Helena is synonymous with *antillensis* Lütken from the West Indies.

Tropical Atlantic, Indian and Pacific Oceans.

Enoplometopus occidentalis (Randall)

Fig. 100.

1839. Randall, J. Ac. Nat. Sci. Philad., viii, p. 139 (*Nephrops o.*).

1862. Milne Edwards, *l. c.*, p. 15, pl. 19, figs. 1–1, *c* (*pictus*).

? 1880. Miers, Ann. Mag. Nat. Hist. (5), v, p. 380 (*pictus*, ? non M. Edw.).

? 1887. de Man, Arch. Naturg., liii, p. 487, pl. 21, fig. 3 (*pictus*, ? non M. Edw.).

1906. Rathbun, Bull. U.S. Fish. Comm. for 1903, pt. 3, p. 900, pl. 17, fig. 2.

1910. Bouvier, Bull. Mus. d'Hist. Nat. Paris, p. 376.

1915. *Id.*, Bull. Sc. Fr. Belge, xlviii, p. 182, figs.

1921. de Man, Zool. Med., vi, p. 94.
1922. *Id.*, *l. c.*, pp. 50, 51 (compared with *longirostris*).
1924. *Id.*, Arch. Naturg., xc, p. 57, fig. 20 (thelycum).
1933. Balss, *l. c.*, p. 87.
1934. Barnard, Nature, cxxxiv, p. 665 (occurrence in S. Africa).
1942. Ward, Mauritius Inst. Bull., ii, p. 61 (*pictus*).

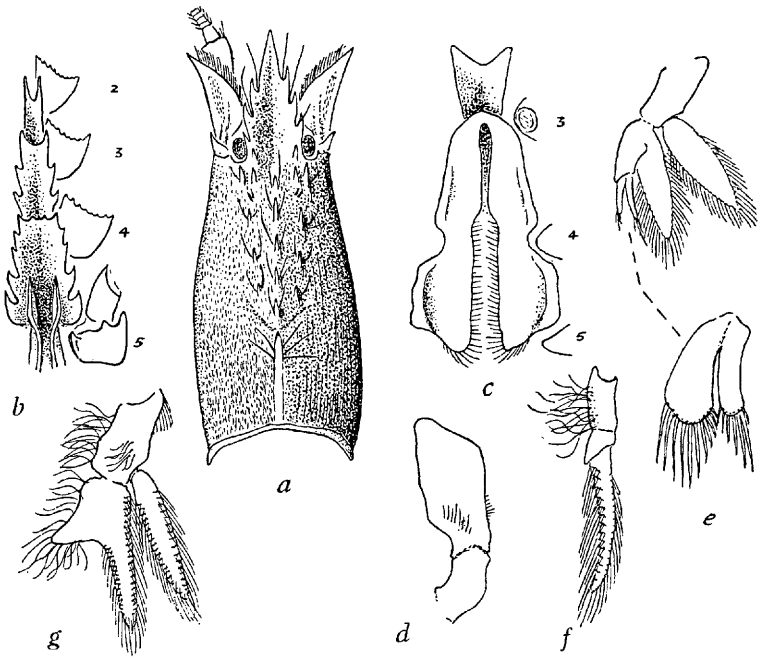

FIG. 100.—*Enoplometopus occidentalis* (Randall). *a*, carapace. *b*, sternal plates, 2nd–5th coxae, and apices of 1st pleopods ♂. *c*, thelycum ♀. *d*, inner (median) view of left 1st pleopod ♂. *e*, anterior view of left 2nd pleopod ♂, with bifid appendix masculina further enlarged (in side view). *f*, 1st pleopod ♀. *g*, 2nd pleopod ♀.

1946. Holthuis, *l. c.*, p. 74, pl. 5, figs. *a*, *c*, *f*, *i*).
1947. Barnard, *l. c.*, p. 382.

Rostrum dorso-ventrally flattened, extending to level of apex (or a trifle beyond) of the lanceolate antennal scale, with 3 (♂) or 4 (♀) lateral teeth (not quite symmetrical), no ventral teeth. Carapace with a medio-dorsal series of 6 spines, only one (the 6th) behind the very inconspicuous cervical groove, a submedian series of 6 spines, the 1st near inner orbital margin, the 3rd inconspicuous, especially in ♂, the last in front of cervical groove, a post-ocular spine; associated

with all these spines and the rostral teeth are long stiff bristles, either singly, or in twos and threes, or in tufts of bristles of unequal length. Occasional bristles scattered over carapace, which is densely pilose except on the spines, the median line behind last median spine, and the costate hind margin. Terga of abdominal segments (except 1st), inner ramus of uropod, and telson with long stiff bristles, arising from low adpressed squamae. Hind margin of 6th abdominal segment transverse, without projecting spines. Telson subquadrangular, apical margin truncate, only slightly convex. Pleura of abdominal segment 1 rounded, concealed by the enlarged and forwardly produced pleura of segment 2, pleurae of segments 3–6 rounded-quadrate. No denticle on margin of any of the pleurae. Telson with a spine on middle of lateral margin, and 2–3 unequal-sized spines at end of lateral margin. Terga and pleurae pilose, but the margins, a medio-dorsal stripe and the squamae bare. Sternal plates of ♂ laterally spinose. 2nd joint of antennal peduncle with spine on lower border external to opening of gland. Chelipeds in ♀ equal; a double row of 6–7 spines on upper margin of 4th joint, proximally only a single row of 3–4, a single row on each of lower margins; outer and inner margins of hand spinose, a series of spines along middle of hand on both upper and lower surfaces, opposed margins of finger and thumb with numerous rather small teeth, more or less equal, but 2–3 near base of finger rather larger, whole of outer margin of finger spinose; all joints pilose (except near median row of spines on lower surface of hand) and with long bristle-hairs, the latter especially numerous on the hand, finger, and thumb. Pleopod 1 ♂ a strong cultrate plate set dorso-ventrally parallel with its fellow; the bifid appendix masculina on pleopod 2 ♂ also set in the same plane, at right angles to the endopod and exopod. Distal margin of tail-fan with thick fringe of plumose spine-setae.

Length ♀ 145 mm., carapace 66 mm.; ♂ 96 mm. and 38 mm. resp.; length of hand to end of thumb ♀ 58 mm., finger 25 mm. Pale-coloured spots across abdominal segments, a white bar across the 6th medio-dorsal spine on carapace, 2nd–5th legs with narrow pale rings on 4th joints.

Localities.—Natal coast, 1 ♂ from stomach of fish (S. Afr. Mus.); Isipingo, Natal, 1 ♀ (Durban Mus.).

Distribution.—Hawaiian Is., East Indies, Réunion, Mauritius.

Remarks.—According to Bouvier (1915, *l. c.*) the specimens referred to *pictus* by Miers, de Man, and Ortmann are really *occidentalis*. The true *pictus* M. Edw. from Réunion has no post-cervical spine.

I have seen the dried ♀ ex Durban Museum, and a ♂ taken from a fish stomach, the latter lacking both chelipeds and some of the other legs. In the latter I have attempted to check the gill-formula, but the gills are very much matted together and not in perfect condition. The formula appears, however, to correspond with that of the Lobster and *Nephrops*, *i.e.* 6 podobranchs plus 7 epipods, 10 arthrobranchs and 4 pleurobranchs = 20 + 7 epipods.

PALINURA.

1907. Borradaile, Ann. Mag. Nat. Hist. (7), xix, pp. 473, 474.

Carapace fused at sides to epistome; hind margin gripped by processes of 1st abdominal segment. Rostrum small or wanting (except *Palinurellus*). Body often depressed. Inner lobes of mx. 2 and mxp. 1 reduced. Appendix interna on some of the pleopods, at least in ♀. Outer ramus of uropod without sharp suture.

Key to the Families.

1. All legs 6-jointed, none of them much larger than the others; none of them, except the last pair in ♀, chelate.* Telson more or less truncate (*Scyllaridea*).
   - *a*. Carapace subcylindrical. Eyes not enclosed in orbits (figs. 101, 102, *i*). Ant. 2 with long whip-like flagellum . . . . . *Palinuridae.*
   - *b*. Carapace depressed. Eyes in orbits. Ant. 2 short, flattened, without whip-like flagellum (fig. 104, *c*, *e*) *Scyllaridae.*

2. All legs 7-jointed, and all, except sometimes the last (5th), chelate; the 1st pair much longer than the others. Eyes rudimentary, eye-stalks immovable (fig. 105, *a*). Telson pointed (*Eryonidea*) . . . . . *Eryonidae.*

Family Palinuridae.

Crayfishes,† *Spiny Lobsters*, *Langoustes* (Fr.).

1911. Gruvel, Ann. Inst. ocean. Paris, iii, fasc. 4, pp. 5 *sqq.* (anatomy, systematics, etc.).‡

* *Palinurus longimanus* has the 1st pair feebly chelate.

† "Crayfish" is derived from écrevisse, the French name for the European River Crayfish (*Potamobius*). By corruption "Crayfish" has become "Crawfish," which is often (in South Africa usually) applied to the marine forms.

‡ This paper mentions neither *J. parkeri* nor *P. gilchristi*. It is useful, but, from a taxonomic point of view, inadequate.

1911. *Id.*, Rev. Zool. Afr., i, p. 141 (West African).

1913. Bouvier, Trans. 2nd Intern. Congr. Entomol., Oxford, ii, p. 78 (*Puerulus* stage).

1916. de Man, Siboga Exp. monogr., xxxix*a*, 2, pp. 31 *sqq.*

1918. Barnard in Gilchrist, Mar. Biol. Rep., iv, p. 49.

1936. Gurney, "Discovery" Rep., xii, p. 400 (*Phyllosoma* stage).

1946. Holthuis, Dec. Macrura Snellius Exp. Temminckia, vii, p. 109 (key to genera).

Carapace more or less cylindrical, gripped between a dorsal lobe of 1st abdominal segment overlapping hind margin externally, and an internal knob on the side of last thoracic segment. The true 2nd and 3rd joints of legs are fused, so that there appear to be only 6 joints in all. No appendages on 1st abdominal segment (except *Palinurellus*); 2nd–5th pleopods (*i.e.* the appendages of 2nd–5th segments) in ♂ uniramous,* lamellate; in ♀ biramous, endopod of 2nd pleopod usually broadly lamellate like the exopod (exceptions: *Linuparus* and *Puerulus*†), but not lamellate in 3rd–5th pleopods, and with appendix interna. A small chela on 5th leg in ♀.

Development.—The eggs after extrusion are carried attached to the pleopods of the female. In *Jasus lalandii* the first larval stage is a *Naupliosoma* (Gilchrist, 1913) which develops into a *Phyllosoma*, which is the typical form of larva in the *Palinuridae*. It is flattened, leaf-like, transparent, and pelagic (see *infra*). Several such stages are passed through before the cylindrical adult shape is assumed, the first of these latter stages having been called the *Puerulus*-stage or Natant-stage.

Remarks.—The stridulating organ consists of a striate area and a polished knob on the under surface of a projection on the inner margin of 3rd peduncular joint of the 2nd antenna, sometimes with a band of setae anteriorly (fig. 102, *c*), and posteriorly adjoining the fleshy pad which continues into the membranous articulation at base of 3rd joint; this slides over the smooth and thickened lateral edges of the antennular plate (see also *Challenger* Rep., xxiv, pl. 10A, fig. C).

* Hale (S. Austral. Crust., pt. 1, fig. 65, *a*, 1927) shows a short rod-like endopod on the "1st" (*i.e.* 2nd) pleopod in ♂ of *J. lalandii*. See also Holthuis, *l. c.*, p. 115.

† See Calman, 1909, Ann. Mag. Nat. Hist. (8), iii, p. 442.

Key to the South African [Mauritian] Genera.

I. Rostrum small or wanting.
  A. No stridulating organ. A small pointed rostrum clasped by lateral processes and separating the eye-stalks medianly (fig. 101, *a*). Flagella of ant. 1 short. Bases of ant. 2 close together (*Silentes*) . . . . . *Jasus.*
  B. Stridulating organ present. Rostrum absent, bases of eye-stalks exposed (*Stridentes*).
    1. Antennular plate narrow, unarmed (figs. 101, *c*, 102, *a*). Bases of ant. 2 close together, hiding bases of ant. 1, flagella of latter short.
      a. Frontal processes obliquely flattened, acute, rather large (fig. 101, *c*). 1st peduncular joint of ant. 1 not extending to end of peduncle of ant. 2 . . . *Palinurus.*
      b. Frontal processes horizontally flattened, blunt, short (fig. 102, *a*). 1st peduncular joint of ant. 1 extending beyond apex of peduncle of ant. 2 . . *Palinustus.*
      c. Frontal processes fused. Flagellum ant. 2 stout, shorter than length of animal . *Linuparus.* (See Addenda.)
    2. Antennular plate broad, spinose (fig. 102, *c*, *e*, *f*). Bases of ant. 2 rather far apart, not hiding bases of ant. 1, flagella of latter long . . *Panulirus.*
II. A well-developed triangular rostrum. Carapace and abdomen dorsally pitted . . . [*Palinurellus*, Mauritius].

Gen. Jasus Parker

1902. Stebbing, Mar. Invest. S. Afr., ii, p. 38.
1910. *Id.*, *l. c.*, p. 374.
1911. Gruvel, *l. c.*, p. 10.
1946. Hickman, Proc. Roy. Soc. Tasman. for 1945, pp. 27, 57 (biology, abnormal reproductive organs).

See key. 2nd peduncular joint of ant. 1 shorter than 3rd (adult).*

* Willem von Bonde (1930, Fish. Mar. Biol. Surv. Rep., viii, Spec. Rep., 1, p. 9) claims that the peduncular joints of the 1st antenna show a constant ratio, in the *Phyllosoma*, *Puerulus*, and adult, in three South African genera. I cannot confirm this. *Jasus* and *Palinurus* (and *Palinustus*) agree in having the 2nd joint shorter than the 3rd; *Panulirus* has the 3rd a little shorter than the 2nd. But the actual ratios given by von Bonde for *Jasus* and *Palinurus* are not constant in the adult, and the two genera cannot be separated by their 1st antennae alone.

Endopod of 3rd–5th pleopods ♀ oblong, not produced (or only slightly) on its outer apex. Appendix interna on pleopod 2 ♀ present but small. The chela on 5th leg ♀ formed by the 7th joint (dactyl) impinging against a spiniform projection of the 6th joint (fig. 101, *b*); this process may be slightly flexible, but is not articulated with the 6th joint (Hale (1927, *l. c.*, p. 69) seems to suggest in his text and fig. 65, *c*, that it is articulated). Coxal joint of 5th leg ♂ not enlarged; vas deferens opening on a tubercle with the orifice guarded by a small trap-door-like flap *within* the rim of the tubercle.

Remarks.—The genus is confined to the Southern Hemisphere.

Key to the South African Species.

1. Frontal processes parallel. Cervical groove distinct. Abdomen squamose . . . . . *lalandii.*
2. Frontal processes diverging. Cervical groove obsolete. Abdomen with a median keel on first 5 segments, otherwise smooth . . . . . *parkeri.*

Jasus lalandii (Lam., M. Edw.)

Cape Crayfish; Kreef.

Fig. 101, *a*, *b*.

1910. Stebbing, *l. c.*, p. 374.

1913. Gilchrist, Mar. Biol. Rep., i, pp. 25 *sqq.* (distribution, sex differences, etc.).

1913. *Id.*, J. Linn. Soc. Lond., xxxii, p. 225, fig. (*Naupliosoma* stage).

1914. Lenz and Strunck, D. Sudpol Exp., xv, p. 292.

1916. Balss, Beitr. Meeresf. Westafr., ii, p. 31.

1916 (Oct.). Archey, Trans. New Zeal. Inst., xlviii, p. 398, figs. 1–6, *a*, and pl. 29, fig. 3.

1916 (Nov.). Gilchrist, J. Linn. Soc. Lond., xxxiii, p. 101, 12 text-figs., and pls. 12–17 (larval and post-larval stages).

1918. *Id.*, Mar. Biol. Rep., iv, p. 46, fig., and Barnard, *ibid.*, p. 49.

1920. *Id.*, J. Linn. Soc. Lond., xxxiv, p. 189, text-figs. 1–13 and pls. 15, 16 (post-*Puerulus* stage).

1923. Odhner, Medd. Göteb. Mus., xxxi, p. 24.

1924. Balss in Skottsberg, Nat. Hist. Juan Fernandez and Easter Is., iii, p. 333 (date *apud* Zool. Rec. 1929).

1927. Hale, S. Austral. Crust., pt. 1, p. 65, figs. 62, 65–67.

1935. Cecil von Bonde and Marchand, Fish. Mar. Biol. Surv., Fisheries Bull., i, pp. 8–25, pls. 1–8 (anatomy, development, etc., maps 1–9 fishing grounds).

1936. Gurney, "Discovery" Rep., xii, pp. 416–425, figs. 28, 29 (*Phyllosoma*).

1936. Cecil von Bonde, Fish. Mar. Biol. Surv., Investigat. Rep., 6, pp. 5–25, pls. 1–12 (embryology, development).

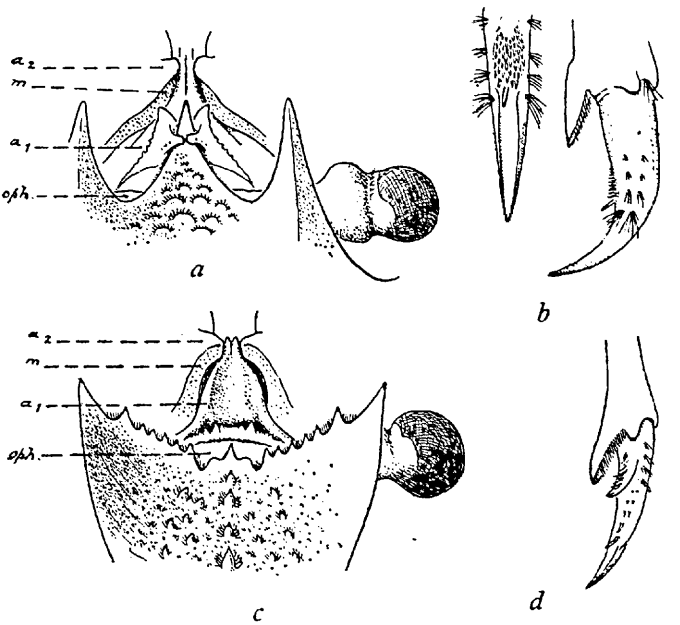

FIG. 101.—*Jasus lalandii* (Lam., M. Edw.). *a*, frontal area, showing base of antenna 2 (a_2), membranous articulation (*m*), antennular segment (a_1) and base of eye-stalk (*oph.*). *b*, apex of 6th joint and dactyl of 5th leg ♀, with inner view of dactyl.

Palinurus gilchristi Stebb. *c*, frontal region, as in *a*, but *oph.* here indicates the ophthalmic segment. *d*, apex of 6th joint and dactyl of 5th leg ♀.

1938. *Id.*, Cape Naturalist, vol. 1, no. 5, pp. 143–154, figs. 1–5 (popular account).

1942. Gurney, Larvae Decap. Crust. Ray Soc., no. 129, p. 97 (distribution).

1946. Holthuis, *l. c.*, p. 146 (references).

[Papers dealing exclusively with economic aspects not quoted.]

Carapace with flattened squamose tubercles of various sizes, each sharp pointed and with a fringe of setae around base. Abdomen with rounded squamae, also fringed with setae, the penultimate transverse

row better developed than the others, so that a more or less conspicuous groove is formed between it and the hindmost row.

Length up to 460 mm. (18 inches) (510 mm. = 20 inches: Australia). Reddish brown, often with purplish or violescent tints in places, especially on tail-fan, under surface dull yellowish, flagellum of antennae often with pale bands.

Localities.—From Cape Cross (north of Walfish Bay) to Cape Point, occasional specimens from False Bay and Agulhas Bank (*e.g.* Odhner, 1923) as far east as Algoa Bay, 0–25 fathoms.

Distribution.—Chile (Balss, 1924, says not Chile), Juan Fernandez, Tristan d'Acunha, St. Paul Is. (southern Indian Ocean), southern Australia, Tasmania, New Zealand.

Remarks.—The Cape Crayfish is the only Crustacean which is of any real economic importance in South Africa. The economic aspects are dealt with in various reports of the Cape Government Biologist (1896–1906), Marine Biological Reports (1913–1918, Administration of the Cape Province), and the Fisheries and Marine Biological Survey Reports (1921→, Union of S. Afr.).

The distribution is subantarctic, the cold Humboldt current permitting its extension to Juan Fernandez. According to Parker (1887) there are constant differences between the New Zealand form (var. *edwardsii* Hutton 1875) and the typical Cape form. The Australasian *verreauxi* (M. Edw.) 1851 differs in having only a few scattered nodules and no transverse grooves on the abdominal segments (*cf.* Gruvel, 1911, *l. c.*, pl. 3, fig. 1).

Jasus parkeri Stebb.

Parker's Crayfish.

1902. Stebbing, Mar. Invest. S. Afr., ii, p. 39, pl. 7.

1910. *Id.*, *l. c.*, p. 375.

1946. Holthuis, *l. c.*, pp. 110, 148.

Carapace smooth, with a submedian and a lateral longitudinal series of spines on either side. Abdomen smooth, a median keel on segments 1–5, and a few spines on segment 6. Chela on 5th leg ♀ as in *lalandii*.

Length ♂ up to 134 mm., ♀ 152 mm. Orange or orange-red (as preserved), flagella of 1st antenna, 5th and 6th joints of legs, and membranous part of tail-fan pale.

Locality.—Off East London, 250–310 fathoms (Stebbing, and S. Afr. Mus.).

Remarks.—Larger specimens agree with Stebbing's description, and

the ♀ is like the ♂ (except for usual sexual differences). The submedian spines on carapace are constant (8 in 10 specimens additional to the type), but the lateral series are slightly variable in number. Smallest specimen examined 74 mm. long.

Although Stebbing says the armature of this species is unique, there is a close resemblance to *Panulirus angulatus* Bate (*Challenger* Rep., xxiv, pl. xi, figs. 2–4), of which *carinatus* Borrad. 1910 seems clearly to be a synonym.

Holthuis (p. 148) removes this species to the genus *Puerulus*, to which it belongs, he says, according to the "description and figure"; "it has, for instance, a distinct stridulating organ." Stebbing made no mention of any such organ, and such an organ is not present in this species. The 2nd pleopod in ♀ resembles that of *lalandii*.

Gen. Palinurus Fabr.

1900. Stebbing, Mar. Invest. S. Afr., i, p. 29.

1910. *Id.*, *l. c.*, p. 373.

1911. Gruvel, *l. c.*, p. 16 (part).

1936. Gurney, "Discovery" Rep., xii, p. 401 (*Phyllosoma*).

See key. 2nd peduncular joint of ant. 1 shorter than 3rd joint (adult). Endopod of 3rd–5th pleopods ♀ deeply forked, bearing the appendix interna at apex of inner fork; appendix interna on pleopod 2 ♀ present but small. The chela on 5th leg ♀ is formed by a basal process of the 7th joint impinging against the conically produced apex of 6th joint (fig. 101, *d*). Coxal joint of 5th leg ♂ not enlarged, opening of vas deferens as in *Jasus* (see also Miers, 1882, Proc. Zool. Soc. Lond., p. 541).

Remarks.—As here defined, the genus contains *vulgaris* (Western Europe, Mediterranean, N.W. Africa), *longimanus* (West Indies, with a variety from Mauritius), and *gilchristi*.

Key to the South African [and Mauritian] Species.

1. Abdominal segments with 2 rather wide transverse grooves. 1st pair of legs not enlarged, not chelate. Hind (upper) margin of frontal processes smooth . . . . . *gilchristi*.
2. Abdominal segments with 4 narrow grooves, some of them incomplete. 1st pair of legs long, robust, chelate, finger falcate and closing against a process of 6th joint. Hind (upper) margin of frontal processes each with 2 smaller spines . . . . . [*longimanus* var. *mauritianus*].

A brief description of the latter is here included.

Palinurus gilchristi Stebb.

Gilchrist's Crayfish.

Fig. 101, *c*, *d*.

1900. Stebbing, *l. c.*, p. 31, pl. 1.

1910. *Id.*, *l. c.*, p. 374.

1914. Selbie, Fish. Ireland Sci. Invest., i, p. 44 (quoted from Calman, 1925).

1936. Gurney, *l. c.*, p. 401, fig. 14 (*Phyllosoma*).

Frontal (ocular) processes far apart, splayed outwards (as in *vulgaris* var. *mauritanicus*, hind (upper) margin smooth, front margin with 4–6 teeth. The two submedian rows of spines on carapace are subparallel in front of the cervical groove, convergent behind. 1st pair of legs slightly shorter, only moderately stouter, than the others; 4th and 5th joints triquetral in cross-section, with a longitudinal groove on outer surface, the groove on 4th joint (incl. that of 1st leg) thickly pilose. Pleurae of abdominal segments 2–6 not so strongly dentate as in *vulgaris*. Abdominal segments 2–5 with a longitudinal groove on either side of the median keel, connecting the anterior and posterior transverse grooves, and forming an **H**-shaped sculpturing; all the grooves thickly pilose (the anterior groove is obsolete in *vulgaris*). Sternum roughly granulose, with 4 larger double tubercles medianly. Ventral surface of 6th abdominal segment in ♂ with a patch of spines.

Length ♂ up to 158 mm., ♀ 310 mm. (carapace length resp. 55 and 100 mm.). Orange or reddish, banded with yellowish white on abdomen, antennae, and legs; the pale marks on abdomen are mostly at the sides and oblique.

Localities.—False Bay and Agulhas Bank to Algoa Bay, 30–60 fathoms. Juveniles are occasionally found in Table Bay.

var. *natalensis* Brnrd.

1921. Gilchrist, Fish. Mar. Biol. Surv., Rep. i (1920), pp. 5, 16, pl. 7 (localities).

1922. *Id.*, *ibid.*, Rep. ii (1921), p. 1 (localities).

1923. Stebbing, *ibid.*, Rep. iii, Spec. Rep. 3, p. 7.

1925. Calman, *ibid.*, Rep. iv, Spec. Rep. 3, p. 21 (locality).

1925. Gilchrist, *ibid.*, Rep. iv, *passim* (localities).

1926. Barnard, Trans. Roy. Soc. S. Afr., xiii, p. 125.

1928. Cecil von Bonde, Fish. Mar. Biol. Surv., Rep. v, *passim* (localities).

1932. *Id.*, *ibid.*, Rep. ix, *passim* (localities).

1933. *Id.*, *ibid.*, Rep. x, *passim* (localities).

Resembles the following variety as regards smoothness of carapace, smooth legs and sternum, and the two points on under surface of 6th abdominal segment in ♂; but as regards sculpturing on upper surface of 2nd–5th abdominal segments is intermediate between typical *gilchristi* and var. *delagoae*.

Localities.—Natal coast, from off Umkomaas in the south as far north as off Tugela River mouth, and apparently extending farther north into the area of var. *delagoae*, 100–260 fathoms.

var. *delagoae* Brnrd.

1926. Barnard, *l. c.*, p. 123, pl. xi.

Carapace less spinose anteriorly, the groups of setae around bases of spines less well developed, anteriorly almost or quite obsolete. No longitudinal groove on either side of the median keel on abdominal segments 2–5 connecting the anterior and posterior transverse grooves; grooves shallower than in typical form, and almost or completely devoid of pilosity. 4th and 5th joints of legs subcylindrical (subtriquetral in 1st leg), 4th joint with longitudinal groove, 5th joint with slight groove (strongest on 1st leg), no pilosity. Sternum smooth except for the 4 median double tubercles and a few feeble rounded granules laterally. Ventral surface of 6th abdominal segment ♂ with only 2 small, blunt points.

Length ♂ up to 244 mm., carapace length 94 mm., carapace of a larger, but incomplete specimen measures 108 mm.

Localities.—Portuguese East Africa (25° 58′ S., 33° 5′ E.), 228 metres. Two other localities (in Gilchrist, 1922, Fish. Mar. Biol. Surv., Rep. ii), viz. 25° 51′ S., 33° 31′ E., and 26° S., 33° 19′ E. probably refer to this variety.

Remarks.—The s.s. *Pieter Faure* obtained no specimens east of Algoa Bay. Later trawling vessels, the s.s. *Pickle* and *Africana*, seem to have done little work between Algoa Bay and Natal, and there are no records of crayfish. From off Umkomaas and Illovo (approx. 30° 9′ S.) northwards Gilchrist's Crayfish becomes abundant and extends to the Delagoa Bay area.

In describing the two varieties it was pointed out that they were more closely related to one another than either of them to the typical

gilchristi, and that *delagoae* (incl. *natalensis*) appears to be a distinctive race in process of differentiation in deep water.

I have seen none of the abundant material obtained by the survey vessels, except the specimens (2 *delagoae*, 1 *natalensis*) originally submitted to me.

The differences between the typical form and *delagoae* offer a curious parallelism with those between *vulgaris* and its var. *mauritanicus* (*cf.* Gruvel, *l. c.*, 1911, p. 22, pl. 1, fig. 4): the latter has the carapace less spinose, squamose, and pilose, the sternites (except the 1st) are non-spinose, and the abdominal grooves are non-pilose. Gruvel does not mention the legs, but his figure of *vulgaris* f. *typica* (pl. 4, fig. 1) seems to show pilose grooves.

Palinurus longimanus M. Edw.

1837. Milne Edwards, Hist. Nat. Crust., ii, p. 294.

1882. Miers, Proc. Zool. Soc. Lond., p. 540, pl. 36, fig. 1 (var. *mauritianus*).

1911. Gruvel, *l. c.*, pp. 17, 18, fig. 7, and pl. 1, fig. 3.

1946. Holthuis, *l. c.*, p. 115 (*Justitia l.*) (references).

Frontal processes each with 2 smaller spines on hind (upper) margin; frontal margin with the median spine flanked by 2 spines, and followed by 3 median spines; no submedian paired spines either in front of or behind cervical groove, but about 8 spines in a transverse row immediately behind the groove. 1st pair of legs much longer and stouter than the others, 6th joint with a process on inner apex against which the abruptly curved, falcate finger impinges. Abdominal segments with narrow transverse grooves, usually 4, but some of them interrupted or incomplete.

Length 152 mm. (carapace 50 mm.). (As dried) red blotched with yellow, abdominal segments dotted with yellow, with a series of yellow spots on hind margins of 1st–5th segments, legs orange-yellow with paler spots (Miers). The typical form from the West Indies, the variety from Mauritius.

Remarks.—Holthuis has created the new genus *Justitia* for this species.

Gen. Palinustus M. Edw.

1880. Milne Edwards, Bull. Mus. Comp. Zool. Harv., viii, p. 66.

1911. Gruvel, *l. c.*, pp. 18–20 (*Palinurus* part).

1946. Holthuis, *l. c.*, p. 116.

See key. 2nd peduncular joint of ant. 1 shorter than 3rd joint.

Chela of 5th leg ♀ as in *Palinurus* (Gruvel, fig. 8, *d*). Coxal joint of 5th leg ♂ not enlarged, but genital opening on a short tubercle, apically setose and guarded by a membranous flap which closes *over* the rim of the tubercle.

Remarks.—Until 1929 only one ♀ was known (in Paris Museum), identified by Gruvel as *truncatus* M. Edw., West Indies. Gruvel does not describe the abdominal appendages. He considers that there are no real differences from *Palinurus*. Nevertheless the character of the frontal processes, the length of the 1st antennae, and the coxal tubercle on 5th leg ♂ are so distinctive that *Palinustus* should be at least a subgenus. Holthuis says it differs from all other Palinurid genera by possessing pleopods on 1st abdominal segment in ♀.

Palinustus mossambicus Brnrd.

Fig. 102, *a*, *b*.

1926. Barnard, Trans. Roy. Soc. S. Afr., xiii, p. 126, pl. xi.

1946. Holthuis, *l. c.*, p. 117, pl. vi, figs. *f–j*, pl. vii, figs. *f–h*, pl. x, figs. *a*, *b*, pl. xi, figs. *g*, *h*.

Carapace granulate, tuberculate, and pilose. Sternum and abdomen also pilose. Frontal margin with a pair of spines, but otherwise unarmed between the frontal processes. Upper and lower margins of 4th joint of 1st, 3rd, and 4th legs spinose (2nd and 5th legs missing). Mxp. 3 and all legs with long stiff hairs. Epistome with 6 denticles on middle lobe (2 median, flanked by 2 pairs), and 4 on lateral lobes.

Length 95 mm. (carapace 30 mm.). Salmon-red, crimson across front of carapace, abdomen with white spots on hind margins of segments and an oblique white line laterally on 2nd–5th segments, apices of pleurae also white; 1st antenna banded with white, flagella crimson; legs spotted and banded with white.

Locality.—Portuguese East Africa (25° S., 33° 10′ E.), 406 metres (Barnard).

Distribution.—East Indies (6° 58′ N., 121° 52′ E.), 72–80 metres (Holthuis).

Remarks.—Only the type ♂ was known until the Snellius Expedition captured 4 ♂♂ and 1 ♀ in 1929. Distinguished from *truncatus* M. Edw. (see Gruvel, 1911, *l. c.*, p. 18, fig. 8, and pl. 2, figs. 2, 3) by the absence of a median spine on frontal margin, which moreover has only 2 spines.

The East Indies specimens differ in having 4–6 small spines on frontal margin of carapace, instead of 2 strong spines, and in other minor details.

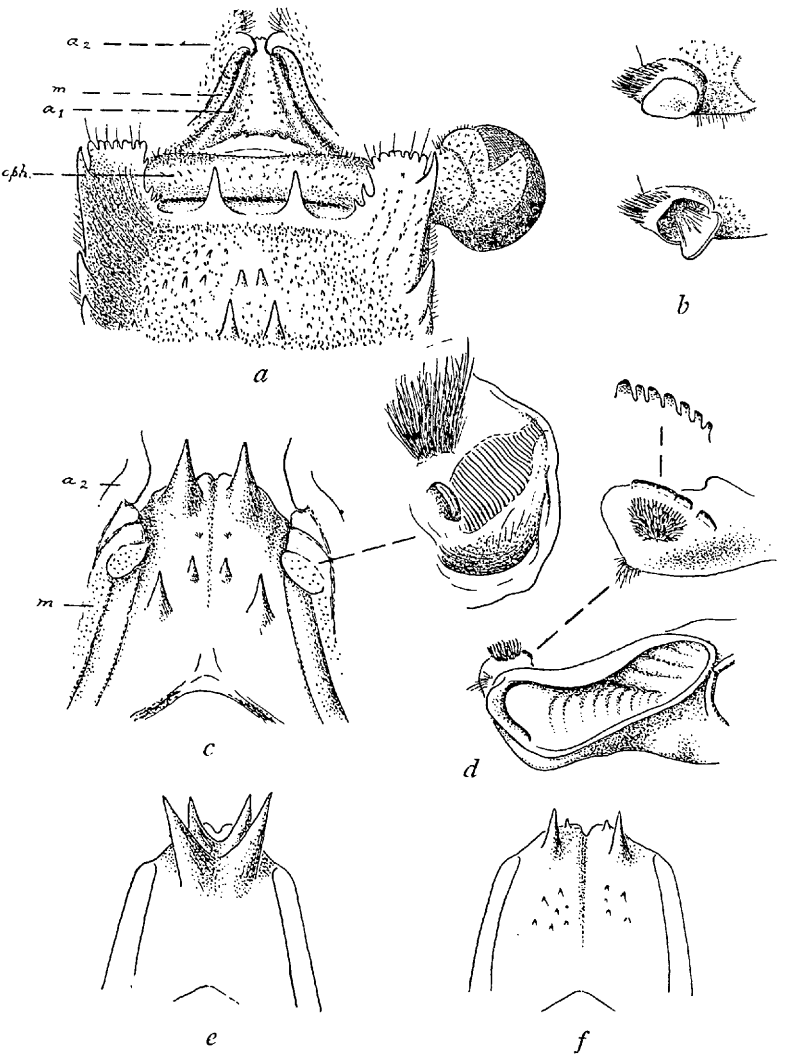

FIG. 102.—*Palinustus mossambicus* Brnrd. *a*, frontal region (frontal processes slightly asymmetrical in type), showing stridulating process of antenna 2 (a_2), membranous articulation (m), antennular segment (a_1) and ophthalmic segment (*oph.*) with eye-stalks. *b*, coxa of left 5th leg ♂, showing flap closed and open.

Panulirus bürgeri (de Haan). *c*, antennular plate, with base of antenna 2 (a_2) and membranous articulation (m), with inner view of stridulating knob further enlarged. *d*, coxa with ♂ genital opening of left 5th leg ♂, with inner end and the chitinous ridge of another specimen further enlarged.

Panulirus penicillatus (Olivier). *e*, antennular plate.

Panulirus japonicus (Siebold). *f*, antennular plate.

Gen. PANULIRUS (Gray) White

1908. Stebbing, Mar. Invest. S. Afr. in Ann. S. Afr. Mus., vi, p. 33.

1910. *Id.*, *l. c.*, p. 374.

1911. Gruvel, *l. c.*, pp. 27 and 50 (key to species).

1916. de Man, Siboga Exp. monogr., xxxix*a*, 2, pp. 33 (list of species) and 42.

1936. Gurney, *l. c.*, p. 405 (*Phyllosoma*).

1946. Holthuis, *l. c.*, p. 122.

See key. 3rd peduncular joint of ant. 1 slightly shorter than 2nd (adult). Endopod of pleopods 3–5 ♀ not deeply cleft, lanceolate, the appendix interna attached to a short projection on its inner margin; appendix interna on pleopod 2 ♀ present but small. Chela of 5th leg ♀ as in *Palinurus*. Coxal joint of 5th leg in adult ♂ conspicuously enlarged transversely to axis of body, orifice of vas deferens large (*regius* and *ornatus* not seen by me); in *bürgeri* and *penicillatus* the orifice of the vas deferens is guarded by a creased and in-folded membrane which appears as if it might be protruded and expanded in the form of a funnel to cover the ♀ aperture; but I have seen no living or fresh specimens.

Remarks.—The presence or absence of the exopod, and its flagellum, on the 2nd and 3rd maxillipeds are specific characters.

The genus is widely distributed, chiefly in tropical and temperate regions, but is not represented in Europe.

Key to the South African Species.

I. Abdominal segments with transverse grooves.

A. Abdominal grooves not interrupted medianly.

1. Exopod of mxp. 3 absent, exopod of mxp. 2 without flagellum. Antennular plate with 4 large spines spaced en carré (fig. 102, *c*) . *bürgeri*.

2. Exopod of mxp. 3 present but without flagellum, of mxp. 2 with flagellum. Antennular plate with 4 large spines united at their base (fig. 102, *e*) . . . . . *penicillatus*.

3. Exopod of mxp. 3 with flagellum. Antennular plate with 2 major spines (fig. 102, *f*) . *japonicus*.

B. Abdominal grooves interrupted medianly.

1. Mxp. 2 and 3, and antennular plate as in *bürgeri* *dasypus*.

2. Exopod of mxp. 3 absent, of mxp. 2 with flagellum. Antennular plate with 4 major spines en carré . . . . . *regius* (Angola).

II. Abdominal segments without grooves.*

A. Exopod of mxp. 2 without flagellum. Legs and abdomen with pale spots. Carapace anteriorly speckled and vermiculate . . . . *ornatus.*

B. Exopod of mxp. 2 with a small single-jointed flagellum. Legs with longitudinal, abdomen with transverse pale stripes. Carapace with a pale longitudinal stripe on side . . . . . *versicolor.*

C. Exopod of mxp. 2 with many-jointed flagellum. A pale stripe across each abdominal segment [*polyphagus*, Mauritius].†

Panulirus bürgeri (de Haan)

Bürger's Crayfish.

Fig. 102, *c*, *d*.

1908. Stebbing, *l. c.*, p. 34.
1910. *Id.*, *l. c.*, p. 374.
1911. Gruvel, *l. c.*, p. 32, fig. 14, and pl. 1, fig. 6.
1918. Barnard in Gilchrist, Mar. Biol. Rep., iv, p. 50.
1925. Calman, Fish. Mar. Biol. Surv., Rep. iv, Spec. Rep. 3, p. 21.
1946. Holthuis, *l. c.*, p. 128 (*homarus* Linn.).

Abdominal grooves always uninterrupted, crenulate with flattened, rounded squamae, pilose. Antennular plate with 4 major spines, separate, en carré, with 2-4 denticles and some little tufts of setae in the centre. Inner end of coxa of 5th leg ♂ with a patch of soft setae, and a hard chitinous keel, more or less lobed or divided into blunt teeth (fig. 102, *d*).

Length ♂ up to 170, ♀ 160 mm. (carapace length resp. 57 and 55 mm.) excl. frontal spines (S. African specimens). Gruvel's figure shows a carapace 150 mm. long. Olivaceous or bluish, speckled and dotted with yellow, a yellow line (more or less divided into short lines or dots) and a yellow lateral spot on each abdominal segment; legs and antennae more or less spotted with yellow.

Localities.—Algoa Bay, East London, Durban, 0–20 fathoms (Stebbing, and S. Afr. Mus.); off Natal coast, 34 fathoms (Calman).

Distribution.—East Indies, south coast of Arabia (var. *megasculptus* Pesta 1915), Madagascar. ? Japan.

* Young specimens of *polyphagus* and *versicolor* may show traces of grooves.

† *P. polyphagus* Herbst 1796 (syn. *fasciatus* Fabr. 1798, M. Edwards 1837); Gruvel, 1911, *l. c.*, pl. 5, fig. 3; Holthuis, *l. c.*, p. 136.

Remarks.—The smallest specimen seen by me is 53 mm. in length, and is a typical *bürgeri* as regards the abdominal sculpturing.

Holthuis proposes to adopt the name *homarus* (Linn.) for this species.

Panulirus dasypus (Latr., M. Edw.)

1837. Milne Edwards, Hist. Nat. Crust., ii, p. 300.

1911. Gruvel, *l. c.*, p. 34, fig. 15, and pl. 2, fig. 5.

1916. de Man, *l. c.*, p. 48.

1946. Holthuis, *l. c.*, p. 134 (references, and differences from *bürgeri*).

Resembles *bürgeri* in all characters, including structure of coxal joint of 5th leg ♂, except abdominal grooves interrupted medianly (in the present specimen on segments 3–5 only, uninterrupted on 2 and 6), feebly denticulate or crimped laterally but medianly almost or quite smooth, never with rounded squamae, feebly pilose, and coloration different.

Length S. Afr. Mus. ♂ 232 mm., carapace 87 mm. (Gruvel's figure shows a carapace of 184 mm., and Milne Edwards gives 350 mm. as total length). Clear olive-green, finely speckled with pale yellow or white on peduncles of 2nd antennae and on carapace anteriorly, abdomen with pale dots, small on first 3 segments, larger on last 3 and base of tail-fan (no transverse pale lines), legs uniformly green (except 1st pair), only the spines pale.

Locality.—One ♂ said to have been caught at Isipingo, Natal, 1930 (S. Afr. Mus.).

Distribution.—Indian Ocean, Ceylon, Madras, East Indies.

Remarks.—It would seem as if this form ought to be regarded merely as a variety of *bürgeri*, though Gruvel has no doubt of their specific distinctness. Perhaps the examination of a large number of both forms of all sizes might throw some light on the question.

A second ♂ specimen (carapace length 88 mm.), also said to have come from the Natal coast, is intermediate between typical *bürgeri* and *dasypus*: all the abdominal grooves are uninterrupted, pilose, those on 2nd–4th segments merely crimped or feebly crenulate, those on 5th and 6th segments scalloped with rounded squamae as in *bürgeri*; hind margin of segments 1–5 with a transverse row of pale dots, legs uniform.

Panulirus penicillatus (Olivier)

Variegated Crayfish.

Fig. 102, *e.*

1908. Stebbing, *l. c.*, p. 33.
1910. *Id.*, *l. c.*, p. 374.
1911. Gruvel, *l. c.*, p. 31, fig. 13, and pl. 2, fig. 4, pl. 3, fig. 2.
1916. de Man, *l. c.*, p. 45, pl. 2, fig. 6 (antennular plate).
1918. Barnard in Gilchrist, *l. c.*, p. 51.
1946. Holthuis, *l. c.*, p. 125 (references).

Abdominal grooves uninterrupted, without pilosity (except very feebly at sides), surface of segments smooth, without squamae, merely pitted. Antennular plate with 4 large spines united at their base. Inner end of coxa of 5th leg ♂ with a sharp chitinous entire keel and no patch of setae.

Length ♂, S. Afr. Mus., 315 mm. (carapace 130 mm.) (M. Edwards: 450 mm., Gruvel's figure of carapace 188 mm.). Bluish green, more or less spotted with yellow on carapace and bases of 2nd antennae and sternum, abdomen dotted with yellow, legs with yellow longitudinal straight or wavy lines.

Locality.—Mozambique (island) (coll. K. H. B.).

Distribution.—Mauritius, Réunion, Red Sea, Indian Ocean, East Indies, Pacific islands, north coast of Australia.

Remarks.—The alleged locality Agulhas Bank (Stebbing) is very unlikely. I have no actual record of this species from the coast of southern Africa within the Union.

Panulirus japonicus (Siebold)

Japanese, or Long-legged, Crayfish.

Fig. 102, *f.*

1868. Milne Edwards, Nouv. Arch. Mus. Paris, iv, p. 87, pl. 21 (*longipes*).
1906. Rathbun, Bull. U.S. Fish. Comm. (1903), pt. 3, p. 897, pl. 5 (coloured).
1911. Gruvel, *l. c.*, p. 28, fig. 11, and pl. 5, figs. 1, 2 (3 on plate, figs. transposed).
1916. de Man, *l. c.*, p. 44.
1918. Barnard in Gilchrist, *l. c.*, p. 51.
1929. McNeill, Rec. Austral. Mus., xvii, p. 148.

1938. Kubo, J. Imp. Fish. Inst. Tokyo, xxxiii, p. 101, pl. 1 (sex dimorphism).

1946. Holthuis, *l. c.*, p. 123, pl. xi, fig. *n* (references).

Abdominal grooves uninterrupted, pilose. Antennular plate with 2 major spines, in front of these 2–4 small denticles on margin, and behind them a group of very small denticles. 2nd leg longest. Inner end of coxa of 5th leg ♂ with a sharp chitinous entire keel, and no patch of setae.

Length ♂, S. Afr. Mus., 233 mm. (carapace 82 mm.) (Gruvel's figure of carapace 120 mm.). Violaceous or indigo, sides of carapace brownish, yellowish-white spots mostly on larger spines on carapace, abdomen dotted with yellowish white with a larger spot on each segment laterally, tail-fan reddish towards hind margin with a white marginal line, peduncles of both antennae with white marks, flagella with white bands, legs and 3rd maxillipeds violaceous with yellowish-white longitudinal lines, and a few spots, 3rd–5th pleopods (♂) each with a white spot.

Locality.—No authentic record from the coast of the Union; Delagoa Bay (Lourenzo Marques Mus.).

Distribution.—Mauritius, Réunion, Zanzibar, Indo-Pacific, Japan.

Remarks.—Specimens, alleged to have been caught at Durban or on the Natal coast, have been sent to the South African Museum; I am inclined to think they may have emanated from Delagoa Bay or Mauritius. The specimen submitted for identification by the Lourenzo Marques Museum was presumably caught in Delagoa Bay.

Panulirus regius (Br. Cap.)

Royal Crayfish; Langouste royale.

1864. Brito Capello, Desc. crost. Afr. occid. Lisbon.

1906. Nobili, Mem. Soc. Espan., i, p. 300, pl. 8, figs. 1, 1, *a–d.*

1911. Gruvel, *l. c.*, p. 35, fig. 16, and pl. 2, figs. 6, 7, pl. 3, figs. 4, 5.

1916. Balss, Beitr. Meeresf. Westafr., ii, p. 32.

1917. Bouvier, Res. Sci. Camp. Monaco, fasc. 50, p. 91, pls. 8 (coloured), 9.

1926. Schmitt, Bull. Amer. Mus. Nat. Hist., liii, p. 42, fig. 67 (*Puerulus*).

1933. Monod, Bull. Et. hist. sci. Afr. occid. Franc., xv, p. 12.

Abdominal grooves shallow, uninterrupted on 1st segment, interrupted on 2nd–6th segments. Antennular plate with 4 major

spines en carré, usually with minor denticles in centre (Bouvier (*l. c.*) records a specimen with 3 pairs of major spines).

Length up to about 300 mm. (carapace: Bouvier's fig. 112 mm., Gruvel's fig. 171 mm.). Bluish or olivaceous green, a broad yellowish band on ventro-lateral portion of carapace, abdominal segments each with a transverse yellow band, bordered with blue in front and behind, on hind margin, and a yellow spot laterally, legs greenish with yellow longitudinal stripes.

Locality.—Mossamedes.

Distribution.—West coast of Africa, from about 23° N. lat. southwards.

Panulirus ornatus (Fabr.)

Ornate Crayfish.

1798. Fabricius, Suppl. Entom. Syst., p. 400.
1837. Milne Edwards, Hist. Nat. Crust., ii, p. 296.
1878. Hilgendorf, MB. Ak. Wiss. Berlin, p. 827.
1911. Gruvel, *l. c.*, p. 47, fig. 22, and pl. 6, fig. 2.
1916. de Man, *l. c.*, p. 51, pl. 2, fig. 7, *b*, *c* (mxp. 2, 3) (references).
1918. Barnard in Gilchrist, *l. c.*, p. 51.
1918. Stebbing, Ann. Durban Mus., ii, p. 59.
1921. Balss, K. Sv. Vet. Ak. Handl., lxi, no. 10, p. 17.
1946. Holthuis, *l. c.*, p. 138, pl. vii, fig. *i*, pl. ix, fig. *d*.

Abdomen without grooves at any stage. Exopod of mxp. 2 tipped with a small tuft of setae (no flagellum). Antennular plate with 2 pairs of major spines en carré, the hinder pair the smaller, with some denticles in the centre. The 3 pairs of submedian spines in front of cervical groove slightly diverging, the 3 pairs behind the groove converging posteriorly.

Length S. Afr. Mus. specimen 248 mm. (carapace 83 mm.) (Gruvel's figure of carapace 180 mm.). Bluish or greenish, carapace anteriorly marbled and vermiculate with pale cream lines, abdominal segments with dark blue cross-bands, with one or two cream-coloured oblique spots or marks laterally; legs and peduncles of 1st antennae banded, spotted or marbled with cream on a greenish ground-colour, peduncles of 2nd antennae with cream vermiculate lines, flagella of 1st antennae with pale bands.

Localities.—Mozambique (Hilgendorf); Durban (Stebbing, and S. Afr. Mus.); Delagoa Bay (Lourenzo Marques Mus.).

Distribution.—Mauritius, Zanzibar, Indo-Pacific, Australia.

Panulirus versicolor (Latr.)

Striped Crayfish.

1804. Latreille, Ann. Mus., iii, p. 394.

1910. Rathbun, Proc. U.S. Nat. Mus., xxxviii, p. 560, pl. 52, fig. 1 (*fasciatus*, non Fabr.).

1911. Gruvel, *l. c.*, p. 48, pl. 6, fig. 3 (*ornatus* var. *taeniatus*).

1916. de Man, *l. c.*, pp. 55–63, pl. 2, figs. 7, 7, *a* (mxp. 2, 3), and 8, 8, *a–e* ("Natant" stage) (references and synonymy).

1918. Barnard in Gilchrist, *l. c.*, p. 52 (*fasciatus* de Haan, non Fabr.).

1926. Musgrave, Austral. Zoolog., iv, p. 205, pl. 27, fig. 3 (*fasciatus* de Haan).

1926. McNeill, *ibid.*, iv, p. 302.

1935. C. von Bonde and Marchand., Fish. Mar. Biol. Surv. S. Afr., Fish. Bull., no. 1, p. 7 (*fasciatus* de Haan, non Fabr., quoted from Barnard, 1918).

1946. Holthuis, *l. c.*, p. 142, pl. vii, fig. *j*, pl. ix, fig. *b*, pl. xi, figs. *e, f, m* (references).

Abdomen without grooves in adult but with indications of grooves on 2nd–4th segments in young. Exopod of mxp. 2 with a small triangular single-jointed flagellum. Antennular plate as in *ornatus*. The 3 submedian pairs of spines in front of and the 3 pairs behind the cervical groove form a parallel series.

Length S. Afr. Mus. specimen 135 mm. (carapace 45 mm.) (de Man's figure: carapace 120 mm., Gruvel's 150 mm.). Carapace dark red-brown (in preserved specimens), with the greater part of the dorsal area except around bases of spines pale cream-coloured, a pale stripe from postero-lateral corner to anterior margin between the antero-lateral corner and the supra-orbital spine; abdominal segments each with a dark transverse band on hind margin with a narrow pale stripe running through it; hinder third of tail-fan purplish blue, margin red; peduncles of 2nd antennae pale with bases of the spines dark, legs and peduncles of 1st antennae with pale longitudinal stripes on a dark ground-colour; pleopods (♂) dark purplish-brown with pale edge and pale central stripe. In a specimen from Port St. Johns the dark ground-colour of carapace is indigo blue, the dorsal part olive-green, the abdomen dull olive-green with the dark bands nearly black, ground-colour of the legs prussian-blue; the colours are said to be brighter in life.

Localities.—Durban harbour and Port St. Johns (S. Afr. Mus.): Delagoa Bay (coll. van der Horst).

Distribution.—East coast of Africa, Mauritius, Seychelles, Indo-Pacific to Japan.

Remarks.—In the case of this beautifully coloured species, the records of its occurrence in South African waters are reliable. At Port St. Johns it is said to be frequently caught by the fishermen when seining in deep water.

Phyllosoma Stage.

Jasus lalandii (Lam., M. Edw.)

Fig. 103.

1910. Stebbing, *l. c.*, p. 376 (*Phyllosoma* sp.).

1936. Gurney, *l. c.*, p. 420, figs. 28, 29.

Distinguishing features seem to be: no strong spine on basal joint of ant. 2; no exopod with plumose setae on either mxp. 2 or mxp. 3 at any stage.

The course of development is given in the papers of Gilchrist and of Cecil von Bonde quoted above (pp. 538, 539). Figures of three stages (from Gilchrist 1916) are reproduced here.

It may be noted that Thomson (1907, Trans. N. Zeal. Inst.. xxxix [1906], p. 484, pl. 20 *) briefly mentioned the early stage, later called the "Naupliosoma" by Gilchrist, in the New Zealand form (*edwardsii*). This stage precedes the *Phyllosoma* stage, and lasts only a few hours.

Palinurus gilchristi Stebb.

1930. Willem von Bonde, Fish. Mar. Biol. Surv., viii, Spec. Rep. 1, p. 9, pls. 1, 2, 8, 9, and 10, fig. 17 (*Phyllosoma* and *Puerulus*).†

1936. Gurney, *l. c.*, p. 401, fig. 14.

The *Phyllosoma* assigned to this species has a strong spine on basal joint of ant. 2, and both mxp. 2 and mxp. 3 have plumose exopods (in the 15·6 mm. stage).

* Volume number and year of publication misquoted in Gilchrist, 1920, p. 201.

† In Gurney (1936, pp. 402, 405, 418, 428, 430, 440; and in 1939, Bibliogr. Larvae Dec. Crust., Ray Soc. Publ., 125, p. 8), this paper is credited to Cecil instead of Willem von Bonde, and wrongly dated 1932 instead of 1930.

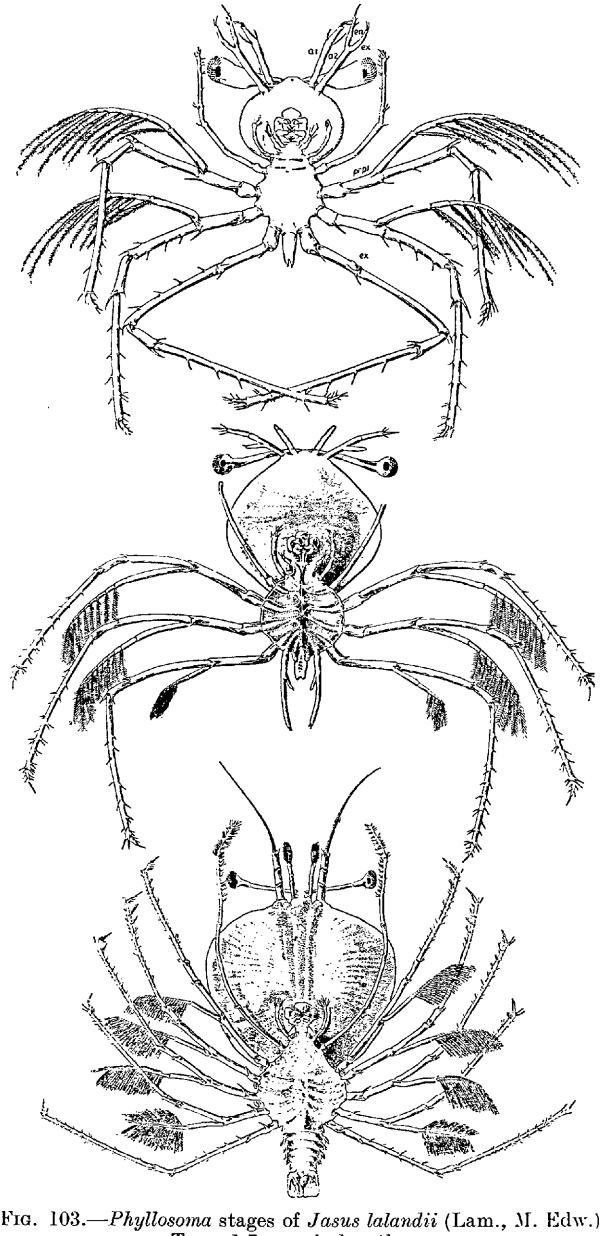

FIG. 103.—*Phyllosoma* stages of *Jasus lalandii* (Lam., M. Edw.).
Top: 1·7 mm. in length.
Middle: 3·8 mm. in length.
Bottom: 35 mm. in length.
(From Gilchrist, J. Linn. Soc. Lond., xxxiii, pls. 14–16, 1916.)

Panulirus sp.

1930. Willem von Bonde, *l. c.*, p. 18, pls. 3, 10, figs. 18–23, 11 (*Phyllosoma* and *Puerulus*).

Cephalic shield oval or piriform, narrowing in front. No spine on basal joint of ant. 2. Mxp. 3, but not mxp. 2, with plumose exopod.

Family SCYLLARIDAE.

1910. Stebbing, *l. c.*, p. 372.

1915. *Id.*, Ann. S. Afr. Mus., xv, p. 61.

1916. de Man, Siboga Exp. monogr., xxxix*a*, 2, pp. 64 *sqq.*

1917. Bouvier, Res. Sci. Camp. Monaco, fasc. 50, p. 98.

1936. Gurney, "Discovery" Rep., xii, p. 426 (*Phyllosoma* stage).

1946. Holthuis, Dec. Macrura Snellius Exp. Temminckia, vii, p. 87.

Carapace more or less flattened dorso-ventrally; gripped between a lobe of 1st abdominal segment and a knob on last thoracic segment (as in *Palinuridae*). Eyes in definite orbits. Ant. 2 modified, consisting of 4 movable joints, the 2nd and 4th (referred to in the descriptions below as the proximal and distal joints) lamellately expanded (fig. 104, *c*, *e*). Legs with only 6 apparent joints (as in *Palinuridae*). No appendages on 1st abdominal segment; 2nd–5th pleopods in ♂ biramous, more or less lamellate, but successively reduced in size; in ♀, as in *Palinuridae*, endopod of 2nd pleopod lamellate, of 3rd–5th rod-like with appendix interna. A small chela on 5th leg in ♀ (except in *Thenus*).

Development.—The *Phyllosoma* stage as in the *Palinuridae*, but distinguished by the stout 2nd antennae (fig. 104, *f*), which foreshadow the broad, plate-like 2nd antennae of the adult. Post-larval stages, corresponding with the *Puerulus*, have been regarded as distinct genera under the names *Pseudibacus* and *Nisto*.

Key to the South African [Mauritian] Genera.

1. Body moderately depressed, subcylindrical, carapace not broader than long.
   - *a*. Exopod of mxp. 3 without flagellum. Rostrum short and truncate. Gills 19 . . . . . *Scyllarus.*
   - *b*. Exopod of mxp. 3 with flagellum. Rostrum salient. Gills 21 . . . . . *Scyllarides.*
2. Body strongly depressed, lamellate, carapace broader than long (fig. 104, *c*).

a. Eye-sockets nearer to middle-line than to outer angles of carapace (fig. 104, *c*) . . . . . *Ibacus*.
b. Eye-sockets at outer angles of carapace (fig. 104, *e*) . *Thenus*.
c. Eye-sockets midway between middle-line and outer angles of carapace . . . . . *Parribacus*, Mauritius.

Gen. Scyllarus Fabr.

1908. Stebbing, Ann. S. Afr. Mus., vi, p. 29.

1916. de Man, *l. c.*, pp. 64, 67 (list of species and key to Indo-Pacific species).

1917. Bouvier, *l. c.*, p. 105.

1921. de Man, Zool. Med., vi, p. 92 (correction to 1916 key).

1938. Bage, Austral. Antarct. Exp., C, ii, pt. 6, p. 10 (*Arctus*).

1941. Hale, B.A.N.Z. Antarct. Res. Exp., B, iv, pt. 9, p. 272.

1946. Holthuis, *l. c.*, p. 89.

Gills 19. Mxp. 2 without gills, its exopod transformed into a lamellate process, supposed to aid the scaphognathite (mx. 2) in producing a current of water.

Bouvier (1915, Bull. Sci. Fr., xlviii, p. 188, figs. 2–4) described *S. thiriouxi* from Mauritius.

Key to the South African Species.

1. Abdominal segments with arborescent or squamiform sculpture (fig. 104, *a*, *b*).
   a. 6th joint of 3rd leg with cultrate inner margin and forming with the dactyl a subchela . . . *cultrifer*.
   b. 6th joint of 3rd leg normal, cylindrical . . . *martensii*.
2. Abdominal segments tuberculate, without squamiform sculpture. 6th joint of 3rd leg normal, cylindrical . *tuberculatus*.

Scyllarus cultrifer (Ortm.)

Fig. 104, *a*.

1888. Bate, Rep. H.M.S. *Challenger*, xxiv, p. 66, pl. 9, fig. 3 (*sordidus*, non Stimpson).

1897. Ortmann, Zool. Jahrb. Abt. Syst., x, p. 272.

1916. de Man, *l. c.*, pp. 68, 77.

1936. Barnard, Trans. Roy. Soc. S. Afr., xiii, p. 122, pl. 10 (*sordidus* Bate, non Stimpson).

1946. Holthuis, *l. c.*, p. 93, pl. 8, figs. *c–e*.

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 382.

Carapace with short dense pile nearly concealing the squamose sculpturing; median keel with 2 teeth anteriorly, the 2nd strongly elevated, and a pair of denticles immediately behind cervical groove; 2 supra-orbital teeth; laterally one tooth behind the level of orbit, and a blunter one at cervical groove. Abdominal segment 1 with obliquely-longitudinal ribs; segments 2–5 with a transverse groove interrupted medianly, sculpture in front of the groove rounded squamae, behind the groove obliquely-longitudinal ribs, segment 6 with rounded squamae; telson with 2 sharp points on the calcified portion. Proximal joint of ant. 2 with a single oblique ridge, 2 teeth on both outer and inner (frontal) margin; distal joint with 5 acute teeth, and a denticle on inner margin.

Length ♂ up to 70 mm., ♀ 75 mm. (Bate). Rusty-red, paler towards end of abdomen, eyes dark maroon.

Locality.—Portuguese East Africa (26° 3′ S., 33° 4′ E.), 290 metres (Barnard).

Distribution.—Arafura Sea, 140 fathoms (Bate); East Indies (Holthuis); Japan (Ortmann).

Remarks.—The change of name follows Ortmann and de Man, whose papers were not available to me in 1926. The 3rd legs were missing (as my figure shows), and the identification was based on other features which appeared to be in conformity with Bate's description and figure. The specimen is no longer accessible to me, and the enlarged representation of the sculpturing is taken from my original photograph.

Scyllarus martensii Pfr.

Fig. 104, *b*.

1881. Pfeffer, Panzerkrebs. Hamburg Mus., p. 48.

1891. Ortmann, Zool. Zahrb. Abt. Syst., vi, p. 44.

1904. Borradaile, F. Geogr. Mald. Laccad. Archip., ii, p. 754, pl. 58, fig. 4.

1906. Rathbun, Bull. U.S. Fish. Comm. [1903], pt. 3, p. 896, pl. 18, fig. 2.

1916. de Man, *l. c.*, pp. 70, 84, pl. 3, figs. 13, 13, *a*.

1920. Stebbing, Ann. S. Afr. Mus., xvii, p. 267 (*Thenus orientalis*, non Lund).

1946. Holthuis, *l. c.*, p. 96.

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 382.

Carapace with short dense pile not concealing the numerous squamiform or nodiform tubercles, a double medio-dorsal row of tubercles,

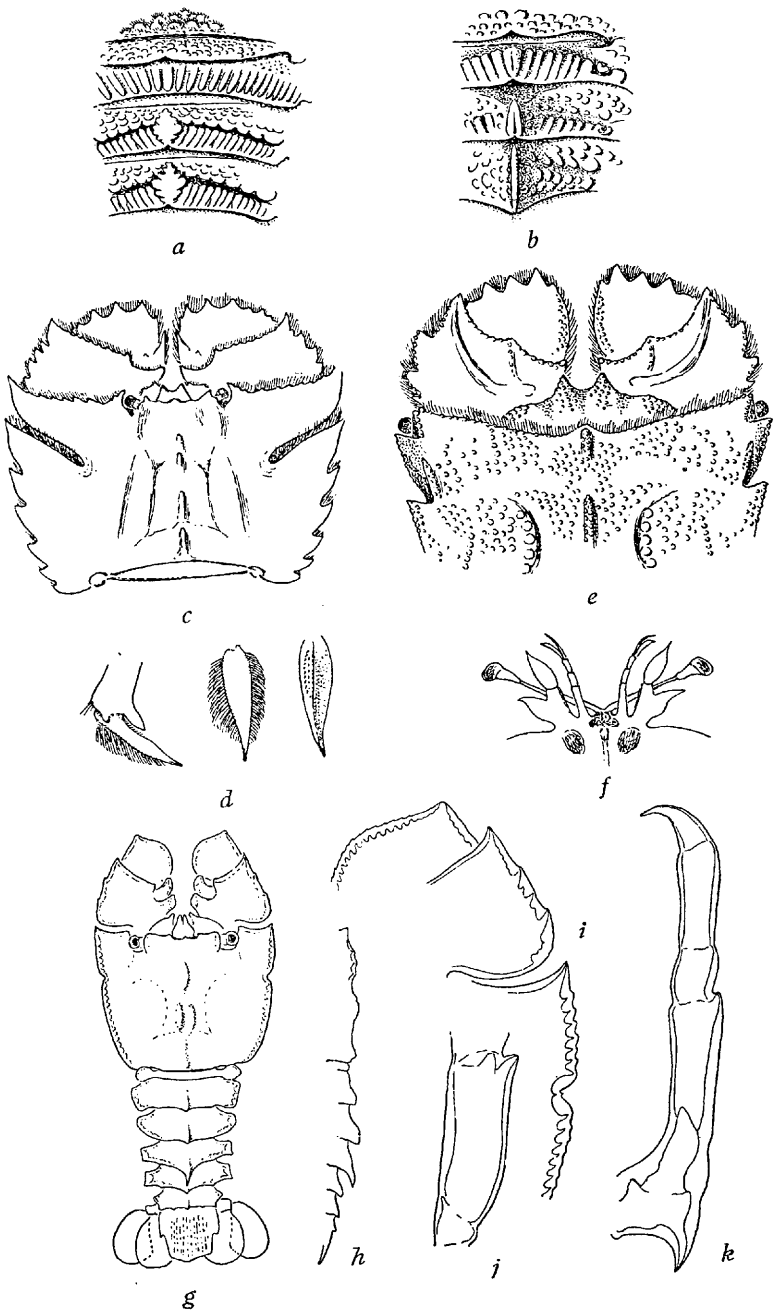

FIG. 104.—*Scyllarus cultrifer* (Ortm.). *a*, hind margin of carapace, and first three abdominal segments, to show sculpture.

Scyllarus martensii Pfr. *b*, the same.

Ibacus incisus (Péron). *c*, carapace with bases of 2nd antennae. *d*, apex of 6th joint and dactyl of 5th leg, ♀, with outer and inner views of dactyl.

Thenus orientalis (Lund). *e*, anterior part of carapace with bases of 2nd antennae.

Phyllosoma of a Scyllarid. *f*, anterior part of specimen 42 mm. in length, to show the stout 2nd antennae.

Nisto stage of *Scyllarides*. *g*, specimen 29 mm. in length, nearly ready for ecdysis. *h*, profile of carapace and abdomen. *i*, portion of carapace and ant. 2 showing new skin within the old. *j*, 4th joint of 1st leg. *k*, ventral view of 5th left leg.

hind margin distinctly notched medianly. Abdominal segment 1 with obliquely longitudinal ribs; segments 2–5 with transverse groove interrupted medianly by a raised keel or ridge, which is particularly prominent on segment 3, and narrowly bifurcate on segment 2, sculpture in front of groove rounded-squamose, behind the groove obliquely ribbed on segment 2, but becoming more squamose on the other segments; telson with rounded squamae on calcified part. Proximal joint of ant. 2 with a single oblique ridge, outer margin with 4 and anterior margin with several denticles; distal joint with 5–6 blunt or subacute digitiform lobules separated by deep incisions. Sternum (thoracic) in ♀ with a median rounded tubercle on each of segments 2–5, in juv. (? ♂) a sharp median tubercle on 5th segment only.

Length ♀ up to 36 mm. (de Man). General colour greyish (de Man).

Localities.—Durnford Point, Zululand, 13 fathoms (Stebbing); Portuguese East Africa (S. Afr. Mus., don. Dr. Gilchrist, without exact locality).

Distribution.—Zanzibar, Maldive and Laccadive Archipelago, East Indies, Singapore, Hawaiian Is., Japan.

Remarks.—The 30 mm. ♀ (received from the late Dr. Gilchrist after my 1926 paper was printed) at once showed my error in assigning Stebbing's 18 mm. juv. (? ♂) (recorded by him as *Thenus orientalis*) to *tuberculatus* instead of to this species.

Scyllarus tuberculatus (Bate)

1888. Bate, Rep. H.M.S. *Challenger*, xxiv, p. 70, pl. 10, figs. 1, 2.

1916. de Man, *l. c.*, pp. 65, 68 (listed and in key).

1926. Barnard, *l. c.*, p. 123, pl. 10 (excl. reference to Stebbing, 1920).

1946. Holthuis, *l. c.*, p. 89, pl. 7, fig. *c*, pl. 8, fig. *a*, pl. 9, fig. *c* (*rugosus* M. Edw.).

Carapace with a double row of tubercles or nodules medio-dorsally and dorso-laterally, with some scattered tubercles between, sides tuberculose. Abdominal segments deeply grooved but without arborescent or squamose sculpture, segment 1 smooth, the following segments increasingly tuberculose or nodose, 2nd–5th segments with median ridge, most prominent on 3rd and 4th segments, on 3rd forming a mushroom-shaped knob. Proximal joint of ant. 2 with a single oblique ridge, outer margin with 4 and anterior margin with several denticles; distal joint with 5–6 blunt digitiform lobules separated by deep incisions. Sternum ♀ without prominent tubercles.

Length up to 58 mm. (♀ Barnard). Red mottled with paler red and white, most of the tubercles with white tips, outer margin of distal joint of 2nd antennae and the smooth dorsum of 1st abdominal segment violet (♀ Barnard).

Locality.—Portuguese East Africa (26° 17′ S., 33° 10′ E.), 415 metres (Barnard).

Distribution.—Between New Guinea and Australia, Singapore, Gulf of Manar, Japan.

Remarks.—The examination of further material, and reference to de Man's paper, show that Stebbing's small specimen cannot, as I thought in 1926, be the young of this species.

Holthuis (*l. c.*) adopts the name *rugosus* M. Edw.

Gen. Scyllarides Gill

1894. Ortmann, Semon's Austral: Reise, v, p. 19 (key to species) (*Scyllarus*, non Fabr.).

1908. Stebbing, Ann. S. Afr. Mus., vi, p. 29.

1910. *Id.*, *l. c.*, p. 372.

1916. de Man, *l. c.*, p. 65 (list of species).

1917. Bouvier, *l. c.*, p. 104.

1936. Gurney, *l. c.*, p. 427 (*Phyllosoma* stage).

Gills 21. Mxp. 2 with 2 gills, its exopod normal, not lamellately expanded.

Key to the South African [and Mauritian] Species.

1. 4th and 5th joints of all legs slightly ridged but not sharply keeled. Antero-lateral corner of carapace acute . .	*elisabethae.*
2. 4th joint of legs with strong, sharp wing-like keel; 5th joint with 2 keels, best developed on the anterior legs. Antero-lateral corner of carapace obtuse-angled . .	[*squammosus*, Mauritius].*

Scyllarides elisabethae (Ortm.)

Port Elizabeth Crayfish.

1894. Ortmann, *l. c.*, p. 20, pl. 2, fig. 3.

1908. Stebbing, *l. c.*, p. 30, pl. 30.

* *squammosus*, *sic* in Milne Edwards, 1837. The post-larval or *Nisto* stage has been described and figured by Miers (1882, Proc. Zool. Soc. Lond., p. 542, pl. 36, figs. 2, 3) as *Pseudibacus pfefferi* from Mauritius. Ortmann (1894) has recorded the adult from Mauritius, and there is a specimen (ex-coll. Robillard) in the South African Museum.

1910. *Id.*, *l. c.*, p. 372.

? 1914. *Id.*, Trans. Roy. Soc. Edin., 50, p. 282.

1918. Barnard in Gilchrist, Mar. Biol. Rep., iv, p. 52 (*elizabethae*, sic).

1921. Gilchrist, Fish. Mar. Biol. Surv., Rep. i, *passim* (localities).

1922. *Id.*, *ibid.*, ii, *passim* (localities).

1923. Odhner, Medd. Göteb. Mus., xxxi, p. 24.

1930. Willem von Bonde, Fish. Mar. Biol. Surv., viii, Spec. Rep. 1, pp. 27–36, pls. 4–7, 12–14.*

1932. Cecil von Bonde, *ibid.*, ix, *passim* (localities).

1933. *Id.*, *ibid.*, x, *passim* (localities).

1936. Gurney, *l. c.*, p. 432, fig. 37 (*Phyllosoma*).

A distinct indentation (cervical groove) on the lateral margin shortly behind level of orbits. Antero-lateral corner of carapace sharply produced forwards. Abdominal segments 2–4 with median longitudinal hump; pleura (coxal plate) of segment 1 with a single blunt lobe. Terminal joint of ant. 2 broader than long; penultimate joint with 5 more or less equally spaced teeth on outer margin (the proximal one very small). Legs strongly pitted; dactyl of 4th and 5th legs (both sexes) rather noticeably flattened and grooved on outer surface; process of 6th joint of 5th leg ♀ (forming the chela) small.

Length ♀ up to 240 mm. (incl. rostrum), width across front of carapace 93 mm. Bright red, more or less mottled, legs cream banded with purple-red or dark maroon.

Localities.—Port Elizabeth (Ortmann, Stebbing); Agulhas Bank from St. Sebastian Bay to Algoa Bay, 20–60 fathoms (Stebbing; S. Afr. Mus.); Table Bay (*fide* the late Dr. L. Péringuey). In the Fishery Survey Reports the most westerly locality is 34° 50′ S., 29° 18′ E.; off the Natal coast in the neighbourhood of Durban, 20° 42′ S. to 30° 13′ S., 132–172 fathoms.

Distribution.—St. Helena, 45–55 fathoms (Stebbing).

Remarks.—The Table Bay record is to be accepted with caution, although W. von Bonde records "a large Scyllarus larva" from west of Cape Point.

The occurrence of this species at St. Helena, as reported by Stebbing, is even more remarkable. According to Rathbun (1900, Proc. U.S. Nat. Mus., xxii, p. 309) *S. latus* (Latr.) was recorded from this island by Bate (? ubi. not in the *Challenger* Rep., xxiv), and there is in the

* It may be "probable" that all the stages of the *Phyllosoma* described are stages of *S. elisabethae*, but there is no conclusive evidence that some of them may not be *Ibacus* or *Thenus*.

South African Museum a specimen of this latter species received in exchange from the Argentine Museum, and said to have come from St. Helena.

S. elisabethae is extremely closely allied to the New South Wales species *sculptus* (Latr., M. Edw.).

Nisto Stage (fig. 104, *g–k*). A specimen, 29 mm. in length from frontal margin to end of telson, was picked up on the beach at Port St. Johns in September 1941. It agrees with Miers' description of *Pseudibacus pfefferi* (*l. c., supra*, p. 561, footnote), and may belong to either *elisabethae* or *squammosus*. The exopod of mxp. 3 has a flagellum. The specimen is almost ready to moult, and the new skin is serrulate and spinulose on the lateral margins of carapace and abdominal segments, and the margins of the 2nd antennae. The 4th joint of all the legs has an apical spine on the new skin. The coxal joint of the 5th leg has a strong recurved spine on both the old and the new skins. White, semi-transparent, the cornea brown, and the gills pink.

Gen. Ibacus Leach

1910. Stebbing, *l. c.*, p. 372.

1916. de Man, *l. c.*, p. 65 (list of species).

1923. Stebbing, Fish. Mar. Biol. Surv. Rep., iii, Spec. Rep. 3, p. 6.

Gills 21–28. Margin of carapace deeply incised in the position of the cervical groove, but no groove dorsally. 4th joint of mxp. 3 inflated, with 5–6 transverse fissures from inner margin, outer margin forming a serrate or spinose crest.

Ibacus incisus (Péron)

Fig. 104, *c*, *d*.

Péron, Coll. du Mus. Paris (? ined.).

1815. Leach, Zool. Misc., ii, p. 152, pl. 119 (*peronii*).

1818. Latreille, Encycl. Meth., pl. 320, fig. 1.

1818. Péron in Lamarck, anim. sans Vert., v, p. 213 (*Scyllarus i.*).

1825. Desmarest, Consid. Crust., p. 183, pl. 31, fig. 2 (*peronii*).

1837. Milne Edwards, Hist. Nat. Crust., ii, p. 287, pl. 24, fig. 10 (*peronii*).

1893. Stebbing, Hist. of Crust., fig. 16 (p. 194) (after Desmarest).

1910. *Id., l. c.*, p. 373 (*verdi*, non Bate).

1918. Barnard in Gilchrist, Mar. Biol. Rep., iv, p. 53 (*verdi*, non Bate, quoted from Stebbing, 1910).

1921. Gilchrist, Fish. Mar. Biol. Surv. Rep., i, *passim* (localities).

1922. *Id., ibid.*, ii, *passim* (localities).

1923. Stebbing, *l. c.*, p. 6, pl. 13 (*peronii*).

1926. Barnard, Trans. Roy. Soc. S. Afr., xiii, p. 123 (*peronii*).

1927. Hale, Crust. S. Austral., pt. 1, p. 70, fig. 68.

1928. C. von Bonde, Fish. Mar. Biol. Surv. Rep., v, *passim* (localities).

1932. *Id., ibid.*, ix, *passim* (localities).

1938. Ramadan, John Murray Exp. Rep., v, p. 128.

Dorsal surface of carapace and abdomen closely pitted; ventral surface of lateral expansions of carapace setose. Anterior margin of carapace with 6–7 teeth (some of them sometimes with an accessory denticle) between orbit and the large antero-lateral tooth; no second tooth between latter and cervical groove; behind cervical groove 7 teeth, decreasing in size posteriorly. The 2 points of the rostrum dentiform. Medio-dorsal keel with 4 blunt points. Anterior margin of terminal joint of ant. 2 with 3 large teeth followed externally by 3–4 smaller ones, a small denticle on inner margin; no sexual difference (contrast *verdi* Bate, *Challenger* Rep., xxiv, pl. 8). Dactyl of 3rd–5th legs (♂ ♀) somewhat flattened on outer surface and densely fringed on both margins with setae; apical process of 6th joint of 5th leg ♀ scarcely half the length of dactyl (contrast *verdi* Bate, *l. c.*).

Length (incl. rostrum) up to 142 mm., width 118 mm. (Hale's measurement 210 mm. probably includes antennae). Dull salmon-red with darker spots, end of tail-fan yellowish (Hale).

Localities.—Off East London, 45 fathoms (Stebbing), and off Natal coast, 130 fathoms; Portuguese East Africa (25° 24′ S., 33° 25′ E.; 26° 3′ S., 33° 4′ E.), 290–310 metres (Barnard); Umvoti to Durban area of Natal coast, 100–200 fathoms (Fishery Survey).

Distribution.—Southern Australia; Chile (Valparaiso: de Man).

Gen. Thenus Leach

1915. Stebbing, Ann. S. Afr. Mus., xv, p. 64.

1916. de Man, *l. c.*, p. 66 (listed).

1936. Gurney, *l. c.*, p. 432 (*Phyllosoma* sed genus ?).

Gills 21. Margin of carapace indented, but not incised, at the cervical groove. 4th joint of mxp. 3 not inflated, not cristate. 5th leg ♀ simple, not chelate.

Remarks.—The genus contains a single species.

Thenus orientalis (Lund)

Fig. 104, *e*.

1878. Hilgendorf, MB. Ak. Wiss. Berlin, p. 849.

1915. Stebbing, *l. c.*, p. 65 (references).

1918. Barnard in Gilchrist, Mar. Biol. Rep., iv, p. 52.

1926. *Id.*, Trans. Roy. Soc. S. Afr., xiii, p. 121.

1928. C. von Bonde, Fish. Mar. Biol. Surv. Rep., v, *passim* (localities).

1935. Boone, Bull. Vanderbilt Mar. Mus., vi, p. 58, pls. 14, 15.

1946. Holthuis, *l. c.*, p. 106 (references).

[Not Stebbing, 1920. =*Scyllarus martensii*.]

Dorsal surface of carapace and abdomen closely studded with flattened granules or tubercles, on abdominal segments 1–5 more or less in transverse lines; the interstices filled with short dense pile. Abdominal segments 2–5 with slight median ridge, which ends in a sharp projecting point on 5th segment. Dactyls of last 3 pairs of legs densely fringed with setae on both margins.

Length (from middle of rostral notch) up to 139 mm., width 81 mm.

Localities.—Mozambique (Hilgendorf); Natal, 26 fathoms (Stebbing); Delagoa Bay (Barnard); Umvoti to Durban area of Natal coast, 100–200 fathoms (Fishery Survey).

Distribution.—Mauritius, Red Sea, Persian Gulf, Indian Seas, East Indies, W. and N.W. Australia, Kermadec Is., China.

Gen. Parribacus Dana

1852. Dana, Proc. Ac. Nat. Sci. Philad., vi, p. 14 (*fide* Neave, Nom. Zool.).

1916. de Man, Siboga Exp. monogr., xxxix*a*, p. 93, also p. 66.

Parribacus ursus major (Herbst)

1793. Herbst, Krabb. u. Krebse., ii, p. 82, pl. 30, fig. 2 (*Cancer* (*Astacus*) *u.m.*).

1852. Dana, U.S. Expl. Exp. Crust., i, p. 517, pl. 32, fig. 6 (*P. antarcticus* Lund).

1906. Rathbun, Bull. U.S. Fish. Comm. for 1903, p. 897, pl. 18, fig. 5 (*P. papyraceus*).

1916. de Man, *l. c.*, p. 93.

1917. Parisi, Atti Soc. ital. Sci. Nat., lvi, p. 13, fig. (juv.).

1935. Boone, Bull. Vanderbilt Mar. Mus., vi, p. 54, pl. 13 (references).

Length 7–8 inches (M. Edwards); about 9 inches (according to Boone's figure).

Locality.—Ifafa Beach, Natal, a young specimen, total length about 60 mm., carapace 23 mm., 1947 (submitted by Zoology Department, Rhodes University College, Grahamstown).

Distribution.—Indo-Pacific to Mauritius and Réunion, but not hitherto recorded from the Red Sea or east coast of Africa. Also Caribbean Sea and coast of Brazil.

Phyllosoma Stage.

1818. Leach in Tuckey, Narr. voy. R. Zaire, App. iv, p. 417, pl. (*Phyllosoma laticorne*).

1888. Bate, Rep. H.M.S. *Challenger*, xxiv, pp. 95–100, pl. 12, B, C, D.

1895. Hornell, J. Mar. Zool., i, p. 69.

1930. Willem von Bonde, Fish. Mar. Biol. Surv. Rep., viii, Spec. Rep. 1, pp. 27–36, pls. 4–7, 12–14.

As remarked on p. 562, footnote, there is no certain way as yet of correlating the several described Phyllosomas with particular genera, to say nothing of the species, in this family.

In the South African Museum there is a very large Scyllarid *Phyllosoma* which was found washed up on Durban beach in June 1930 (fig. 104,*f*). Length from between eye-stalks to end of telson 42 mm., from buccal mass to end of telson 25 mm., from last thoracic ganglion to end of telson 15 mm., from base of 5th leg (laterally) to end of telson 9 mm., median length of cephalic shield 26 mm., greatest width 34 mm., width between bases of 3rd legs 15 mm., between 5th legs 10 mm., telson length 3 mm., basal width 5 mm. The specimen corresponds with W. von Bonde's 17 mm. specimen (*l. c.*, pl. 7), but has a broader cephalic shield; exopod on mxp. 2 very minute, telson with a strong spine on each lateral margin. Gills: mxp. 3 to 5th leg resp. 4, 4, 5, 5, 5, 1.

Family ERYONIDAE.

1901. Alcock, Cat. Ind. Deep-sea Crust., p. 164.

1916. de Man, Siboga Exp. monogr., xxxix*a*, 2, pp. 1 *sqq.*

1917. Bouvier, Res. Sci. Camp. Monaco, fasc. 50, pp. 26 *sqq.* (10th May).

1917. Stebbing, Ann. S. Afr. Mus., xvii, p. 27 (18th May).

1923. Stephensen, Dana Exp. Rep., vii, pp. 64, 65.

1925. Balss, D. Tiefsee Exp., xx, p. 189.

1939. Boas, K. Dansk. Vidensk. Selsk. Biol. Medd., xiv, 7, pp. 1–32, figs.

Carapace dorsally flattened, with sharp lateral margins; in the post-larval stages inflated and globose; hind margin gripped (in adult) between 2 lobes both on 1st abdominal segment. All legs 7-jointed, but 2nd and 3rd joints fused, without independent movement. Pleopod 1 uniramous; 2nd–5th pleopods biramous, with appendix interna bearing coupling-hooks at its apex, pleopod 2 ♂ in addition with appendix masculina. Tail-fan not softer (membranous) behind than before, without sutures.

Development.—The opinion has been expressed that the species of the "genus" *Eryoneicus* are the post-larval stages, corresponding with *Puerulus*, *Nisto*, *Pseudibacus* of the *Palinuridae* and *Scyllaridae*; for discussion see Bouvier, 1917. Although Bouvier declined to accept this view, the observations of Balss and Calman (*l. c.*, *infra*, 1925) leave very little doubt that *Eryoneicus* is the post-larval stage (fig. 105, *h*).

Boas was of the same opinion; and also claimed (1879, 1880, and 1939) that the well-known larval form *Amphion* might be the earlier stage of *Polycheles* (sensu lato) corresponding with the *Phyllosoma* of the *Palinura* (fig. 105, *g*). This latter view does not find favour with Balss (1925) or with Gurney (1924 and 1936, *l. c. infra*). Gurney (1936, p. 393) makes a slight slip in calling *Eryoneicus* the "larva" of *Polycheles*, instead of the post-larva.

Key to the Genera.

1. Carapace dorsally flattened, not greatly wider than abdomen (adult).
   - *a*. Eye-stalks fixed in deep incisions of front border of carapace (fig. 105, *a*). Thumb of 1st chela without tooth.
     - i. Epipod of mxp. 3 of fair size, those of the legs normal, ascending into branchial chamber . . *Polycheles.*
     - ii. Epipod of mxp. 3 a mere papilla, those of the legs merely membranous expansions of their podobranchs . . . . . *Stereomastis.*
   - *b*. Eye-stalks fixed beneath and parallel with front border of carapace. Thumb of 1st chela with subapical tooth . . . . . [*Willemoesia*].
2. Carapace inflated, globose, abruptly wider than abdomen (post-larval stage) (fig. 105, *h*) . . . . . *Eryoneicus.*

Bate (1888, *Challenger* Rep., xxiv, pp. 164, 169) records a specimen of *Willemoesia* from the neighbourhood of Tristan d'Acunha, and the genus may later be found to occur in South African waters.

Gen. Polycheles Heller

1901. Alcock, *l. c.*, p. 171 (*Pentacheles*).
1916. de Man, *l. c.*, pp. 5, 21.
1917. Bouvier, *l. c.*, p. 34 (part).
1917. Stebbing, *l. c.*, p. 28.

Lateral borders of carapace armed with usually more than 20 spines, medio-dorsal keel usually double. First abdominal segment without 2 spines near outer end of anterior border. Chela on 5th leg feebly developed in ♂ compared with ♀.

Remarks.—In repose the elongate 1st pair of legs are carried folded under the carapace in a shallow groove between the lateral margin of carapace and a slight ridge running lengthwise across the pterygostomial region, the tip of the chela just reaching the anterior corner of carapace, and the "elbow" (junction of 4th and 5th joints) projecting freely behind.

Key to the South African Species.

1. One rostral spine. Each orbital sinus divided by a serrate lobe stretching across from inner border . . . *typhlops.*
2. Two rostral spines. Orbital sinuses not divided (fig. 105, *a*).
   a. No large spines on carapace except on lateral margins and median keel . . . . . *granulatus.*
   b. Scattered large spines both in front of and behind cervical groove . . . . . *demani.*

Polycheles typhlops Heller

1862. Heller, SB. Ak. Wiss. Wien, xlv, p. 392, pl. 1, figs. 1–6.
1894. Alcock, Ann. Mag. Nat. Hist. (6), xiii, p. 237, and 1895, Illustr. Zool. R.I.M.S. "Investigator," pl. 10, figs. 2, 2, *a–c* (*hextii*).
1901. *Id.*, *l. c.*, p. 172.
1914. Selbie, Fish. Irel. Sci. Invest., p. 12, pl. 1, figs. 1–13.
1916. de Man, *l. c.*, p. 24 (references).
1917. Bouvier, *l. c.*, p. 36, pl. 2, figs. 1–6.
1923. Stephensen, *l. c.*, p. 67.
1925. Balss, *l. c.*, pp. 197, 201, figs. 1–4, 12–14, and pl. 19.
1925. Calman, Fish. Mar. Biol. Surv. Rep., iv, Spec. Rep. 3, p. 18.
1938. Ramadan, John Murray Exp., v, p. 124.

Carapace pilose, with sharp granules and spinules in addition to the larger spines on the keels; lateral margin with 7 or 8+5 spines in front of cervical groove, and (14) 18–28 behind; one spine on inner orbital angle, several on outer orbital angle; one spine on eye-stalk; hind margin of carapace spinose. Abdominal segments with serrate edges, surface more or less granular; median keel on 1st segment feeble, on 6th double and granulate, on 2nd–5th raised into a sharp antrorse spine; basal keel and the 2 distal keels on telson granulate. Basal joint of ant. 1 with 2 spines on outer distal angle, inner margin serrate.

Length ♀ up to 113 mm., carapace 49 mm. (de Man). Rose-red (Bouvier's coloured figure).

Locality.—Off Natal coast (Durban area), 270 fathoms (Calman).

Distribution.—N. Atlantic, Mediterranean, Arabian and Indian Seas, East Indies.

Polycheles granulatus Faxon

1894. Alcock, *l. c.*, p. 236, and Illustr. "Investigator," pl. 8, fig. 3 (*beaumontii*).

1895. Faxon, Mem. Mus. Comp. Zool. Harv., xviii, p. 123, pl. 32, fig. 1, pl. 33, figs. 2, 2, *a*.

1901. Alcock, *l. c.*, p. 175 (*beaumontii*).

1906. Rathbun, Bull. U.S. Fish. Comm., 1903, pt. 3, p. 899, fig. 54 (antennal scale).

1914. Stebbing, Ann. S. Afr. Mus., xv, p. 11.

1917. Bouvier, *l. c.*, p. 45, pl. 2, figs. 7–14.

1923. Stephensen, *l. c.*, p. 67.

Carapace pilose, smooth or merely granulate between the lateral margins and median keel; lateral margin with 8 to 10+3 or 4 spines in front of, and 13–14 behind cervical groove; one spine on both inner and outer angle of orbital sinus; one spine on eye-stalk projecting forwards. Keels on abdominal segments 1–5 not notched, 1st–3rd with short forwardly-directed points. Basal joint of ant. 1 with spine on outer distal angle, inner margin turned upwards (against its fellow), serrate, ending in a long spiniform point.

Length up to 39 mm., carapace 20 mm. (Alcock: 80 and 36 resp.; Bouvier: ♂ 88 and 40 mm., ♀ 117 and 49 mm. resp.). Rose-red.

Locality.—Off Cape Point, 480–600 fathoms (Stebbing).

Distribution.—Gulf of Panama, Hawaiian Is., Ceylon, south-west coast of Ireland, Madeira, Canary Is. and Azores.

Polycheles demani Stebb.

Fig. 105, *a–c*.

1908. Stebbing, Ann. S. Afr. Mus., vi, p. 25 (? *beaumontii*).
1910. *Id.*, *l. c.*, p. 377 (? *beaumontii*).
1916. de Man, *l. c.*, p. 5, footnote 2.
1917. Stebbing, *l. c.*, p. 28, pl. 3 (Crust., pl. 92).
1925. Calman, *l. c.*, p. 17.

Carapace pilose, smooth or granulate and with large spines scattered over the area between lateral margins and median keel; lateral margin with 7 or 8 (9) + 4 spines in front of, and 19–26 behind cervical groove; one spine on inner angle of orbit, one or two (symmetrical or asymmetrical) on outer angle; one spine on eye-stalk. Keels on abdominal segments 1–5 not notched, 1st to 3rd or 4th with short forwardly-directed points. Basal joint of ant. 1 with spine on outer distal angle, inner margin turned upwards, serrate, ending a sharp spiniform point.

Length ♂ up to 140 mm., ♀ 134 mm. (carapace 64 and 60 mm. resp.).

Localities.—Off Cape Point, 500–1400 fathoms (Stebbing, Calman, and S. Afr. Mus.).

Remarks.—Fifteen or sixteen specimens were obtained by the s.s. *Pieter Faure*, of which 9 are now in the South African Museum, including the original ♂ and ♀ described in 1908 by Stebbing, but not the ♀ figured in 1917. The 2 spines on outer angle of orbit are not constant and cannot be regarded as a specific character. Stebbing in 1908 said there were 2 spines on outer side of the large 1st joint of ant. 1; none of the specimens has more than one, but a tuft of matted hair may have been mistaken for a spine; the 1917 figure is not clear on this point; Calman also found only one spine in his specimens.

The larger ♀♀ have a triangular glandular patch between the bases of 4th and 5th legs, as described for *P. phosphorus* Alcock (1901, p. 169). As preserved the texture of this brown substance is very similar to that of the coagulated sperm which sometimes protrudes from the openings of the vasa deferentia. May not the deep hollow in the ♀ form a receptaculum seminis?

Gen. Stereomastis Bate

1901. Alcock, *l. c.*, p. 166 (*Polycheles*, non Heller).
1916. de Man, *l. c.*, pp. 4, 7.
1917. Bouvier, *l. c.*, p. 34 (*Polycheles* part).
1917. Stebbing, *l. c.*, p. 29.

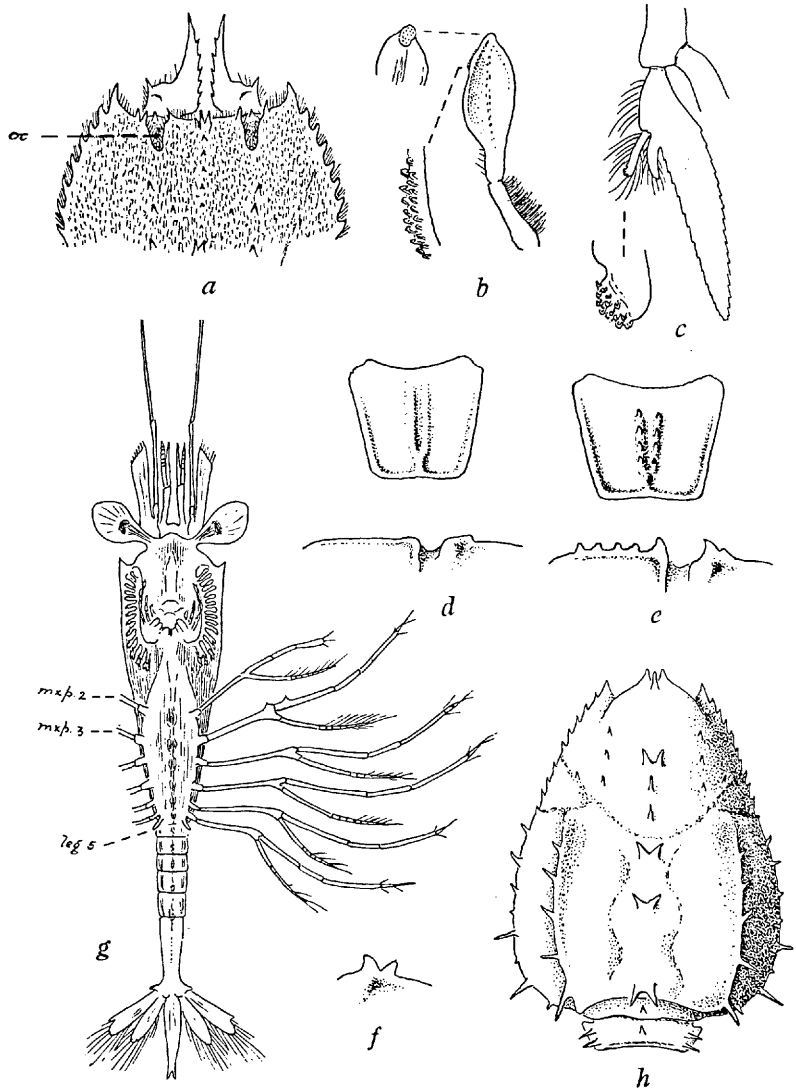

FIG. 105.—*Polycheles demani* Stebb. *a*, front of carapace (asymmetrical), and bases of 1st antennae. *b*, ventral view of pleopod 1 ♂, with scabrous apex in dorsal view and portion of row of coupling-hooks further enlarged. *c*, endopod of pleopod 2 ♂, with apex of appendix interna further enlarged, setae and exopod omitted.

Stereomastis sculpta (S. I. Smith). *d*, dorsal view of 6th abdominal segment, and profile of 6th segment and base of telson.

Stereomastis nana (S. I. Smith). *e*, the same.

Stereomastis suhmi (Bate). *f*, profile of base of telson.

Amphion larval stage. *g* (copy after Boas, 1939).

Eryoneicus faxoni Bouv. = larval stage of *Stereomastis sculpta*. *h* (copy after Bouvier, 1917).

Lateral borders of carapace constantly with fewer than 20 spines, medio-dorsal keel with a definite number of 4–7 spines; 1st abdominal segment with 2 spines on anterior margin near outer end (except *S. cerata* (Alck.)). Other characters as in *Polycheles*, except epipods, for which see key.

Key to the South African Species.

1. Grooved ridge on 6th abdominal segment low and uniform (fig. 105, *d*) . . . . . *sculpta.*
2. Grooved ridge with high, dentate edges (fig. 105, *e*).
   a. Antrorse spines on abdominal keels simple. . . . *nana.*
   b. Antrorse spines on segments 2–5 with a subsidiary denticle on hind slope . . . . . *suhmi.*

Stereomastis sculpta (S. I. Smith)

Fig. 105, *d*.

1882. S. I. Smith, Bull. Mus. Comp. Zool. Harvard, x, p. 23, pls. 3, 4 (*Pentacheles s.*).

1910. Stebbing, *l. c.*, p. 377 (*Polycheles s.*) (date of Stebbing, S. Afr. Crust., pt. 2, for 1882 read 1902).

1916. de Man, *l. c.*, p. 8.

1917. Bouvier, *l. c.*, p. 51, pl. 3, fig. 1.

1917. Stebbing, *l. c.*, p. 30.

1923. Stephensen, *l. c.*, p. 66.

1925. Balss, *l. c.*, p. 201.

1925. Calman, Fish. Mar. Biol. Surv. Rep., iv, Spec. Rep. 3, p. 18.

Median keel with 2 (rostral), 1, 2, 1 (♀ 2, 1, 1, 2, 1) spines in front of cervical groove, and 2, 1, 2 (in one juv. specimen 2, 2, 2) spines behind (*cf.* fig. 105, *h*); sublateral keel on branchial region with 5 spines, lateral margin with 5 or 6 + 3 in front of cervical groove, 6–8 behind. Inner orbital angle with a spine in ♂ (absent in ♀); spine on eye-stalk. Outer distal angle of basal joint of ant. 1 with 2 spines, inner margin smooth. Abdominal segments 1–5 with keels forming antrose spines, increasing in size from 1st to 4th, 5th smaller; 6th segment with a low sulcate groove, non-dentate; telson with very slight median keel at base.

Length ♀ up to 128 mm., ♂ 96 mm.

Localities.—Off Cape Natal (Durban), 440 fathoms (Stebbing); off Cape Point, 537–600 fathoms (Calman).

Distribution.—N. Atlantic, Mediterranean, Arabian Sea, East Indies, west coast of N. America.

Remarks.—In the s.s. *Pieter Faure* collection in the South African Museum there are 3 Cape Point specimens, including a 72 mm. ♀ and 2 juv. of 45 mm., which were taken in the same locality (in one case in the same haul) as numerous specimens of the following species (*nana*); they are assigned to *sculpta* on account of the ornamentation of the 6th abdominal segment. The ♀ has a triangular glandular patch between the bases of the last legs.

Stereomastis nana (S. I. Smith)

Fig. 105, *e*.

1910. Stebbing, *l. c.*, p. 377 (*Polycheles n.*).
1917. *Id.*, *l. c.*, p. 30.
1925. Calman, *l. c.*, p. 19.

Similar to *sculpta*, but median keel with 2, 1, 1, 2, 1 spines in front of, and 2, 2, 2 behind, cervical groove (12 specimens); 2 specimens with respectively 2, 1, 1, 2, 1, 1 and 2, 2, 2; one specimen with 2, 1, 1, 1, 1 and 2, 2, 2; one with 2, 1, 2, 1 and 2, 2, 2; abdominal segments 1–5 with the antrorse spines slightly stronger, the 5th at least as large as 4th (in one case 1st spine obsolete), sulcate keel on 6th segment with several sharp denticles on each side, with a prominent upstanding tooth behind; basal keel on telson with an upstanding or antrorse tooth, with a subsidiary denticle on its hinder slope. Pleopods 1 and 2 as in *demani* (fig. 105, *b*, *c*).

Length ♂ up to 54 mm., ovig. ♀ 65 mm. (carapace resp. 24 and 27 mm.).

Localities.—Off Cape Point, 750–800 fathoms (Stebbing); the same, 580–1200 fathoms (Calman); the same, 210–900 fathoms (S. Afr. Mus.).

Distribution.—East and west coasts of N. America. If *grimaldii* Bouv. be regarded as a variety the distribution extends to the eastern Atlantic.

Remarks.—The ovigerous ♀ and larger ♀♀ have the glandular patch between the bases of the last legs.

It has been suggested that *nana* is a dwarf deep-sea form of *scuplta*, but this does not seem to be supported by the bathymetrical distribution of the two forms.

Stereomastis suhmi (Bate)

Fig. 105, *f*.

1878. Bate, Ann. Mag. Nat. Hist. (5), ii, p. 278 (*Pentacheles s.*).
1888. *Id.*, Rep. H.M.S. *Challenger*, xxiv, p. 154, pl. 15, figs. 3, 4.
1920. Sund, Ann. Mag. Nat. Hist. (9), vi, p. 223.
1925. Calman, *l. c.*, p. 19, pl. 3, fig. 9.

Differs from *nana* in the spine formula for the median keel on carapace, viz. 2, 1, 1, 2, 2, 1 in front of, and 2, 2, 2, 2 behind cervical groove. The lateral spines number 5+2 or 3 in front of, and 8–9 behind cervical groove. Antrorse spine on 5th abdominal segment as large as that on 4th; spines on 2nd–5th segments each with a subsidiary denticle on its hind slope. Basal median keel of telson with 2 subequal divergent denticles one behind the other.

Length ♀ up to 47 mm. (carapace 20 mm.) (*Challenger* ♀ 50 mm. total).

Localities.—Off Cape Point, 1200 fathoms (Calman); same locality, 800 fathoms (S. Afr. Mus.).

Distribution.—West coast of Patagonia, 160–245 fathoms.

Remarks.—Exceedingly close to *nana*, but distinguished by the bifid antrorse spines on abdominal segments.

Amphion and *Eryoneicus* Stages.

1882. Bate, Ann. Mag. Nat. Hist. (5), x, p. 457.
1888. *Id.*, *Challenger* Rep., xxiv, pp. 122–126 (*Eryoneicus*) and pp. 901–918 (*Amphion*).
1901. Alcock, *l. c.*, p. 176 (*Eryonicus*, sic).
1915. Sund, Nature, xcv, June 3, p. 372 (*Eryoneicus*).
1917. Bouvier, *l. c.*, p. 54 (*Eryoneicus*)..
1924. Gurney, "Terra Nova" Rep., zool., viii, p. 104 (*Amphionidae*).
1925. Calman, *l. c.*, pp. 18–21 (*Eryoneicus*).
1936. Gurney, "Discovery" Rep., xii, p. 392 (*Amphionidae*).
1939. Boas, *l. c.*, pp. 24–29, figs. 11, 12 (*Amphion, Eryoneicus*).

Key to Eryoneicus *Forms correlated with Adults found in South Africa.*

The flat-topped papillae are not included in the following spine formulae; *c* = cervical groove.

1. Whole carapace covered with numerous spines . . . *kempi.*
2. Spines only on the keels on carapace:
   a. Spines on median keel: 2, 1, 2, 1, 1, *c* 2, 2, 2 . . *caecus* (*faxoni*).
   b. „ „ : 2, 1, 1, 2, 1, *c* 2, 2, 2 . . *hibernicus.*
   c. „ „ : 2, 1, 1, 2, 2, 1, *c* 2, 2, 2, 2 . *suhmi.*

Eryoneicus kempi Selbie = *Polycheles typhlops.*

1914. Selbie, Fish. Irel. Sci. Invest., p. 37, pl. 5, figs. 3–8.
1915. Sund, *l. c.*, p. 372.
1923. Stephensen, *l. c.*, p. 66.

Eryoneicus caecus Bate and *faxoni* Bouv. = *Stereomastis sculpta.*

Fig. 105, *h.*

1888. Bate, *l. c.*, p. 122, fig. 30, and pl. 12, E (*caecus*).
1905. Bouvier, C.R. Ac. Paris, cxl, p. 482 (*faxoni*).
1914. Selbie, *l. c.*, p. 29, pl. 4, figs. 1–5.
1917. Bouvier, *l. c.*, p. 78, pl. 4, figs. 14, 15, pl. 5, figs. 13–16 (*faxoni*).
1920. Sund, Ann. Mag. Nat. Hist. (9), vi, p. 220 (*caecus*).
1923. Stephensen, *l. c.*, p. 66 (*faxoni*).
1925. Calman, *l. c.*, p. 18.
Length 37 mm.
Locality.—Off Cape Point, 790 fathoms (Calman).

Eryoneicus hibernicus Selbie = *Stereomastis nana.*

1914. Selbie, *l. c.*, p. 33, pl. 5, figs. 1, 2.
1915. Sund, *l. c.*, p. 372.

Eryoneicus Stage = *Stereomastis suhmi.*

1925. Calman, *l. c.*, p. 20, pl. 4, fig. 10.
Length 26 mm.
Locality.—Off Cape Point, 790 fathoms (Calman).

NATANTIA.

1907. Borradaile, Ann. Mag. Nat. Hist. (7), xix, p. 469 (key to tribes).
1909. Calman, Lankester's Treatise, Zool., vii, p. 310.
The 5 pairs of abdominal appendages well developed, and used for swimming.

Key to the Divisions.

1. Third pair of legs chelate (except in genera in which the legs are much reduced). Pleurae of 1st abdominal segment not overlapped by those of 2nd segment (figs. 106, 119, *c*). Abdomen without sharp bend or hump.
   a. One or both legs of the 3rd pair longer and stouter than 1st and 2nd pairs. 1st pair of abdominal appendages ♂ not forming a petasma. Eggs carried by ♀ attached to the pleopods . . . . *Stenopodidea*, p. 576.
   b. Third pair of legs not longer or stouter than 1st and 2nd pairs. 1st pair of abdominal appendages ♂ forming a petasma (p. 580, figs. 107–120). Eggs shed loose into sea . . . . . *Penaeidea*, p. 579.
2. Third pair of legs not chelate. Pleurae of 1st abdominal segment overlapped by those of 2nd segment (figs. 128, 131, 147, 150). Abdomen usually with a sharp bend or hump (figs. 128, 131, 147). 1st pair of abdominal appendages ♂ not forming a petasma. Eggs carried by ♀ attached to the pleopods . . . . . *Caridea*, p. 646.

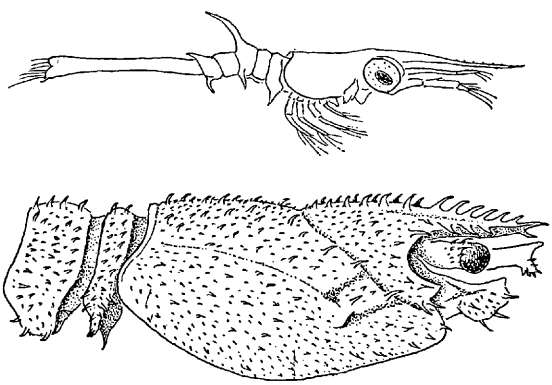

FIG. 106.—*Stenopus hispidus* (Olivier). 1st larval stage (copy from Gurney), and lateral view of carapace and first two abdominal segments of adult.

STENOPODIDEA.

1907. Borradaile, *l. c.*, p. 469 (Stenopides).

1909. Calman, *l. c.*, p. 311.

1924. Gurney, "Terra Nova" Rep., zool., viii, pp. 139–141 (affinities).

1946. Holthuis, Decap. Macrura Snellius Exp. Temminckia, vii, p. 2.

Abdomen without sharp bend or hump; pleura of 1st segment not overlapped by those of 2nd segment. Ant. 1 without spiniform projection (stylocerite). Mandibular palp curved inwards. Mxp. 1 without lobe at base of exopod, endopod short; mxp. 2 with terminal joints normal (contrast *Caridea*); mxp. 3 with 7 joints. First 3 pairs of legs chelate; one or both of the 3rd pair longer and much stouter than 1st and 2nd pairs. 1st pleopods ♂ not forming a petasma (see *Penaeidea*); no appendix interna on any of the pleopods; pleopod 1 ♀ without endopod. Gills trichobranchiate. Eggs carried by ♀ attached to the pleopods. First larval stage is a *Zoea*.

Remarks.—One family comprising seven described genera.

Gurney (1924) comes to the conclusion that "on the evidence of the adult structure *Stenopus* holds a position between the *Penaeidea* and the *Homaridea*," and that as regards its development it should be included in the *Reptantia*, near to the *Laomediidae* and *Anomura*.

Family STENOPODIDAE.

1901. Alcock, Cat. Ind. Deep-sea Macrura, p. 143 (deep-sea genera).
1917. Stebbing, Ann. Durban Mus., i, p. 440.
1946. Holthuis, *l. c.*, p. 4 (key to genera).

Key to the South African [and Mauritian] Genera.

1. Body compressed. Endopod of uropod with 2 dorsal ridges, a median one and an inner weaker one . . . . *Stenopus.*
2. Body depressed. Endopod of uropod with a single median ridge . . . . . [*Microprosthema*].

Microprosthema Stimpson 1860 (syn. *Stenopusculus* Richters 1880) is represented at Mauritius by 2 species: *validum* Stmpsn. and *plumicorne* (Richters). (See Holthuis, *l. c.*, 1946.)

Gen. Stenopus Latr.

1825. Latreille in Desmarest, Consid. gen. Crust., p. 226.
1917. Stebbing, *l. c.*, p. 440.
1936. Gurney, "Discovery" Rep., xii, pp. 380 *sqq.* (larval stages).
1941. Lebour, J. Linn. Soc. Lond., xli, p. 161, figs. 20–26 (larval stages).
1946. Holthuis, *l. c.*, p. 5 (key to species).

Eyes present. Rostrum long. Carapace and abdomen spinose. Antennal scale long, flat. Endopod of mxp. 1 3-jointed; exopod of

mxp. 3 well developed. 3rd leg with 5th joint of fair length, 6th joint slender (except *robustus* Borrad. 1910). 4th and 5th legs with 5th and 6th joints multiarticulate, dactyls short, biunguiculate. Telson pointed. Gills 19 + 7 epipods (Bouvier, Holthuis) or 21 + 7 epipods (Gurney, 1924).

Stenopus hispidus (Olivier)

Spiny Shrimp.

Fig. 106.

1893. Herrick, Mem. Nat. Ac. Sci., v, pp. 326, 339, pls. 5–13.

1901. Rathbun, Bull. U.S. Fish. Comm. [1900], xx, p. 99, pl. 2 (synonymy).

1917. Stebbing, *l. c.*, p. 440 (references).

1924. Gurney, *l. c.*, p. 133 (larval stage).

1927. Boone, Bull. Bingham Ocean. coll., i, p. 82 (colour).

1930. McNeill and Ward, Rec. Austral. Mus., xvii, p. 360.

1936. Gurney, *l. c.*, pp. 380, 391, figs. 1–3 (larval stages).

1940. Kubo, J. Imp. Fish. Inst. Tokyo, xxxiv, p. 95, figs. 14, 15.

1941. Lebour, *l. c.*, p. 175, figs. 24–26 (larval stages).

1946. Holthuis, *l. c.*, p. 12, pl. 1, figs. *a–g* (references).

Rostrum extending scarcely beyond apex of 1st joint of ant. 1; 3 (main) outstanding lateral spines, 5–6 medio-dorsal spines (excl. apical point) followed by 5–6 pairs of spines back to cervical groove, 1 subapical ventral spine. Medio-dorsal length of raised spinose portion of abdominal segment 2 much greater than that of anterior smooth portion, with numerous rows of spines. Abdominal segments 4 and 5 with numerous adpressed spines arranged obliquely and radiately on either side of smooth median stripe, leaving only a small area bare of spines at bases of segments. Abdominal segment 6 with numerous spines arranged in longitudinal or slightly oblique rows. Telson with 6–7 lateral spines (excl. the one at each corner of narrow apex). A medio-ventral spiniform tubercle on abdominal segments 1-5 in ♂, on segment 5 only in ♀; ventral surface of 6th segment closely covered with numerous spines and spinules. Longest spines on eye-stalk scarcely extending half-way over the cornea. All ridges on 4th–6th joints of 3rd leg (incl. lower ridges on 6th joint, and lower edge of thumb) with strong, regularly and closely-set, curved spines.

Length (incl. rostrum) ovig. ♀ up to 61 mm., 3rd leg 70 mm. (S. Afr. Mus.). White or pellucid, with carapace in front of cervical groove, rostrum, 3rd and 6th abdominal segments, and telson crimson or

violaceous; sternum claret, bases of legs violaceous; legs white banded with yellow or orange; antennae white.

Localities.—Durban (Stebbing, and S. Afr. Mus.); off Pondoland coast, Agulhas Bank, and S.W. of Cape Point (35° S., 17° 49′ E.) (Gurney: larval stages).

Distribution.—Madagascar, east coast of Africa, Chagos, Indo-Pacific; West Indies.

Remarks.—According to Gurney the larva is distinguished by having a medio-ventral hook on 5th abdominal segment, a medio-dorsal spine on 3rd abdominal segment, and the rostrum smooth or with minute spinules.

Both rami of the 2nd–4th pleopods in the ovigerous ♀ are very large and arch over towards the middle line, forming a loose kind of brood-pouch, which is closed fore and aft by the 1st and 5th pleopods respectively. The eggs are very numerous, approximately ·75 mm. in diameter.

Possibly *tenuirostris* de Man (1887, Arch. Naturg., liii, p. 567, pl. 22, *a*, fig. 5) (Amboina, 25 mm. in length, ♂♂♀♀) may prove to be the not fully-grown form of *hispidus*, especially as de Man (1902, Abh. Senckenb. Ges., xxv, p. 761) has described *tenuirostris* var. *intermedius* combining features of both "species." *S. tenuirostris* has a longer rostrum with 3, 4, 5 or even 9 spines on the ventral edge, and longitudinal rows of spinules on legs 1, 2, 4 and 5 (see Holthuis, *l. c.*, 1946).

PENAEIDEA.

1907. Borradaile, Ann. Mag. Nat. Hist. (7), xix, pp. 469, 470 (Penaeides).

1909. Calman, Lankester's Treatise, Zool., vii, p. 310.

1924. Gurney, "Terra Nova" Rep., zool., viii, pp. 48 *sqq.* (larval forms).

Abdomen without sharp bend. Pleurae of 2nd abdominal segment not overlapping those of 1st segment. Antenna 1 usually with stylocerite. Mandibular palp straight. Mxp. 1 without lobe at base of exopod, endopod long; mxp. 2 with terminal joints normal (contrast *Caridea*); mxp. 3 with 7 joints. First 3 pairs of legs chelate (except when the legs are much reduced), 3rd pair not stouter than 1st and 2nd pairs. 1st pleopods ♂ forming a petasma (see below); no appendix interna on any of the pleopods, but an appendix masculina (uni- or bi-lamellate) on plepood 2 ♂; endopod of pleopod 1 ♀ reduced

or absent. Gills dendrobranchiate (absent in *Leuciferidae*). Eggs not carried by ♀.

Remarks.—The eggs are shed loose into the sea. The 1st larval stage is a *Nauplius*, successive stages being *Metanauplius*, *Protozoea*, *Zoea*, *Metazoea*, and the *Mysis* (or Schizopod) stage. In the *Sergestidae* the first larval stage is the *Protozoea*.

The petasma (andricum or curtain) formed by the 1st pleopods of the ♂ functions as a kind of scoop or channel for the transmission of the sperm or spermatophores to the ♀. The thelycum (spermatheca or receptaculum seminis) of the ♀ receives and stores the sperm or sperm-packets; it may be simple or rather complicated in structure.

Alcock and Borradaile arrange the Penaeides in 2 families: *Penaeidae* and *Sergestidae*, with subfamilies. Calman prefers one family, *Penaeidae*, with subfamilies. For the sake of convenience the present arrangement has three families, one of them with several genera.

Key to the South African Families.

1. Gills numerous. First 3 pairs of legs chelate; 4th and 5th pairs well developed. . . . . *Penaeidae.*
2. Gills few, not more than 8. 1st pair of legs non-chelate; 4th and 5th pairs rudimentary, or reduced, or absent . *Sergestidae.*
3. Gills absent. Head greatly elongate. First 2 pairs of legs non-chelate; 3rd (imperfectly) chelate; 4th and 5th pairs absent (fig. 121) . . . . . *Leuciferidae.*

Family PENAEIDAE.

1901. Alcock, Cat. Ind. Deep-sea Crust., p. 11.

1906. *Id.*, Cat. Ind. Dec. Crust., pt. 3, p. 4.

1907. Borradaile, *l. c.*, p. 470.

1908. Bouvier, Res. Sci. Camp. Monaco, fasc. 33, pp. 9 sqq.

1910. Stebbing, *l. c.*, p. 379.

1911. de Man, Siboga Exp. monogr., xxxix*a*, pp. 5 *sqq.* (list of species to 1910), and plates publ. 1913.

1924. Gurney, *l. c.*, pp. 49 *sqq.* (larval forms).

1927. *Id.*, Trans. Zool. Soc. Lond., pt. 2, pp. 232 *sqq.* (larval forms).

1938. Ramadan, John Murray Exp., v, pp. 141–5 (eye-stalks, structure).

Rostrum laterally compressed, usually well developed. Mxp. 2 with well-developed epipod. Exopods often present on some or all of the legs. Gills numerous, arthrobranchs always present. Petasma sometimes asymmetrical. Thelycum well developed (usually).

Key to the Subfamilies and South African Genera.

I. A foliaceous flexible appendage on inner margin of basal joint of ant. 1 (except in *Macropetasma*, where it is short (fig. 111, *c*). No podobranchs on legs [except *Haliporus* s.s., not S. African].

A. Cervical groove incomplete or absent (figs. 107–112). 1st joint of mandibular palp smaller than 2nd (fig. 107, *h*) (*Penaeinae*).

1. Rostrum dentate on dorsal and ventral edges.*

a. Cutting-process of mandible short, square-cut (fig. 107, *h*) . . . . . *Penaeus.*

b. Cutting-process elongate, scythe-like (fig. 112) . . . . [*Funchalia* subgen. *Pelagopenaeus*].

2. Rostrum dentate only on dorsal edge.

a. Mxp. 3 without epopod. Carapace without lateral keels. Lateral keel on 6th abdominal segment discontinuous and inconspicuous.

i. Telson grooved. Dorsal keel on at least 4th–6th abdominal segments.

α. Longitudinal and transverse sutures on carapace absent.

* Exopods on all legs. Telson subapically trifid (fig. 108, *d*) . . *Penaeopsis.*

** Exopods absent from 5th leg. Telson not trifid. *Metapenaeus.*

β. Longitudinal and transverse sutures present (fig. 110, *a*, *c*, *f*).

* Exopods absent from all legs. Telson trifid . *Parapenaeus.*

** Exopods on all legs, but epipods absent from at least last 3, sometimes all 5, legs. Telson not trifid . . *Parapenaeopsis.*

ii. Telson not grooved. Dorsal keel only on 6th and hinder part of 5th abdominal segments. Rostrum cultrate . . . . . *Macropetasma.*

b. Mxp. 3 with epipod. Lateral keels on carapace. Lateral keel on 6th abdominal segment continuous. Cutting-process of mandible elongate, scythe-like (fig. 112) . . . . *Funchalia* subgen. *Funchalia.*

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* Caution: abnormal specimens; see Remarks under *P. indicus*, p. 589.

B. Cervical groove reaching dorsum (figs. 113, 115). 1st joint of mandibular palp large, almost or quite equal to 2nd.* A post-orbital (submarginal) spine present (*Solenocerinae*).

1. Flagella of ant. 1 broad, compressed, forming a respiratory channel. 3rd–5th sternites narrow (fig. 113, *b*) . . . . . *Solenocera.*
2. Flagella of ant. 1 not forming a channel. 3rd–5th sternites broad (fig. 115, *b*) . . . *Hymenopenaeus.*

II. No appendage on ant. 1, or only a short rigid scale, not foliaceous.

A. Podobranchs on first 2 or 3 pairs of legs (except *Gennadas* where none behind mxp. 2). Arthrobranchs in a double series (*Aristeinae*).

1. Outer flagellum of ant. 1 short and thickened. Rostrum tri- or multi-dentate, usually long.
   a. Rostrum tridentate (2–4). Hepatic spine absent . . . . . *Plesiopenaeus.*
   b. Rostrum multidentate. Hepatic spine present . . . . . *Aristeomorpha.*
2. Both flagella of ant. 1 long. Rostrum short, unidentate.
   a. No podobranch on mxp. 3 or any of the legs. Only 6th abdominal segment keeled . *Gennadas.*
   b. Podobranchs on mxp. 3 and 1st–3rd legs.
      i. Exopod of mxp. 1 distally constricted and segmented. Abdominal segments 3–6 keeled . . . [*Benthesicymus*].
      ii. Exopod of mxp. 1 not constricted nor segmented. Only abdominal segment 6 keeled . . . . *Bentheogennema.*

B. Podobranchs on mxp. 2 only. Pleopods uniramous (except in a modified form on plp. 1 and 2 ♂). Integument firm. Carapace and abdomen dorsally keeled (*Eusicyoninae*) . . . . *Eusicyonia.*

Gen. PENAEUS Fabr.

1906. Alcock, Cat. Ind. Decap. Crust., pt. 3, p. 4 (s. lato), p. 7 (s. restricto).

1910. Stebbing, *l. c.*, p. 380.

1911. de Man, *l. c.*, pp. 10 (list of species) and 95.

1926. Schmitt, Biol. Res. "Endeavour," v, p. 359 (key to Australian and Indo-Pacific species).

1934. Burkenroad, Bull. Amer. Mus. Nat. Hist., lxviii, p. 74.

* Where palp is 3-jointed as in *Hymenopenaeus triarthrus*, read: middle and apical joints instead of 1st and 2nd respectively.

1938. Dakin, Proc. Zool. Soc. Lond., ser. A, pt. 2, pp. 163 *sqq.*, pls. 1–7 (development, habits, *P. plebejus*).

1938. Heldt, Ann. Inst. ocean. Paris, xviii, pp. 45, etc. (reproduction, development).

1940. Dakin, Rec. Austral. Mus., xx, p. 354 (development, additional notes and figures).

As restricted by S. I. Smith (1885) and Alcock (1901): pleurobranch present on 5th leg; no epipods on last 2 legs; exopods present on all legs, or all but the 5th. Gills 19 + 6 epipods (Alcock). Flagella of ant. 1 short. Terminal (7th) joint of mxp. 3 in ♀ inserted apically on 6th joint, *i.e.* normal, terete, setose; in ♂ 6th joint carries apically a pencil of bristles which lie in the grooved and glabrous 7th joint, which is inserted subterminally on 6th (fig. 107, *i*). Appendix masculina on pleopod 2 ♂ scale-like, with marginal spinules (fig. 107, *f*).

Remarks.—Mostly inhabitants of littoral and shallow water, and mostly Indo-Pacific.

Dakin (1938, 1940) has described the life-history of the Australian King Prawn (*P. plebejus* Hess). During the winter small prawns are found in the rivers and lagoons. In September–October they appear nearer the harbour-mouths and in increasing size. From December to the end of summer shoals of large-sized prawns, but with unripe gonads, pass out to sea. The largest-sized prawns with ripe ovaries are only caught well out to sea, where the eggs are laid. The planktonic stages move inshore, and the prawns in the post-*Mysis* and young-prawn stages enter the estuaries and lagoons. They become bottom-dwellers at about 17 mm. in length. It is believed that they spend about twelve months here before descending to the sea for spawning, and that after reaching the sea another six months elapse before they reach sexual maturity. It seems certain that the sexually developed prawns do not re-enter the estuaries after spawning.

Cf. Weymouth, Lindner and Anderson (1932 and 1933), and Burkenroad (1934, *l. c.*, pp. 81–84), for life-history of the American *P. setiferus*. Also Burkenroad, 1939, Bull. Bingham Ocean. Coll., vi, pp. 45 *sqq.*

Key to the South African Species.

I. Lateral grooves on either side of rostrum not extending to hind margin of carapace (fig. 107, *a*, *g*). Rostrum with 2–5 ventral teeth. No post-ocular crest. Telson without lateral spines. Thelycum (♀) of 2 flaps meeting in middle line (fig. 107, *c*).

A. No exopod on 5th leg (fig. 107, *a*). Rostral teeth usually $\frac{7}{3}$ . . . . . *monodon* (incl. *caeruleus*).

B. Exopod on 5th leg (but smaller than preceding ones) (fig. 107, *j*).
1. Subhepatic crest present (*cf.* fig. 107, *a*). Rostral formula $\frac{6-7}{3}$ . . . . . *semisulcatus.*
2. No subhepatic crest (fig. 107, *g*). Rostral formula $\frac{7-8}{4-5}$, rostrum usually extending beyond apex of antennal scale . . . . . *indicus.*

II. Lateral rostral grooves extending almost to hind margin of carapace. Post-ocular crest present (fig. 107, *m*).
A. Coxal joint of 1st–3rd legs with a spine. Telson with lateral spines. Post-ocular crest looped. Rostral formula $\frac{10-11}{1}$ . . . . . [*trisulcatus* Angola].
B. Coxal joints unarmed.
1. Post-ocular crest simple. More than one ventral tooth on rostrum. Telson without lateral spines . . . . . [*duorarum* Angola].
2. Post-ocular crest looped (fig. 107, *m*).
a. Telson without lateral spines. Rostral formula $\frac{10-12}{1}$ . . . . *canaliculatus.*
b. Telson with 3 pairs of lateral spines. Rostral formula $\frac{9-10}{1}$. Thelycum (fully developed) tubular, pouch-like (fig. 107, *n*) *japonicus.*

Burkenroad (1934, p. 76) has pointed out that *P. durbani* Stebb (1917, Ann. Durban Mus., i, p. 442, pl. 22) was incompletely described and figured. It might have been, and probably was, a specimen of *indicus*, but the figure shows a post-ocular tooth and only one ventral tooth on rostrum (but see Remarks under *indicus*, p. 590). Burkenroad also states that *pulchricaudatus* Stebb. (1914, Ann. S. Afr. Mus., xv, p. 14, pl. 3 (Crust., pl. 117)), in spite of its size, is a post-*Mysis* (Sicyonine stage) of probably *japonicus*.

Burkenroad (1939, Bull. Bingham Ocean. Coll., vi, pp. 26 *sqq.*) has divided *P. brasiliensis* Latr. *sensu lato* into three Atlantic and two Pacific species, and renamed the West African form *duorarum* (*l. c.*, p. 31, figs. 18, 19, 23, 25–27).

Penaeus monodon Fabr.

Tiger Prawn.

Fig. 107, *a–f.*

? 1878. Hilgendorf, MB. Ak. Wiss. Berlin, p. 843 (*semisulcatus* var. *exsulcatus*).

1905. Stebbing, Mar. Invest. S. Afr., iv, p. 74 (part synonymy).

1905. *Id.*, *ibid.*, p. 77, pls. 21, 21 *bis* (*caeruleus*).

1906. Alcock, *l. c.*, p. 10, pl. 1, fig. 2 (*semisulcatus*, non de Haan).

1910. Stebbing, *l. c.*, p. 380 (*monodon* and *caeruleus*).

1911. de Man, *l. c.*, pp. 99, 100 (*caeruleus*, colour var. of *semisulcatus* de Haan).

1911. *Id.*, *ibid.*, p. 101 (*carinatus* Dana).

1912. Lenz, Ark. Zool., vii, no. 29, p. 5.

1915. Kemp, Mem. Ind. Mus., v, p. 317, fig. 36 (juv.) (*carinatus*).

1926. Barnard, Trans. Roy. Soc. S. Afr., xiii, p. 121.

1926. Schmitt, *l. c.*, p. 359 (*carinatus*, in key) and pp. 363, 364.

[not *monodon* Bate, 1888, nor Alcock, 1906. =*semisulcatus* de Haan.]

Rostrum with a more or less distinct double curve, extending to about end of antennal scale (in specimens from about 30 mm. total length upwards), lateral grooves extending backwards scarcely to the hindmost rostral tooth; post-rostral median keel flat-topped with indications of a groove (one or two shallow elongate depressions); usually 7 teeth above, 3 below, sometimes 6 or 8 above, 2 or 4 below. Carapace glabrous; post-antennular spine continued as an oblique ridge to the hepatic spine; above this a ridge and a groove connecting with the feebly defined cervical groove, and at their junction a rather deep tomentose hollow, subhepatic (branchial) ridge distinct. Abdominal segments 4–6 keeled, keel on 6th segment ending acutely. Telson medianly grooved, without lateral spines. 2nd and 3rd joints of 1st leg, and 2nd joint only of 2nd leg each with a spine; exopod of 5th leg absent (a tiny immobile papilla marking its position). 7th joint of mxp. 3 ♂ not quite as long as 6th joint (equal to distance from base of 6th joint as far as subterminal insertion of 7th joint). Thelycum of two flaps meeting (when fully developed) in middle line. Petasma, fig. 107, *e*.

Length up to 300 mm. (Alcock). Pale buff, more or less semi-transparent, minutely speckled with blue, especially on abdomen, greyish cross-bands more or less conspicuous on 1st, 3rd and 6th abdominal segments, that on 6th segment the most conspicuous, keel on carapace and abdominal segments grey-brown; antennal scale, eye-stalks, and especially the apical parts of uropods blue, fringe on latter *dull* reddish; flagella of antenna banded; pleopods dark reddish. In *caeruleus* the colour is a vivid blue, especially intense on eye-stalks, antennal scale, and uropods, and on the cross-bands on abdominal segments.

Localities.—Natal (Krauss); Zwartkops River mouth, Algoa Bay (Stebbing); Nahoon River, East London (Stebbing); Buffalo River,

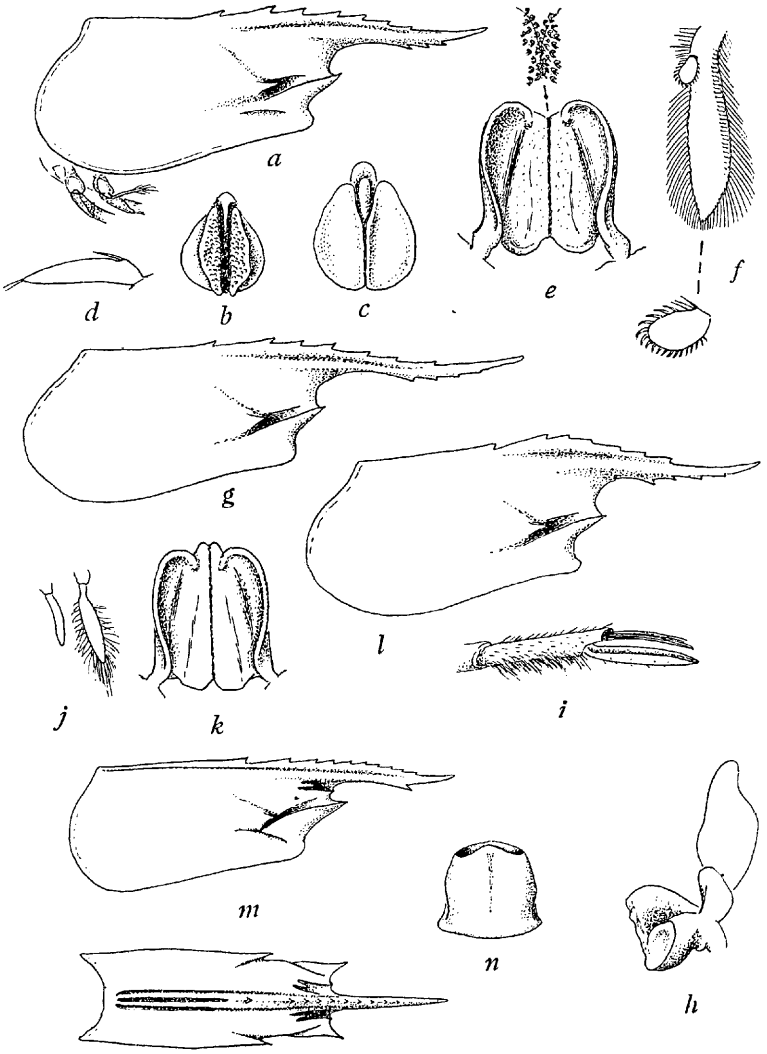

FIG. 107.—*Penaeus monodon* Fabr. *a*, carapace (setae on rostrum omitted) with bases of 4th and 5th legs. *b*, open thelycum, ♀ 145 mm. long. *c*, thelycum, ♀ 190 mm. long. *d*, pleopod 1 ♂, 30–55 mm. long (inner margin above). *e*, petasma (1st pleopods), ♂ 160 mm. long, opened out, posterior view, with coupling further enlarged. *f*, anterior view of endopod of left pleopod 2 ♂, with appendix masculina further enlarged.

Penaeus indicus M. Edw. *g*, carapace (setae on rostrum omitted). *h*, inner view of mandible, setae on palp omitted. *i*, 6th and 7th joints of mxp. 3 ♂. *j*, exopods of 4th (right) and 5th (left-hand figure) legs. *k*, petasma of ♂. *l*, carapace of ♀ approximating to *merguiensis* de Man.

Penaeus japonicus Bate. *m*, lateral and dorsal views of carapace. *n*, thelycum of ♀.

East London (S. Afr. Mus.), Port St. Johns (S. Afr. Mus.); Durban (Lenz); Durban and Umgeni Lagoon, and Delagoa Bay (S. Afr. Mus.); off Durban, 27–40 fathoms (Gilchrist); St. Lucia Bay, Zululand (coll. Fisheries Survey, 1940).

Distribution.—Indian Seas, East Indies, Japan.

Remarks.—Owing to the unholy confusion between "*monodon*" and "*semisulcatus*," de Man and Kemp recorded this species under Dana's name.

The records of Bianconi (Mozambique) and Hilgendorf (*l. c., supra*, Quelimane and Zanzibar) are probably, but not certainly, referable to this species.

The largest specimen I have seen (a ♀ from Delagoa Bay) measures 270 mm.

I have no hesitation in making *caeruleus* a synonym; I would not even regard it as a special colour variety. de Man regarded it as a variety of *semisulcatus* de Haan because, on examination of a specimen sent him by Stebbing, he found an exopod on the 5th leg. This statement is in conflict with Stebbing's description, and my own examination of 15 cotypes, 30–125 mm. in length. In a bottle containing 4 large cotypes of *caeruleus*, returned by Stebbing with his autograph label, there was also a specimen of *indicus* (speckled with blue). Is it not possible that Stebbing sent de Man a specimen of *indicus* by mistake, and that de Man accepted it as *caeruleus* "on trust"? *P. indicus has* an exopod on 5th leg, and as Stebbing says (1900, Mar. Invest. S. Afr., i, p. 36), "mistakes are never impossible."

Stebbing's largest *caeruleus* was approximately 135 mm. in length. He figured one side of the petasma of an immature ♂, described and figured an immature thelycum, and mentioned that in 2 larger ♀♀ the sides of the thelycum have closed over to meet in the middle line.

The 4 largest cotypes (95–125 mm.) are all immature ♂♂, because the two halves of the petasma are not united, although the whole inner margin is closely set with coupling-hooks (in Stebbing's pl. 21, fig. *pet.* represented as serrations). In a 160 mm. *monodon* they are united, not indissolubly, but very firmly, the very numerous multiseriate coupling-hooks resembling what might be described as a "multi-Zip" fastener (fig. 107, *e*). In specimens 30–55 mm. in length each half of the petasma, *i.e.* each pleopod 1, is a small lanceolate appendage with a spine-seta on its inner margin (opposed to its fellow) (fig. 107, *d*).

These juvenile specimens show the specific features of the adult; absence of exopod on 5th leg, presence of spines on the proximal joints

of 1st and 2nd legs (that on 2nd leg indicated only by a minute setiferous tubercle in the 30 mm. specimen), rostral formula and ridges on carapace.

Penaeus semisulcatus de Haan

1888. Bate, Rep. H.M.S. *Challenger*, xxiv, p. 250, pl. 34, fig. 1 (*monodon*, non Fabr.) (? figs. 1″, 1‴; these figs. show no 5th exopod).

1906. Alcock, *l. c.*, p. 8, pl. 1, figs. 1, 1, *a*, *b* (*monodon*, non Fabr.).

1911. de Man, *l. c.*, p. 97, and 1913, pl. 9, figs. 31, *a*, *b*.

1917. Stebbing, Ann. Durban Mus., i, p. 441, pl. 22 (petasma).

1925. Calman, Fish. Mar. Biol. Surv. Rep., iv, Spec. Rep. 3, p. 12.

1930. Monod, Zool. Anz., xcii, p. 138, fig. 2.

[not *semisulcatus* Stebbing 1915. =*indicus*.]

Agrees with *monodon* except that it possesses a small but distinct exopod on 5th leg.

Length up to 230 mm. (Alcock).

Localities.—Durban Bay (probably) (Stebbing); off Durban, 38 fathoms (Calman); Durban Bay, St. Lucia Bay, and off Zululand coast, 26 fathoms (S. Afr. Mus.).

Distribution.—Suez, Red Sea, coasts of India, East Indies, Philippine Is., Japan. By migration through Suez Canal to Gulf of Alexandrette, Syria.

Remarks.—Although Stebbing (1917) did not mention the exopod of the 5th leg as being present or absent in his specimen, he quotes de Man and must have been aware of this diagnostic feature separating *semisulcatus* and *monodon*.

Hilgendorf's record has been assigned to *monodon* (see *supra*), but there is no means of being sure unless the specimens are still in existence.

I have only seen 1 ♂, 2 juv. ♂♂, and 2 juv. ♀♀. The species would seem to be much rarer than *monodon*.

Penaeus indicus M. Edw.

Fig. 107, *g–l*.

1878. Hilgendorf, MB. Ak. Wiss. Berlin, p. 844.

1915. Stebbing, Ann. S. Afr. Mus., xv, p. 69 (*semisulcatus*, non de Haan).

1915. Kemp, Mem. Ind. Mus., v, p. 319.

1917 (May). Stebbing, Ann. S. Afr. Mus., xvii, p. 32.

? 1917 (July). Stebbing, Ann. Durban Mus., i, p. 442, pl. 22 (*durbani*).

1917. *Id.*, *ibid.*, p. 443 (*indicus* var. *longirostris* de Man).

1921. *Id.*, Ann. S. Afr. Mus., xviii, p. 463, pl. 20 (Crust., pl. 115) (*longicornis*).

1926. Schmitt, *l. c.*, p. 360 (in key) and p. 361.

1937. Menon, Bull. Madras Mus., III, 5, p. 2, figs. (development).

1938. Ramadan, John Murray Exp., v, p. 62.

1942. Chace, Bull. Mus. Comp. Zool. Harv., xci, p. 185.

Rostrum with distinct double curve, slender distally and extending beyond apex of antennal scale, usually longer in juv. than in adult; lateral grooves extending backwards to about the hindmost rostral tooth; post-rostral keel often feebly developed, moderately sharp or slightly flattened, with one or two shallow pits; 8–9 (occasionally 7) dorsal and 4–5 (occasionally 3 or 6 or 7) ventral teeth. Carapace glabrous; post-antennular spine and ridge, hepatic spine, with ridge above as in *monodon*, but subhepatic ridge absent. Abdominal segments 4–6 keeled, keel on segment 6 ending acutely. Telson grooved, without lateral spines. 2nd and 3rd joints of 1st leg, and 2nd joint only of 2nd leg with a spine. A small but movable, non-setose, exopod on 5th leg. 7th joint of mxp. 3 of adult ♂ sub-equal to 6th joint. Thelycum as in *monodon*. Petasma, fig. 107, *k*.

Length up to 200 mm. (Alcock). Pale buff more or less semi-transparent, speckled with blue; crest of carapace and abdomen, keel and margin of telson, median ridge and outer margin of uropods brown; eye-stalks and antennal scale faintly bluish, margin of uropods usually blue with the fringe *bright* red; flagella of antennae banded or spotted, 2nd antennae uniform; pleopods faintly reddish.

Localities.—Quelimane (Hilgendorf); Umgeni Lagoon and Durban (Stebbing); Delagoa Bay (Stebbing, and S. Afr. Mus.); off Tugela River, Natal, 24 fathoms, and mouth of Zwartkops River, Algoa Bay (S. Afr. Mus.); Buffalo River, East London (S. Afr. Mus.) Port St. Johns (S. Afr. Mus.); St. Lucia Bay, Zululand (Fisheries Survey, 1940).

Distribution.—East coast of Africa, Gulf of Aden, coasts of India and Ceylon, Andaman Is., East Indies.

Remarks.—Stebbing's 1921 locality (off Cape Point, 650 fathoms) is obviously due to a mixture of labels; the Museum registration number does not refer to a Decapod Crustacean, and the locality is incorrect; the specimen was not returned to the Museum and cannot be checked.

Two large ♀♀ (185 mm.) from off the Tugela River approximate to

merguiensis de Man in the shape of the rostrum, which is rather strongly arched, but not so strongly as in de Man's (1888) or Alcock's (1906) figures (fig. 107, *l*). One of this pair has no trace of any ventral teeth on rostrum (Stebbing's *durbani* had only one ventral tooth). The ♂♂ from Umgeni Lagoon are typical *indicus* as regards the proportional lengths of the 6th and 7th joints of mxp. 3.

Occasionally the exopod of 5th leg is absent from one side, or from both sides; in which case the identity must be confirmed by recourse to the characters of the rostrum and carapace.

Schmitt (1926) had not seen Stebbing's 1921 paper; but as Burkenroad (1934) does not follow Stebbing in identifying *indicus* M. Edw. 1837 with *longicornis* (Oliv.) 1825, Milne Edwards' name is here retained.

Penaeus canaliculatus Oliv.

1888. Bate, Rep. H.M.S. *Challenger*, xxiv, p. 243, pl. 32, figs. 1, 2.

1911. de Man, *l. c.*, p. 106, and 1913, pl. 9, figs. 34, *a*, *b*.

[not Alcock, 1906, nor Stebbing, 1914, p. 13. =*japonicus*.]

The typical form, from which Bate separated *japonicus* as a variety, is characterized by having no spines on the lateral margins of telson.

Length up to 137 mm. (de Man).

Locality.—Port Edward, Natal (coll. T. A. Stephenson).

Distribution.—Mauritius, Red Sea, East Indies, Fiji Is.

Remarks.—As stated below under *japonicus*, Stebbing's 1914 specimen (S. Afr. Mus., No. A1190, that is to say, the specimen *returned as such* by Stebbing and bearing his autograph label) is really *japonicus*.

The only specimens I have seen, in which there are no spines on the telson and no trace of any pits or notches for their insertion, are two juv. ♀♀, 45 and 70 mm. in length, from the above locality.

Penaeus japonicus Bate

Fig. 107, *m*, *n*.

1878. Hilgendorf, MB. Ak. Wiss. Berlin, p. 843 (*canaliculatus* with telsonic spines).

1906. Alcock, *l. c.*, p. 14, pl. 2, figs. 6, 6, *a–c* (*canaliculatus*, non Oliv.).

1914. Stebbing, Ann. S. Afr. Mus., xv, p. 12, and p. 13 (*canaliculatus*, non Oliv.).

? 1914. *Id.*, *ibid.*, p. 14, pl. 3 (Crust., pl. 117) (*pulchricaudatus*, = juv.).

1918. Stebbing, Ann. Durban Mus., ii, p. 60.

1926. Barnard, Trans. Roy. Soc. S. Afr., xiii, p. 121.

1926. Schmitt, *l. c.*, p. 359 (in key) and pp. 366, 369.

1930. Monod, Zool. Anz., xcii, p. 138, fig. 3.

Rostrum nearly straight, extending to or slightly beyond end of antennal scale, lateral grooves extending backwards almost to hind margin of carapace, flanking the post-rostral grooved keel; 9–11 dorsal teeth and a single ventral tooth. Carapace glabrous; post-ocular spine and ridge present, post-antennular spine and ridge, hepatic spine with ridge above, and a well-marked subhepatic ridge curving downwards anteriorly. Abdominal segments 4–6 keeled, keel on segment 6 ending acutely. Telson grooved, distal half of lateral margin with 3 mobile spines (sometimes indistinct or lost, but the notches for their insertion distinct). 2nd joints of 1st and 2nd legs each with a strong slender spine, but no spine on 3rd joint of 1st leg. Exopod of 5th leg setose and not much smaller than that of 4th leg. 7th joint of mxp. 3 ♂ about half the length of 6th joint. Thelycum pouch-like, opening anteriorly. Petasma similar in shape to that of *monodon*.

Length up to 270 mm. (Kishinouye). Light brown or greenish with darker cross-bands, especially on abdomen; telson and uropods banded with red, brown and yellow, with a blue band at end of both rami of uropods, the fringe carmine (Kishinouye, Stebbing).

Localities.—Mozambique (Hilgendorf); off Cape St. Francis, 32 fathoms, off Durban, 15 fathoms, and Durban Bay (Stebbing); Delagoa Bay (coll. K. H. B.); Knysna, Zwartkops River mouth, and St. Lucia Bay (S. Afr. Mus.).

Distribution.—East coast of Africa, Red Sea, Indian Seas, East Indies, Japan, Fiji Is. By migration through Suez Canal to Gulf of Alexandrette, Syria.

Remarks.—The specimen S. Afr. Mus., No. A1190 (returned as such by Stebbing), which was recorded by Stebbing as *canaliculatus* because of the supposed absence of telsonic spines, has in fact got 3 pairs of spines.

In ♀♀ 85–90 mm. in length the thelycum has the characteristic shape but not its full size; in one of 45 mm. there are 2 small cushion-like lobes not meeting in the middle line; in specimens of 70–80 mm. the lobes meet but are not yet fused to form a tubular structure.

Two large ♀♀, 168 and 175 mm. in length, from Knysna were collected by Dr. J. L. B. Smith, and constitute the most westerly record on the South African coast of any species of *Penaeus*.

This species seems to be much rarer in South African waters than either *monodon* or *indicus*.

Gen. PENAEOPSIS Bate (M. Edw. MS.)

1906. Alcock, *l. c.*, pp. 5, 7, 16 (*Metapenaeus* part).

1911. de Man, *l. c.*, pp. 8 (list of species) and 53 (*Penaeopsis* part + *Parapenaeus* part).

1926. Schmitt, Biol. Res. "Endeavour," v, p. 319 (part).

1934. Burkenroad, Bull. Bingham Ocean. Coll., iv, pp. 4, 7 (restricted).

1943. Gurney, Proc. Zool. Soc. Lond., cxiii, B, p. 12 (larval stages).

Carapace without longitudinal or transverse sutures; antero-inferior angle with a spine. Basal joint of ant. 1 with spine on inner margin. Exopods on all legs; 2nd joint of 3rd leg without spine. Telson with a pair of lateral spiniform teeth distal to a series of mobile spines. Petasma without channelled spout-like projections, symmetrical (*Penaeopsis*) or asymmetrical (*Metapenaeopsis*). Mxp. 3 in ♂ not modified, but inner flagellum of ant. 1 frequently sexually dimorphic.

Remarks.—Most of the species included in this genus as restricted by Burkenroad are Indo-Pacific.

Key to the South African Species.

Petasma asymmetrical (*Metapenaeopsis*) in all three species.

1. Rostrum extending beyond eyes to end of antennal scale, with 6–7 dorsal teeth (excl. epigastric tooth) . . *philippii.*
2. Rostrum extending a little beyond eyes, but not to end of antennal scale.
   - *a.* 6th abdominal segment twice as long as 5th, and longer than telson . . . . . *quinquedentata.*
   - *b.* 6th abdominal segment 1½ times the 5th, and shorter than telson . . . . . *hilarulus.*

Penaeopsis philippii (Bate)

Fig. 108, *a*, *b*.

1881. Bate, Ann. Mag. Nat. Hist. (5), viii, p. 181 (*Penaeus p.*).

1888. *Id.*, Rep. H.M.S. *Challenger*, xxiv, p. 261, pl. 35, figs. 2, 3 (*philippinensis*).

1906. Alcock, *l. c.*, p. 27, pl. 4, fig. 13 (thelycum) (*M. coniger* var. *andamanensis*).

1919. Parisi, Atti Soc. Ital. Sci. Nat., lviii, p. 64, pl. 5, fig. 7 (*coniger* var. *andamanensis*).

1923. Calman, Ann. Mag. Nat. Hist. (9), xii, p. 536, figs. 1, 2 (thelycum, antennular spine).

1925. *Id.*, Fish. Mar. Biol. Surv. Rep., iv, Spec. Rep. 3, p. 12.

1938. Ramadan, John Murray Exp., v, p. 70.

Body tomentose. Carapace without stridulating ridges.* Rostrum rather slender and curved, extending beyond eyes to end of antennal scale, with 6–7 teeth dorsally in addition to the smaller epigastric tooth. Inner flagellum of ant. 1 longer than outer, in ♂ concave on upper margin near base, followed by a swelling bearing a stout spine. Left side of petasma longer than right side. Thelycum with median plate broad, longitudinally grooved, its free hind margin more or less bilobed. Telson shorter than 6th segment, which is twice length of 5th segment.

Length up to 133 mm. (Alcock).

Locality.—Off Durban, 191 fathoms (Calman).

Distribution.—Zanzibar, Andaman Is., East Indies, Philippine Is., Japan.

Penaeopsis quinquedentata (de Man)

Fig. 108, *c–f*.

1914. Stebbing, Ann. S. Afr. Mus., xv, p. 15 (references).

Body tomentose. Carapace without stridulating ridges. Rostrum rather strong, short, extending very little beyond eyes and not reaching end of antennal scale, with 5–6 teeth dorsally in addition to the small epigastric tooth, ventrally fringed with long plumose setae. Flagella of ant. 1 subequal, inner flagellum without spine in ♂. Petasma with left lobe longer than right. Telson with 3 pairs of movable spines anterior to the trifid apex, shorter than 6th abdominal segment which is twice as long as 5th, and $1\frac{1}{2}$ times the 3rd segment; 3rd–6th segments keeled.

Length up to 45 mm. (de Man).

Locality.—Off Cape Natal (Durban), 54–62 fathoms (Stebbing, and S. Afr. Mus.).

* Stridulating ridges occur on the postero-lateral margin of the carapace where they are played over by the pleurae of 1st abdominal segment, in *P. novae-guineae* (Hasw.) (syn. *stridulans* Alcock 1906).

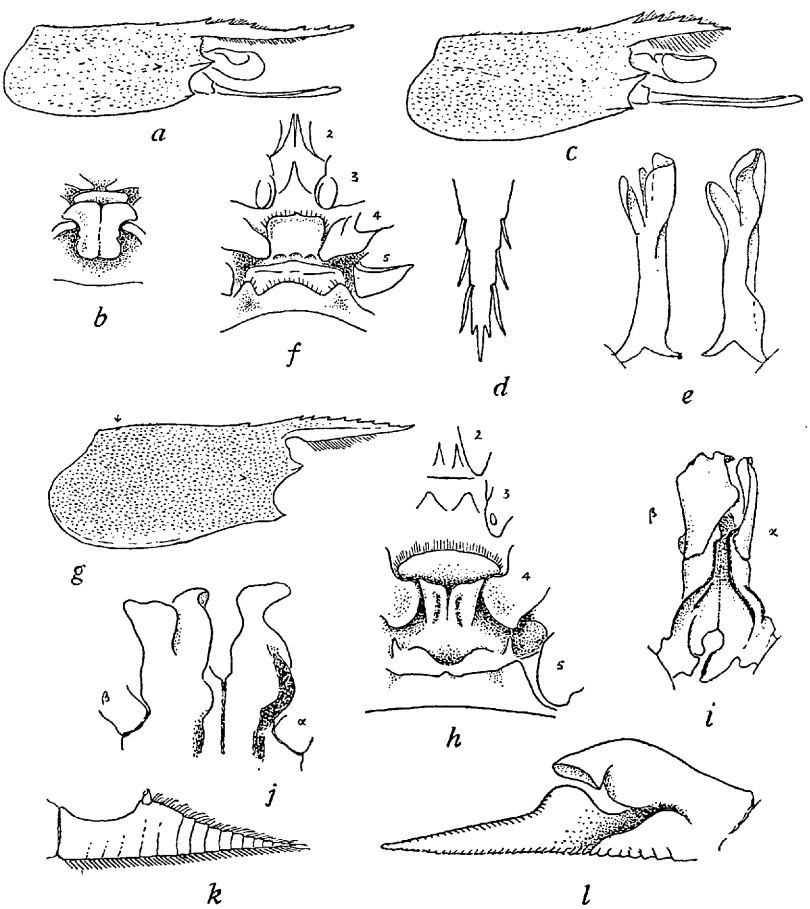

FIG. 108.—*Penaeopsis philippii* (Bate). *a*, carapace, with eye and antennal scale. *b*, thelycum ♀. (Both figures after Bate, 1888.)

Penaeopsis quinquedentata (de Man). *c*, carapace, with eye and antennal scale. *d*, apex of telson, setae omitted. *e*, two views of petasma of juv. ♂. *f*, sternum and thelycum ♀, after de Man's fig. 23, *d*.

Penaeopsis hilarulus de Man. *g*, carapace, arrow indicating bare medio-dorsal dot. *h*, sternum and thelycum ♀. *i*, posterior view of petasma ♂, thick lines indicating strongly chitinised ribs. *j*, the same, apex further enlarged, only the bases of the displaced lateral flaps (α and β) shown. *k*, inner flagellum of ant. 1 ♂, bases only of the long setae on lower margin shown. *l*, pleopod 2 ♂, setae omitted.

Distribution.—East Indies.

Remarks.—There are 17 other specimens in the South African Museum, all juvenile and none of them exceeding Stebbing's 38 mm. specimen in length. The two halves of the petasma are not joined, and the thelycum resembles Calman's fig. 2 of that of *philippii* (1923) more than it does de Man's fig. 23, *d* (1913). The appendix masculina on pleopod 2 ♂ is scale-like.

Penaeopsis hilarulus de Man

Fig. 108, *g–l.*

? 1902. Rathbun, Proc. U.S. Nat. Mus., xxvi, p. 39, figs. 6–8 (*Parapenaeus mogiensis*).

? 1906. Alcock, *l. c.*, p. 29, pl. 5, figs. 15, 15, *a*, *b* (*Metapenaeus mogiensis*).

1911. de Man, *l. c.*, p. 70 (*P.* sp.) and p. 71 (*hilarulus*).

1913. *Id.*, *ibid.*, pl. 7, fig. 22, *a–d* (*P.* sp.).

? 1926. Schmitt, *l. c.*, p. 347, pl. 61, fig. 3 (thelycum of *mogiensis* from Torres Straits).

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 382.

Body thickly tomentose. Carapace without stridulating ridges. Rostrum moderately long, extending to end of 2nd joint of peduncle of ant. 1; with 9 teeth, the epigastric tooth small, and the subapical one minute; no post-rostral keel; in ♀ a small round dot without tomentum in middle line near hind margin. Flagella of ant. 1 subequal, short, equal to 2nd peduncular joint, inner flagellum in ♂ laterally compressed, upper margin concave near base, followed by a swelling bearing a stout spine. Mxp. 3 extending to end (almost), 3rd leg to middle, and 5th leg to basal third of antennal scale. Petasma asymmetrical, left hinged lobe narrower than right, apical lobes (see fig. 108, *j*). Thelycum (fig. 108, *h*): a hollowed plate with arched setiferous anterior margin between bases of 4th legs, in its centre 2 juxtaposed projecting plates overlapping (as seen in figure, underriding in normal position of animal) the oval plate-like expansions of the 4th coxae; 2 transverse plates between bases of 5th legs, the anterior one with sharp tooth laterally. In ♀ (not in ♂) 2 triangular teeth between bases of 3rd legs, and 2 spines between bases of 2nd legs. Appendix masculina of pleopod 2 ♂ with apical, shallowly-trumpet-like expansion; endopod short with semicircular expansion on inner basal margin. 5th abdominal segment about $\frac{3}{5}$ length of 6th, which is a little shorter than telson, and only very little longer than 3rd segment;

3rd–6th segments keeled (hind part of 2nd segment scarcely keeled, but with a bare median stripe).

Length up to 56 mm. ♂♀.

Locality.—Durban Bay (coll. K. H. B. 1912, 1 ♂, 2 ♀♀).

Distribution.—East Indies.

Remarks.—As regards the thelycum these specimens agree with de Man's figures of *hilarulus*, and, less closely, with Schmitt's figure of a Torres Straits specimen. de Man shows the expanded 4th coxal plates as rectangular, whereas here they are rounded; and when the legs are closely drawn in, these plates lie between the hollowed "sternal" plate and the two projecting plates.

Schmitt regards *hilarulus* as a synonym of *mogiensis* (Rathbun). The thelycum of Alcock's specimens certainly seems much more like that of *mogiensis* as figured by Rathbun and Schmitt, than that of de Man's specimens. The lack of information, however, on other features, such as the details of the petasma, appendix masculina on pleopod 2, inner flagellum of ant. 1 ♂, prevent a proper comparison and verdict of the identity of the various specimens. The Durban specimens are provisionally identified with de Man's East Indies species.

Gen. METAPENAEUS W-Mason & Alck.

1891. Wood-Mason and Alcock, Ann. Mag. Nat. Hist. (6), viii, p. 271 (part).

1906. Alcock, *l. c.*, p. 16 (part).

1911. de Man, *l. c.*, p. 53 (*Penaeopsis* part).

1926. Schmitt, Biol. Res. "Endeavour," v, p. 319 (*Penaeopsis* part).

1934. Burkenroad, Bull. Bingham Ocean. Coll., iv, pp. 7, 29 (restricted).

Carapace without longitudinal and transverse sutures; antero-inferior angle without spine. Basal joint of ant. 1 without spine on inner margin. No exopod on 5th leg; 2nd joint of 3rd leg with a spine; epipods absent from mxp. 3 and last 2 pairs of legs. Telson with lateral movable spines or spinules (minute and inconspicuous in *monoceros* and *affinis*, but easily visible in *stebbingi*, and with some of the posterior ones enlarged and conspicuous in *ensis*), but no subapical fixed spiniform teeth. Petasma symmetrical, forming (when fully developed) an almost completely closed tube, with apical spout-like projections. Mxp. 3 not modified, but 4th joint

of 5th leg, or of 4th and 5th legs, modified in adult ♂. Appendix masculina on pleopod 2 ♂ pedunculate, apically knob-like, strongly chitinized, fitting into the concave base of endopod (in *monoceros* and *stebbingi*, other species not seen by me).

Remarks.—Indo-Pacific, but some of the species appear to have migrated in recent times through the Suez Canal into the Mediterranean.

Key to the South African Species.

1. 5th leg not reaching to end of antennal scale.
   a. Petasma with apical convoluted flaps. Thelycum, fig. 109, *c* . . . . . *monoceros.*
   b. Petasma with laterally curving projections, and apical stylets. Thelycum, fig. 109, *h* . . . . *stebbingi.*
2. 5th leg extending beyond (usually) end of antennal scale . *affinis.*

Metapenaeus monoceros (Fabr.)

Fig. 109, *a–e.*

1878. Hilgendorf, MB. Ak. Wiss. Berlin, p. 844.

1914. Stebbing, Ann. S. Afr. Mus., xv, p. 17, pl. 4 (Crust., pl. 68) (*Penaeopsis spinulicauda*).

1915. *Id.*, *ibid.*, p. 70 (references).

1915. Kemp, Mem. Ind. Mus., v, p. 321 (*Penaeopsis m.*).

1915. Pesta, Arch. f. Naturg., Abt. A, 1, p. 104 (quoted from Schmitt).

1917. Stebbing, Ann. Durban Mus., i, p. 444 (*P. spinulicauda*).

1925. Calman, Fish. Mar. Biol. Surv., Rep. iv, Spec. Rep. 3, p. 12 (*Penaeopsis m.*).

1926. Schmitt, *l. c.*, p. 325, pl. 58, figs. 1, 2.

1927. Balss, Trans. Zool. Soc. Lond., xxii, pp. 221, 225.

1930. Monod, Zool. Anz., xcii, p. 140, fig. 4 (*Penaeopsis m.*).

1934. Burkenroad, *l. c.*, p. 32.

Body very finely tomentose, but frequently the greater part of the abdomen and the branchial region of the carapace are rubbed more or less naked. Rostrum nearly straight, slightly up-tilted, extending to about end of peduncle of ant. 1, with 9–12 teeth (incl. epigastric tooth); post-rostral keel continued nearly to hind margin of carapace. 2nd joint of 1st–3rd legs with a strong, simple spine; inner apex of 3rd joint of 1st leg with a short spine. 5th leg extending to about middle (rarely to near end) of antennal scale; its 3rd joint in adult ♂ with

short keels or flanges on dorsal and ventral margins distally, 4th joint with a notch near base on dorsal margin and a spine curving outwards and downwards, the upper margin beyond the spine crenulate or serrulate (fig. 109, *b*). Telson medio-dorsally grooved, with numerous minute (mobile) spinules on lateral margins. Petasma with the

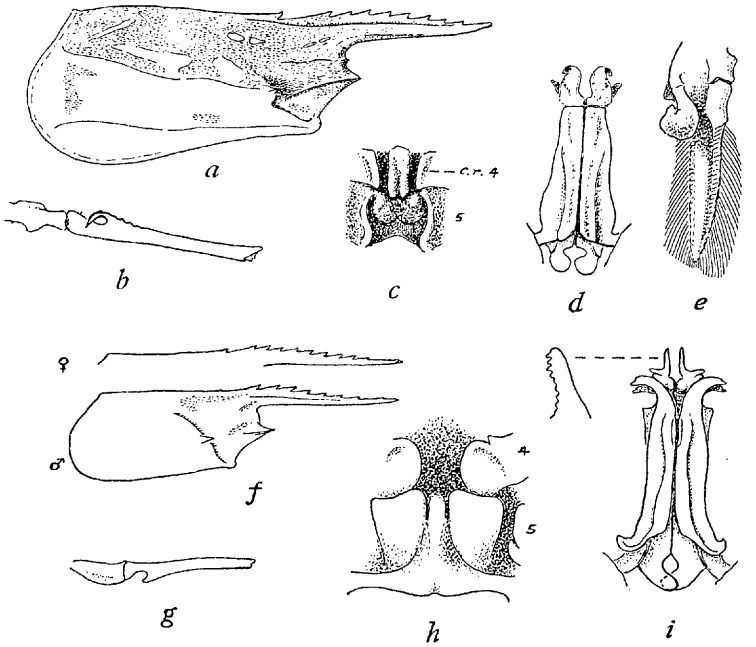

FIG. 109.—*Metapenaeus monoceros* (Fabr.). *a*, carapace, setae on rostrum mitted. *b*, 4th joint and end of 3rd joint of 5th leg ♂. *c*, thelycum ♀, *c.r.* 4, oxal ridge of 4th legs. *d*, hind view of petasma ♂, closed. *e*, anterior view of endopod and appendix masculina of left pleopod 2 ♂.
Metapenaeus stebbingi Nob. *f*, carapace ♂ and ♀. *g*, 4th joint and end of 3rd joint of 5th leg ♂. *h*, thelycum ♀, with 4th and 5th coxae. *i*, hind view of petasma ♂, closed, with apex of median lobe further enlarged.

posterior (ventral) flap of the apical projection convoluted. Thelycum enclosed laterally by prominent vertical ridges which may be ear-like and in-curved, anteriorly a median grooved ridge flanked by the ridge-like lobes of the 4th coxae. Appendix masculina on pleopod 2 ♂ (fig. 109, *e*). Outer margin of outer ramus of uropod proximally concave in ♂.

Length ♀ up to 180 mm., ♂ smaller. Pale, more or less semi-transparent with bluish speckling, chiefly in the form of cross-bands

on abdominal segments, flagellum of antenna 2 reddish, pleopods bluish (K. H. B.).

Localities.—Quelimane (Hilgendorf); Delagoa Bay (Pesta, Stebbing); Durban Bay, and off Tugela River, 12–14 fathoms (Stebbing); off Umvoti River, Natal, 38 fathoms (Calman); Delagoa Bay, Zululand coast, Durban Bay, Umgeni Lagoon, Umkomaas, Port St. Johns, and Cape Henderson (N. of East London) (S. Afr. Mus.).

Distribution.—Mauritius, Indian Seas, East Indies, Philippine Is., Japan, Queensland. Mediterranean, by migration through Suez Canal.

Remarks.—As Burkenroad suggests (*l. c.*, p. 30), *spinulicauda* can only be regarded as founded on an immature specimen of this species. Other specimens, up to 75 mm. in length, identified by Stebbing as *spinulicauda*, show all the characters (as far as they are developed, *e.g.* relatively short 5th leg) of *monoceros*.

Metapenaeus stebbingi Nob.

Fig. 109, *f–i*.

1904. Nobili, Bull. Mus. d'Hist. Nat. Paris, x, p. 229.

1906. *Id.*, Ann. Sci. Nat. zool., ser. 9, iv, p. 15, pl. 1, fig. 2.

1921. Tattersall, J. Linn. Soc. Lond., xxxiv, p. 365, pl. 27, figs. 7–10, pl. 28, fig. 13.

1927. Gurney, Trans. Zool. Soc. Lond., p. 233 (development *Penaeopsis s.* ?).

1930. Monod, Zool. Anz., xcii, p. 140, fig. 5 (*Penaeopsis s.*).

1934. Burkenroad, *l. c.*, p. 33.

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 382.

Carapace glabrous except for a short strip of fine tomentum on either side of epigastric tooth, a patch above the post-antennal spine, and in the post-orbital groove; cervical groove well marked both above and below hepatic spine, its hind margin setulose; rostrum extending almost to end of peduncle of ant. 1, with 9 (♂), 11 (♀) teeth (incl. the epigastric tooth), the subapical one minute, the epigastric almost obsolete in the present ♂, post-rostral keel none or very feeble. Mxp. 3 extending to end of peduncle of ant. 2. A strong simple spine on 2nd joint of 1st–3rd legs, that on 3rd leg not enlarged or different from the others. 5th leg extending to end of first third of antennal scale (middle of eye); ventral margin of 3rd joint in ♂ keeled, 4th joint with a notch and triangular tooth on ventral margin near base. Telson medio-dorsally grooved, with about a dozen (in the present ♂)

(Nobili: 6–8) small but easily visible lateral mobile spines. Petasma with 2 laterally curved spout-like processes on each side, and an apical styliform process, which is serrate on its hind (ventral) margin; basal lobes overlapping. Thelycum, fig. 109, *h*; the 4th coxa has a strong ridge projecting medianly but not meeting its fellow; 3rd coxa with a small and inconspicuous ridge.

Length up to 90 mm. (Nobili). Greyish, faintly speckled, pleopods pinkish (K. H. B.).

Locality.—Delagoa Bay (coll. K. H. B. 1912, 1 ♂, 1 ♀).

Distribution.—Suez, Red Sea. By migration through Suez Canal to Port Said.

Remarks.—Burkenroad has pointed out that the numerals 9 and 12 on Tattersall's plate 27 have been transposed, the right-hand figure being referable to *stebbingi*, the left-hand one to *vaillanti*.

I have seen only the pair collected by myself, which agree with Tattersall's figures. They both measure 70 mm. I have not seen Nobili's 1906 paper.

Metapenaeus affinis (M. Edw.)

1914. Stebbing, Ann. S. Afr. Mus., xv, p. 16.

1934. Burkenroad, *l. c.*, p. 29.

Not decisively separable from *monoceros*, but the rostrum usually somewhat sigmoid and cristate, with fewer teeth (less than 9), carapace and hinder abdominal segments less strongly carinate; 5th leg extending at least to, usually beyond, apex of antennal scale, its joint with a notch and triangular tooth; thelycum more open, the lateral ridges splayed outwards and unequally bilobed.

Stebbing himself regarded the identification of a specimen of unknown origin as uncertain. The specimen is a very young ♀, and the 5th legs reach almost to end of antennal scale.

Distribution.—Indian Seas, East Indies, Japan.

Gen. Parapenaeus S. I. Smith

1906. Alcock, *l. c.*, pp. 7, 30, 52.

1911. de Man, *l. c.*, pp. 9, 77.

1914. Stebbing, Ann. S. Afr. Mus., xv, p. 18.

1926. Schmitt, Biol. Res. "Endeavour," v, p. 323.

1934. Burkenroad, Bull. Amer. Mus. Nat. Hist., lxviii, p. 107 (redefined).

1938. Heldt, Ann. Inst. ocean. Paris, xviii, pp. 40 *sqq.* (reproduction. development).

1938. Ramadan, John Murray Exp., v, p. 73.

1939. Burkenroad, Bull. Bingham Ocean. Coll., vi, p. 53.

Carapace with longitudinal and transverse sutures; antero-inferior angle with a branchiostegal (pterygostomial) spine (tooth), except in *longipes* Alck. Basal joint of ant. 1 with spine (often very small) on inner margin. Exopods absent from all legs (or minute rudiments present). Epipods absent from mxp. 3 and last 2 or 3 legs. A spine on 2nd and 3rd joints of 1st leg only. Telson with a pair of subapical fixed spiniform teeth (*i.e.* apex trifid), preceded by a pair of minute mobile spines. Petasma symmetrical. Thelycum with a pair of invaginated receptacles but without median pocket. Appendix masculina on pleopod 2 ♂ (in *fissurus*) knob-like as in *Metapenaeus*. Neither mxp. 3 nor 5th leg sexually dimorphic.

Remarks.—As redefined by Burkenroad contains only 6 Atlantic and Indo-Pacific species.

Key to the South African Species.

1. Branchiostegal spine small, forming the antero-inferior angle of carapace. 5th abdominal segment ⅔ length of 6th . *fissurus.*
2. Branchiostegal spine large, submarginal. 6th abdominal segment more than twice as long as 5th . . . *investigatoris.*

Parapenaeus fissurus (Bate)

Fig. 110, *c–e.*

1914. Stebbing, *l. c.*, p. 19, pl. 5 (Crust., pl. 69).

1938. Ramadan, *l. c.*, p. 73.

Carapace glabrous. Rostrum with double curve, extending nearly to end of peduncle of ant. 1 in ♀, but shorter in ♂, with 7 (sometimes 6 or 8) teeth, the subapical one minute and some little distance from tip, post-rostral keel moderately distinct; a distinct post-orbital denticle; branchiostegal spine small, forming the antero-inferior angle of carapace. 5th leg extending to middle of antennal scale. 5th abdominal segment about ⅔ length of 6th, which is subequal to telson. Petasma with hind (ventral) margins not fully in contact, apex with a bulbous flap, external to which is a more strongly chitinized trilobed process, anterior (dorsal) surface with a short chitinized ridge on either side of the conjoined margins, and some chitinized ribs (more or less projecting) supporting the apical flaps. Thelycum with 2 lobes or

bosses between the 5th coxae, a semicircular plate between 4th coxae, the intervening cavity with one or two obscure tubercles, and bounded laterally by a larger tubercle or knob on either side.

Length up to 135 mm. Salmon-red, cornea of eyes dark maroon.

Localities.—Off Tugela River, Natal, 36–46 fathoms (Stebbing, and S. Afr. Mus.); Port St. Johns (S. Afr. Mus.).

Distribution.—Zanzibar, Indian Seas, East Indies, Philippine Is.

Remarks.—The Port St. Johns specimens were washed ashore during an up-welling of cold water in September 1943 and March 1944. Similar occurrences were noted by the late Commander Z. Marsh in July 1936, October 1939, and February 1941.

Parapenaeus investigatoris Alck. & And.

Fig. 110, *a*, *b*.

1899. Alcock and Anderson, Ann. Mag. Nat. Hist. (7), iii, p. 279.

1899. Illustr. Zool. R.I.M.S. "Investigator," Crust., pl. 41, figs. 1, 1, *a*, *b*.

1901. Alcock, Ind. Deep-sea Crust., p. 18.

1906. *Id.*, *l. c.*, p. 32, pl. 6, figs. 17, 17, *a–c*.

1911. de Man, *l. c.*, p. 80.

1938. Ramadan, *l. c.*, p. 73, fig. 15, *d*, *e* (carapace, rostrum).

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 382.

Rostrum short, extending only a little way beyond eyes, straight, directed slightly upwards, with 6–7 teeth; post-rostral keel faint or obsolete; a minute post-orbital denticle; branchiostegal spine large, submarginal, the antero-inferior corner narrowly rounded. 5th leg reaching slightly beyond middle of antennal scale. 6th abdominal segment more than twice length of 5th, and longer than telson. Petasma (according to Alcock) similar to that of *fissurus* but apically "not so intricate." Thelycum with semicircular plate between 4th coxae, a median concavity with lateral bosses or knobs, and a sub-circular plate between 5th coxae bearing a median setiferous tubercle.

Length ♀ up to 75 mm. Cornea of eyes (as preserved) reddish.

Locality.—Off Cape Natal (Durban), 185 fathoms (S. Afr. Mus.).

Distribution.—Gulf of Aden, Indian Seas, East Indies.

Remarks.—Only a single ♀ collected by the s.s. *Pieter Faure* is in the South African Museum Collection.

Ramadan's fig. 15, *e* (as also his fig. 15, *a*, of *murrayi*), shows the longitudinal suture coinciding anteriorly with the post-antennal ridge

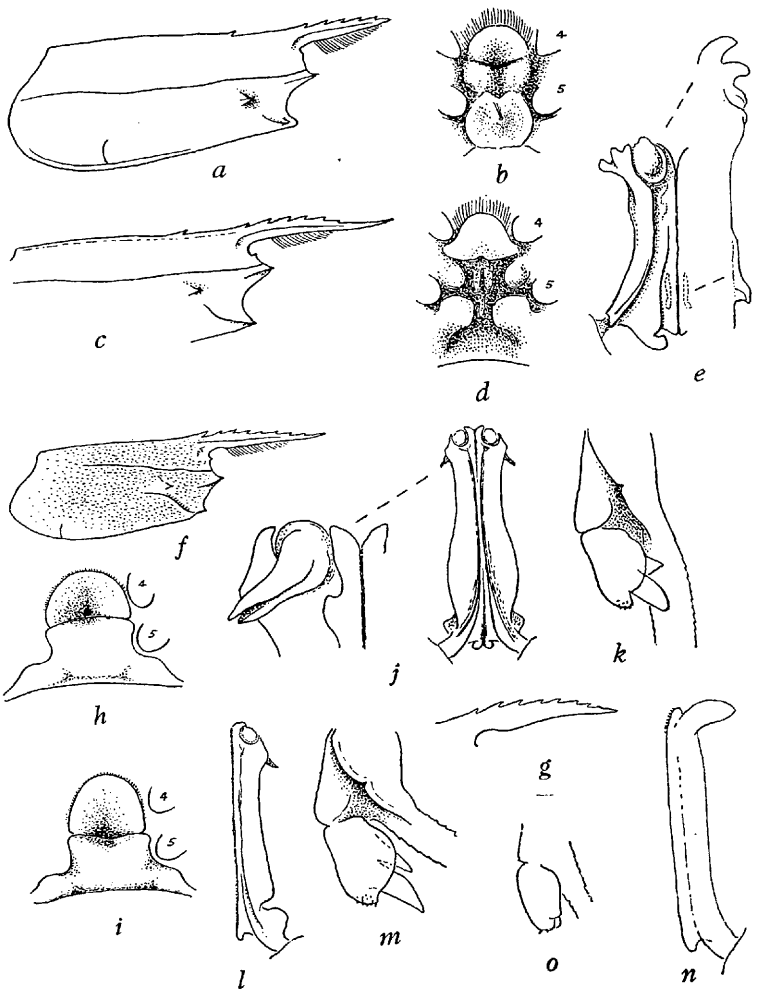

FIG. 110.—*Parapenaeus investigatoris* Alck. & And. *a*, carapace. *b*, thelycum ♀. *Parapenaeus fissurus* (Bate). *c*, carapace. *d*, thelycum ♀. *e*, posterior view of right side of petasma ♂, with profile of anterior surface showing chitinised ridge and supporting ribs.

Parapenaeopsis acclivirostris Alck. *f*, carapace. *g*, rostrum of 24 mm. ♂. *h*, *i*, thelycum ♀, showing variation. *j*, posterior view of petasma ♂, with anterior view of apex further enlarged. *k*, appendix masculina on pleopod 2 ♂. *l*, left pleopod 1 of 29 mm. ♂. *m*, appendix masculina of 29 mm. ♂. *n*, left pleopod 1 of 24 mm. ♂. *o*, appendix masculina of 24 mm. ♂.

and spine, instead of reaching the post-orbital margin *above* the post-antennal spine.

Gen. PARAPENAEOPSIS Alck. (W-Mason MS.)

1901. Alcock, Cat. Ind. Deep-sea Crust., p. 14.

1906. *Id.*, *l. c.*, pp. 7, 34, 52.

1911. de Man, *l. c.*, pp. 9, 92.

1934. (Dec.). Burkenroad, Bull. Amer. Mus. Nat. Hist., lxviii, p. 95.

1934. (Sept.). *Id.*, Bull. Bingham Ocean. Coll., iv, p. 58 (although published earlier this paper is a sequel to the December paper).

1936. Kubo, J. Imp. Fish. Inst. Tokyo, xxxi, p. 55.

Carapace with longitudinal and transverse sutures, but the longitudinal suture not reaching hind margin of carapace; antero-inferior angle of carapace subacute or dentiform. Basal joint of ant. 1 without spine on inner margin (*acclivirostris*). Exopods present on all legs; epipods absent from mxp. 3 and at least the last 3 legs, sometimes from all legs. Telson without subapical fixed spiniform teeth (*i.e.* not trifid) and without movable spinules. Petasma symmetrical. Appendix masculina on pleopod 2 ♂ knob-like as in *Metapenaeus*, the endopod sometimes (*hungerfordi* Alck.) greatly reduced. Neither mxp. 3 nor 5th leg sexually dimorphic.

Parapenaeopsis acclivirostris Alck.

Fig. 110, *f–o*.

1905. Alcock, Ann. Mag. Nat. Hist. (7), xvi, p. 530.

1906. *Id.*, *l. c.*, p. 42, pl. 8, figs. 27, 27, *a*.

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 382.

Carapace minutely punctate and hispid. Rostrum extending to end of 2nd (♂) or 3rd (♀) peduncular joint of ant. 1, with 8 (or 7 or 9) teeth, the foremost one minute; no epigastric tooth and no post-rostral keel; antero-inferior angle with very small point; longitudinal suture extending about $\frac{2}{3}$ to hind margin of carapace. 5th leg reaching a little beyond middle of antennal scale. Epipods absent from all legs; 2nd joint of 1st and 2nd legs with a spine. 6th, 5th and hind half of 4th abdominal segments keeled; telson subequal to 6th (or a trifle longer), medianly grooved, without lateral spinules. Petasma with apical spout-like processes on anterior (dorsal) surface which curve proximally and laterally and are apparently erectile. Thelycum

with a semicircular concave plate between 4th coxae, and a broad trapezoidal plate between and behind 5th coxae. Appendix masculina on pleopod 2 ♂ trilobed.

Length ♀ up to 73 mm., ♂ 47 mm. Eyes deeply pigmented.

Localities.—Zululand coast as far south as Tugela River, 13–26 fathoms (S. Afr. Mus.); Delagoa Bay (coll. K. H. B. 1912, 1 ♂, 1 ♀).

Distribution.—Indian Seas, Persian Gulf.

Remarks.—These specimens are undoubtedly the same as Alcock's species, and equally certainly they are not Bate's *tenellus* as figured by Kishinouye. The latter author's figure of the petasma of the Japanese species shows much longer apical horn-like processes, and his figure of the thelycum shows a lozenge (diamond)-shaped plate between the 4th coxae. Both de Man and Burkenroad quote both species without suggesting their being synonymous. The former regards *crucifera* Ortm. 1890 as a synonym of *tenellus*.

The s.s. *Pieter Faure* obtained a large quantity of specimens off the Zululand coast. The largest ♀ exceeds the 60 mm. given by Alcock: the ♂♂ are all considerably smaller, not exceeding 47 mm. In a ♂ 29 mm. long the two halves of the petasma are not completely coupled; at 24 mm. the shape is rather strikingly different from that of the fully developed petasma (fig. 110, *n*). Slight variation occurs in the thelycum (fig. 110, *h*, *i*); the anterior margin of the plate between the 5th coxae may be slightly but distinctly concave.

Gen. Macropetasma Stebb.

1914. Stebbing, Ann. S. Afr. Mus., xv, p. 22.
1926. Schmitt, Biol. Res. "Endeavour," v, p. 325 (note).
1934 (Dec.). Burkenroad, *l. c.*, pp. 73, 74, 117–120.
1934 (Sept.). *Id.*, *l. c.*, pp. 9, 10.

Carapace without longitudinal and transverse sutures. Basal joint of ant. 1 without spine on inner margin, appendage on inner margin rather small, not twisted (fig. 111, *c*). Exopods on mxp. 1 and 1st leg; epipods absent from mxp. 3 and last 2 legs. Gills 15: 4 pleurobranchs, one each on mxp. 3 and 1st–3rd legs; 10 arthrobranchs, one each on mxp. 2 and 4th leg, 2 each on mxp. 3 and 1st–3rd legs; 1 podobranch on mxp. 2. No spines on 2nd or 3rd joints of legs; in ♂ a coxal spine on 1st leg, and denticles on 2nd joint of 3rd leg. Telson with 4 pairs of mobile spines, according to Burkenroad, but the hindmost pair appears to be fixed. Petasma attached near bases of peduncles of 1st pleopods, symmetrical, with very long apical stiletto-like filaments.

Thelycum: lateral parts of 5th sternite folded over to form paired ovoid receptacles, with a cowl-like median plate between 4th coxae. Male genital openings subcoxal. Peduncle of pleopod 1 ♀ unusually broad, exopod unusually long, no trace of endopod. Appendix masculina on pleopod 2 ♂ bell-shaped, endopod reduced. Inner flagellum of ant. 1, 1st joint of 1st leg, and 2nd joint of 3rd leg sexually dimorphic.

Remarks.—Endemic genus with one species. Balss stated that there were 2 arthrobranchs on mxp. 2; Burkenroad corrected this to one arthrobranch and one podobranch, which is herewith confirmed. Burkenroad on p. 119 said there were no exopods except on 1st leg, although he correctly stated on p. 74 that there was one also on mxp. 1.

Macropetasma africanum (Balss)

Fig. 111.

1913. Balss, Schultze Reise Südafr., v, p. 105, figs. 1–6 (*Parapenaeus a.*).

1914. Stebbing, *l. c.*, p. 22, pl. 8 (Crust., pl. 72).

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 382.

Carapace glabrous. Rostrum short, extending to end of eye or a little beyond, arched and cultrate, with 9–10 teeth incl. the epigastric tooth, foremost tooth often minute, lower margin straight, fringed with plumose setae; in some specimens the smooth apical point is conspicuous (fig. 111, *b*); no post-rostral keel, no post-ocular tooth, antero-inferior angle narrowly rounded, hepatic spine small, cervical groove short. Flagella of ant. 1 longer than peduncle, nearly as long as carapace; inner flagellum in ♂ with tooth-like keel on inner margin near base, then abruptly narrowing. Mxp. 3 extending to base of flagellum of ant. 2. 3rd leg longest, reaching beyond end of peduncle of ant. 1; 5th leg longer than 4th. In ♂ a coxal spine on 1st leg, situate on the anterior surface (weakly chitinized and easily overlooked); in ♂ also the inner margin of 2nd joint of 3rd leg keeled, with 2–4 little denticles. 6th abdominal segment twice as long as 5th, without any trace of a lateral keel; only the 6th segment dorsally keeled, and sometimes feebly the hinder half of 5th, both ending in a small denticle. Telson shorter than 6th segment, shorter than inner ramus of uropod, not keeled dorsally, ending in a fine spiniform apex, with 3–4 pairs of lateral mobile spines, the anterior pairs small and inconspicuous, the distal pair usually fixed. Petasma with stiletto-like processes more than twice as long as main portion; the latter

when viewed from anterior (dorsal) side shows a longitudinal rib with buttress-like support at base, and externally a keel or lamina whose free distal end overlaps base of the stiletto-like process. Pleopod 2 ♂ with bell-shaped appendix masculina, the wide distal end of the bell only shallowly concave; endopod reduced, short, with semi-circular expansion at base, the usual numerous long plumose setae

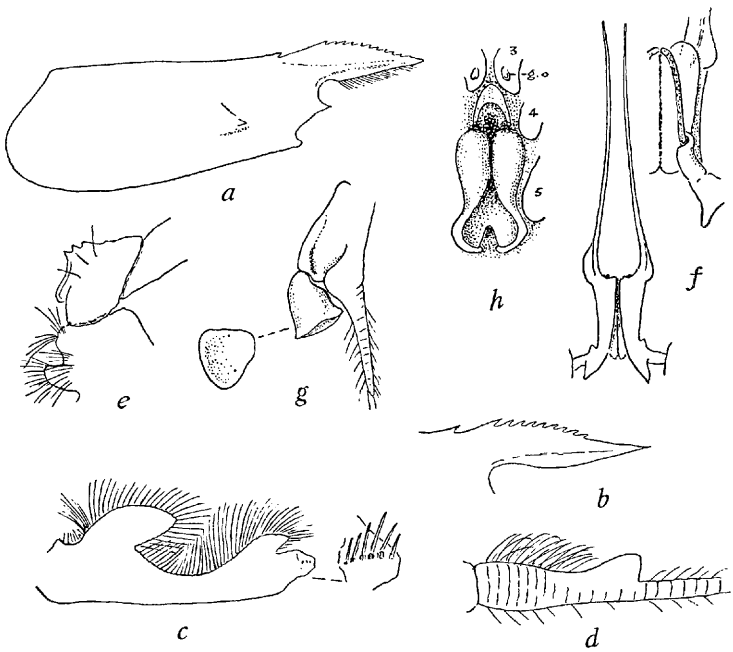

FIG. 111.—*Macropetasma africanum* (Balss). *a*, carapace. *b*, rostrum with prominent apex. *c*, inner view of basal joint of ant. 1, with apical lobe further enlarged (the marginal setae are plumose). *d*, base of inner flagellum of ant. 1 ♂. *e*, 1st and 2nd joints of 3rd leg ♂. *f*, petasma ♂, hind view, and anterior (dorsal) surface of basal part further enlarged. *g*, pleopod 2 ♂, with full view of end of bell-shaped appendix masculina. *h*, thelycum ♀.

reduced to a few short setae. Thelycum, fig. 111, *h*; 3rd leg with rather long coxal lobes bearing the genital openings. Pleopod 1 ♀ unusually broad at base, narrowing rapidly, exopod unusually long, extending to antero-inferior angle of carapace, no trace of endopod.

Length up to 94 mm. (Balss). White, pale cream, or pinkish, semi-transparent, with more (dark var.) or less (light var.) numerous brown stellate or dendritic dots and specks, hinder part of 3rd abdominal segment, and margins and apices of telson and uropods with darker brown dots; mxp. 3 and 1st–3rd legs and peduncles of 2nd and 3rd

pleopods speckled with brown; 4th and 5th legs pale, unspotted; eyes dark brown (K. H. B. from specimens freshly preserved in formalin).

Localities.—Swakopmund (Balss); Mossel Bay, 15 fathoms (Stebbing); False Bay and mouth of Muizenberg Vlei, Knysna, Keurbooms River mouth (Plettenberg Bay), and Durban Bay (S. Afr. Mus.).

Remarks.—Stebbing recorded a ♀ 67 mm. in length; I have seen ♂♂ and ♀♀ up to 45 mm. At 33 mm. both ♂ and ♀ are apparently mature, the ♂ with the two halves of the petasma joined, and with the modification of the flagellum of antenna 1; a ♂ of 25 mm., however, has the halves of the petasma separate and no modification on the flagellum.

Stebbing's description and figure of the "inner ramus" of pleopod 2 ♂ is not quite correct.

Four specimens found washed up on the beach at the mouth of Keurbooms River (K. H. B., Jan. 1931) were quite pale in colour, with traces of red or pink on the end of 6th abdominal segment and ends of telson and uropods, but without the brown speckling usually so conspicuous in Natal specimens.

Luminous Spots.—These Keurboom River specimens also had luminous spots on the abdominal segments: a medio-dorsal one on each of 1st–6th segments, near the anterior margin on 1st–5th, but in the middle on 6th segment; and a lateral one near the hind margin on each of 1st–5th segments; a spot on base of telson, and a larger oval spot on both inner and outer rami of uropods. I have seen luminous spots also in examples from False Bay which had not been long in preservative.

With the exception of *Hymenopenaeus debilis* and *Plesiopenaeus coruscans*, photophores are unknown in the *Penaeidae*: see Burkenroad, 1936, Bull. Bingham Ocean. Coll., v, p. 102, 1938, and also p. 112, where he says these organs fade in alcohol; also Ramadan, John Murray Exp., v, pp. 137–140.

Gen. Funchalia Johnson

1867. Johnson, Proc. Zool. Soc. Lond., p. 895.

1905. Bouvier, C.R. Ac. Paris, cxl, p. 981 (*Hemipenaeopsis*).

1905. *Id.*, *ibid.*, p. 982 (*Grimaldiella* = post-larval stage).

1908. *Id.*, Res. Sci. Camp. Monaco, fasc. xxxiii, p. 91.

1925. Balss, D. Tiefsee Exp., xx, p. 227.

1925. Calman, Fish. Mar. Biol. Surv., Rep. iv, Spec. Rep. 3, pp. 10, 11.

1934. Burkenroad, Bull. Amer. Mus. Nat. Hist., lxviii, pp. 76, 77 (subgen. *Pelagopenaeus*).

1936. *Id.*, Bull. Bingham Ocean. Coll., v, pp. 126 *sqq.*

1940. *Id.*, Ann. Mag. Nat. Hist. (xi), vi, p. 36.

Carapace with 3 lateral longitudinal keels, the middle and lower ones connected by a transverse keel; hepatic spine (if present) on the middle keel. Rostrum without (*Funchalia* s.s.) or with (*Pelagopenaeus*) teeth on lower edge. No orbital angle. Flagella of ant. 1 long. Mandible with elongate, scythe-like incisor process. Maxilla 2 with only 3 endites. Mxp. 3 with epipod. Rudimentary exopods on all legs. A spine on 2nd and 3rd joints of 1st and 2nd legs. A lateral keel on 5th and 6th abdominal segments, distinct and continuous (*i.e.* not divided into short, inconspicuous ridges as in *Penaeus*, etc.). Telson with 3 pairs of fixed lateral spines. Petasma asymmetrical (*Funchalia* s.s., see *infra*) or symmetrical (*Pelagopenaeus*), simple, open. Thelycum a more or less simple depression. Pleopod 2 ♂ appendix masculina (see *infra*). Terminal (7th) joint of mxp. 3 sexually dimorphic: lanceolate in ♂, subulate in ♀.

Funchalia (*Funchalia*) *woodwardi* Johnson

Fig. 112.

1867. Johnson, *l. c.*, p. 895.

1908. Bouvier, *l. c.*, p. 93, pl. 1, fig. 7 (part).

1920. Sund, Rep. "Michael Sars" Exp., iii, pt. 2, p. 32.

1922. Bouvier, Res. Sci. Camp. Monaco, lxii, p. 13.

1925. Calman, *l. c.*, p. 10, pl. 2, fig. 5, pl. 3, figs. 6–8 (references, but not Lenz and Strunck, 1914; see Burkenroad).

1936. Burkenroad, *l. c.*, pp. 131–135.

? 1938. Ramadan, John Murray Exp., v, p. 63, fig. 9 (carapace) (? *woodwardi* or *villosa*).

1938. Roger, Bull. Soc. zool. Fr., lxiii, p. 23, figs. 1–4 (mand. prp. 1, telson, thelycum).

Body pubescent. Rostrum with 11(–13) teeth. A small hepatic spine with strong keel behind it, and an inconspicuous denticle (shown in Calman's figure) on antennal angle of carapace. A keel on the hinder part of 6th abdominal segment below the mid-lateral one. Telson extending to level of tooth on outer margin of outer ramus of uropod. Dactyl of 4th leg half the length of 6th joint.

Petasma of adult ♂ asymmetrical, both halves forming simple folded tubes, the one half longer than the other and apically expanded

(fig. 112, *e*); in 11 examples this occurs on the left side, in 5 on the right side (one of the latter figured). Appendix masculina of pleopod 2 ♂ obconical (cf. *Macropetasma*), its anterior margin armed with close-set spines, its posterior margin with long stiff setae (fig. 112, *f*).

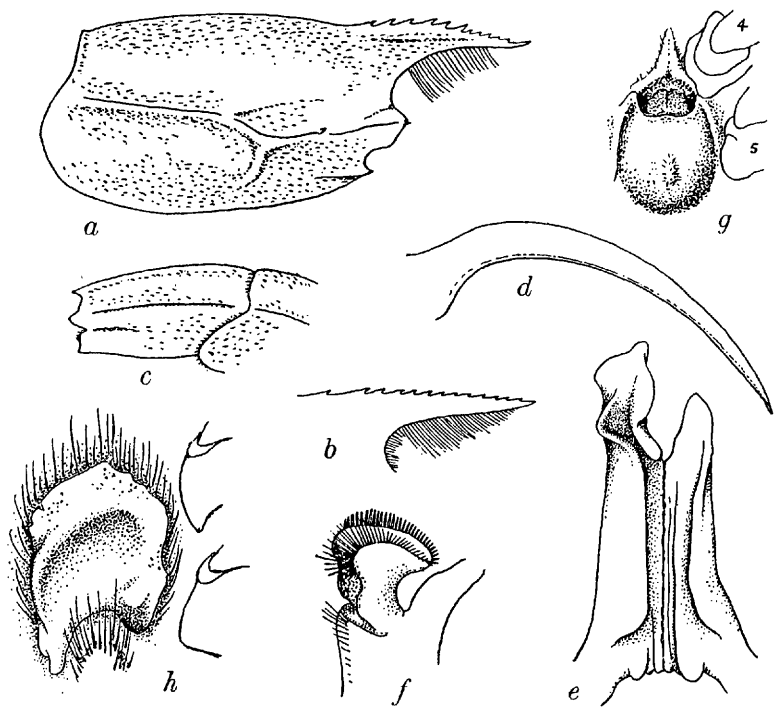

FIG. 112.—*Funchalia woodwardi* Johnson. *a*, carapace. *b*, rostrum. *c*, 6th abdominal segment. *d*, incisor process of mandible. *e*, petasma ♂, hind view. *f*, appendix masculina of pleopod 2 ♂. *g*, thelycum ♀. *h*, thelycum ♀. (*a*, *c*, *g* after Colman.)

Thelycum of adult ♀ a white chalky mass, slightly asymmetrical in outline, with an asymmetrical oblique ridge and depression (fig. 112, *h*).

Length up to 157 mm. (Calman: Johnson's type). More or less reddish, especially at the junctions of the abdominal segments and of the joints of the legs, and on the telson.

Localities.—Off Cape Point, 135 fathoms (Calman); off Table Bay (stock-fish grounds) (S. Afr. Mus.).

Distribution.—Eastern N. Atlantic and south-eastern S. Atlantic.

Remarks.—The adult ♂ petasma and the ♀ thelycum are described and figured from 22 specimens (16 ♂♂, 6 ♀♀) caught Jan.–Feb. 1943

and acquired by the South African Museum.* They were taken from the stomachs of stock-fish (*Merluccius*) and all are slightly mutilated. The rostrum of one ♂ resembles Bouvier's figure (1908, pl. 15, fig. 2) with 13 teeth, of which 3 are behind the orbit, the posterior one remote from the others; rostra of the others mutilated. These seem to be the first *woodwardi* ♂♂ with fully developed petasma to be captured and described; they range from approximately 100–130 mm. in length.

Gen. Solenocera Lucas

1915. Stebbing, Ann. S. Afr. Mus., xv, p. 66.

1924. Gurney, "Terra Nova" Rep., zool., viii, p. 73 (larval forms).

1934. Burkenroad, Bull. Amer. Mus. Nat. Hist., lxviii, pp. 65, 68 *sqq.*

1936. *Id.*, Bull. Bingham Ocean. Coll., v, p. 120.

1938. Ramadan, John Murray Exp., v, p. 56.

1938. Burkenroad, Zoologica, xxiii, p. 61.

1939. *Id.*, Bull. Bingham Ocean. Coll., vi, p. 6.

1941. Lindner and Anderson, J. Wash. Ac. Sci., xxxi, p. 181 (key to Atlantic species).

Carapace with cervical groove extending dorsally, interrupted only at the mid-dorsal line; post-orbital tooth (submarginal) present. Flagella of ant. 1 long, compressed, concave on inner side, forming when juxtaposed to their fellows a respiratory tube. A small tubercle on eye-stalk. Exopods on all mxp. and legs. Epipods on mxp. 2 and 3 and all legs. Two arthrobranchs (the anterior one filamentous) on the segment of 4th leg. Telson trifid, without movable spines. Appendix masculina on pleopod 2 ♂ (so far as known) bilamellate.

Remarks.—The distinctive feature of this genus is the modification of the flagella of 1st antennae; also, the posterior raised (more strongly chitinized) portion of abdominal segment 1 is very narrow mediodorsally.

Key to the South African Species.

1. Rostrum shallow, lanceolate, with 5–7 teeth, of which 3–4 are behind orbit. A post-rostral keel (fig. 113, *a*).
   a. Apex of each half of petasma bilobed (fig. 113, *e*).
      i. Ant. 1 $1\frac{2}{3}$ times length of carapace (incl. rostrum). 5th leg reaching to end of eyes . . . *siphonoceras.*

* Through the kindness of Mr. Rattray, formerly of the Low Temperature Laboratories, Cape Town, while studying the food and diseases of the stock-fish.

ii. Ant. 1 twice length of carapace (incl. rostrum). 5th leg reaching to end of peduncle of ant. 1 . *africanum.*

b. Apex of each half of petasma trilobed (fig. 113, *h*) . *algoense.*

2. Rostrum deep, cultrate, with 4–5 teeth, of which 2 are behind orbit. No post-rostral keel (fig. 113, *j*) . . . *comatum.*

Solenocera siphonoceras (Phil.) *

1837. Milne Edwards, Hist. Nat. Crust., ii, p. 417 (*Penaeus membranaceus* Risso).

1840. Philippi, Arch. Naturg., Jahrg. 6, p. 190, pl. 4, fig. 3 (*Penaeus s.*).

1893. Stebbing, Hist. Crust., p. 217 (*siphonoceras*).

1910. Kemp, Fish. Irel. Sci. Invest., 1908, p. 20, pl. 2, figs. 1–8 (*siphonocera*).

1916. Balss, Beitr. Kenntn. Meeresf. Westafr., ii, p. 14.

1923. Stephensen, Dana Ocean. Exp., ii, D3, p. 16 (*siphonocera*).

1925. Balss, D. Tiefsee Exp., xx, p. 226 (*membranacea* M. Edw.).

1934. Burkenroad, *l. c.*, pp. 69–71 (*membranacea* M. Edw.).

1938. Heldt, Ann. Inst. ocean. Paris, xviii, pp. 42, etc., figs. 4, 19, 20, 21 (petasma), 22 (app. masc.), etc. (reproduction, development).

Carapace ? glabrous. Rostrum reaching nearly to end of eyes, with 5–7 teeth, of which 3–4 are behind the orbit; post-rostral keel disappearing in posterior third of carapace (Kemp); small orbital, antennal, and pterygostomial spines present, and a stronger post-orbital one; no branchiostegal spine. Mandibular palp with 2nd joint triangular, rapidly tapering; cutting-edge undulate. Ant. 1 about $1\frac{2}{3}$ times length of carapace (incl. rostrum). 2nd joint of 1st and 2nd legs and 3rd joint of 1st leg each with a spine. 4th leg shorter than 5th, the latter reaching to end of eyes. 3rd abdominal segment faintly, 4th–6th segments distinctly keeled, the keel on 6th segment ending in a short spine; a small spine distally on ventral margin of 6th segment. Telson about as long as outer ramus of uropod. Petasma: each half apically bilobed, the length of the coupling-margin

* If the species which M. Edwards *attributed to Risso* and *re*-described as Risso's species is actually the same as Risso's, the name should be *membranaceum* Risso. But if the two are not the same, the combination "*Penaeus membranaceus*" of M. Edwards (or anyone else) cannot be used for M. Edwards' species (or any other species). Philippi's name is clearly the correct one to use if there is any doubt about Risso's species (see Stebbing, 1893). As Philippi's paper is not available here, I have used the termination "cer-*as*" (as in Stebbing, 1893), though Bouvier (1908) and Stebbing (1917) use "cer-*os*."

about half the total length, outer lobe longer than inner. (Description after Kemp.) Thelycum, pleopod 1 ♀, and pleopod 2 ♂ ?.

Length up to 71 mm. (Kemp). Reddish buff in general (Kemp).

Localities.—Outside Table Bay, and on Agulhas Bank, 117–178 metres (Balss); 40 miles N.W. of Cape Town, 150 fathoms (Burkenroad).

Distribution.—Mediterranean, eastern Atlantic from Ireland to Senegambia, Azores.

Remarks.—Balss stated that his specimens were compared with Mediterranean examples, and that they did not belong to *africanum*; also that *africanum* was based on unimportant differences, but differences from what species was not stated; if he meant *membranacea*, how did he differentiate his South African specimens from *africanum* ?

Burkenroad's specimen had longer 1st antennae than typical *siphonoceras*, but also a keeled 3rd abdominal segment (as in *africanum*, and contrary to Kemp's description).

Until we have a detailed description of *siphonoceras*, *africanum* may be allowed to stand as a distinct species.

Solenocera africanum Stebb.

Fig. 113, *a–c* (type ♀), *d–g* (♂).

1917. Stebbing, Ann. S. Afr. Mus., xvii, p. 32, pl. 4, fig. A (Crust. pl. 93, fig. A).

1925. Calman, Fish. Mar. Biol. Surv. Rep., iv, Spec. Rep. 3, p. 10 (*Solenocera* sp.).

1934. Burkenroad, *l. c.*, pp. 70, 71.

1939. *Id.*, *l. c.*, p. 6.

Type ♀. Carapace glabrous, faintly and sparsely punctate, mainly near the post-rostral keel, with a few minute setules behind antennal angle, and with a clearly demarcated (symmetrical on the two sides) pilose area alongside the dorsal teeth as far as the oblique lateral keel on rostrum. Rostrum reaching not quite to tips of eyes, shallowly lanceolate, dorsal teeth 7, the foremost one minute, 3 behind orbit; post-rostral keel scarcely notched by the cervical groove, extending nearly to hind margin of carapace. A small orbital spine; antennal and pterygostomial spines also small, post-orbital and hepatic spines larger. A conspicuous hollow behind the (marginal) pterygostomial spine. An inconspicuous notch in cervical ridge above hepatic spine (but no spine as shown by Stebbing). Ant. 1 twice as long as carapace (incl. rostrum). Mandibular palp and cutting-edge as in *siphonoceras*.

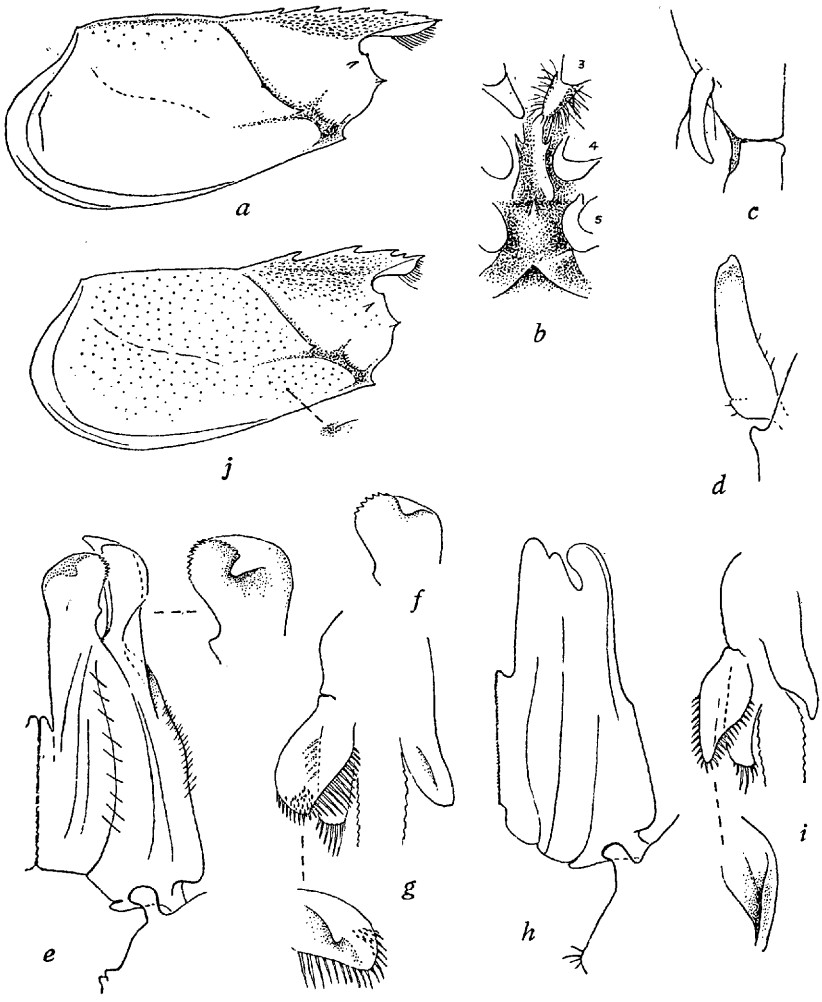

FIG. 113.—*Solenocera africanum* Stebb. *a*, carapace of type ♀. *b*, thelycum. *c*, pleopod 1 ♀. *d*, pleopod 1 of juv. ♂ 37 mm. in length. *e*, one-half of petasma of ♂ 61 mm., posterior view, with anterior view of apex of inner lobe further enlarged. *f*, anterior view of apex of inner lobe of ♂ 46 mm. *g*, anterior view of left pleopod 2 ♂, with posterior view of median lobe of appendix masculina, exopod omitted.

Solenocera algoense Brnrd. *h*, one-half of petasma of ♂ 63 mm. (but possibly not quite adult). *i*, anterior view of left pleopod 2 ♂, with posterior view of median lobe of appendix masculina, exopod omitted.

Solenocera comatum Stebb. *j*, carapace of type ♂.

2nd joint of 1st and 2nd legs, and 3rd joint of 1st leg each with a spine. 4th leg reaching to tip of eye, 5th leg to end of peduncle of ant. 1. 3rd–6th abdominal segments distinctly keeled, the spine at end of 6th broken off; 6th segment a little shorter than 5th, postero-inferior angle of 5th rounded-quadrate; a small denticle distally (at about $\frac{3}{4}$ length) on ventral margin of 6th segment (concealed amongst long plumose setae). Telson scarcely as long as *inner* ramus, distinctly shorter than outer ramus, of uropod. Sternites (fig. 113, *b*): coxal lobes of 3rd legs prominent, ridge-like, strongly setose, hollow between 4th coxae bounded by a thin ridge bearing a spine (or sharp tooth) (inconspicuous), between 5th coxae a low median boss bearing a spiniform tubercle, posteriorly a transverse plate; 5th coxa bluntly dentiform anteriorly. Endopod of pleopod 1 slightly in-curved (towards peduncle), with 2 long setae. Length 65 mm. (Stebbing: 70·5 mm., apparently measured on the curve).

Localities.—Off Sebastian Bluff (Agulhas Bank), 34 fathoms (Stebbing); off Durban, 22 fathoms (Calman); off Cape Point, 45 and 85 fathoms (S. Afr. Mus.); off Struys Point, 42 fathoms, Cape St. Blaize, 25 fathoms, and Algoa Bay, 57 fathoms (S. Afr. Mus.).

Remarks.—Of Stebbing's type ♂ there is in the South African Museum only a slide containing the mandible and mxp. 2. The petasma is missing. When unmounted the mandible showed no unusual features, and the difference in the lengths of the terminal and penultimate joints of mxp. 2 is inappreciable.

The re-examination of the type ♀, and the examination of additional material in the South African Museum, goes to show that Burkenroad's opinion is probably correct: that *africanum* cannot really be separated from *siphonoceras*, and perhaps does not deserve even varietal rank. As already remarked, however, there are several details of *siphonoceras* (*e.g.* surface of carapace, details of petasma and pleopod 2 ♂) which are not given in descriptions (at least not in those available to me), with which *africanum* should be compared before finally relegating it to synonymy.

In the present material the differences from *siphonoceras* seem to be: shorter telson, longer 1st antennae, longer 4th and 5th legs, and a distinct keel on 3rd abdominal segment (in addition to the keels on 4th–6th segments).

As in the case of *comatum* (*infra*) Stebbing has very evidently examined and drawn the petasma only *after* mounting on a slide. The varying thickness and degree of chitinization seen by transmitted light through the flattened appendage misled him to describe the apex

of the inner lobe as bidentate. Kemp's fig. 2 (*l. c.*, 1910), though giving a faint indication, fails to give a true representation of the real structure owing to the small size of his drawing. When the petasma is examined loose, the "bidentate" appearance is seen to be due to a stout thickened tooth on the anteriorly overturned distal margin; external to this tooth the margin is denticulate or serrate, a detail which appears in neither Kemp's nor Stebbing's figures. The apex of the outer lobe is composed of 2 laminae, closely appressed and free only at their edges.

Pleopod 2 ♂. The process curving outwards from base of endopod bears a short ridge on its anterior surface. The anterior lobe of appendix masculina is spatulate, its median margin ridged (*not* flattened), the median border of the hollowed posterior surface formed by a projecting keel (fig. 113, *g*).

A spiniform process, more or less uncinately curved forwards, on each of abdominal sternites 1–5, strong on 1st, small on 5th, in both sexes, but tending to become bluntened in adult.

The present material comprises ♂♂ 37–61 mm., ♀♀ 62 and 73 mm., and juveniles from 25–32 mm. in length. In the 46 mm. ♂ the two halves of the petasma are not coupled together; and in the 37 mm. specimen each half is a simple digitiform process (fig. 113, *d*). There are 21 specimens with 6, and 7 with 7 rostral teeth.

Solenocera algoense Brnrd.

Fig. 113, *h*, *i*.

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 383.

♂. 63 mm. in length. Rostrum with 6 teeth, 3 behind orbit, apex up-turned. Surface of carapace as in *africanum*, but more strongly and closely punctate dorsally behind the cervical groove. Indentation on latter (above hepatic spine) barely traceable; other spines as in *africanum*. Abdominal segments more strongly punctate; 3rd–6th segments keeled, keel on 6th ending in a spine, a denticle on lower distal margin of 6th segment. A strong blunt tooth-like (laterally compressed) process on 1st abdominal sternite, and a small conical setiferous tubercle on each of 2nd–5th sternites (very small on 5th). Telson a little longer than inner ramus and slightly longer than outer ramus of uropod. Ant. 1 twice length of carapace (incl. rostrum). Mandbular palp as in *siphonoceras*. Spines on 1st and 2nd legs as in *siphonoceras* and *africanum*; 4th leg reaching to end of peduncle of ant. 1, 5th leg longer. Petasma, the two halves not coupled together,

no trace of serration or other armature on the apices of the lobes, and therefore probably not quite fully developed. Pleopod 2 ♂, appendix masculina with anterior lobe spatulate (hollowed on posterior surface), the median edge flattened.

Locality.—Off Nanquas Peak (eastern portion of Algoa Bay), 50 fathoms (S. Afr. Mus.).

Remarks.—Although apparently not quite mature, the petasma of this 63 mm. ♂ is quite distinct from that of the 47 mm. ♂ *comatum* (*infra*) and the 61 mm. ♂ *africanum*.

Solenocera comatum Stebb.

Figs. 113, *j*, 114.

1915. Stebbing, Ann. S. Afr. Mus., xv, p. 67, pls. 13, 14 (Crust., pls. 77, 78).

1939. Burkenroad, *l. c.*, p. 6.

Type ♂. Carapace with rather numerous minute punctae, most of them with a minute setule, more numerous and closely-set on the rostral and post-orbital areas, which can be described as definitely pilose or pubescent. Rostrum extending very little beyond base of cornea, rather deep and cultrate, the lower margin strongly arcuate, dorsal teeth 4, the foremost one smaller than the others, 2 behind orbit; post-rostral keel obsolete behind cervical groove. Orbital angle without spine, antennal and pterygostomial spines small, hepatic and post-orbital spines larger. Lower portion of cervical groove of nearly uniform depth, without a conspicuous hollow behind the pterygostomial spine. Ant. 1, $1\frac{1}{2}$ times length of carapace (incl. rostrum). Mandibular palp and cutting-edge as in *siphonoceras*, but the basal width of terminal joint of palp less than width of basal joint (as in Stebbing's figure). 2nd joint of 1st and 2nd legs and 3rd joint of 1st leg each with a spine (4th and 5th legs have been removed from specimen). 4th–6th abdominal segments dorsally keeled, the 6th ending in a small spine; 6th segment a little longer than 5th, postero-inferior angle of 5th quadrate (contrast *africanum*); a small denticle below postero-inferior angle of 6th segment. A small median setiferous tubercle on abdominal sternites 2–5 (1st segment defective), very small on 5th. Telson a little shorter than inner ramus and only $\frac{3}{4}$ length of outer ramus of uropod. Petasma: the two halves in contact (along coupling-margin) for about $\frac{2}{3}$ total length of lobes, inner lobe longer than outer, apically expanded, with distal margin overturned anteriorly (dorsally), the whole margin serrate; middle lobe

somewhat uncinate, pointing medianly, the bent-over margin strongly serrate; outer lobe apically more strongly chitinized, with a rounded projecting flap on anterior (dorsal) surface; on the peduncle an anvil-shaped flap posterior to the base of the petasmal plate (cf. *melantho* de Man, Siboga Exp. monogr., xxxix*a*, 1913 (atlas), pl. 5, fig. 12, *e*). Pleopod 2 ♂, the process on outer side of base of endopod somewhat spatulate or boat-shaped, hollowed on its proximal side, lying behind (ventral to) the exopod, appendix masculina of two opposable flaps,

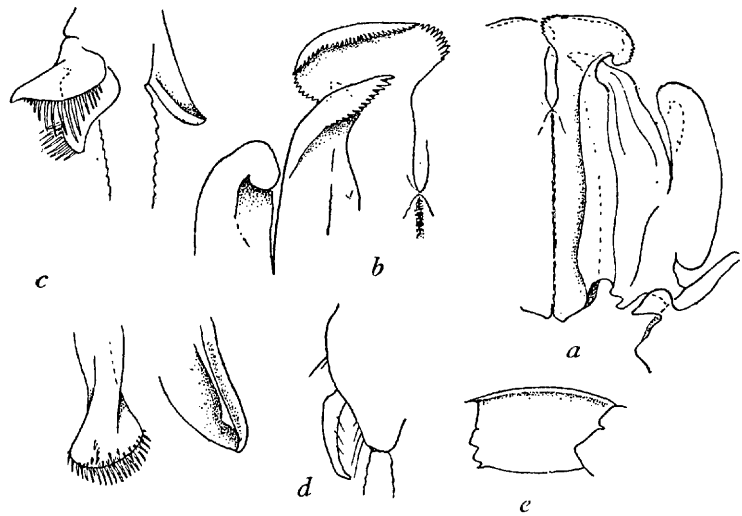

FIG. 114.—*Solenocera comatum* Stebb. *a*, posterior view of one-half of petasma ♂. *b*, anterior view of apex of same, further enlarged. *c*, anterior view of left pleopod 2 ♂, with posterior views of the two lobes of the appendix masculina, exopod omitted. *d*, pleopod 1 ♀ 33 mm. *e*, 6th abdominal segment ♂.

both armed with strong spines, the anterior one spatulate with median edge flattened, the posterior one twisted (true shape only seen from posterior side). Length 47 mm.

Type ♀. Only a slide was available with the dried-up remains of appendages of which only the 1st pleopod could be saved. This has the form figured by Stebbing, but the question may be asked whether it is really a ♀ and not a young ♂.

Localities.—Off East London, 43–50 fathoms (Stebbing): near Gt. Fish Point, 30 and 53 fathoms (S. Afr. Mus.).

Remarks.—Stebbing apparently did not describe the appendages until after they had been mounted in glycerine jelly on a slide; hence the defectiveness of his description and figure of the petasma.

The two juv. ♀♀, 32 mm. in length, from near Gt. Fish Point, have the endopod of pleopod 1 as in fig. 114, *d*. There is a straight spiniform setiferous process on 1st abdominal sternite, and a small setiferous conical tubercle on each of 2nd–5th sternites (as in ♂).

Gen. Hymenopenaeus S. I. Smith

1882. S. I. Smith, Bull. Mus. Comp. Zool. Harv., x, p. 91.

1888. Bate, Rep. H.M.S. *Challenger*, xxiv, p. 273 (*Philonicus* part).

1888. *Id.*, *ibid.*, p. xii (*Pleoticus*, nom. nov. for *Philonicus* preocc.).

1888. *Id.*, *ibid.*, p. 284 (*Haliporus* part).

1911. de Man, *l. c.*, pp. 7, 31 (*Haliporus*).

1914. Stebbing, Ann. S. Afr. Mus., xv, p. 20 (*Haliporoides*).

1925. Calman, Fish. Mar. Biol. Surv. Rep., iv, Spec. Rep. 3, pp. 9, 10 (*Haliporus*).

1936. Burkenroad, Bull. Bingham Ocean. Coll., v, p. 102 (references).

1938. Ramadan, John Murray Exp., v, p. 57.

Carapace with cervical groove extending to mid-dorsal line; post-orbital tooth present; branchiostegal and pterygostomial spines one or the other or both either present or absent. Appendage on inner margin of basal joint of ant. 1 moderately long, flexible, twisted. One or both of the flagella of ant. 1 very long, filiform. A small tubercle on eye-stalk. Exopods on all mxp. and legs. Epipods on mxp. 2 and 3, and 1st–4th legs. Two arthrobranchs on the segment of 4th leg; a podobranch on mxp. 2, but none on the appendages posterior to it. Telson trifid, without movable lateral spines.

Remarks.—Burkenroad restricts *Haliporus* Bate 1881 to Bate's genotype *curvirostris* and Faxon's *thetis*, characterized by having podobranchs on some of the appendages behind mxp. 2, mobile spines on telson (as well as the fixed spines forming the trifid apex), and a short rigid appendage on inner margin of basal joint of ant. 1.

Calman regards the 3-jointed mandibular palp, which characterizes *Haliporoides triarthrus* (and also *Haliporus sibogae* de Man), as an inadequate basis for generic separation; and Burkenroad also places Stebbing's genus in synonymy. Stebbing's name, however, might be retained as a subgeneric or sectional name.

Hymenopenaeus (*Haliporoides*) *triarthrus* (Stebb.)

Knife-Prawn.

Fig. 115.

1914. Stebbing, *l. c.*, p. 21, pls. 6, 7 (Crust., pls. 70, 71).

1921. Gilchrist, Fish. Mar. Biol. Surv. Rep., i, pp. 45, etc. (localities).
1925. Calman, *l. c.*, p. 9.

Whole body, including thoracic and abdominal sternites, and peduncles of pleopods, finely pubescent (or minutely hispid). Rostrum large, strongly arcuate, 10 dorsal teeth, of which 2 behind orbit, 2 ventral teeth; no post-rostral keel. Carapace with pterygostomial

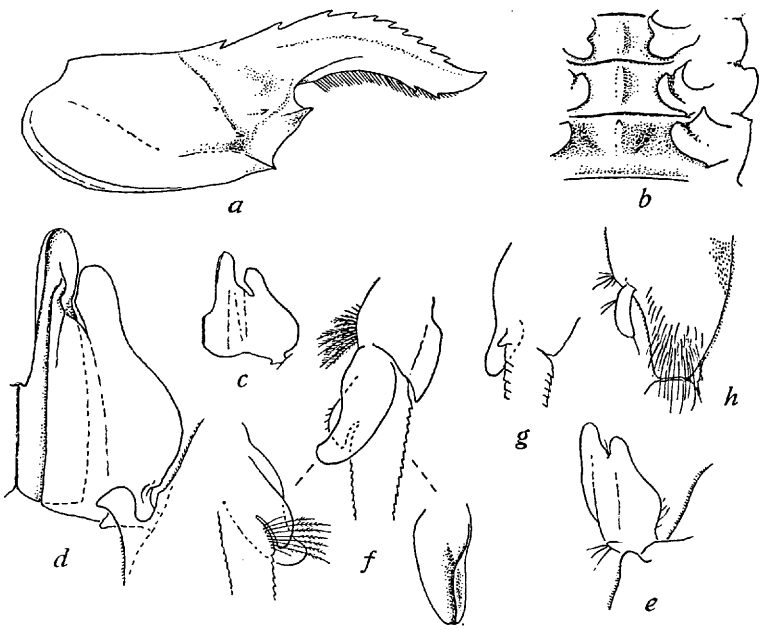

FIG. 115.—*Hymenopenaeus* (*Haliporoides*) *triarthrus* (Stebb.). *a*, carapace, pubescence not shown. *b*, 3rd–5th sternites, with profile. *c*, one-half of adult petasma, expanded, lobe on peduncle omitted. *d*, one-half of petasma, folded. *e*, pleopod 1 (developing petasma) juv. ♂ *ca.* 80 mm. in length. *f*, anterior view of left pleopod 2 ♂, with posterior view of the two lobes, and medio-posterior view of one of them. *g*, anterior view of pleopod 2 juv. ♂. *h*, pleopod 1 ♀, the pubescence actually covers whole peduncle, though only partly shown.

spine, and a minute spine (very inconspicuous, obsolete in the largest specimens) on the cervical ridge above the hepatic tooth; no orbital tooth, the orbital margin being an even curve. Both flagella of ant. 1 much longer than length of animal (in a specimen *ca.* 85 mm. the outer flagellum is *ca.* 130 mm., the inner *ca.* 200 mm.). Flagellum of ant. 2 also very long. Mandibular palp distinctly 3-jointed. No spines on proximal joints of 1st or 2nd legs; 3rd leg reaching to end of antennal scale, 4th extending beyond 3rd, and 5th beyond 4th. Coxal lobe of 3rd leg rather strong; and a blunt tooth on antero-median corner of 5th coxa in adult ♂. 4th–6th abdominal segments keeled, each

keel ending in a short spine; postero-inferior corners of 5th and 6th segments rounded. Telson shorter than uropods. Sternites of both ♂ and ♀ similar (figs. 115, *b*), a median ridge on each segment between bases of 3rd–5th legs, that between 4th legs slightly the highest, that between 5th legs with a small tubercle anteriorly. Petasma simple, folded, when fully expanded each half about as broad as long, inner lobe longer than outer, somewhat spatulate; the somewhat knob-like lobe on the peduncle quite separate from the actual attachment-stalk of the petasma (de Man's fig. 10, *i*, of *sibogae* is in this respect ambiguous, if not actually misleading). Appendix masculina on pleopod 2 ♂ of 2 lobes, the anterior one flattened distally on its median surface, and concave on posterior surface, margin entire.* Endopod of pleopod 1 ♀ digitiform.

Length up to 150 mm. (Calman).

Localities.—Off East London, 250–300 fathoms (Stebbing, and S. Afr. Mus.); off Durban, 160–300 fathoms (Calman, and Fishery Survey Rep.); off Table Bay (Lion's Head S.E. × E. distant 50 miles), 230 fathoms (S. Afr. Mus., 1 juv.).

Remarks.—Close to *sibogae* de Man 1907 (also descr. and figd., *l. c.*, 1911 and 1913), from the East Indies, which differs in the less arcuate rostrum and the fewer rostral teeth $\left(\frac{6-9}{1-2}\right)$. The sternites and petasma of the two species are very similar. But before making *triarthrus* a synonym, it would be advisable to compare actual petasmas of the two species, and also the 2nd pleopods.

In the South African Museum there are the appendages from Stebbing's type ♀, and 11 topotypes, including a ♂ 132 mm. and a ♀ 120 mm. in length. The petasma and 2nd pleopod of an immature ♂ 80 mm. in length are figured. The juvenile from off Table Bay measures 38 mm., with rostral formula $\frac{9}{2}$.

Known to the crew of the Survey vessel, and recorded in the Fishery Survey Reports, as the Knife-Prawn on account of its prominent rostrum.

Gen. Plesiopenaeus Bate

1881. Bate, Ann. Mag. Nat. Hist. (5), viii, p. 188 (part).

1888. *Id.*, Rep. H.M.S. *Challenger*, xxiv, p. 309 (*Aristeus* part).

* In this species, more so than in *Solenocera* (figs. 113, 114), the position of the posterior lobe strongly supports Burkenroad's suggestion (*l. c.*, 1936, p. 100, footnote) that this lobe represents the appendix *interna*.

1891. Wood-Mason and Alcock, Ann. Mag. Nat. Hist. (6), viii, p. 282 (*Aristaeopsis*).

1901. Alcock, Cat. Ind. Deep-Sea Crust., pp. 35, 40 (*Plesiopeneus* [sic] and *Aristaeopsis*).

1908. Bouvier, Res. Sci. Camp. Monaco, fasc., xxxiii, pp. 61, 63 (*Aristaeopsis* and *Plesiopenaeus*).

1936. Burkenroad, Bull. Bingham Ocean. Coll., v, p. 94.

1938. Ramadan, John Murray Exp., v, p. 49.

Carapace with cervical groove distinct or obsolete; post-antennal and marginal pterygostomial spines present; no orbital or hepatic spines; rostrum elongate in both sexes, or long in ♀ and short in ♂, tridentate (abnormally 2–4 dentate). No lobe or scale on inner margin of basal joint of ant. 1; outer (upper) flagellum short, dorso-ventrally flattened, inner flagellum elongate. Exopods on legs minute (if present). Podobranchs on mxp. 2 and 3, and 1st–3rd legs; epipods on all mxp. and 1st–4th legs. Exopod of mxp. 2 often very long. Exopods of anterior pleopods long.

Remarks.—Sexual dimorphism may occur in the length of the rostrum, and of the antennal scale, the shape of the proximal part of the long inner flagellum of ant. 1, and the terminal joint of mxp. 3. Atlantic and Indo-Pacific.

Key to the South African Species.

1. 4th–6th abdominal segments keeled. Inner flagellum of ant. 1 and apical joint of mxp. 3 modified in ♂. In ♀ a shield-shaped plate on 4th thoracic sternite . . . *nitidus.*
2. 3rd–6th abdominal segments keeled. Antennal scale produced in a long process in ♂. In ♀ a shield-shaped plate on 5th thoracic sternite . . . . . *edwardsianus.*

Plesiopenaeus nitidus Brnrd.

Fig. 116.

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 383.

Carapace glabrous; cervical groove obsolete except in lower part, a shallow groove below hepatic area, continued faintly towards hind margin of carapace; rostrum tridentate, teeth equally spaced or the 1st and 2nd nearer to one another, middle one in advance of orbital margin; no post-rostral keel; in some specimens (♂ ♀) a minute median tubercle near hind margin of carapace. Inner flagellum of ant. 1 in ♂ expanded on ventral margin just beyond apex of outer flagellum.

Exopod of mxp. 2 extending to base of antennal scale; exopod of mxp. 3 about as long as that of mxp. 2, extending nearly to end of 4th joint (of mxp. 3). Mxp. 3 extending $\frac{3}{4}$ along antennal scale, and a little farther than 3rd leg, terminal joint modified in ♂ (fig. 116, *g*). Terminal joint of mandibular palp triangular, inner margin not (or scarcely) emarginate. 1st–3rd legs increasing in length, 3rd extending

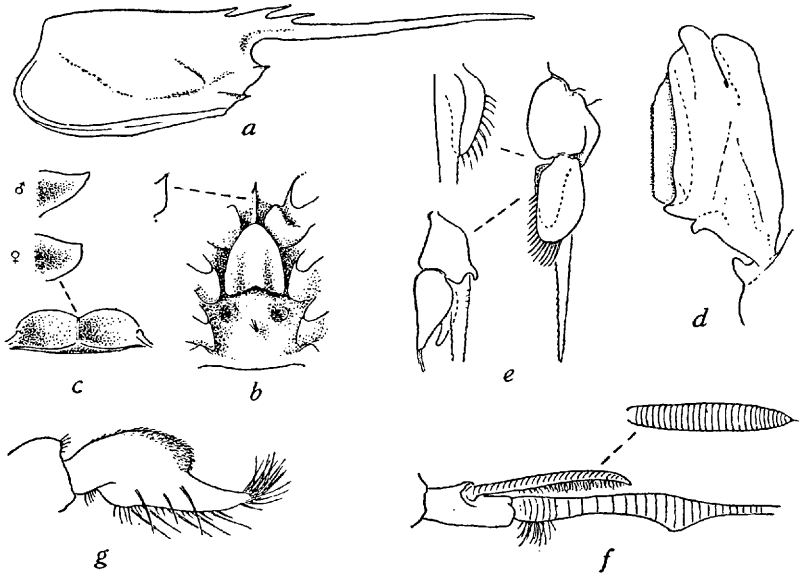

FIG. 116.—*Plesiopenaeus nitidus* Brnrd. *a*, carapace. *b*, thoracic sternites 3–5 ♀, with profile of spine between 3rd legs. *c*, sternite of 1st abdominal segment ♀, with profile of median keel in ♀ and ♂. *d*, one-half of petasma of ♂. *e*, anterior view of left pleopod 2 ♂, with posterior view (above) and external view after removal of exopod (below). *f*, externo-lateral view of right ant. 1 ♂, proximal part only of inner flagellum shown, with dorsal view of outer flagellum. *g*, terminal joint of mxp. 3 ♂.

half-way along antennal scale, all slender; 4th and 5th legs equally long, or 5th a little longer, extending nearly to spine on antennal scale; dactyls setiform, $\frac{1}{2}$ length of 6th joint. No spines (other than mobile spine-setae) on proximal joints of legs, but a minute spine on inner distal angle of 3rd joint of mxp. 3. 4th–6th abdominal segments keeled, keels ending in short spines; 3rd segment not keeled, but when viewed dorsally the hind margin is slightly dentiform in middle line. Postero-inferior corners of segments 1–5 rounded, a small tooth below the postero-inferior angle of 6th segment. Telson shorter than inner ramus of uropod, not grooved or keeled, with 3 pairs of lateral mobile

spines distally. Pleopod 1, exopod extending to base of antennal scale; petasma with the 2 halves rather feebly coupled, but appearing to be fully developed (fig. 116, *d*); pleopod 1 ♀ with small digitiform endopod arising midway along peduncle. Pleopod 2 ♂ with bilamellate appendix masculina, the posterior lobe ovoid, the anterior subtriangular, concealed, endopod short. Sternites of last 3 thoracic segments, and sternites of the abdominal segments similar in ♂ and ♀, but in ♂ the spine between bases of 3rd legs and the spines on the abdominal segments larger and more acute than in ♀; between bases of 4th legs a shield-shaped plate, partly covering (in ventral view) the coxal lobes of 3rd legs in ♀; between bases of 5th legs a lateral hollow on each side and a small median setiferous tubercle.

Length ♀ up to 150 mm., ♂ 110 mm.

Locality.—Off Cape Point, 475–630 fathoms (S. Afr. Mus.).

Remarks.—These 3 ♂♂ and 3 ♀♀ (coll. s.s. *Pieter Faure*) appear to differ from *armatus* (Bate), *edwardsianus* (Johnson), and *coruscans* (W-Mason and Alck.) in the modified antennular flagellum and 3rd maxilliped of the ♂. *A. antennatus* (Risso) has a modified antennular flagellum, and a modified terminal joint on mxp. 2 (Bouvier, 1908, pl. 12, fig. 4), but in the present species there is no modification of mxp. 2. Further, the carapace is very smooth.

Plesiopenaeus edwardsianus (Johnson)

1867. Johnson, Proc. Zool. Soc. Lond., p. 897.

1878. Miers, *ibid.*, p. 308, pl. 17, fig. 3 (mandible).

1892. Illustr. Zool. "Investigator," Crust., pl. 1, figs. 1 (♂), 2 (♀).

1901. Alcock, *l. c.*, p. 36.

1908. Bouvier, *l. c.*, p. 64, pl. 2 (coloured), pl. 13, figs. 13–17, pl. 14, figs. 1–8.

1925. Balss, D. Tiefsee Exp., xx, p. 223.

1938. Ramadan, John Murray Exp., v, p. 51 (*edwardisianus* [sic]).

Post-rostral keel sharp to end of gastric region, then becoming obsolete; middle rostral tooth directly above hind margin of orbit; a strong sharp ridge from orbit to cervical groove, and other ridges and longitudinal grooves well marked. Neither inner flagellum of ant. 1 nor apical joint of mxp. 3 modified in ♂, but antennal scale produced in a long narrow process in ♂. Exopod of mxp. 2 very long, rigid, extending to end of (or beyond) antennal scale; exopod of mxp. 3 extending scarcely to end of 4th joint (of mxp. 3). Terminal joint of mandibular palp deeply bifurcate. Dactyls of 4th and 5th legs

narrow lanceolate. 3rd–6th abdominal segments dorsally keeled, the keels ending in short points; postero-inferior corners of 3rd–5th segments each with a small point, and a small point below the postero-inferior corner of 6th segment. Telson distally flattened, obscurely channelled. Exopod of pleopod 1 extending to middle of antennal scale. In ♀ thoracic sternite 3 unarmed, on sternite 4 a triangular tooth with sharp forwardly-directed point, on sternite 5 an ovoid tubercle or shield-shaped plate. Median antrorse teeth on abdominal sternites 1 and 2 strong (stronger than in ♂ of *nitidus*).

Length up to 226 (Alcock) and 315 mm. (Bouvier). Deep crimson (Alcock, and Bouvier's coloured figure).

Distribution.—Madeira and Azores, West Indies, Indian Seas, Arabian Sea, east coast of Africa.

Remarks.—A single ♀, 185 mm. in length, is in the South African Museum. Although it has no locality label, there is very little doubt that it is part of the *Pieter Faure* collection, and in all probability came from a deep-water station off the Cape Point.

Gen. ARISTAEOMORPHA W-Mason & Alck.

1891. Wood-Mason and Alcock, Ann. Mag. Nat. Hist. (6), viii, p. 286.

1901. Alcock, Cat. Ind. Deep-Sea Crust., p. 38.

1908. Bouvier, Res. Sci. Camp. Monaco, fasc. xxxiii, p. 52.

Carapace with cervical groove (for most part) distinct; spines as in *Plesiopenaeus* but with the addition of an hepatic spine; rostrum elongate but often shorter in ♂ than in ♀, multidentate. Ant. 1 as in *Plesiopenaeus*. Exopods on legs absent (? always). Podobranchs and epipods as in *Plesiopenaeus*. Exopod of mxp. 2 very long; of mxp. 3 short. Exopods of anterior pleopods long.

Remarks.—No sexual dimorphism except in the length of the rostrum.

Aristaeomorpha foliacea (Risso)

Fig. 117.

1826. Risso, Hist. Nat. Eur. merid., v, p. 29, pl. 2, fig. 6.

1892. Wood-Mason, Illustr. Zool. "Investigator," Crust., pl. 2, fig. 2 (*giglioniana*, nom. nud. Mediterranean specimen of *foliacea* figured for comparison, see Kemp and Sewell, 1912, Rec. Ind. Mus., vii, p. 19).

1914. Stebbing, Ann. S. Afr. Mus., xv, p. 24 (*rostridentatus*) (not the references to W-Mason and Alcock, 1891, Alcock, 1901, Kemp and Sewell, 1912).

1925. Balss, D. Tiefsee Exp., xx, p. 221, figs. 1, 2 (*rostridentatus*).

1925. Calman, Fish. Mar. Biol. Surv. Rep., iv, Spec. Rep. 3, p. 7 (synonymy).

1926. Schmitt, Biol. Res. "Endeavour," v, p. 313, pl. 57, figs. 1–3.

1933. Yokoya, J. Coll. Agric. Tokyo, xii, p. 3, fig. 1 (*Aristeus japonicus, fide* Burkenroad).

1936. Burkenroad, Bull. Bingham Ocean. Coll., v, p. 85.

1938. Ramadan, John Murray Exp., v, p. 53, fig. 5, *b* (carapace with short rostrum).

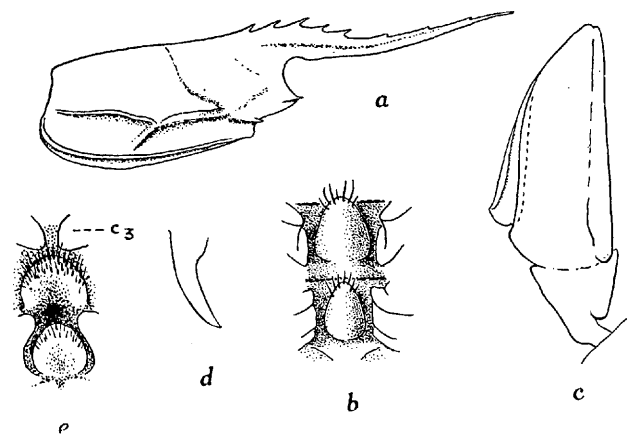

FIG. 117.—*Aristaeomorpha foliacea* (Risso). *a*, carapace of ♂ 123 mm. in length (pubescence omitted). *b*, 4th and 5th thoracic sternites ♂. *c*, one-half of petasma, not fully developed. *d*, lateral view (from right side) of spine on 1st abdominal sternite. *e*, thelycum.

Carapace finely pubescent; pterygostomial area 3·5–4 times as long as high; cervical groove indistinct dorsally, a well-marked groove below hepatic spine, from its hind end a low ridge to hind margin of carapace; rostrum with double curve, about equal in length (from orbital sinus) to rest of carapace, with (8) 10–12 teeth, of which 5–6 on the arched basal portion are larger than the distal ones; rostrum often shorter in adult ♂, lacking the distal slender portion (see Kemp and Sewell, 1912, *l. c.*, pl. 1, fig. 5). Apical joint of mandibular palp with inner basal corner produced, inner margin excavate. Exopod of mxp. 2 reaching nearly to spine on antennal scale, exopod of mxp. 3 nearly to end of 3rd joint (of mxp. 3). No exopods on legs. No (fixed) spines on proximal joints of anterior legs. 4th and 5th

legs very slender, especially the distal joints, dactyls about $\frac{1}{3}$ length of 6th joint (Calman: in the present ♂ $\frac{1}{2}$ length of 6th). 3rd–6th abdominal segments keeled, each keel ending in a short spine; postero-inferior corners of segments 1–5 rounded, a small spine below postero-inferior angle of 6th segment. Telson not quite reaching to end of inner ramus of uropod, with 3–4 pairs of lateral mobile spines. Outer ramus of uropod produced beyond the external spine for not more than $\frac{1}{7}$ its length. Petasma of juv. ♂, fig. 117. Pleopod 2 ♂ similar to that of *Plesiopenaeus nitidus* (*supra*). Sternites between 4th and 5th legs each with a shield-shaped plate. Sternites of abdominal segments 1–3 each with an ensiform process, of segments 4 and 5 with a short low medio-longitudinal keel.

Length up to 215 mm. (♀). Immature ♂ here figured 123 mm. (longirostrate). Red with blue ova (s.s. *Pieter Faure* log-book); reddish (Bouvier, 1908, coloured figure).

Localities.—Off East London, 250–310 fathoms (Stebbing, and S. Afr. Mus.); off Durban, 230 fathoms (Calman).

Distribution.—Mediterranean, eastern N. Atlantic, Fiji Is., Japan, S.E. Australia, East Indies (Balss: figure seems to indicate *foliacea* rather than *wood-masoni*).

Remarks.—Calman has separated the Indian form (*rostridentatus* W-Mason & Alck., non Bate) under the name *wood-masoni*. It has a deeper pterygostomial area on the carapace (*cf.* Kemp and Sewell, 1912, *l. c.*, pl. 1, figs. 5 and 6), and differs in certain other characters, which, it must be admitted, are of rather minor importance. Kemp and Sewell (1912) found no differences in the thelycum or petasma of the two forms. Balss gave a figure showing the petasma *in situ*, but this is quite useless for indicating any specific details. I have seen no figure of the fully developed petasma.

In the South African Museum there is the immature ♂ seen and recorded by Stebbing, and a juvenile 45 mm. in length from a nearby locality. I have seen a large ♀ from the Port Elizabeth Museum. It measures 175 mm. with broken rostrum; probably the full length would have been about 215 mm., the maximum given by Kemp and Sewell.

Gen. GENNADAS Bate (restr. Burkenroad)

1881. Bate, Ann. Mag. Nat. Hist. (5), viii, pp. 171, 191.

1882. S. I. Smith, Bull. Mus. Comp. Zool. Harv., x, p. 86 (*Amalopenaeus*).

1914. Stebbing, Trans. Roy. Soc. Edin., 50, p. 282 (references).

1922. Bouvier, Res. Sci. Camp. Monaco, fasc. lxii, p. 9.

1924. Gurney, "Terra Nova" Rep. zool., viii, p. 52 (larval stages).

1925. Calman, Fish. Mar. Biol. Surv. Rep., iv, Spec. Rep. 3, p. 3 (part).

1927. Balss, D. Tiefsee Exp., xxiii, p. 250 (*Amalopenaeus*).

1936. Burkenroad, Bull. Bingham Ocean. Coll., v, p. 59 (restricted, key to species).

1938. *Id.*, Zoologica, xxiii, p. 57.

Carapace with infra-antennal angle (if developed) pointing downwards; rostrum short, deep, unidentate. 2nd and 3rd peduncular joints of ant. 1 expanded. Exopod of mxp. 1 without distal segmented prolongation; 3rd joint of mxp. 2 expanded. Only a vestige of a gill on mxp. 1; no podobranchs on mxp. 3 or any of the legs. Only the 6th abdominal segment dorsally keeled. Telson apically truncate, with only a single pair of lateral mobile spines. Petasma always with "lobus accessorius" (see fig. 118). Appendix masculina on pleopod 2 ♂ bilamellate.

Remarks.—Burkenroad restricts the genus to include only those species which lack podobranchs behind mxp. 2. The species are closely allied and difficult to separate. The ♂ petasma and the ♀ thelycum are the two most useful characters.

Cosmopolitan; mostly pelagic, in contrast to *Benthesicymus* which is usually benthic.

Key to the South African Species (after Burkenroad).

Males (petasma).

1. Median lobe undivided (fig. 118, *e*).
   - *a.* External lobe undivided (fig. 118, *e*).
     - i. Both lobules of internal lobe spinulose, accessory lobe slender, clavate, inserted nearer inner margin . . . . . *capensis.*
     - ii. Only median lobule spinulose; accessory lobe broad, inserted nearer outer margin . . *kempi.*
   - *b.* External lobe divided; inner lobe not extending as far as external lobe, accessory lobe much less than half as broad as external lobe . . . . *elegans.*
2. External and median lobes both divided (fig. 118, *g*).
   - *a.* Lobules of median lobe subequal in breadth, not hooked or acuminate (fig. 118, *g*, *k*).
     - i. Outer lobule of external lobe longer than inner lobule. Lobules of median lobe short and stout . . . . . *valens.*

ii. Inner lobule of external lobe longer than outer. Lobules of median lobe long and rather slender . . . . . *gilchristi.*

b. Lobules of median lobe very unequal in breadth, external lobe much shorter than median (fig. 118, *i*, *o*).

i. Outer lobule of median lobe much broader than inner . . . . . *talismani.*

ii. Outer lobule of median lobe much narrower than inner, latter not acuminate . . *scutatus.*

Females (thelycum).

1. Orifices of seminal receptacles separate, not included in a common atrium (fig. 118, *f*, *n*).

a. Orifices widely separated, not guarded posteriorly by large prominences (fig. 118, *f*).

i. Transverse elevation of hind margin of 3rd sternite W-shaped, 4th sternite without rectangular elevation . . . . *capensis.*

ii. Transverse elevation of 3rd sternite Λ-shaped, 4th sternite with conspicuous rectangular elevation, its antero-lateral corners overlapping hind lips of orifices of receptacles . *kempi.*

b. Orifices not widely separated, guarded posteriorly by prominences. Posterior portion of 4th sternite without shield-shaped median elevation . . *elegans.*

2. Orifices of seminal receptacles lying within a common atrium (fig. 118, *l*).

a. A transverse pair of conspicuous tooth-like projections on 4th sternite; hinder lip of 3rd sternite not much produced; projections of 4th extending towards middle line.

i. Projections of 4th not meeting in middle line, not nearly reaching to anterior margin of 4th sternite . . . . . *valens.*

ii. Projections of 4th nearly meeting in middle line, reaching nearly to anterior margin of 4th sternite . . . . . *gilchristi.*

b. No transverse pair of projections on 4th sternite. Atrium between 3rd and 4th divided by a well-defined median longitudinal ridge, 4th with distinct anterior and posterior elevated areas.

i. Elevated area on 4th weakly separated into a short anterior and a long posterior portion by a transverse groove . . . . *talismani.*

ii. 4th with distinct anterior and posterior elevations. A free flap projecting forward from anterior margin of 5th nearly to anterior margin of 4th . . . . . *scutatus.*

Simplified First-Aid Key.

1. Infra-antennal angle acute.
   a. 4th joint of 3rd leg longer than 5th joint . . . *capensis.*
   b. 5th joint longer than 4th . . *gilchristi, valens, talismani, scutatus.*
2. Infra-antennal angle blunt. 4th joint of 3rd leg longer than 5th . . . . . *kempi, elegans.*

Gennadas capensis Calman

Fig. 118, *e*, *f*.

1925. Calman, *l. c.*, p. 5, pl. 1, figs. 1, 2 (antennal scale, petasma).

1936. Burkenroad, *l. c.*, p. 67, figs. 51, 53 (antennal scale, thelycum).

Antennal and infra-antennal angles pointed, branchiostegal (or pterygostomial) spine distinct, marginal; distance between cervical and post-cervical grooves (*cf.* fig. 118, *a*) dorsally about $\frac{1}{5}$ distance of latter from hind margin of carapace. Apex of antennal scale nearer to inner than to outer margin. 4th joint of 3rd leg slightly longer than 5th joint. Coxae of 4th and 5th legs ♀ enlarged, the enlargement on 4th leg being a narrow inwardly directed process. Petasma, fig. 118, *e*. Thelycum, fig. 118, *f*.

Length up to 40 mm. (Calman).

Locality.—Off Cape Peninsula, 1014 fathoms (Calman, also Burkenroad).

Distribution.—Bahamas, Bermuda, Gulf of Mexico.

Gennadas kempi Stebb.

Fig. 118, *a–d*.

1914 (June). Stebbing, *l. c.*, p. 283, pl. 27.

1914 (Dec.). *Id.*, Ann. S. Afr. Mus., xv, p. 12.

1925. Calman, *l. c.*, p. 4.

1927. Balss, *l. c.*, p. 260, figs. 14, 15.

1936. Burkenroad, *l. c.*, pp. 64 (in key), 68, 69, figs. 52, 54 (antennal scale, thelycum).

Antennal angle pointed, infra-antennal angle rounded, branchiostegal spine distinct. Apex of antennal scale symmetrically midway between inner and outer margins. 4th joint of 3rd leg longer than 5th joint. Petasma, fig. 118, *d*. Thelycum, fig. 118, *c*. No spine on sternite of 1st abdominal segment in either sex.

Length up to 31 mm. (Stebbing).

Localities.—Off Cape Point, 700–1000 fathoms (Stebbing); off

Cape Peninsula, 755–1014 fathoms (Calman); "Valdivia" St. 89, 31° 21′ S., 9° 46′ E. (Balss).

Distribution.—S. Atlantic.

Remarks.—There is no ♂ in the South African Museum, and as Stebbing's 1914 figure of the petasma is not very good, I have copied Balss' figure.

Gennadas elegans S. I. Smith.

Fig. 118, *m*, *n*.

1910. Kemp, Fish. Irel. Sci. Invest., 1908, p. 14, pl. 1, figs. 1–16 (*Amalopenaeus e.*).

1920. Sund, Rep. "Michael Sars" Exp., iii, pt. 2, p. 27.

1927. Balss, *l. c.*, p. 253, fig. 3.

1936. Burkenroad, *l. c.*, p. 71, fig. 55 (thelycum).

1938. Heldt, Ann. Inst. ocean. Paris, xviii, pp. 42, etc., figs. 71, etc. (reproduction, development).

[not *elegans* Stebbing 1917. =*gilchristi*.]

Antennal angle pointed, infra-antennal angle blunt, branchiostegal spine distinct. Apex of antennal scale symmetrical. 4th joint of 3rd leg slightly longer than 5th joint. Petasma, fig. 118, *m*. Thelycum, fig. 118, *n*.

Length up to 38 mm. (Kemp). Red, darker in front, paler on abdomen, eye-stalks with a jet-black spot, blue or purplish patches on mouth-parts and bases of legs, 1st antennae, and on sternites of abdominal segments 1–5 (Kemp).

Locality.—Balss quotes Stebbing's record, which, however, refers to *gilchristi*.

Distribution.—N. and S. Atlantic, Mediterranean.

Remarks.—The blue pigment is considered to be connected with some luminous function (Kemp, 1910, pp. 15, 16).

Gennadas valens (S. I. Smith)

Fig. 118, *k*, *l*.

1908. Bouvier, Res. Sci. Camp. Monaco, fasc. xxxiii, pp. 28 (in key), 44, pl. 1, fig. 3, pl. 9.

1914. Lenz and Strunck, D. Südpol Exp., xv, p. 311.

1936. Burkenroad, *l. c.*, p. 75, fig. 57 (thelycum).

Antennal and infra-antennal angles pointed, branchiostegal spine distinct; distance between cervical and post-cervical grooves about

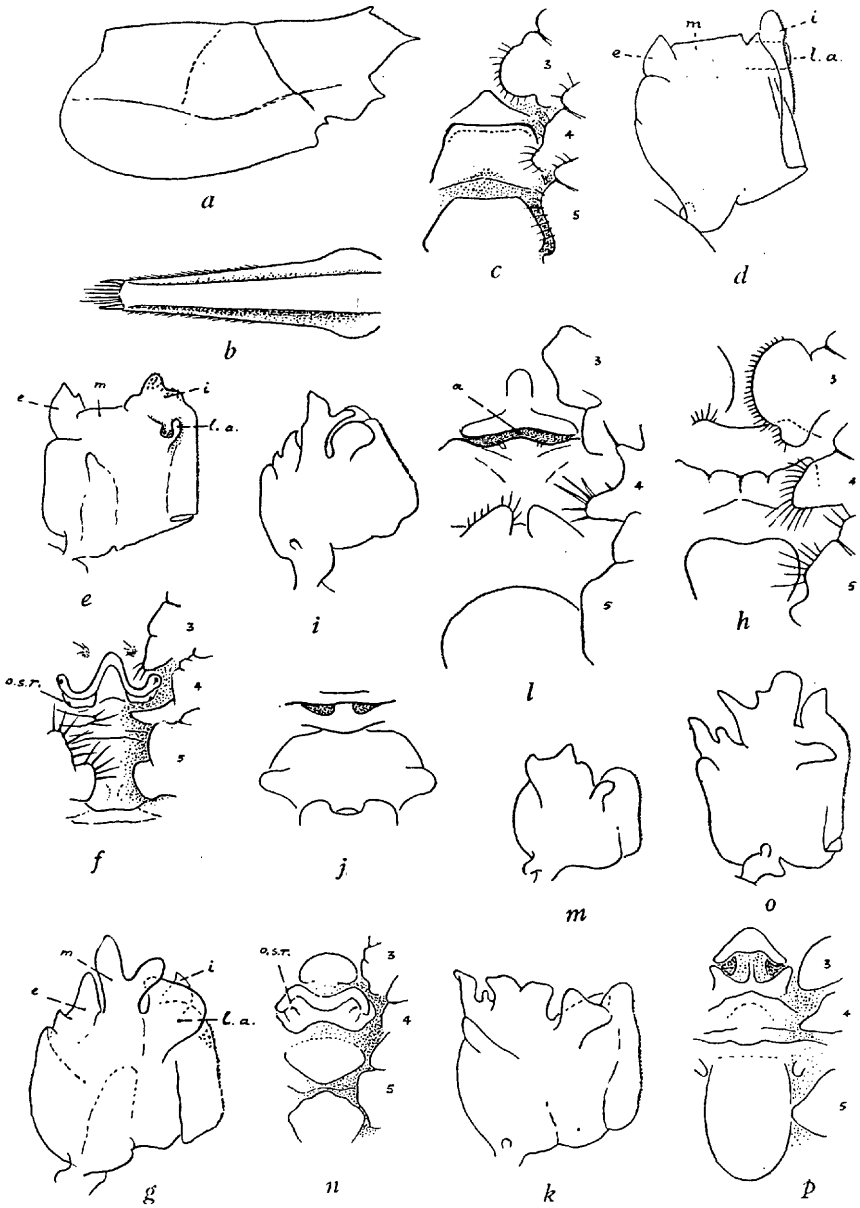

FIG. 118.—*Gennadas kempi* Stebb. *a*, carapace. *b*, telson. *c*, thelycum. *d*, petasma (after Balss).
Gennadas capensis Calman. *e*, petasma. *f*, thelycum.
Gennadas gilchristi Calman. *g*, petasma. *h*, thelycum (Stebbings' specimen: *elegans*, non Smith).
Gennadas talismani Bouv. *i*, petasma (after Bouvier and Lenz & Strunck). *j*, thelycum.
Gennadas valens (S. I. Smith). *k*, petasma. *l*, thelycum.
Gennadas elegans S. I. Smith. *m*, petasma (after Smith). *n*, thelycum.
Gennadas scutatus Bouv. *o*, petasma. *p*, thelycum, flap on 5th sternite pulled back to show 4th sternite.

(*e*, *g*, after Calman; *f*, *j*, *l*, *n*, *p*, after Burkenroad; *k*, *o*, after Bouvier.)
(*e*, *i*, *m*, external, internal, and median lobes; *l.a.*, accessory lobe; *o.s.r.*, orifice of seminal receptacle. *a*, atrium.)

$\frac{1}{4}$ distance of latter from hind margin of carapace. 4th joint of 3rd leg shorter than 5th joint. Petasma, fig. 118, *k*. Thelycum, fig. 118, *l*.

Length up to 45 mm. (Bouvier).

Locality.—35° 39′ S., 8° 16′ E. (Lenz and Strunck).

Distribution.—Atlantic.

Gennadas gilchristi Calman

Fig. 118, *g*, *h*.

1917. Stebbing, Ann. S. Afr. Mus., xvii, p. 31 (*Amalopenaeus elegans*, non S. I. Smith).

1925. Calman, *l. c.*, p. 6, pl. 1, figs. 3, 4 (antennal scale, petasma).

1927. Balss, *l. c.*, p. 261, figs. 16, 17.

1936. Burkenroad, *l. c.*, pp. 66 (in key), 76, 79, 80, fig. 58 (thelycum).

Antennal and infra-antennal angles acute, branchiostegal spine distinct. Distance between cervical and post-cervical grooves dorsally about $\frac{1}{4}$ distance of latter from hind margin of carapace. Apex of antennal scale symmetrical, hardly projecting beyond external spine. 4th joint of 3rd leg slightly shorter than 5th joint. Coxae of 3rd legs strongly expanded. Petasma, fig. 118, *g*. Thelycum, fig. 118, *h*.

Length up to 25 mm.

Localities.—Off Cape Point, 360 fathoms (Stebbing: *elegans*); off Cape Peninsula, 500–1014 fathoms (Calman).

Gennadas talismani Bouv.

Fig. 118, *i*, *j*.

1906. Bouvier, Bull. Mus. ocean. Monaco, no. 80, p. 10 (in key), fig. 15.

1908. *Id.*, *l. c.*, p. 28 (in key).

1914. Lenz and Strunck, *l. c.*, p. 311, pl. 18, figs. 1–14.

1936. Burkenroad, *l. c.*, pp. 66 (in key), 85, fig. 60 (thelycum).

Antennal and infra-antennal angles pointed, branchiostegal spine ?; distance between cervical and post-cervical grooves nearly $\frac{1}{2}$ distance of latter from hind margin of carapace. 4th joint of 3rd leg shorter than 5th joint. Petasma, fig. 118, *i*. Thelycum, fig. 118, *j*.

Locality.—35° 39′ S., 8° 16′ E. (Lenz and Strunck).

Distribution.—Atlantic.

Gennadas scutatus Bouv.

Fig. 118, *o*, *p*.

1908. Bouvier, *l. c.*, p. 42, pl. 8.

1925. Calman, *l. c.*, p. 4 (references, excl. Kemp, 1910, Rec. Ind. Mus., v, p. 178, subsp. *indicus*, =*propinquus* Rathbun).

1936. Burkenroad, *l. c.*, p. 83, fig. 59 (synonymy).

1938. *Id.*, *l. c.*, p. 59.

[not *scutatus indicus* Balss 1927.]

Antennal and infra-antennal angles acute, branchiostegal spine distinct. 4th joint of 3rd leg slightly shorter than 5th joint (Calman), longer than 5th joint (Bouvier). Petasma, fig. 118, *o*. Thelycum, fig. 118, *p*.

Length up to 23 mm.

Locality.—Off Cape Peninsula, 1014 fathoms (Calman).

Distribution.—N. and S. Atlantic, Indo-Pacific.

Gen. BENTHEOGENNEMA Burk.

1927. Balss, D. Tiefsee Exp., xxiii (*Gennadas*, non Bate, restr. Burk.).

1936. Burkenroad, Bull. Bingham Ocean. Coll., v, p. 56.

1940. *Id.*, Ann. Mag. Nat. Hist. (xi), vi, p. 37.

Differs from *Gennadas* in having podobranchs on mxp. 3 and 1st–3rd legs; and telson with more than one pair of lateral spinules (but no median apical point).

Bentheogennema intermedia (Bate)

Fig. 119, *a*, *b*.

1925. Calman, Fish. Mar. Biol. Surv., Rep. iv, Spec. Rep. 3, p. 7 (*Gennadas i.*).

1936. Burkenroad, *l. c.*, p. 56, fig. 50 (references).

Rostrum with or without dorsal tooth. Distance between cervical and post-cervical grooves dorsally $\frac{1}{3}$–$\frac{1}{2}$ distance of latter from hind margin of carapace. Infra-antennal angle rounded, branchiostegal spine present or absent. Telson with 4 pairs of lateral spines. Petasma, fig. 119, *b*. Thelycum, fig. 119, *a*.

Length up to 54 mm. (Calman).

Locality.—Off Cape Peninsula, 500–1014 fathoms (Calman).

Distribution.—Atlantic, and Hawaiian Is. ? East coast of Africa and Indian Ocean.

Gen. EUSICYONIA Stebb.

1914. Stebbing, Ann. S. Afr. Mus., xv, p. 25 (nom. nov. pro *Sicyonia* M. Edw. 1830, preocc.).

1934 (Dec.). Burkenroad, Bull. Amer. Mus. Nat. Hist., lxviii, pp. 116 *sqq.*

1934 (Sept.). *Id.*, Bull. Bingham Ocean. Coll., iv, pp. 70 *sqq.*

1938. *Id.*, Zoologica, xxiii, p. 80.

1939. *Id.*, Bull. Bingham. Ocean. Coll., vi, p. 57.

1943. Gurney, Proc. Zool. Soc. Lond., cxiii, B, p. 1 (larval stages) (*Sicyonia*).

Integument firm. Carapace rather deep; rostrum short, somewhat up-turned, dentate dorsally and with 1–2 teeth ventrally, continued backwards as a dentate post-rostral keel to hind margin of carapace. Hepatic spine present, sometimes also a spine on antennal angle. All abdominal segments dorsally keeled. Telson apically trifid, with 1–3 pairs of lateral mobile spinules (often minute). No scale on inner margin of basal joint of ant. 1; both flagella of ant. 1 short. Maxilla 2 with only 3 endites. Podobranch only on mxp. 2. Epipods on mxp. 1 and 2 and 1st–3rd legs. No exopods on legs. No gills on segment of 5th leg. Bunches of setae (so-called "cleansing organ") on inner apex of 5th joint and base of 6th joint of 1st leg in ♂ only. Pleopods (in adult) without endopods, except the modified 1st and 2nd appendages in ♂.

Remarks.—Burkenroad (1946, Ark. Zool., xxxvii, 2, A9, pp. 1–10) gives reasons for regarding *Sicyonia* as not being preoccupied, the Lepidopterous genus having been originally spelt, or intended to be spelt, *Sycionia*. However that may be, the similarity of the two names might become confusing, and I have retained Stebbing's name.

Key to species: see Addenda.

Eusicyonia longicauda (Rathbun)

Fig. 119, *c–f*.

1914. Stebbing, *l. c.*, p. 26, pl. 9 (Crust., pl. 73).

? *E. fallax* de Man 1907.

Integument finely pilose. Carapace with 2 post-rostral teeth behind level of hepatic spine, antennal angle unarmed; rostrum reaching to or

nearly to end of peduncle of ant. 1, with 3 dorsal teeth, apex bidentate, the actual apex projecting beyond the ventral tooth. Posterior angles of bifurcate dorsal keels on abdominal segments 1–5 quadrate, not produced into spines or sharp points, keel on segment 6 ending in a sharp point, no notch or emargination in keel on segment 2; 6th segment $1\frac{1}{2}$ times as long as 5th, its postero-inferior angle sharply

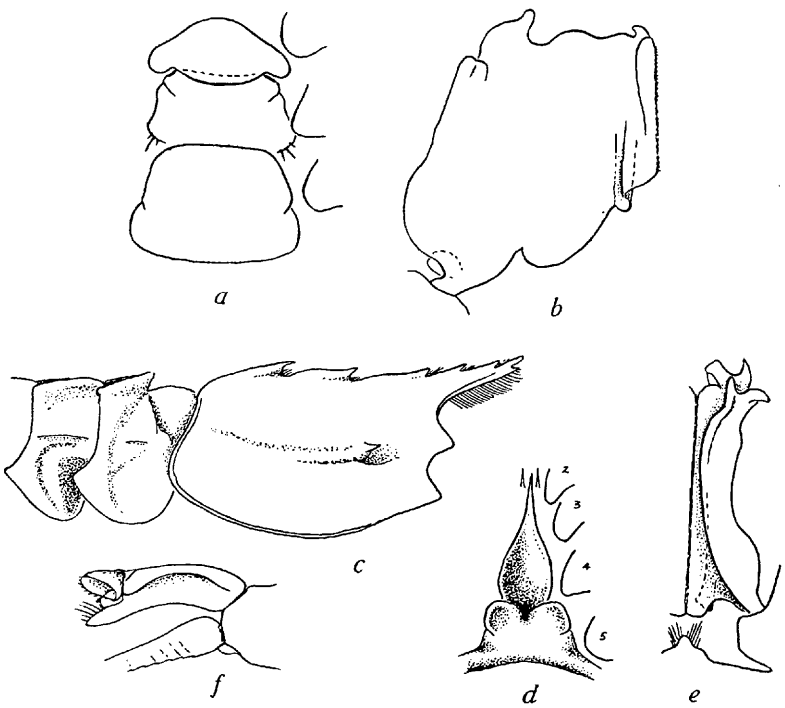

FIG. 119.—*Bentheogennema intermedia* (Bate). *a*, thelycum (after Burkenroad). *b*, posterior view of right half of petasma (after Kemp, 1909). *Eusicyonia longicauda* (Rathbun). *c*, carapace and first two abdominal segments. *d*, thelycum. *e*, posterior view of left half of petasma. *f*, pleopod 2 ♂.

pointed; ventral margins of segments rounded, without denticles; a faint horizontal lateral keel or ridge on segments 1–6 (usually only a definite keel on segments 1–3, and a low rounded ridge on segments 4–6), dorsal to which there are no vertical grooves except a faint one on segment 1, ventrally a shallow groove on each segment, a more or less triangular sunken area on segments 2–6 over which the pleurae of the preceding segments slide, becoming less conspicuous posteriorly. Telson a little longer than 6th segment, dorsally channelled between

dorso-lateral keels, on which there are 2–4 pairs of minute spinules (none on actual lateral margins). A spine on inner apex of 2nd and 3rd joints of 1st leg. Inner ramus of uropod slightly shorter than telson, outer ramus slightly shorter than inner. Petasma, outer margin evenly emarginate without deep notch, both posterior and anterior apical lobes bifurcate. Thelycum, fig. 119, *d*. Pleopod 2 ♂, appendix masculina rather stout, apically bifid, inner (median) lobe rather strongly chitinized, obliquely truncate, outer lobe thin and flexible. The antrorse sternal spine between bases of 4th legs present in both ♂ and ♀; sternite between 5th legs in ♂ simply concave; the pair of small spines between bases of 2nd legs (on either side of apex of the large antrorse spine) present in ♀ only.

Length ♀ up to 67 mm.

Localities.—Off East London, 310 fathoms (Stebbing); off Cape Morgan, 250–320 fathoms (S. Afr. Mus.).

Distribution.—Hawaiian Is. (*longicauda*). East Indies (*fallax*).

Remarks.—There are 8 specimens in the South African Museum (including 2 returned by Stebbing). The smallest is a ♂, 31 mm. in length, with fully-coupled petasma, not differing in shape from that of another ♂ of 46 mm.

Only female specimens of *longicauda* are known, and only one ♀ of the very closely allied *fallax* de Man 1907 (see Siboga Exp. monogr., xxxix*a*, p. 115, 1911, and pl. 9, fig. 38, 1913). As regards the relative lengths of the 5th and 6th abdominal segments, the present specimens are more like *fallax*. Until the ♂♂ of *longicauda* and *fallax* are discovered in their type localities, Stebbing's identification of the South African specimens may be allowed to stand.

Family SERGESTIDAE.

1905. Stebbing, Mar. Invest. S. Afr., iv, p. 80 (references).

1910. *Id.*, *l. c.*, p. 380.

1919. Hansen, Siboga Exp. monogr., xxxviii, pp. 1–65, pls. 1–5.

1922. *Id.*, Res. Sci. Camp. Monaco, fasc. lxiv, pp. 1–232, pls. 1–11 (key to genera) (incl. *Luciferinae*).

1924. Gurney, "Terra Nova" Exp., zool., viii, pp. 77 *sqq.* (larval stages).

Carapace moderately compressed, rostrum shorter than eye-stalks, small, sometimes rudimentary. Lower flagellum of ant. 1 ♂ modified as a prehensile organ. Flagellum of ant. 2 elongate, with a kink or bend, beyond (distal to) which the joints are setose. Mxp. 1 with

well-developed epipod and exopod. Mxp. 3 and all legs without epipods. Mxp. 2 and 3 and all legs without exopods. Gills reduced, no arthrobranchs. Petasma always symmetrical. No thelycum, but sternite between 3rd legs, sometimes also 4th legs, and the coxae of 3rd legs in ♀ modified. Pleopod 2 ♂ with unilamellate appendix masculina (Bate's pl. 69 is incorrect in showing two lobes).

Remarks.—Atlantic, Indo-Pacific, more numerous in tropical waters.

Key to South African genera: see Addenda.

Gen. Sergestes M. Edw.

1905. Stebbing, *l. c.*, p. 80 (references).
1919. Hansen, *l. c.*, pp. 2 *sqq.* (key to some of the species).
1922. *Id.*, *l. c.*, pp. 11 *sqq.* (key to N. Atlantic species).
1935. Gordon, J. Linn. Soc. Lond., xxxix, p. 308 (photophores).
1939. *Id.*, Ann. Mag. Nat. Hist. (xi), 4, p. 498.
1940. Burkenroad, Ann. Mag. Nat. Hist. (xi), 6, p. 38.

First 3 pairs of legs elongate, slender, with stiff outstanding bristles; 1st leg without proper chela; 3rd leg with very small chela (non-chelate in *pectinatus*); 4th–6th legs 6-jointed, the dactyls being absent, 5th much shorter than 4th, one or the other natatory. Mx. 1 with palp; mx. 2 with 2 lobes; mxp. 1 with segmented palp. Branchial lamellae as well as pleurobranchs; 2 pleurobranchs on 4th leg. Petasma with the processus ventralis not forked (fig. 120, *c, f, j*).

Remarks.—The carapace is thin, and the gills usually show through in the branchial region. The petasma is complicated, and forms the best specific character. As Hansen says, each part of it should be mentioned in the specific diagnosis; and a general view of the petasma *in situ* or without details is more misleading than useful.

Luminous organs have been found in several species, but their presence is not easy to determine unless fresh material is available.

Larval stages. The first stage is the *Protozoea*, followed by the *Zoea* (*Elaphocaris*), Schizopod (*Acanthosoma*), and *Mastigopus* stages. The *Mastigopus* stage is characterized by the temporary disappearance of the last two pairs of legs, which reappear in the adult.

Key to the South African Species (adapted from Hansen).

1. Mxp. 3 about the same length as 3rd leg. Middle part and processus uncifer of the petasma long (fig. 120, *c, f, i, l*). Outer ramus of uropod setose for less than half its length.

A. Supra-orbital and hepatic spines well developed (fig. 120, *a*). 3rd joint of peduncle of ant. 1 slender in both sexes. 5th leg with natatory setae on only one margin of the two distal joints . . . *arcticus.*

B. Supra-orbital spine absent (fig. 120, *e*, *h*, *k*). 3rd joint of peduncle of ant. 1 stout. Natatory setae on both margins of distal joints of 5th leg.

1. Denticle on antennal scale not projecting beyond apical margin. Two blunt lobes on 3rd coxa ♀ (fig. 120, *g*). Lobus armatus on petasma very long (fig. 120, *f*) . . . . *phorcus.*

2. Denticle on antennal scale projecting beyond apical margin.

a. No lobus inermis on petasma (fig. 120, *l*). No teeth or lobes on 3rd coxa ♀. No luminous organs . . . . *splendens.*

b. Lobus inermis present (fig. 120, *j*). Two sharp teeth on 3rd coxa ♀. Luminous organs present . . . . . *gloriosus.*

II. Mxp. 3 much longer and stouter than 3rd leg. Middle part of petasma short and broad, processus uncifer almost rudimentary (fig. 120, *o*, *p*). Outer ramus of uropod setose for at least half its length . . . . *armatus.*

Sergestes arcticus Kröyer

Fig. 120, *a–d*.

1910. Stebbing, *l. c.*, p. 381.

1922. Hansen, *l. c.*, p. 62, pl. 1, figs. 1, 2 (coloured), pl. 3, figs. 3–5, pl. 4, figs. 1, 2 (references).

1925. *Id.* in Calman, Fish. Mar. Biol. Surv. Rep., iv, Spec. Rep. 3, p. 23.

Rostrum short, horizontal, acute; supra-orbital and hepatic spines distinct. Eyes obconic, cornea wider than stalk, no protuberance on latter. Telson with one lateral denticle distally, and 3 on the sub-rounded apex. Petasma, fig. 120, *c*; ventral process long, distally with more or less reflexed and spiniform projections; lobus armatus long, curved; connecting lobe stout, triangular; terminal lobe with 2 apical "crochets"; no lobus inermis. Hind margin of 2nd sternite ♀ convex and bulbous; coxa of 3rd leg ♀ with 2 somewhat unciform teeth.

Length ♀ up to 65 mm. (Kemp), ♂ smaller. Transparent, stomach blackish, other internal organs reddish, red dots on abdominal segments.

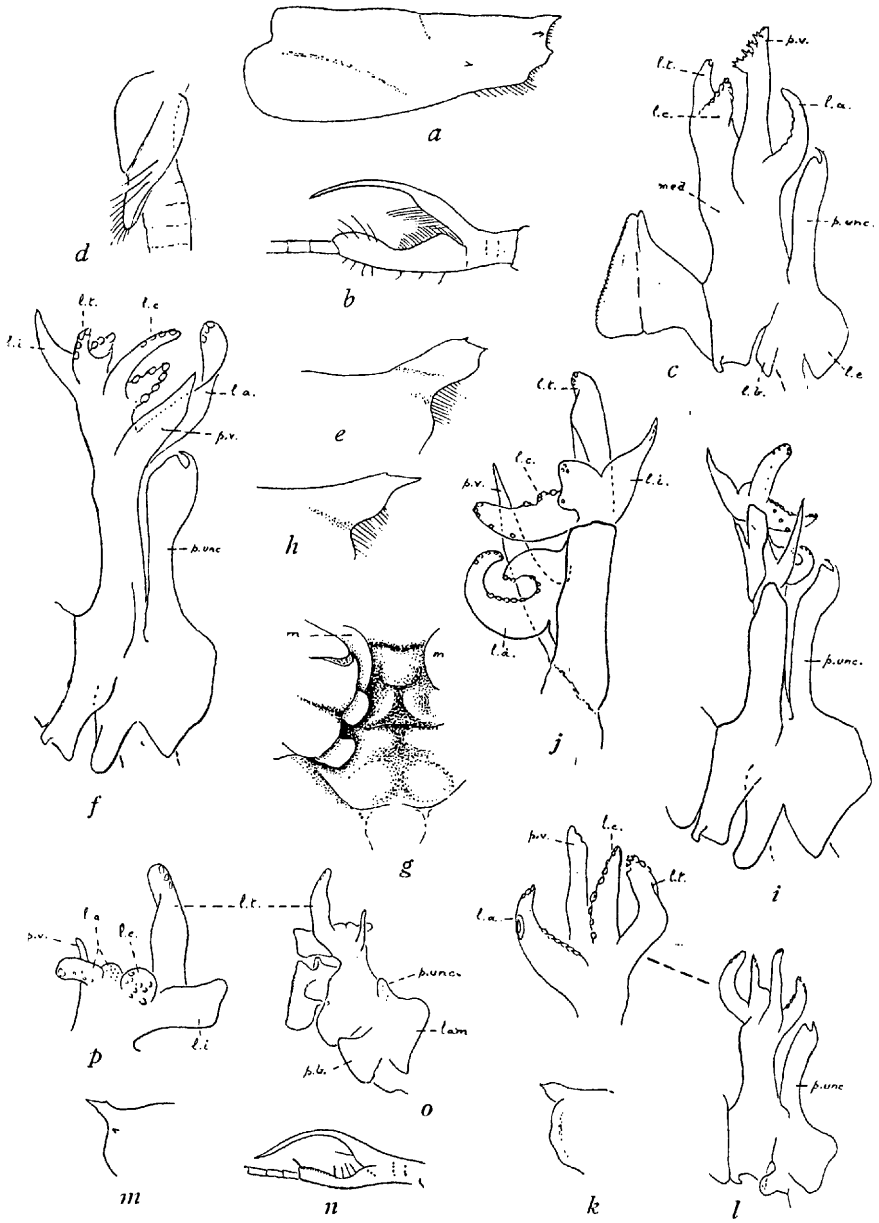

FIG. 120.—*Sergestes arcticus* Kröyer. *a*, carapace. *b*, lower flagellum of ant. 1 ♂. *c*, posterior view of left half of petasma. *d*, anterior view of left pleopod 2 ♂. *Sergestes phorcus* Faxon. *e*, rostrum. *f*, petasma. *g*, sternites of ♀ (*m* = membranous fold guarding genital openings). *Sergestes gloriosus* Stebb. *h*, rostrum. *i*, posterior view of left half of petasma. *j*, anterior view of apex further enlarged. *Sergestes splendens* Sund. *k*, rostrum. *l*, one-half of petasma, with apex further enlarged. *Sergestes armatus* Kröyer. *m*, rostrum. *n*, lower flagellum of ant. 1 ♂. *o*, one-half of petasma. *p*, apex further enlarged. (*k*–*p* after Hansen, 1922.)

(*lam.*, external lamina. *l.a.*, lobus armatus. *l.b.*, lobus basalis. *l.c.*, lobus connectens. *l.i.*, lobus inermis. *l.t.*, lobus terminalis. *med.*, middle part. *p.unc.*, processus uncifer. *p.v.*, processus ventralis.)

Localities.—Off Table Bay, 300 fathoms (Stebbing); N.W. of Table Bay, 500 and 900 fathoms (Hansen); off Cape Point, 310 fathoms (S. Afr. Mus.).

Distribution.—N. and S. Atlantic, Mediterranean, S. Australia.

Sergestes phorcus Faxon

Fig. 120, *e–g*.

1893. Faxon, Bull. Mus. Comp. Zool. Harv., xxiv, p. 217.

1895. *Id.*, Mem. Mus. Comp. Zool. Harv., xviii, p. 210, pl. 52 (*bisulcatus*, non Wood-Mason).

1905. Stebbing, *l. c.*, p. 87, pl. 24, fig. A (*bisulcatus*, non Wood-Mason).

1910. *Id.*, *l. c.*, p. 381 (*bisulcatus*, non Wood-Mason).

1919. Hansen, *l. c.*, p. 5.

1922. *Id.*, *l. c.*, pp. 92, 97 (references to *bisulcatus* Stebb. and *phorcus*).

? 1925. *Id.* in Calman, *l. c.*, p. 23 (*grandis*, non Sund).

Rostrum obliquely upstanding, oblong, apex acute, a small denticle on upper margin; supra-orbital spine absent, a small blunt knob in place of the hepatic spine. Eyes obconic, cornea wider than stalk, no protuberance on latter. Telson apically pointed, with 1–3 minute and inconspicuous pairs of lateral spinules distally. Petasma, fig. 120, *f*; ventral process lanceolate; lobus armatus very long, apex curving inwards, with 3–4 "crochets"; lobus connectens and terminalis both bifid, the anterior portion broader and more triangular in shape; lobus inermis projecting beyond lobus terminalis. Hind margin of 2nd sternite ♀ convex and bulbous, coxa of 3rd leg ♀ with 2 large blunt lobes. Lower flagellum of ant. 1 ♂ as in *arcticus* (*cf.* fig. 120, *b*).

Length ♀ up to 86 mm., ♂ 75 mm. Red (Stebbing).

Localities.—Off Cape Point, 250–300 fathoms (Stebbing); N.W. of Table Bay, 270–1500 fathoms (Hansen); off Natal coast, 820 fathoms (Hansen); off Cape Point and south of Agulhas Bank, 360–560 fathoms (S. Afr. Mus.).

Distribution.—Eastern Pacific.

Remarks.—In 1919 Hansen considered that Stebbing's specimen might well be *phorcus*, but in 1922 he decided that it was more likely to be the Atlantic species *grandis*, which Sund had shown to be different from *phorcus*. In 1925 Hansen records *grandis* but, like Stebbing, he had no male. Two males in the South African Museum from the

same haul as Stebbing's ♀ show that the Cape form is most closely allied to *phorcus*, if not identical with it. Hansen (1922, p. 97) has detailed the differences between *grandis* and *phorcus*, but without figuring the petasma of the latter for comparison. The most noteworthy feature of the petasma of *phorcus* seems to be the enormous lobus armatus.

Sergestes splendens Sund

Fig. 120, *k*, *l*.

1920. Sund, Rep. "Michael Sars" Exp., iii, pt. 2, p. 14, figs. 16–21.
1922. Hansen, *l. c.*, p. 98, pl. 5, fig. 4, *a–l* (*crassus* nom. nov.).
1925. *Id.* in Calman, *l. c.*, p. 23 (*crassus*).

Rostrum ovate, apex acute; supra-orbital spine absent, hepatic spine represented by a rounded knob. Eyes obconic, cornea wider than stalk, latter with a protuberance on inner surface near cornea. Telson apically acute, lateral spinules minute or absent. Petasma, fig. 120, *l*; lobus inermis absent. 3rd coxa ♀ without teeth or lobes. Lower flagellum of ant. 1 ♂ similar to that of *arcticus*.

Length ♀ up to 39 mm. (Sund), ♂ 37 mm. (Hansen).

Locality.—Off Table Bay, 900 and 1014 fathoms (Hansen).

Distribution.—N. Atlantic, and Monaco area (not the Mediterranean as a whole).

Remarks.—Hansen in 1919 merely gave the name "splendens" to a species collected by the "Talisman," without description as he himself stated in 1920. It is therefore a *nom. nud.* Sund's species *splendens* was published on 30th March 1920, whereas Hansen's full description of the "Talisman" *splendens* was later than 24th June 1920 (Bull. Mus. d'Hist. Nat., 1920, no. 6, contains papers presented at the meeting on that date; see no. 7, p. 597). Therefore Sund's *splendens* is a valid name, Hansen's *nom. nov. crassus* 1922 is not required, Hansen's *splendens* is *nom. preocc.*, and a new name was required for the "Talisman" species: *S. talismani* Brnrd. 1947 (Ann. Mag. Nat. Hist. (xi), 13, p. 384).

Sergestes gloriosus Stebb.

Fig. 120, *h–j*.

1905. Stebbing, *l. c.*, p. 84, pls. 22, 23.
1910. *Id.*, *l. c.*, p. 381.
1925. Hansen in Calman, *l. c.*, p. 24.

Rostrum lanceolate, apex acute, a small denticle on upper margin; supra-orbital spine absent, hepatic spine represented by a blunt knob. Eyes obconic, cornea wider than stalk, latter without protuberance. Telson apically acute. Petasma, fig. 120, *i*, *j*, apparently more strongly chitinized than in other species, distal portion of the middle part forming a rigid sheath along the bases of the processus ventralis and lobus armatus, its outer edges (on anterior and on posterior surface) projecting freely like a knife-edge; lobus armatus bilobed, the lobes curving towards one another; lobus inermis also bilobed, the inner (towards median line of animal) lobe lanceolate, the outer rounded-quadrangular, hidden in posterior view by the lobus terminalis. 3rd coxa of ♀ with 2 sharp curved teeth. Lower flagellum of ant. 1 ♂ as in *arcticus* (not well shown in Stebbing's figure).

Length up to 50 mm.

Localities.—Off Sandy Point (N. of Gt. Kei River), 800 (*sic*; log-book says 500?) fathoms (Stebbing); off Durban, 260 fathoms (Hansen); off Gt. Kei River, Bashee River, and East London, 250–300 fathoms (S. Afr. Mus.).

Remarks.—The luminous organs are not very easy to detect in long-preserved and faded specimens. According to Stebbing and Hansen there are 7–8 on inner surface of carapace at the upper border of the branchial cavity, 18 near lower border of carapace; others on the last 3 thoracic and first 5 abdominal sternites, peduncle of antenna 1 and antennal scale, mouth-appendages and legs, peduncles of pleopods, 6th abdominal segment, uropods, and one on underside of eye-stalk.

The numbers of luminous organs along lower margin of carapace and on antennal scale are greater than in any other species (*challengeri* Hansen 1903, *fulgens* Hansen 1919, "splendens" Hansen 1920 *).

Sergestes armatus Kröyer

Fig. 120, *m–p*.

1922. Hansen, *l. c.*, p. 174, pl. 10, fig. 6, *a–k*.

1925. *Id.* in Calman, *l. c.*, p. 26.

Rostrum apically acute, with denticle on upper margin; supra-orbital and hepatic spines small. Eyes slightly obconic, cornea wider than stalk, latter with protuberance on inner margin. Telson apically rounded, with a pair of minute apical spinules. Petasma, fig. 120, *o*, *p*, middle part short and broad, processus uncifer very

* See remarks under *splendens* Sund.

small, lobus connectens subglobular. 3rd coxa ♀ with a well-developed process.

Length ♀ up to 47 mm., ♂ 35 mm.

Locality.—N.W. of Table Bay, 755 fathoms (Hansen).

Distribution.—N. and S. Atlantic.

Remarks.—The long and robust 3rd maxilliped distinguishes this species at a glance from the other South African species.

Family LEUCIFERIDAE.*

1914. Stebbing, Ann. S. Afr. Mus., xv, p. 27 (*Leuciferidae*).

1919. Hansen, Siboga Exp. monogr., xxxviii, p. 48 (*Luciferinae*).

1922. *Id.*, Res. Sci. Camp. Monaco, fasc. lxiv, pp. 10, 198 (*Luciferinae*).

Carapace strongly compressed, anteriorly elongated so that the mandibles are widely separated from the antennae and eyes; rostrum short, acute. Antenna 1 without lower flagellum in both sexes. Mxp. 1 without epipod and exopod; mxp. 2 without epipod. Only the 1st–3rd pairs of legs present, and only the 3rd pair chelate (imperfectly). Sixth abdominal segment with 2 ventral processes in ♂. Telson in ♂ with strong ventral protuberance. Genital openings in both sexes single (unpaired). Petasma sessile, symmetrical. Appendix masculina on pleopod 2 ♂ unilamellate.

Remarks.—Only one genus. Pelagic. The only Decapod Crustacean without gills.

Gen. Leucifer M. Edw.*

1882. Brooks, Philos. Trans. Roy. Soc., clxxiii, p. 57 (*Lucifer*).

1909. Calman in Lankester's Treatise Zool., vii, pp. 295–297, figs. 172–174, and p. 311 (*Leucifer*).

1914. Stebbing, *l. c.*, p. 27 (*Leucifer*).

1915. Borradaile, Ann. Mag. Nat. Hist. (8), xvi, p. 226 (*Lucifer*).

1915. Kemp, Mem. Ind. Mus., v, p. 322 (*Lucifer*).

1919. Hansen, *l. c.*, p. 48 (key to species) (*Lucifer*).

* Stebbing (1893, Hist. Crust., p. 221, and *l. c.*, *supra*, p. 27) claims that *Lucifer* V–T. is preoccupied by Linné 1760. But Sherborne says *Lucifer* Linn. "non gen. sed triv. est." The Prussian Academy Nomenclator gives "*Lucifer* Linn. 1763. non bin." Neave's Nomenclator does not mention *Lucifer* Linn.

Stebbing gives date of Vaughan-Thompson's name as 1829, Sherborne as January 1830, Neave also as 1830.

1922. Hansen, *l. c.*, p. 198 (*Lucifer*).

1927. Gurney, Trans. Zool. Soc. Lond., p. 246 (development).

Remarks.—Hansen (1919) admits only 6 species, divided into two groups according as the eyes are long (about as long as the "neck" of the carapace) or short (about half the length of the "neck").

The first larval stage is the *Metanauplius*, which is followed by the *Protozoea*, *Zoea*, Schizopod, and *Mastigopus* stages (Calman, *l. c.*, figs. 172–174). As regards the absence of the 4th and 5th legs, *Leucifer* represents a permanent *Mastigopus*-form (Calman).

Leucifer penicillifer Hansen

Fig. 121.

1914. Stebbing, *l. c.*, p. 28 (*typus*, non M. Edw., Hansen).

1919. Hansen, *l. c.*, p. 59, pl. 5, fig. 2, *a–k*.

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 384.

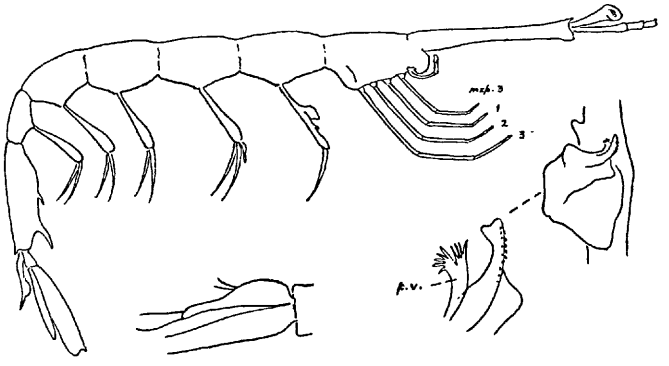

FIG. 121.—*Leucifer penicillifer* Hansen. Outline of ♂; petasma, with chitinized portion and processus ventralis further enlarged; appendix masculina on pleopod 2 ♂.

Length of "neck" twice or slightly more than twice length of eyes (stalk plus cornea). 1st peduncular joint of ant. 1 extending to or very slightly beyond end of cornea. On 6th abdominal segment ♂ the 2nd process is longer than the 1st, tapering to a narrow subacute apex. Outer ramus of uropod with marginal tooth not or scarcely reaching apex. Petasma: chitinized portion curved, apically expanded, inner margin scabrous; processus ventralis widening distally, with a bipartite apical brush of spiniform projections; protuberance on peduncle (distal to petasma) bluntly digitiform.

Length ♂ up to 9·5–10 mm., ♀ 10·8 mm.

Locality.—Mossel Bay, surface (Stebbing, and S. Afr. Mus.).

Distribution.—East Indies, Bay of Bengal, Philippine Is., China Sea, Gulf of Yeddo (Hansen).

Remarks.—Stebbing's record was published before Hansen had shown that the species could be easily distinguished by the petasma. In this species the apically spinose processus ventralis is distinctive.

It seems curious that specimens of this Crustacean were captured on only one occasion by the s.s. *Pieter Faure* (9th February 1904).

CARIDEA.

1907. Borradaile, Ann. Mag. Nat. Hist. (7), xix, p. 470 (*Carides*).

1909. Calman, Lankester's Treat. Zool., vii, p. 311.

1910. Stebbing, *l. c.*, p. 381.

1924. Gurney, "Terra Nova" Exp. Rep., zool., viii, pp. 103 *sqq.* (larval stages).

1939. Burkenroad, Ann. Mag. Nat. Hist. (xi), 3, p. 310 (superfamilies).

Abdomen generally with a sharp bend at the 3rd segment (figs. 128, 131, 147). Pleurae of 2nd segment overlapping those of 1st segment (figs. 128, 131, 147, 150). Ant. 1 usually with stylocerite. Mandibular palp, if present, straight. Mxp. 1 with lobe at base of exopod, endopod short; mxp. 2 usually with last joint attached like a strip to the margin of penultimate joint, but see key and fig. 122, *a–c*; mxp. 3 with 4–6 joints. Third pair of legs never chelate. First pair of pleopods ♂ without petasma. Gills phyllobranchiate. Eggs carried by ♀ attached to the pleopods.

Remarks.—Borradaile grouped the families into seven superfamilies, but Kemp (1910, Fish. Irel. Sci. Invest. [1908], i, p. 36) considered this premature until the families themselves were more satisfactorily defined. These superfamilies (tribes) were accepted by Balss (1926–7, Kükenthal and Krumbach, Handb. Zool., iii, p. 1000). Burkenroad has suggested a re-grouping of the superfamilies. Kemp (*l. c.*, pp. 35, 36) gave a key to 10 N. Atlantic families. The South African fauna includes representatives of 14 out of the 16 families recognized by Borradaile (excl. *Autonomaeidae*) and Calman.

The family *Campylonotidae* (Sollaud 1913) has been included in the Oplophoroid series. *Campylonotus capensis* Bate 1888, off Marion Is. and Pernambuco, can scarcely be reckoned in the South African fauna in spite of its specific name.

Key to the South African Families
(adapted from Borradaile and Kemp).

I. Mxp. 2 with 7th joint attached terminally to 6th, exopod rudimentary or absent (fig. 122, *a*). First 2 pairs of legs longer and stouter than the others; exopods on all legs, but no epipods. Rostrum small or absent . . *Pasiphaëidae.*

II. Mxp. 2 with 2 terminal joints attached side by side to the penultimate joint (fig. 122, *b*). Exopods absent from all legs, but epipods present on 1st–4th legs. Chelae of first 2 legs with very short palm and long fingers and thumbs. Rostrum elongate . . . . . *Stylodactylidae.*

III. Mxp. 2 with short 7th joint attached (usually) more or less laterally to 6th joint (fig. 122, *c*).

A. First 2 pairs of legs substantially similar, chelate, wrist unsegmented.

1. Finger and thumb of chelae spoon-like, ending in tufts of bristles (fig. 123, *b, c, h, q*). Mandible without palp. Exopods absent from some or all of the legs. Freshwater . . *Atyidae.*

2. Chelae not as in 1. Mandible with palp. Exopods on at least 4 legs. Marine.

a. Last 3 legs not abnormally long. Exopods on legs 1–5. Exopod of mxp. 1 without flagellum. Mandible imperfectly cleft (fig. 124) . . . . . *Oplophoridae.*

b. Last 3 legs abnormally long. Exopods on legs 1–4. Exopod of mxp. 1 with flagellum. Mandible deeply cleft (fig. 125, *i*) * . . . . . *Nematocarcinidae.*

B. First 2 pairs of legs more or less dissimilar. Mandible deeply cleft, or simple (figs. 125, *i* and 147, *c* resp.). Exopod on 1st leg only, or entirely absent.

1. Wrist of 2nd leg divided into 2 or more jointlets (figs. 135, *d*, 136, *i*, 141, *d*).

a. Eyes not covered by front margin of carapace.

i. 1st legs both simple or both chelate. Rostrum large, spinose or dentate.

α. 1st and 2nd legs slender, 1st simple or minutely chelate; 2nd chelae small. Mandible with distinct molar and incisor processes, and palp. Mostly deep water . *Pandalidae.*

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* Both Borradaile (1907) and Balss (1925, D. Tiefsee Exp., xx, and 1926–7, *l. c.*) place the *Nematocarcinidae* in the HOPLOPHOROIDA, with mandible indistinctly cleft!

β. 1st and 2nd legs not very slender, 1st with moderate-sized chelae. Mandible with or without incisor process, with or without palp. Mostly shallow water . *Hippolytidae.*

ii. 1st legs one simple, the other chelate. 2nd legs one much longer than the other. Rostrum short, unarmed . . . . . *Processidae.*

iii. 1st legs both subchelate. Rostrum long. Telson spiniform. Integument hard and sculptured *Glyphocrangonidae.*

b. Eyes covered by projecting frontal margin (figs. 136–144), except *Ogyrides* (fig. 135). 1st legs usually robust, chelate . *Alpheidae.*

2. Wrist of 2nd leg simple, unsegmented (fig. 146, *d*).

a. Rostrum movable (fig. 145). Epipods on legs . . . . . *Rhynchocinetidae.*

b. Rostrum immovable. No epipods on legs.

i. Mxp. 3 expanded, operculiform (figs. 146, 147) . . . . . *Gnathophyllidae.*

ii. Mxp. 3 normal.

a. 1st legs with small chelae, 2nd with larger and more robust chelae. Some species fluviatile . . . . . *Palaemonidae.*

β. 1st legs subchelate, 2nd very thin, often reduced, minutely chelate, or simple *Crangonidae.*

Family PASIPHAËIDAE.

1901. Alcock, Cat. Ind. Deep-sea Crust., p. 57.

1914. Stebbing, Trans. Roy. Soc. Edin., 50, p. 293 (references and key to genera).

1920. de Man, Siboga Exp. monogr., xxxix *a*, 3, pp. 1 *sqq.* (list of species).

1924. Gurney, "Terra Nova" Exp., zool., viii, p. 111 (larval stage).

1940. Chace, Zoologica, xxv, p. 121.

Rostrum short, sometimes represented by a spine arising behind the frontal margin. Mandibular palp present or absent; molar process absent. Mxp. 2 with 7th joint attached terminally to 6th (fig. 122, *a*), exopod rudimentary or absent. First 2 pairs of legs longer and much

stouter than the others, chelae elongate, with slender fingers and thumbs, wrist short, unsegmented. Exopods on all legs, often very long; present (often very small) on mxp. 3; often forming the chief part of mxp. 1. Eggs often large, and development abbreviated.

Key to the South African Genera.

1. Mandible with slender 2-jointed palp. Telson apically truncate . . . . . *Parapasiphaë.*
2. Mandible without palp. Telson apically notched . . *Phye.*

Gen. PARAPASIPHAË S. I. Smith

1901. Alcock, *l. c.*, pp. 58, 64.
1914. Stebbing, Ann. S. Afr. Mus., xv, p. 32.
1940. Chace, *l. c.*, p. 126.

Rostrum normal but short; a post-orbital and post-antennal spine may be present. Mandible with slender 2-jointed palp. 4th leg shortest, 5th shorter than 3rd. Gills 11 plus 3 epipods (on mxp. 1–3). Telson apically narrow, truncate.

Parapasiphaë sulcatifrons S. I. Smith

Fig. 122, *d*.

1910. Kemp, Fish. Irel. Sci. Invest. [1908], p. 47, pl. 5, figs. 1–21.
1914. Stebbing, Ann. S. Afr. Mus., xv, p. 33.
1923. Stephensen, Dan. Oceanogr. Exp., II, D. 3, p. 40.
1925. Balss, D. Tiefsee Exp., xx, p. 236, text-fig. 10, and pl. 20.
1940. Chace, Zoologica, xxv, p. 126, fig. 6.
1941. Hale, B.A.N.Z. Antarct. Res. Exp., B, iv, pt. 9, p. 264.

Rostrum not extending beyond eyes. Carapace carinate, strongly arched anteriorly, the anterior third sulcate to tip of rostrum; no post-orbital or (conspicuous) post-antennal spines; a lateral interrupted carina, bending downwards in front. Abdominal segments dorsally rounded, except 4th which is slightly carinate and ends in a short point. Telson dorsally sulcate, the narrow apex rounded-truncate, with 8 spines, the outermost pair the longest. Cornea of eye not wider than stalk.

Length up to 83 mm. Bright scarlet, with darker red pigment specks (Kemp).

Locality.—Off Cape Point, 660 fathoms (Stebbing).

Distribution.—N. Atlantic as far south as 32° N. lat., also 5° S., 10° E. (Balss). Balss also records a young specimen from the Indian

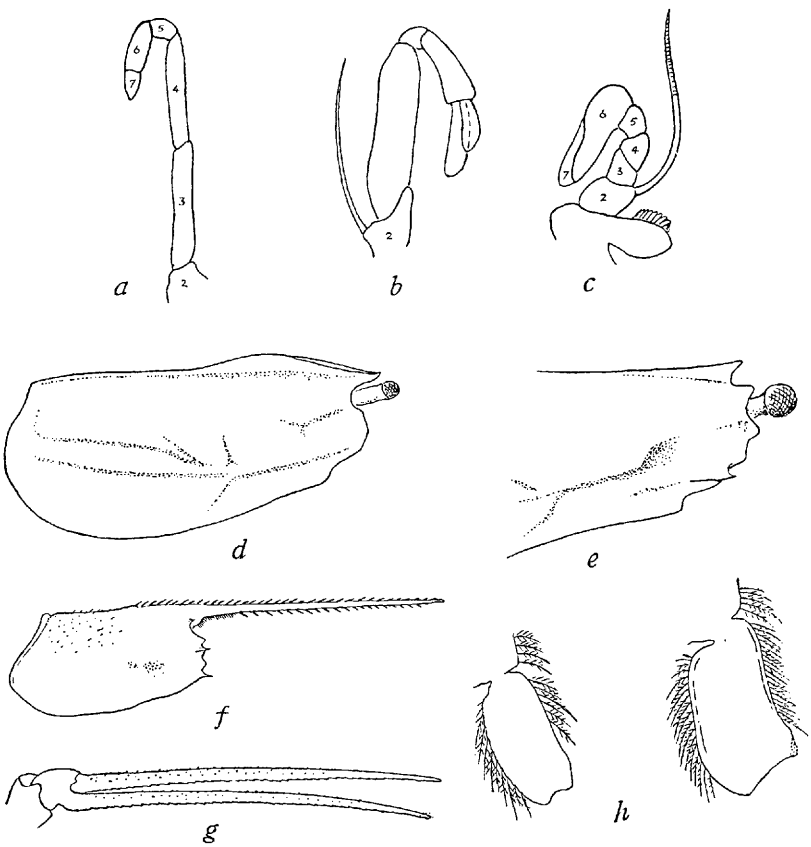

FIG. 122.—Diagrammatic figures (setae omitted) of maxilliped 2 of: *a*, *Pasiphaë*. *b*, *Stylodactylus*. *c*, *Pandalus*.
Parapasiphaë sulcatifrons S. I. Smith. *d*, carapace, showing sulcate carina.
Phye pacificus (Rathbun). *e*, carapace.
Stylodactylus bimaxillaris Bate. *f*, carapace. *g*, chela of 1st leg, plumose setae on lower margins omitted. *h*, endopod of pleopod 1 ♂ of specimens 35 mm. (left) and 58 mm. (right) in length.

Ocean, 10° S., 97° E. Hale records a specimen from 45° 53′ S., 84° 33′ E.

Remarks.—Forty specimens were caught and 20 preserved by the s.s. *Pieter Faure*, but only the one specimen, later sent to Stebbing, came to the South African Museum.

Gen. PHYE Wood-Mason

1901. Alcock, *l. c.*, p. 61 (as subgen. of *Pasiphaë*).

1914. Stebbing, Trans. Roy. Soc. Edin., 50, p. 294.

1920. de Man, *l. c.*, p. 5 (=*Pasiphaea*).

Rostrum a post-frontal crest or spine; a post-antennal (branchiostegal) but no post-orbital spine. Mandible without palp. Gills 8 plus a rudimentary epipod on mxp. 3. Telson apically notched. 4th leg shorter than 3rd and 5th, which are subequal, or 3rd the longer.

Phye pacificus (Rathbun)

Fig. 122, *e*.

1914. Stebbing, Ann. S. Afr. Mus., xv, p. 33.

1921. Schmitt, Univ. Calif. Publ. Zool., xxiii, p. 29, fig. 14 (*Pasiphaea p.*).

Post-frontal spine not extending as far forward as front, continued backwards as a carina nearly to end of carapace; a conspicuous post-antennal spine; a blunt lateral ridge. Abdominal segments 2–6 dorsally carinate, but without projecting points; 6th segment with a curved lateral ridge. Telson with numerous spines in the deep apical notch. Cornea of eye wider than stalk.

Length up to 103 mm. Deep red (s.s. *Pieter Faure* log-book).

Locality.—Off Durban, 440 fathoms (Stebbing).

Distribution.—Alaska to Gulf of California.

Remarks.—Seven specimens were caught and preserved, but only one was in the *Pieter Faure* collection when handed over to the South African Museum.

FAMILY STYLODACTYLIDAE.

1914. Stebbing, Ann. S. Afr. Mus., xv, p. 49.

1925. Kemp, Rec. Ind. Mus., xxvii, p. 256.

Rostrum elongate, serrate dorsally and (usually) also ventrally. Mandible with 2-jointed palp, molar and incisor processes not clearly separated. Mxp. 2 with two terminal joints attached side by side to apex of penultimate joint (fig. 122, *b*). Exopods absent from all legs, but epipods present on 1st–4th legs. Legs moderately long, subequal, slender; wrist of first 2 pairs unsegmented, chelae elongate, fingers and thumbs slender, contiguous, palm very short. Telson acute.

Remarks.—A single genus. For comments on the interpretation of the joints of mxp. 2 see Stebbing. Bate's figure of the telson is deceptive.

Gen. Stylodactylus M. Edw.

1914. Stebbing, *l. c.*, p. 50.
1920. de Man, Siboga Exp. monogr., xxxix *a*, 3, p. 31 (list of species).
1925. Kemp, *l. c.*, p. 256 (key to species).

Stylodactylus bimaxillaris Bate.

Fig. 122, *f–h*.

1888. Bate, Rep. H.M.S. *Challenger*, xxiv, p. 855, pl. 138, fig. 3.
1914. Stebbing, *l. c.*, p. 51, pl. 12 (Crust., pl. 76) (*serratus*, non M. Edw.).
1925. Kemp, *l. c.*, pp. 257 (in key), 258.
1925. Calman, Fish. Mar. Biol. Surv., Rep. iv, Spec. Rep. 3, p. 16.
1939. *Id.*, John Murray Exp., vi, p. 188.

Rostrum longer than rest of carapace, 37–40 spines on dorsal margin, 19–23 (in one case 25) on ventral margin. Carapace not carinate, sparsely setose posteriorly, hind margin costate; small post-orbital, post-antennular and post-antennal (branchiostegal) spines; cervical groove obsolete. Antennal scale nearly as long as carapace (excl. rostrum), its outer margin entire (except for the apical spine). Abdominal segments dorsally rounded, segment 3 longer than the others, distincly humped and produced over base of 4th; inferior margins entire, postero-inferior angle of segments 4–6 with a small sharp point. Telson with 5 pairs of dorsal spines in front of the apical spines.

Length ♂ up to 58 mm., ♀ 77 mm.; smallest ovig. ♀ in S. Afr. Mus. 48 mm. Whitish, with orange-coloured eggs (s.s. *Pieter Faure* log-book).

Localities.—Off East London, 300 fathoms (Stebbing, and S. Afr. Mus.); off Cape Morgan (S. Afr. Mus.); off Cape Peninsula, 755 fathoms (Calman) and 190 fathoms (S. Afr. Mus.).

Distribution.—Admiralty Is. and Japan.

Remarks.—Although the s.s. *Pieter Faure* log-book records that many were caught at one station off the Cape Peninsula and 12 preserved, only 2 of these are now available; from the other localities, however, there are 11 ovig. ♀♀ (April), 1 juv. ♀, and 1 juv. ♂.

Family ATYIDAE.

1910. Stebbing, *l. c.*, p. 393.

1912. Kemp, Rec. Ind. Mus., vii, pp. 113 *sqq.* (deals chiefly with *Xiphocaridina*).

1924. Gautier, Bull. Soc. Hist. Nat. Afr. Nord., xv, pp. 337 *sqq.*, pls. (development, *Atyaëphyra*).

* 1925. Bouvier, Atyides. Encycl. Entomol., iv, pp. 1–370, 716 text-figs.

1926. J. Roux, Rec. Austral. Mus., xv, p. 237 (Australian forms).

1927. Gurney, Trans. Zool. Soc. Lond., p. 252 (development, *Caridina*).

1928. Calman, Proc. Zool. Soc. Lond., p. 737 (Tanganyika forms).

1929. J. Roux, Faune Col. Franç., iii, p. 293.

1931. *Id.*, Rev. Suisse Zool., xxxviii, pp. 34, 63 (Indian forms).

1938. Kubo, J. Imp. Fish. Inst. Tokyo, xxxiii, p. 67 (Japanese forms).

Rostrum well developed. Last 2 peduncular joints of ant. 1 at least as long as broad. Mandible without palp, molar and incisor processes not separated by a cleft. Exopod of mxp. 1 produced inwards at apex, epipod reduced. Mxp. 2 with 7th joint larger than, and attached laterally to, 6th joint (except in *Xiphocaris*). 1st and 2nd legs subequal, chelate, wrist unsegmented, finger and thumb with apical brush of setae (except in *Xiphocaris*). Abdominal hump well marked, or obsolete. Telson truncate, without apical median point. Exopods on all legs, or absent from some, or all. Epipods at most on 1st–4th legs, sometimes only on 1st leg. Arthrobranchs on 1st leg, but absent from the others (except in *Xiphocaris*). Gills 12 (*Xiphocaris*), or 9, or fewer.

Remarks.—All the members of this family inhabit fresh water, and are found all over the world except in the polar regions, but chiefly in the tropical and subtropical zones.

Development in many cases abbreviated.

Only one genus in South Africa.

Key to the African Series and Genera.

Chelae with brushes of setae. Gills at most 9 (typical Atyids).

I. Supra-orbital spines present. Exopods at least on 1st and 2nd legs. *Paratya* series, represented in Africa by one genus (*Dugastella*) in Morocco.

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* 1925 on title-page. Publisher's advertisement facing title-page (inside cover) gives 1924.

II. No supra-orbital spines. No exopods on legs.
A. No arthrobranchs on legs. Gills 8, 5, or 4. *Caridella* series, represented by 5 genera in the Great Lakes and Upper Nile.
B. One arthrobranch on 1st leg. Gills 9 (in African genera). *Caridina* series.
1. Chelae not cleft to base (fig. 123, *b*, *c*, *h*).
a. Wrist of 2nd leg not excavate, of 1st leg usually excavate but not always (fig. 123, *b*, *c*) . . . . . *Caridina*.
b. Wrist of both 1st and 2nd legs excavate . . . [*Ortmannia*, Mauritius, West Africa, etc.].
2. Chelae cleft to base (fig. 123, *q*) . . . . [*Atya*, Mauritius, etc., West Africa, and extra African].

Gen. CARIDINA M. Edw.

1898. Hilgendorf, Deutsch Ostafr., iv, Decap. Crust., p. 34.
1908. de Man, Rec. Ind. Mus., ii, pp. 255 *sqq*.
1910. Stebbing, *l. c.*, p. 393.
1925. Bouvier, *l. c.*, p. 124.
1925. de Man, Ann. Mus. Congo, ser. 3, sect. 3, fasc. 1. [Not seen by me.]
1930. Gordon, Proc. Zool. Soc. Lond., p. 33.
1933. Id., J. Linn. Soc. Lond., xxxviii, p. 351 (East African Lakes).
1938. Kubo, J. Imp. Fish. Inst. Tokyo, xxxiii, p. 82.

Rostrum smooth or serrate. No supra-orbital spines; antennal spine present, near to or fused with the infra-orbital angle. Wrist of 1st leg usually, of 2nd leg never, excavate; fingers and thumbs of both pairs terminated by a single stylet or unguis, and brushes of setae which are shorter than the fingers. No exopods on legs. Arthrobranch on 1st leg. Epipods on some or all of 1st–4th legs. Gills 9.

Remarks.—Variation and plasticity are so great that it is very difficult to define any species with exactitude. Bouvier's keys to the *varieties* of a species often employ the same characters as are used in the key to the "*species*" (*cf.* A and A′, pp. 145, 146, with C and C′, pp. 136, 137. Also the eggs of *nilotica* var. *paucipara*, p. 145, are approximately of the same dimensions as those of *africana*, p. 137). The present taxonomy, in fact, seems to suffer from almost too much "finesse." As Dr. Gordon said (*l. c.*, 1930, p. 33): "Previous workers have generally found that each new collection differed somewhat from

most or all previously described forms, and in many cases definite subspecific or varietal names have been given." Dr. Gordon therefore very rightly endeavoured to show the *extent of variation* of certain structures (rostrum, etc.) in collections from different parts of Africa. The detailed examination of a large amount of material from very many localities in one region, *e.g.* Natal–Zululand, if carried out *taking no account of so-called varieties*, should lead to useful and important results.*

Moreover, collecting should be done not merely intensively, but with a set purpose; casual collecting of a few specimens here and there is not very helpful.

The growth-changes in a colony at any one locality in South Africa have not yet been studied (*cf.* Gurney, 1927).

With the material at hand I have not undertaken any detailed examination, merely separating the three well-marked forms: *typus*, *nilotica* var. with large eggs, and a longirostrate form from the Zambesi River.

Key to the South African Species and Varieties.

1. Wrist of 1st leg deeply excavate (fig. 123, *b*); whole upper margin of rostrum smooth . . . . . *typus.*
2. Wrist of 1st leg not deeply excavate (fig. 123, *h*).
   - *a*. Apical portion of rostrum dorsally smooth; rostrum as long as or a little longer than carapace.
     - i. Eggs medium sized: ·7–·86 mm. major axis . *nilotica.*
     - ii. Eggs small: ·42–·46 mm. major axis . . . var. *natalensis.*
     - iii. Eggs large: ·9–1·3 mm. major axis . . . var. *paucipara.*
   - *b*. Dorsal margin of rostrum dentate almost to apex.
     - i. Rostrum much longer (1½ times) than carapace, with *ca.* 40 dorsal teeth . . . . ? *indistincta.*
     - ii. Rostrum shorter than carapace, with not more than 26 dorsal teeth. Telsonic spines, fig. 123, *n* . . . . . *africana.*

For Mauritian species and varieties see Bouvier, *l. c.*, 1925.

Caridina typus M. Edw.

Fig. 123, *a–d.*

1837. Milne Edwards, Hist. Nat. Crust., ii, p. 363, pl. 25 *bis*, figs. 4, 5.

1897. Weber and de Meijere, Zool. Jahrb., x, p. 167.

* See also Woltereck, "Untersuchungen an Atyiden von Belgisch Kongo," Rev. Zool. Bot. Afric., xxxvi, 1942, pp. 229 *sqq.*

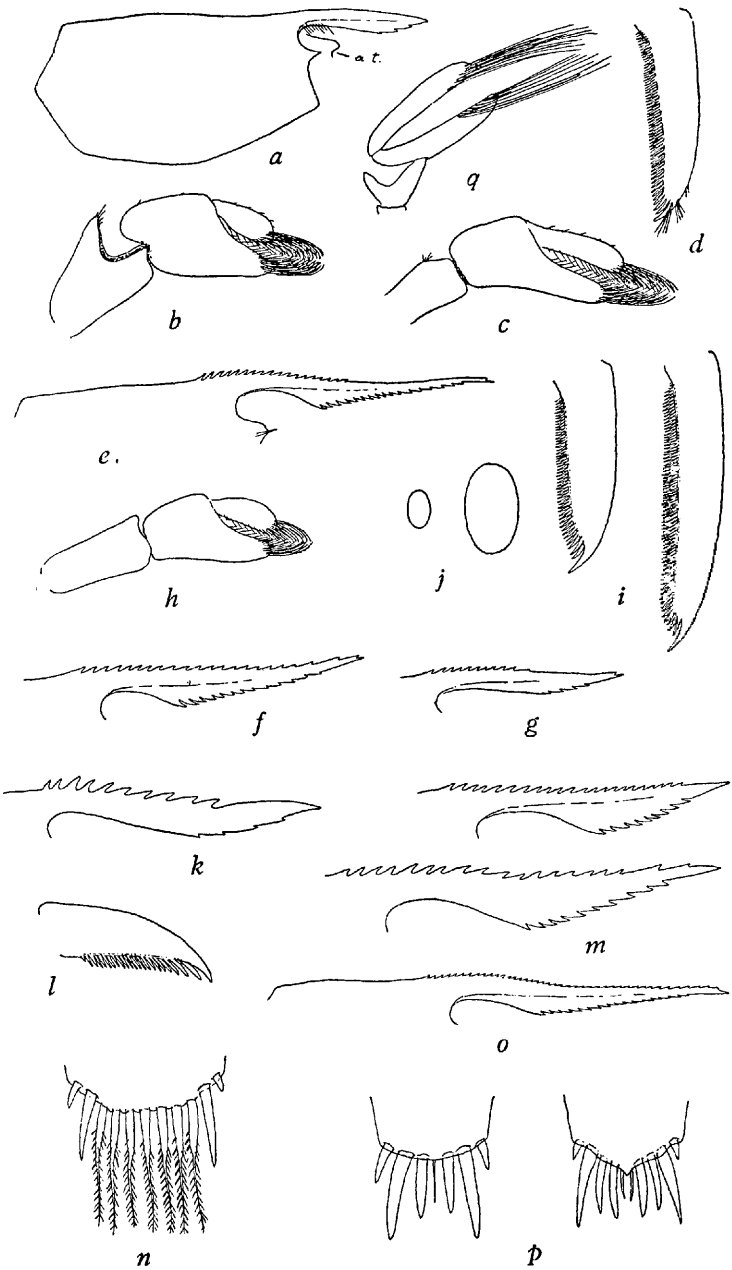


FIG. 123.—*Caridina typus* M. Edw. *a*, carapace (*a.t.*, antennular tubercle). *b*, wrist and chela of 1st leg (♀). *c*, the same, 2nd leg (♀). *d*, dactyl of 5th leg. *Caridina nilotica* (P. Roux). *e*, rostrum of specimen from Uvongo River. *f*, rostrum of abnormal specimen from Vaal River at Warrenton. *g*, rostrum of juv. 8 mm. long from Zoutpansberg. *h*, wrist and chela, 1st leg. *i*, dactyls of 5th leg of var. *natalensis* (left) and var. *paucipara* (right) (after de Man). *j*, eggs of var. *natalensis* (left) and var. *paucipara* (right) (after de Man). *Caridina* "*africana*" de Man 1897 (? non Kingsley). *k*, *l*, rostrum and dactyl of 5th leg (after de Man). *Caridina africana* Kingsley. *m*, rostra (above, after Bouvier; below, after Gordon). *n*, apex of telson (after Bouvier and Gordon). *Caridina* ? *indistincta* Calman. Zambesi River. *o*, rostrum. *p*, apex of telson, left 1 specimen, right 2 specimens. *Atya serrata* Bate. *q*, wrist and chela, 1st leg.

1898. Hilgendorf, *l. c.*, p. 34.

1910. Stebbing, *l. c.*, p. 394 (in note on *nilotica*).

1925. Bouvier, *l. c.*, p. 249, figs. 271–297 (on pp. 126, 127).

1926. J. Roux, Rec. Austral. Mus., xv, p. 246.

1938. Kubo, *l. c.*, p. 83, figs. 13, 14.

Rostrum shorter than carapace, reaching to middle or end, or slightly beyond end, of 2nd peduncular joint of ant. 1, narrow lanceolate, smooth dorsally, ventrally with 1–3 (4) denticles. Infra-orbital angle not developed apart from the antennal spine. Antennular keel or tubercle (between bases of eye-stalks) prominent. Basal process of ant. 1 not reaching end of 1st peduncular joint. 1st legs shorter than mxp. 3, 5th joint (wrist) deeply excavate distally, finger not quite as long as palm. 2nd legs reaching at least as far as mxp. 3, 5th joint longer than chela, finger longer than palm. Dactyl of 5th leg nearly $\frac{1}{3}$ length of 6th joint, with 60–70 spines along margin. Lateral spines on apex of telson usually shorter than the median ones. Epipods on mxp. 3 and 1st–4th legs. Eggs small and numerous, about ·5 mm. major axis.

Length ♀ up to 41 mm.

Localities.—Natal: Umhloti, Umgeni, Illovo and Umbilo Rivers (Weber); Winkel Spruit and Uvongo River (S. Afr. Mus.).

Distribution (incl. varieties).—Mauritius, Réunion, Rodriguez, Madagascar, Zanzibar, Seychelles, East Indies, Bonin Is., New Caledonia, Queensland.

Remarks.—Ovigerous ♀♀ have been taken in March.

Caridina nilotica (P. Roux)

Fig. 123, *e–j*.

1833. P. Roux, Ann. Sci. Nat., xxviii, p. 73, pl. 7 (*Pelias n.*).

? 1878. Hilgendorf, MB. Ak. Wiss. Berlin, p. 828.

1897. Weber and de Meijere, Zool. Jahrb., x, p. 168 (*wyckii*, non Hickson, and var. *paucipara* nov.).

? 1897. de Man in Weber, *ibid.*, p. 170, pl. 15, fig. 2, *a–f* (*africana*, ? non Kingsley).

1908. de Man, *l. c.*, pp. 255, 262, 263, pl. 20, figs. 3, 4 (vars. *natalensis* nov. and *paucipara* Weber and de Meijere).

1910. Stebbing, *l. c.*, p. 394.

1912. Lenz, Ark. Zool., vii, no. 29, p. 5 (vars. *natalensis* and *paucipara*).

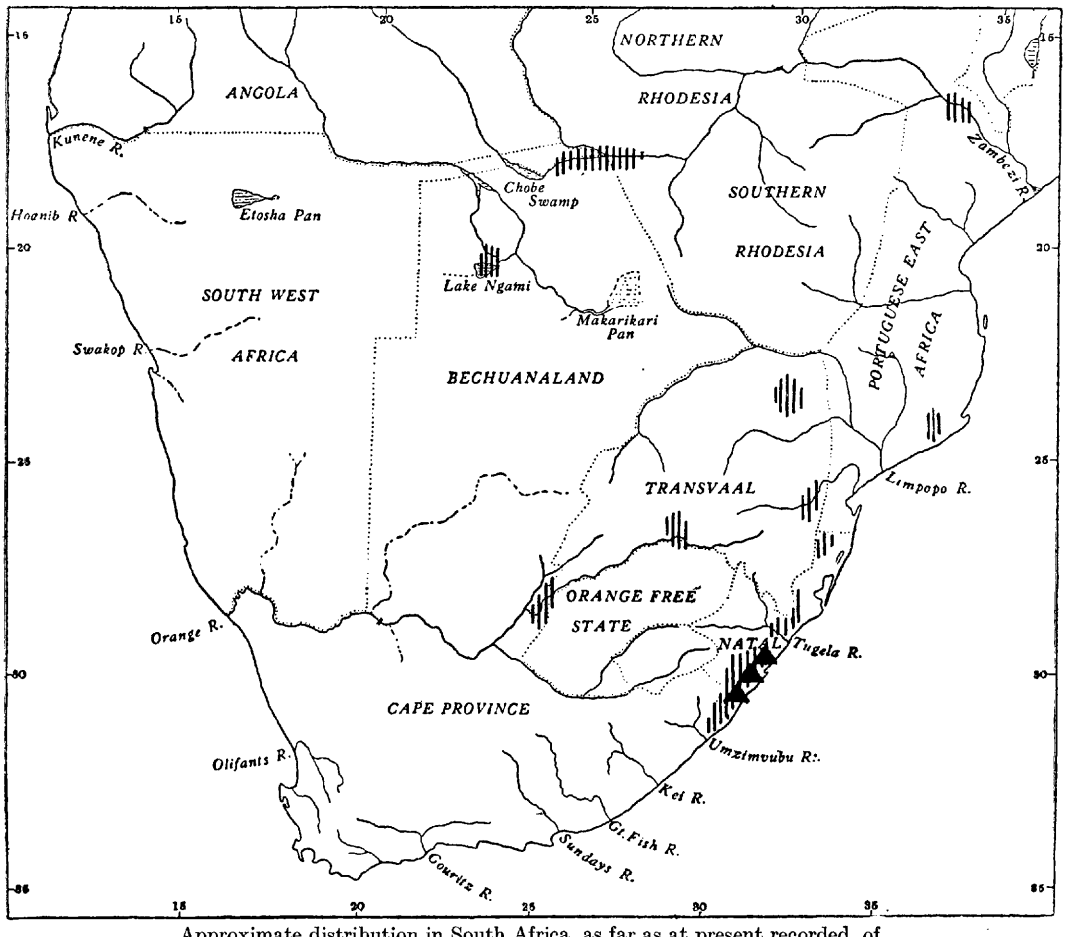
1914. Stebbing, Ann. S. Afr. Mus., xv, p. 48.

1925. Bouvier, *l. c.*, p. 143, figs. 309–331 (*not* fig. 308, =*africana*).

? 1925. *Id.*, *ibid.*, p. 214 (*africana* var. *natalensis*).

1926. J. Roux, *l. c.*, p. 246 (Australian vars.).

1927. Gurney, *l. c.*, p. 252, figs. 60–62 (larval stages).



Approximate distribution in South Africa, as far as at present recorded, of *Caridina nilotica, africana,* and varieties: |||||. *Caridina typus*: ▲.

1930. Gordon, *l. c.*, p. 33, figs. 1–5, 7–13, *b*, *c* (discussion of variable characters).

1933. *Id.*, *l. c.*, p. 351, figs. 1–3.

1933. J. Roux, Senckenbergiana, xv, p. 338.

1935. Barnard, Ann. Transv. Mus., xvi, p. 486.

1942. Woltereck, Rev. Zool. Bot. Afr., xxxvi, p. 279, figs. 12, 13 (rostra).

Rostrum as long as or a little longer than carapace, reaching at least to end of peduncle of ant. 1 and antennal scale, or beyond; ensiform, with 16–21 dorsal teeth proximally, the distal portion for a varying distance non-dentate, or with 1–2 teeth, or occasionally completely dentate, apex usually bifid, ventrally with 12–26 teeth; juveniles with fewer dorsal and ventral teeth. Infra-orbital angle well developed, curved inwards above antennal spine. No antennular tubercle. Basal process of antenna 1 not reaching apex of 1st peduncular joint. 1st leg shorter than mxp. 3, 5th joint about twice as long as wide, not excavate distally, finger subequal to palm. 2nd leg reaching at least as far as mxp. 3, 5th joint longer than chela, finger longer than palm. Dactyl of 5th leg about $\frac{1}{4}$ length of 6th joint, with 40–70 spines along margin. Telson usually with apical median point, but sometimes rounded-truncate, 3–4 spines on either side (not counting the small lateral one), the outermost one longer than the median ones. Epipods on mxp. 3 and 1st–4th legs. Eggs small, ·42–·46 mm. (var. *natalensis*), medium, ·66–·86 mm. (forma *typica*), or large, ·9–1·3 mm. (var. *paucipara*).

Length ♀ up to 30 mm., usually 25–26 mm. Semi-transparent with faint pinkish or orange-brown speckling, eyes black.

Localities.—Pondoland: Msiwanga and Xura Rivers, near Lusikisiki, and Port St. Johns (S. Afr. Mus.).

Natal: Illovo, Umgeni, Umbilo, Umhloti and Umhlasine Rivers (Weber); Amanzimtoti (Lenz); Umgeni and Greytown (Gordon); Illovo, Uvongo (south of Port Shepstone), Umbilo, Umlaas, Impolweni (S. Afr. Mus.).

Zululand (Lenz); Eshowe, Empangeni, Umhlatuzi, Pongola River (S. Afr. Mus.).

Limpopo system and Eastern Transvaal: Sabie River, and Gt. Letaba River (J. Roux); Zoutpansberg and Louis Trichardt (S. Afr. Mus.).

Lake Ngami (Gordon); Chobe River (Zambesi) (Barnard).

Orange River system: Vaal River, Kimberley (Bouvier); Vaal River, Parys (Stebbing, and S. Afr. Mus.); Vaal River at Warrenton, Mooi River at Potchefstroom, and Orange River above Aughrabies Falls (S. Afr. Mus.).

Portuguese East Africa: Guengue, below Tete, Zambesi River (Bouvier); Masiene, between Chai Chai and Inhambane (S. Afr. Mus.).

Distribution.—Throughout East Africa to Egypt; Mauritius; Madagascar; India, China, East Indies, Queensland.

Remarks.—I have not considered it worth while to detail separately the localities of the vars. *natalensis* and *paucipara* recorded from South Africa, for the reason that both varieties have been recorded from some of the localities. Moreover, all the ovigerous specimens in the South African Museum have large ova as in *paucipara*, but combined with a short dactyl on 5th leg as in *natalensis* (see de Man, 1908). As more and more material from numerous localities is examined, the value of these varietal names seems to diminish.

Ovigerous ♀♀ (S. Afr. Mus. coll.) were taken in July, September, December, and January (Natal localities), and October (Warrenton).

Together with 80 specimens from Warrenton (Vaal River) with normal rostra, there are 3 in which the rostrum is dentate to the apex, and 2 intermediates, *i.e.* with one or two spaced teeth on the part which is normally smooth. The fully dentate specimens are very like *africana* but lack the peculiar telsonic spines said to be characteristic of this latter species. Among 38 specimens from Parys there are 2 intermediates.

In two of the large East African Lakes Gordon (*l. c.*, 1930) has shown the presence of a *lacustrine* form differing from the ordinary *fluviatile* form by having a more slender rostrum.

In Zululand these shrimps were killed in the rivers as a result of the D.D.T. spraying operations against tsetse-fly.

Caridina ? *indistincta* Calman

Fig. 123, *o*, *p*.

1926. Calman, Ann. Mag. Nat. Hist., ser. 9, vol. xvii, p. 244, fig. 3 (rostrum).

1942. Woltereck, *l. c.*, p. 290, fig. 14 (rostra).

Rostrum about 1½ times as long as carapace, extending well beyond antennal scale, armed throughout its dorsal margin with about 38–42 teeth, of which 4 are post-orbital, ventrally with 16–22 adpressed teeth. No antennular tubercle. Finger longer than palm in both 1st and 2nd legs. Dactyl of 5th leg about 3¼ times as long as wide, with 36 spines along margin. Telson in 2 of the specimens with median triangular point, flanked by 3 pairs of spines between the large lateral ones, the innermost pair slender and shortest; in the 3rd specimen apically rounded-truncate, with a median seta flanked by only 1 pair of spines between the large lateral pair.

Length 22 m.

Locality.—Victoria Falls, Zambesi River (S. Afr. Mus., ex coll. Dr. Arnold, Rhodesian Mus.).

Remarks.—As regards the rostrum the nearest form appears to be *nilotica* var. *stylirostris* Bouvier (*l. c.*, fig. 309) from Madagascar. But far more material is required. Two specimens with complete rostra have the telson as in the right-hand figure; a third with incomplete rostrum has the telson as in the left-hand figure.

C. indistincta was described from Queensland. Woltereck has referred specimens from Luapula River, Lubumbashi River, and Lake Moeru in the Belgian Congo to this species.

Caridina africana Kingsley

Fig. 123, *m*, *n*.

1882. Kingsley, Bull. Essex Inst., xiv, p. 127, pl. 1, fig. 3.

1910. Stebbing, *l. c.*, p. 394 (in note on *nilotica*).

1912. Lenz, Ark. Zool., vii, no. 29, p. 5.

1925. Bouvier, *l. c.*, p. 212, figs. 308 (telson, as *nilotica*), 470–477.

1930. Gordon, *l. c.*, pp. 36, 38, 39, 43, 46, 49, figs. 6 (telson), 13, *a* (rostrum).

1933. *Id.*, *l. c.*, p. 357, fig. 4 (pleopod 1 ♂).

? 1942. Woltereck, *l. c.*, p. 293, figs. 15–18 (rostra) (*togoensis*).

[? Not *africana* de Man 1897, nor *africana* var. *natalensis* Bouv. 1925. =*nilotica*.]

Rostrum shorter than carapace (Gordon, 1930, p. 49), extending to end of antennal scale, armed along nearly whole dorsal margin with 13–26 teeth, of which 3–4 are post orbital, ventrally with 4–5 or 8–10 teeth. Infra-orbital angle developed as an incurved lobe. No antennular tubercle. Dactyl of 5th leg longer and more slender than in *nilotica* (Gordon, *l. c.*). Telson with rounded-truncate apex, with several plumose spine-setae between the outermost large pair of spines, usually consisting of a short spiniform basal part and a terminal slender plumose part.

Localities.—Zululand (Kingsley); Amanzimtoti, Natal (Lenz).

Remarks.—de Man's single (♂) specimen (Umhloti River) was 25 mm. long, rostral formula $\frac{1}{4}^{0}$, the upper apical margin being smooth (as in *nilotica*). The dactyl of 5th leg is very short (contrast Gordon's statement), about 3 times as long as broad, with 21 spines (fig. 123, *k*, *l*).

This form was given the varietal name *natalensis* by Bouvier. I am inclined to think that it is really only an aberration of *nilotica*.

Woltereck has assigned specimens with rostra very similar to Bouvier's and Gordon's figures, from Lakes Moeru and Bangweulu and other localities in the Belgian Congo, to *togoensis* Hilg. No mention is made of *africana*.

Family OPLOPHORIDAE.

1905. Stebbing, Mar. Invest. S. Afr., iv, p. 104 (*Miersiidae*).

1910. *Id.*, *l. c.*, p. 394 (*Oplophoridae*).*

1920. de Man, Siboga Exp. monogr., xxxix*a*, 3, pp. 41 *sqq.* (list of species).

1924. Gurney, "Terra Nova" Exp., zool., viii, p. 106 (larval stages).

1925. Balss, D. Tiefsee Exp., xx, p. 239 (key to genera).

1936. Chace, J. Wash. Ac. Sci., xxvi, p. 24.

1940. *Id.*, Zoologica, xxv, p. 132.

Rostrum usually long. Mandible with 3-jointed palp, molar and incisor process indistinctly separated. Mxp. 2 with terminal joint attached laterally to penultimate. Exopod of mxp. 1 without flagellum. Exopods and epipods on all legs. Last 3 pairs of legs not abnormally long. Chelae of first 2 legs small. Telson acute.

Remarks.—Pelagic forms, sometimes with reduced eyes, or with luminous organs.

Oplophorus grimaldii Coutière is recorded (Lenz and Strunck, 1914) from 30° 21′ S., 14° W.

The preparation of the report on the "Discovery" material of this family has been interrupted by the lamented death of Dr. S. Kemp.

Key to the South African Genera (adapted from Chace).

A. Exopod of at least mxp. 3 and 1st leg foliaceous and rigid. Outer margin of antennal scale spinose. 2nd–4th or 3rd–5th abdominal segments with long medio-dorsal teeth. Telson apically acute. Eyes large, pigmented. Eggs large . . . . . [*Oplophorus*].

B. None of the exopods foliaceous or rigid.

1. 6th abdominal segment not dorsally carinate. Eggs large.

* Etymology demands the aspirate, but the International nomenclatorial rules call for the exact original spelling, viz. *Oplophorus* as written by Milne Edwards. Agassiz in 1846 emended the name to *Hoplophorus*, which, however, is preoccupied by Lund, 1838.

a. Eyes very large, well pigmented. Anterior margin of 1st abdominal segment with distinct lobe or tooth overlapping carapace (fig. 124, *a*). Telson apically acute . . . . . *Systellaspis.*

b. Eyes very small, feebly pigmented. 1st abdominal segment not lobate (fig. 124, *b*). Telson apically truncate . . . . . *Hymenodora.*

2. At least the last 4 abdominal segments carinate. Eggs small.

a. Usually no lateral keel on carapace. Incisor process of mandible toothed along whole cutting-edge (fig. 124, *c*) . . . . *Acanthephyra.*

b. At least one lateral keel on carapace. Anterior half of cutting-edge of mandible smooth (minutely denticulate) (fig. 124, *i*) . . *Notostomus.*

Gen. SYSTELLASPIS Bate

1888. Bate, Rep. H.M.S. *Challenger*, xxiv, p. 757.
1905. Coutière, Bull. Mus. ocean. Monaco, No. 48, p. 5.
1925. Balss, *l. c.*, p. 241.
1940. Chace, *l. c.*, p. 179.
1941. Gurney, J. Linn. Soc. Lond., xli, p. 103.

Carapace without horizontal keel or oblique hepatic keel. Sixth abdominal segment not dorsally carinate. Telson apically acute. Exopods of mxp. 3 and legs not foliaceous or rigid. Eyes well pigmented, usually large. Outer margin of antennal scale not spinose. Whole of cutting-edge of mandible toothed. Eggs large. Luminous organs in some species.

Systellaspis debilis (M. Edw.)

Fig. 124, *a*.

1910. Kemp, Fish. Irel. Sci. Invest. [1908], i, p. 59, pl. 6, figs. 1–15.
1925. Calman, Fish. Mar. Biol. Surv., Rep. iv, Spec. Rep. 3, p. 13 (*Acanthephyra d.*).
1925. Balss, *l. c.*, p. 242.
1939. Calman, John Murray Exp., vi, p. 189.
1940. Chace, *l. c.*, p. 181, figs. 51–53.

Rostrum slender, longer than carapace, 3–5 teeth on its basal crest (2–3 behind orbit), followed by 9–12 teeth dorsally, 8–11 ventral teeth. Branchiostegal spine sharp but not supported by a definite keel. Abdominal segment 3 and hinder part of 4 dorsally carinate, 3rd segment ending in a sharp spine, 4th and 5th in small points; lateral

margins of 4th and 5th denticulate; a notch in hind margin of 5th pleuron; 6th segment twice as long as 5th in young, less in adults. Telson with 3–5 pairs of dorsal spinules, apically with 5 pairs of

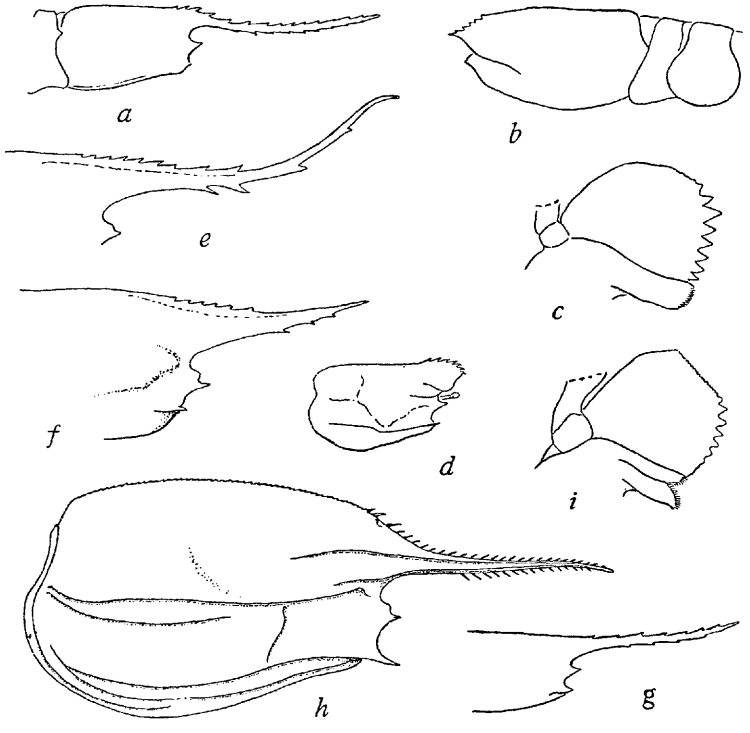


FIG. 124.—*Systellaspis debilis* (M. Edw.). *a*, carapace and 1st abdominal segment (after Chace).
Hymenodora glacialis (Buchholz). *b*, carapace and 1st and 2nd abdominal segments (after Kemp, 1910).
Acanthephyra. *c*, mandible (palp not completely drawn).
Acanthephyra stylorostratis (Bate). *d*, carapace (after Chace).
Acanthephyra eximia S. I. Smith. *e*, *f*, rostrum of typical form and of var. *brachytelsonis* (after Balss).
Acanthephyra quadrispinosa Kemp. *g*, rostrum.
Notostomus auriculatus Kemp. *h*, carapace. *i*, mandible (palp not completely drawn).

spines, the 1st pair much stouter than the others. Photophores present on carapace, abdomen, eye-stalk, and bases of appendages: 12 (6 pairs in young)–147 (paired and unpaired) in adult (Kemp, 1910, pp. 61, 64; Chace, 1940, pp. 182, 204).

Length up to 78 mm. Bright scarlet, eyes dark brown, photophores deep blue.

Localities.—Off Cape Point, 500–1500 fathoms (Calman); Natal coast, 760 fathoms (Calman); 33° 23′ S., 16° 19′ E., and 37° 31′ S., 17° 1′ E. (Balss).

Distribution.—N. and W. Atlantic, Indo-Pacific.

Gen. Hymenodora Sars

1877. Sars, Arch. Math. Naturv., ii, p. 340.*

1888. Bate, Rep. H.M.S. *Challenger*, xxiv, p. 838.

1910. Kemp, Fish. Irel. Sci. Invest. [1908], i, pp. 56 (in key), 72.

1925. Balss, *l. c.*, p. 270.

1941. Gurney, *l. c.*, p. 103 (reference to eggs and development).

Integument thin, membranous. Rostrum short, dorsally serrate. Abdominal segments not dorsally carinate. Telson apically truncate. Endopod of mxp. 1 composed of only 2 joints. The 2 inner distal lobes of mx. 2 broad and not projecting beyond the basal lobe. Exopod without flagellum. Whole cutting-edge of mandible toothed. Eyes small, feebly pigmented. Eggs large.

Hymenodora glacialis (Buchholz)

Fig. 124, *b*.

1885. Sars, Norw. N. Atl. Exp., Crust., i, p. 37, pl. 4.

1925. Calman, Fish. Mar. Biol. Surv., Rep. iv, Spec. Rep. 3, p. 15.

1925. Balss, *l. c.*, p. 270.

1935. Stephensen, Medd. Grönl., lxxx, Godthab. Exp. Crust. Dec., p. 68, figs. 26–30 (larval stages).

1941. Hale, B.A.N.Z. Antarct. Res. Exp., B, iv, pt. 9, p. 265.

Carapace scarcely compressed, carinate anteriorly and produced in a short pointed rostrum, bearing 4–6 small serrations, and extending as far forward as the small, feebly pigmented eyes. Telson dorsally sulcate, with a few pairs of spinules, narrowing distally, apex with 4–7 spines, the outermost much the longest.

Length up to 83 mm. Vivid blood-red, eyes opaque white (Sars).

Locality.—Off Cape Point, 1014 and 1500 fathoms (Calman).

Distribution.—N. Atlantic, N. and E. Pacific, as far as Panama and Ecuador.

* *Teste*, Pruss. Akad. Nomencl. Anim. and Neave's Nomencl. Zool. Bate and Balss quote "vii, p. 345."

Gen. ACANTHEPHYRA M. Edw.

1905. Stebbing, Mar. Invest. S. Afr., iv, p. 106.

1910. *Id.*, *l. c.*, p. 394.

1920. de Man, *l. c.*, pp. 43, 53.

1923. Stephensen, Dan. Oceanogr. Exp., no. 7, p. 43.

1925. Balss, *l. c.*, p. 250 (key to species).

1939. Kemp, Ann. Mag. Nat. Hist. (xi), 4, p. 568 (revision of *purpurea* group).

1940. Chace, Zoologica, xxv, p. 133 (key to Bermuda species).

1941. Lebour, J. Linn. Soc. Lond., xli, p. 90 (larval stages).

Carapace without oblique hepatic and straight lateral keels. Rostrum variable in shape. Abdomen with at least the last 4 segments dorsally keeled, posterior teeth sometimes absent. Telson apically truncate. Exopods of mxp. 3 and legs not foliaceous or rigid. Eyes variable, but well pigmented. Outer margin of antennal scale not spinose. Whole cutting-edge of mandible toothed (fig. 124, *c*). Eggs small.

Key to the South African Species.

A. Rostrum short, elevated (fig. 124, *d*) . . . . . *stylorostratis.*
B. Rostrum slender, more or less elongate (fig. 124, *e–g*).
  1. Carapace dorsally carinate throughout its length . . *eximia.*
  2. Carapace not carinate on its hinder third.
    a. Branchiostegal spine flared outwards and supported by a conspicuous keel. Abdominal segments 3–6 each ending in a tooth.
      i. Telson with 13–19 pairs of spinules (excl. the apical group) . . . . . *acanthitelsonis.*
      ii. Telson with 7–11 pairs of spinules . . *haeckelii.*
      iii. Telson with 4 pairs of spinules . . . *quadrispinosa.*
    b. Branchiostegal spine not supported by a keel. No tooth on abdominal segments 4 and 5. Telson with 6 pairs of spinules . . . . *sexspinosa.*

Acanthephyra stylorostratis (Bate)

Fig. 124, *d*.

? 1888. Bate, Rep. H.M.S. *Challenger*, xxiv, p. 724, pl. 123, fig. 3 (*Bentheocaris exuens*).

1888. *Id.*, *ibid.*, p. 726, pl. 123, fig. 4 (*Bentheocaris s.*).

1925. Calman, Fish. Mar. Biol. Surv., Rep. iv, Spec. Rep. 3, p. 14.
1940. Chace, *l. c.*, p. 144, fig. 22 (*stylorostrata*).

Rostrum short, high, somewhat semicircular in shape, with 7–8 spiniform teeth dorsally. Carapace carinate nearly, but not quite, to hind margin, keel not interrupted by cervical groove. Branchiostegal spine supported by a keel which extends back to hind part of branchial region. Abdomen keeled on all segments except 1st, and ending in a tooth on each of segments 3–6, that on 3rd larger than the others. Telson with 3 pairs of dorsal spinules.

Length up to 48 mm. Brilliant scarlet, eyes golden-bronze speckled with black, eggs scarlet (Chace).

Locality.—Off Natal coast, 760 fathoms (Calman).

Distribution.—Eastern N. Atlantic, off east coast of N. America; and S. Pacific (*exuens*).

Remarks.—Only a single ovigerous ♀ has been obtained in South African waters (s.s. *Pickle*).

Acanthephyra eximia S. I. Smith

Fig. 124, *e*, *f*.

1915. Stebbing, Ann. S. Afr. Mus., xv, p. 97 (*brachytelsonis*).
1920. de Man, *l. c.*, p. 55.
1925. Balss, *l. c.*, p. 258, figs. 27, 28 (and var. *brachytelsonis*).
1939. Calman, John Murray Exp., vi, p. 191.
1940. Chace, *l. c.*, p. 147, fig. 24.

Rostrum variable in length, with 6 (5–9) teeth dorsally, the distal portion unarmed, and usually 3–4 (1–5) teeth ventrally. Carapace dorsally carinate throughout its length, dorsal profile indented where crossed by cervical groove; branchial region defined above by a ridge, branchiostegal spine buttressed by a keel. Abdominal segments 2–6 (1st also in Stebbing's specimen) keeled, on 3rd–6th segments ending in teeth, that on 3rd segment largest. Telson with 3–4 pairs of dorsal spinules. Cornea wider than eye-stalk. Incisor process of mandible with 8–9 strong teeth.

Length up to 180 mm. Crimson (Alcock).

Locality.—Off Durban, Natal, 440 fathoms (Stebbing).

Distribution.—Western Atlantic, off coasts of North and South America, Indo-Pacific.

Remarks.—The s.s. *Pieter Faure* specimen is the only one recorded from South African waters.

Acanthephyra acanthitelsonis Bate

1888. Bate, Rep. H.M.S. *Challenger*, xxiv, p. 745, pl. 125, fig. 3.

1925. Balss, *l. c.*, p. 254.

1939. Kemp, *l. c.*, p. 574, also pp. 571, 578, 579.

Carapace not carinate on its hinder third. Branchiostegal spine strong, flared outwards, and supported by a sharp keel. Abdominal segments 3–6 keeled, each ending in a tooth, that on 3rd segment the largest. Telson with 13–19 pairs of dorsal spinules.

Length up to 134 mm.

Distribution.—Central and South Atlantic, from about 14° N. to 28° S.

Remarks.—Not yet recorded actually from South African waters.

Acanthephyra haeckelii (von Martens)

1868. von Martens, Arch. Naturg., xxxiv, Bd. i, p. 54, pl. 1, fig. 7, *a, b* (*Ephyra h.*).

1888. Bate, Rep. H.M.S. *Challenger*, xxiv, p. 739, pl. 125, fig. 1 (*sica*).

1939. Kemp, *l. c.*, p. 575, also pp. 572, 574, 578 (*haeckeli*).

1940. Chace, *l. c.*, p. 140, figs. 18–20.

1941. Hale, B.A.N.Z. Antarct. Res. Exp., B, iv, pt. 9, p. 264.

Rostrum rather long, with 7 (–9) dorsal and 5 ventral teeth. Carapace not dorsally carinate posteriorly, dorsal profile not indented at cervical groove; branchiostegal spine supported by a keel. Abdomen as in *acanthitelsonis*. Telson with 7–11 (6–13) pairs of dorsal spinules.

Length up to 147 mm.

Locality.—Off Cape Point, 660–900 fathoms (S. Afr. Mus.).

Distribution.—N. Atlantic to 13° N.; Mediterranean; S. Atlantic from 24° S. southwards; southern Indo-Pacific northwards to 32° S.

Remarks.—Two specimens were taken by the s.s. *Pieter Faure.*

Acanthephyra quadrispinosa Kemp

Fig. 124, *g*.

1905. Stebbing, *l. c.*, p. 107, pl. 24, B (*batei*, non Faxon).

1908. *Id.*, Ann. S. Afr. Mus., vi, p. 35 (probably var. or syn. of *purpurea*).

1910. *Id.*, *l. c.*, p. 395 (*purpurea*, non M. Edw.).

1915. *Id.*, *l. c.*, p. 96 (*purpureus*, non M. Edw.).

1925. Calman, Fish. Mar. Biol. Surv., Rep. iv, Spec. Rep. 3, p. 12 (*purpurea*, non M. Edw.).

1925. Balss, *l. c.*, p. 252 (*purpurea* part).

1939. Kemp, *l. c.*, p. 576, also pp. 571, 572.

1941. Hale, *l. c.*, p. 265.

Rostrum with 7 dorsal and 4 ventral teeth. Carapace not dorsally carinate posteriorly, dorsal profile not indented; branchiostegal spine strong, flared outwards, buttressed by a conspicuous keel. Abdominal segments 3–6 each with a tooth, that on 4th segment a little smaller than that on 5th. Telson with 4 pairs of dorsal spinules.

Length up to 111 mm. Bright red.

Localities.—Off Cape Point, 360 fathoms (Stebbing), 900–1800 fathoms (Calman), and 700–900 fathoms (S. Afr. Mus.); off Natal coast, 820 fathoms (Calman).

Distribution.—S. Atlantic from 32° S. to 40° S. Indo-Pacific from East African coast to 163° W., and from 25° N. to 42° S.

Acanthephyra sexspinosa Kemp

1939. Kemp, *l. c.*, p. 575, also pp. 570, 571, 574, 579.

Rostrum usually shorter than carapace. Branchiostegal spine strong, not buttressed by a keel but forming the termination of a short, smoothly rounded swelling. Abdominal segments 3 and 6 each, ending in a tooth, no tooth on segments 4 and 5. Telson with (5) 6 pairs of dorsal spinules.

Length up to 96 mm.

Distribution.—Central and South Atlantic from 17° N. to 18° S.

Remarks.—Not yet recorded actually from South African waters.

Gen. Notostomus M. Edw.

1905. Stebbing, Mar. Invest. S. Afr., iv, p. 109.

1913. Kemp, Trans. Linn. Soc. Lond., zool., xvi, p. 65 (key to species).

1920. de Man, *l. c.*, p. 46 (list of species only).

1925. Balss, *l. c.*, p. 265.

1940. Chace, *l. c.*, p. 152 (key to Bermuda species).

Carapace with an oblique hepatic keel and at least one horizontal lateral keel. At least the last 4 abdominal segments keeled. Telson

apically truncate. Exopod of mxp. 3 and legs not foliaceous or rigid. Eyes well pigmented. Outer margin of antennal scale not spinose. Incisor process of mandible toothed for only half the length of the cutting-edge. Eggs small.

Notostomus [*auriculatus* Kemp, ined.]

Fig. 124, *h*, *i*.

1905. Stebbing, *l. c.*, p. 110 (*westergreni*, non Faxon).

1910. *Id.*, *l. c.*, p. 395 (*westergreni*, non Faxon).

Carapace strongly arched; 5 lateral keels on its posterior half, the uppermost extending almost to the orbital margin; post-orbital keel continuous with ventro-lateral rostral keel. Abdominal segments 1 and 2 dorsally keeled, segments 3–6 keeled and each ending in a tooth.

Length 144 mm., carapace with rostrum 74 mm. Bright red.

Locality.—Off Cape Point, 800 fathoms (Stebbing).

Remarks.—Stebbing (1905) noted that the strong posterior tooth on 6th abdominal segment might indicate a species different from *westergreni*. The specimen was seen by Kemp and named by him in MS.

Family NEMATOCARCINIDAE.

1914. Stebbing, Trans. Roy. Soc. Edin., 50, p. 296.

1914. *Id.*, Ann. S. Afr. Mus., xv, p. 43.

1920. de Man, Siboga Exp. monogr., xxxix*a*, 3, pp. 72 *sqq.* (list of species).

1925. Balss, D. Tiefsee Exp., xx, p. 271.

Rostrum well developed. Flagella of both ant. 1 and ant. 2 very long. Mandible deeply cleft between molar and incisor processes, palp 3-jointed. Mxp. 2 with terminal joint attached laterally to 6th joint. Exopod of mxp. 1 with flagellum. Exopods and epipods on 1st–4th legs. Last 3 pairs of legs very long and slender, with thickened, splice-like articulation between 3rd and 4th joints (fig. 125, *c*), 4th and 5th joints very long. Dactyls of 3rd and 4th legs spiniform, of 5th leg short, more or less concealed in a tuft of bristles (fig. 125, *d*, *e*, *n*). Chelae of first 2 legs small. Telson acute. Last 3 thoracic sternites in ♂, in ♀ only the ante-penultimate sternum, strongly carinated.

Remarks.—The deeply cleft mandible is another feature in favour of Alcock's view that the *Nematocarcinidae* ought not to be separated from the *Pandalidae.* And it is remarkable that both Borradaile (1907) and Balss (1927) should have overlooked the cleft mandibles and included this family in the superfamily (tribe) *Hoplophoroida* defined as having (*inter alia*) imperfectly cleft mandibles.

Calman, and Balss, think that these Crustacea are bottom-dwellers (benthic), and the long legs are used like stilts for walking over the soft ooze.

A single genus.

Gen. NEMATOCARCINUS M. Edw.

1914. Stebbing, Ann. S. Afr. Mus., xv, p. 43.
1920. de Man, *l. c.*, pp. 72 *sqq.*

Key to the South African Species.

1. Rostrum (if fully developed) longer than rest of carapace. Minimum abdominal length of ♂ with *two* appendices on 2nd pleopod about 63 mm. Minimum abdominal length of ovigerous ♀ 65 mm. . . . . *longirostris.*
2. Rostrum shorter than rest of carapace. Abdominal length of ♂ with two appendices on 2nd pleopod 42 mm. Abdominal length of ovigerous ♀ 58 mm. . . . *parvidentatus.*

Nematocarcinus longirostris Bate

Fig. 125, *a–k.*

1914. Stebbing, Ann. S. Afr. Mus., xv, p. 44 (*lanceopes*, non Bate).
1925. Calman, Fish. Mar. Biol. Surv., Rep. iv, Spec. Rep. 3, p. 15 (*lanceopes*, non Bate).

Rostrum, when normally and fully developed, longer than, or at least as long as rest of, carapace (measured from tip to orbital sinus, and from latter to mid-dorsal point of hind margin of carapace); often obviously in course of regeneration (fig. 125, *f*); armed above proximally with numerous small close-set spines passing gradually into more widely spaced denticles or serrations distally, about 6–8 of the latter usually distinct; below with 5–6 denticles distally, setose proximally. Cervical groove faintly indicated, and a faint curved ridge laterally on hinder part of carapace. Eyes moderately large. Abdominal segments not dorsally carinate or ending in points, though

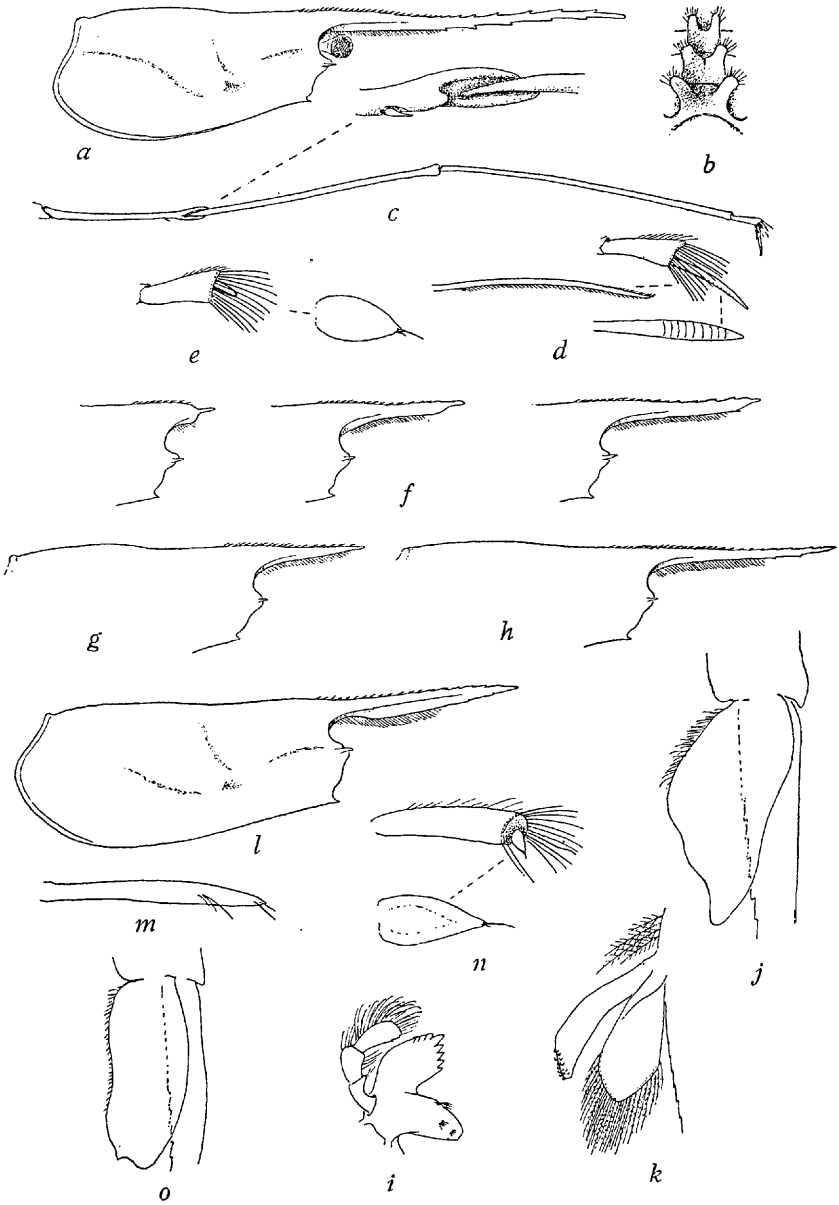


FIG. 125.—*Nematocarcinus longirostris* Bate. *a*, carapace. *b*, 3rd–5th thoracic sternites ♂. *c*, 3rd leg, with junction of 3rd and 4th joints further enlarged. *d*, 6th joint and dactyl of 3rd (and 4th) leg, with dactyl and seta on 6th joint further enlarged. *e*, 6th joint and dactyl of 5th leg, with dactyl further enlarged. *f*, three stages in regeneration of rostrum, specimens with carapace (excl. rostrum) length 32–34 mm. *g*, brevirostrate carapace of juv., carapace length 17 mm., rostrum 8 mm. *h*, the same; longirostrate, carapace 17 mm., rostrum 14 mm. *i*, mandible. *j*, endopod of pleopod 1 ♂. *k*, appendix interna and appendix masculina of pleopod 2 ♂.

Nematocarcinus parvidentatus Bate. *l*, carapace. *m*, ventral view of dactyl of 3rd leg. *n*, 6th joint and dactyl of 5th leg, with dactyl further enlarged (some of the setae on apex of 6th joint omitted). *o*, endopod of pleopod 1 ♂.

the 3rd segment is somewhat protuberant medio-dorsally; 6th segment not quite twice as long as 5th. Telson subequal to or a little longer than 6th segment, extending to apex of outer ramus, but beyond apex of inner ramus, of uropod; dorsally with 6–8 spinules excluding apical spines, minute and obscure proximally. Mxp. 3 extending $\frac{3}{4}$ along antennal scale. 1st leg extending to about end of antennal scale or end of 4th joint of 3rd leg; 2nd leg about $\frac{2}{3}$ along 3rd leg; 3rd–5th legs when extended forwards of approximately equal length. Dactyl of 3rd and 4th legs subequal to or slightly longer than 6th joint, elongate unguiform, *i.e.* wider when viewed dorsally than when viewed laterally, concave ventrally, with an appearance of being segmented. Dactyl of 5th leg much shorter than 6th joint, lanceolate. Apices of 4th joints not dentiform in any of the legs. An adpressed but movable spine on lower surface of 3rd joint distally (just proximal to swollen articulation with 4th joint) on 1st–3rd legs, but not on 4th or 5th legs. Last 3 thoracic sternites each with a conspicuous bifid process in ♂, in ♀ only the ante-penultimate process well developed. Abdominal sternites 1 and 2 in juv. and ♂ each with a pair of denticles on hind margin, suppressed in adult ♀.

Length (from tip of telson to front margin of 1st abdominal segment, and from tip of telson to orbital sinus resp.) ♂ 74 and 103 mm., ♀ 93 and 128 mm.; smallest ovig. ♀ resp. 65 and 91 mm. Deep red.

Locality.—Off Cape Point, 460–1200 fathoms (Stebbing, Calman, and S. Afr. Mus.).

Distribution.—Japan. *N. proximatus* Japan, East Indies, west coast of S. America, Marion Is.

Remarks.—Two of the lots mentioned by Stebbing (1914, p. 44) were returned to the South African Museum with his autograph labels "*longirostris*." It is not clear why Stebbing should have changed his opinion and "after long deliberation as a counsel of despair" recorded all specimens as *lanceopes*. The rostrum of the Cape specimens does not resemble that of *lanceopes*, whereas it *does* agree with that of *longirostris*, and its near ally *proximatus*.

The rostrum seems subject not so much to variation as to injury and subsequent regeneration. A few adults in the present collection show regeneration, but it seems much more frequent in juveniles. It is difficult therefore to judge whether the rostrum normally, and if so to what extent, increases in length relatively to the rest of the carapace. A selection of measurements of the mid-dorsal length of carapace to orbital sinus, and from the latter to tip of rostrum in juveniles, is given here.

Carapace	9 mm.	. .	rostrum	4·5 mm.	(2 specimens)
	13	. .		8	
	14	. .		10–11	
	15	. .		10–12	(3 ,,)
	16	. .		13	(3 ,,)
	16	. .		16	(2 ,,)
	17	. .		8–9	(2 ,,)
	17	. .		14–15	(2 ,,)
	18	. .		8	
	18	. .		16	
	20	. .		11	
	24	. .		26–28	(6 ,,)
	26	. .		28	
	38	. .		27	

The smallest specimen examined has a length of 22 mm. tip of telson to front margin of 1st abdominal segment, and 31 mm. tip of telson to orbital sinus.

In ♂♂ up to 60 mm. *abdominal* length there is only one appendix on the 2nd pleopod; from about 63 mm. abd. length upwards the appendix masculina is also present. This species is therefore a large one, attaining maturity at about 63 mm. abd. length in the ♂ and about 65 mm. in the ♀.

Parasites.—The Bopyrid Isopod *Hemiarthrus nematocarcini* Stebb. is found between the anterior pleopods. In one case, in spite of the size of the parasite, there was still room left between the hinder pleopods for a considerable number of the eggs of the host.

Another Isopod probably parasitic on this host is *Zonophryxus quinquedens* Brnrd.

Nematocarcinus parvidentatus Bate

Fig. 125, *l–o.*

1888. Bate, Rep. H.M.S. *Challenger,* xxiv, p. 814, pl. 132, fig. 7.

1915. Stebbing, Ann. S. Afr. Mus., xv, p. 99 (reference to page numbers in Bate misquoted).

Rostrum less than length of rest of carapace, deeper than in *longirostris* specimens with abnormally short rostra, and with distinct sinuosity at base ventrally; armed above with spinules (not so closely set as in *longirostris*) passing into denticles (about 6) distally, below with setae and 3–4 obscure denticles. Other characters as in *longirostris* (so far as ascertainable from the material at hand).

Length (abdominal and from tip of telson to orbital sinus resp.) ♂ 42 and 58 mm., ♀ 58 and 82 mm.

Localities.—Off Durban, 440 fathoms (Stebbing); off East London, 400 fathoms, off Cape Point, 660–900 fathoms (S. Afr. Mus.).

Distribution.—Japan.

Remarks.—Stebbing's specimen is a ♂ with appendix interna and appendix masculina on pleopod 2, with abdominal length 38 mm., carapace to orbital sinus 15·5 mm., and rostrum 7·5 mm.

Four specimens from off Cape Point (660 fathoms) comprise 1 ♂ with both appendices on pleopod 2, measuring (as above, resp.) 42, 17, and 8 mm.; 2 non-ovigerous ♀♀ measuring, carapace 18 and 21 mm., rostrum 10 and 15 mm.; and 1 ovig. ♀ measuring, abdomen 58 mm., carapace 23 mm., rostrum 15 mm. There are two specimens in poor condition from 800 to 900 fathoms.

Not only the shape of the rostrum, but the smaller size at which the ♂ develops the appendix masculina and the ♀ becomes ovigerous, indicate that this is an entirely different species from *longirostris*.

Family PANDALIDAE.

1910. Stebbing, *l. c.*, p. 391.

1914. *Id.*, Ann. S. Afr. Mus., xv, p. 36.

1920. de Man, Siboga Exp. monogr., xxxix*a*, 3, pp. 100 *sqq.* (key to genera and list of species).

1924. Gurney, "Terra Nova" Exp., zool., viii, p. 113 (larval stages).

1937. Gurney, Proc. Zool. Soc. Lond., ser. B, p. 330, figs. (larval stages, *Chlorotocella*).

1940. Lebour, J. Mar. Biol. Assoc. Plym., xxiv, pp. 239 *sqq.* (larval stages).

1940. Chace, Zoologica, xxv, p. 190.

Rostrum well developed. Mandible deeply cleft into molar and incisor portions, palp usually 3-jointed. Mxp. 2 with 7th joint attached laterally to 6th. Exopod of mxp. 1 with flagellum. Mxp. 3 with or without exopod; exopods absent from all legs. Epipods on mxp. 1–3, present or absent on legs 1–4. 1st leg simple or microscopically and imperfectly chelate; 2nd leg minutely chelate, with bi-, tri-, or multi-articulate wrist; 3rd–5th legs long and slender. Telson acute.

Remarks.—*Pantomus* (Gulf of Mexico) is remarkable for its movably articulated rostrum (cf. *Rhynchocinetes*, p. 763).

Key to the South African Genera.

1. Wrist of 2nd leg composed of more than 3 jointlets.
   a. Carapace with post-rostral keel only.
      i. Mxp. 3 without exopod. Post-rostral keel with movable spines . . . . . *Pandalina.*
      ii. Mxp. 3 with exopod . . . . . *Plesionika.*
   b. Carapace with lateral and post-rostral keels . . . *Heterocarpus.*
2. Wrist of 2nd leg composed of 2 jointlets . . . . *Chlorotocus.*

Gen. PANDALINA Calman

1899. Calman, Ann. Mag. Nat. Hist. (7), iii, p. 37.
1910. Kemp, Fish. Irel. Sci. Invest. [1908], i, p. 97.
1920. de Man, *l. c.*, p. 102 (in key).
1946. Holthuis, Zool. Med., xxvi, p. 281.

Carapace smooth except for the post-rostral keel, rostrum half as long as rest of carapace, armed with movable spines and fixed teeth above, and fixed teeth below. Eyes large, cornea wider than stalk. Lateral process of ant. 1 distally broad and rounded (fig. 126, *b*). Posterior lobe of mx. 2 (scaphognathite) truncate (fig. 126, *c*). Mxp. 3 without exopod. 2nd pair of legs unequal in length and dissimilar on the two sides, wrist of one with 4, of the other with many, jointlets. Epipods on legs 1–4. Gills 8, plus 6 epipods, arthrobranchs absent from all legs.

Remarks.—Differs from *Pandalus* in the truncate posterior lobe of mx. 2, the twofold character of the armature on rostral keel (in *Pandalus* all movable spines), and the absence of arthrobranchs from the legs.

Pandalina brevirostris (Rathke)

Fig. 126, *a–e.*

? 1888. Bate, Rep. H.M.S. *Challenger*, xxiv, p. 670, pl. 114, fig. 4 (*Pandalus modestus*).
1899. Calman, *l. c.*, p. 37, fig. 4 on pls. 1–4.
1910. Kemp, *l. c.*, p. 97.
1910. Stebbing, *l. c.*, p. 392 (*Pandalus modestus*, quoted after Bate).
1914. *Id.*, *l. c.*, p. 36 (*Pandalus modestus*).

1940. Lebour, *l. c.*, p. 243, fig. 3 (1st larval stage).

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 384.

Post-rostral keel with 5 movable spines, rostrum a little more than half length of carapace, with 3–5 teeth above, 2–4 below; antennal spine and branchiostegal tooth distinct. Basal joint of ant. 1 with denticle on inner margin; flagella longer in ♂ than in ♀. Antennal scale only slightly narrowed distally, the lamellar part apically rounded, extending about as far as spine at end of straight outer margin. 2nd pair of legs with wrist multi-articulate on right, 4-articulate on left. Dactyl of 3rd–5th legs with 4–5 spinules proximally on inner margin; dactyl of 3rd leg $\frac{1}{3}$ length of propodus, of 5th leg shorter ($\frac{1}{4}$). 3rd abdominal segment slightly keeled posteriorly where it overhangs the 4th segment. Telson subequal to 6th segment and shorter than uropods, with 7 pairs of dorso-lateral spines, and 2 longer pairs on apex.

Length up to 30 mm.

Localities.—35° 4′ S., 18° 37′ E. (western slope of Agulhas Bank), 150 fathoms (Bate); exact locality uncertain (Stebbing); off Saldanha Bay, 145 fathoms, off Cape Peninsula, 190 fathoms, and off East London, 195 fathoms (S. Afr. Mus.).

Distribution.—N.E. Atlantic to Mediterranean, littoral to 584 fathoms. Barents Sea.

Remarks.—If Stebbing had recalled Calman's definitions of *Pandalus* and *Pandalina* he would have recognized the resemblance of this form to *Pandalina brevirostris*. In addition to Stebbing's 3 specimens there are 19 specimens, and I fail to find any points of disagreement between them and Calman's description and figures, except the length of the dactylus of 3rd leg. Calman makes no mention of a spine or denticle on inner margin of basal joint of ant. 1, and I have no northern specimens for comparison.

Although Bate utilized the dimorphic character of the rostral and post-rostral armature for generic purposes, and although he placed his species *modestus* in *Pandalus* (all movable spines on dorsal profile of carapace), it is more than probable that *modestus* is the form here discussed.

Holthuis (1946, Zool. Meded., xxvi, p. 281, fig. 1, *a–c*) has described *P. profunda* a deep-water form distinct from *brevirostris*, but which bears a curiously close resemblance to Bate's *modestus*. Holthuis (in litt. 22/1/47), however, does not think *profunda* is the same as *modestus*. A final decision must await the re-examination of Bate's type, if it is still available.

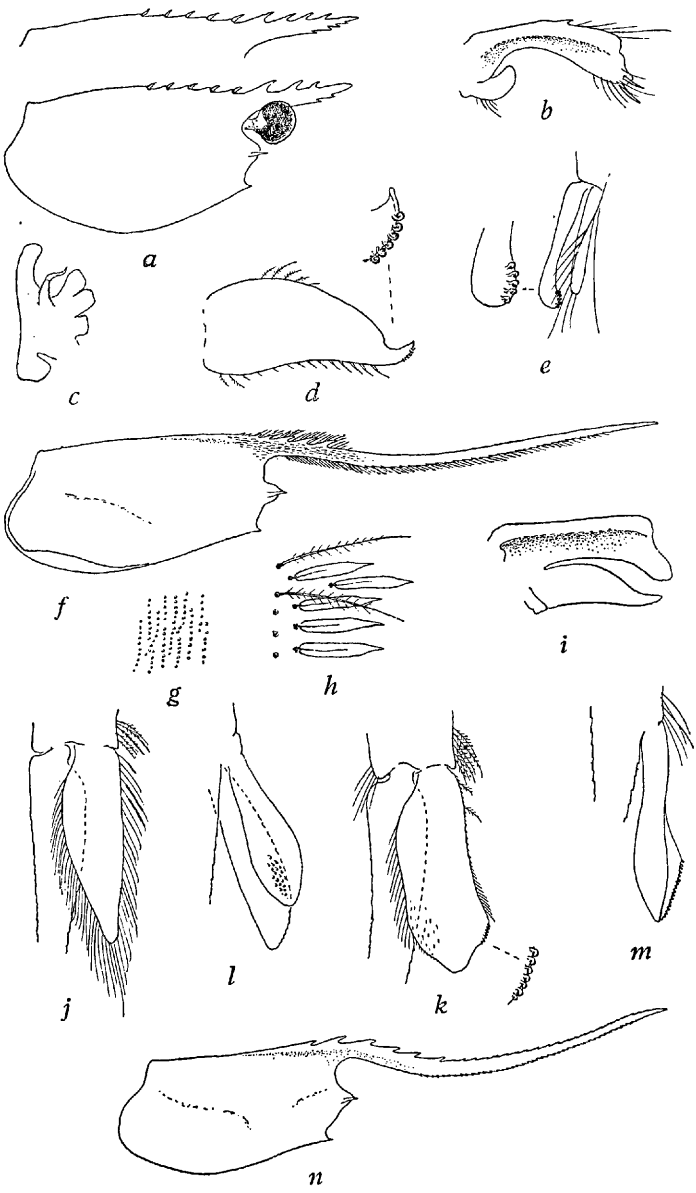


FIG. 126.—*Pandalina brevirostris* (Rathke). *a*, carapace, with dorsal profile of another specimen. *b*, basal joint of ant. 1. *c*, maxilla 2, setae omitted. *d*, endopod of pleopod 1 ♂. *e*, appendix interna and appendix masculina on pleopod 2 ♂.
Plesionika martia (M. Edw.). *f*, carapace. *g*, portion of surface of integument. *h*, the same further enlarged, with spines and setae, from 6th abdominal segment. *i*, basal joint of ant. 1, setae omitted. *j*, endopod of pleopod 1 ♀. *k*, endopod of pleopod 1 ♂. *l*, appendix interna and appendix masculina on pleopod 2 ♂, setae on latter omitted. *m*, appendix interna on pleopods 2–5 ♀.
Plesionika longirostris (Borrad.). *n*, carapace.

Gen. Plesionika Bate

1910. Stebbing, *l. c.*, p. 392.

1914. *Id.*, Ann. S. Afr. Mus., xv, p. 37.

1920. de Man, *l. c.*, pp. 105 (list of species), 111 (key to species).

1939. Calman, John Murray Exp., vi, p. 197.

Carapace smooth except for the post-rostral keel, rostrum usually at least as long as carapace, post-rostral keel and rostrum armed above with fixed teeth, rostrum with or without teeth on ventral edge. Cornea large, often with an ocellus behind it. Lateral process of basal joint of ant. 1 acute (fig. 126, *i*). Posterior lobe of mx. 2 rounded. Mxp. 3 with exopod. 2nd pair of legs subequal or conspicuously unequal. Epipods on legs 1–4 (except *minor* Calman). Gills 12, plus 6 epipods (Kemp: 6, Alcock: 7), including arthrobranchs on legs 1–4.

Remarks.—Although the rostral armature consists of all movable spines in *Pandalus*, *Plesionika* is regarded by some authors as only a subgenus of *Pandalus*.

Odhner (1923, Medd. Göteb. Mus., xxxi, p. 4) records the Mediterranean *P. heterocarpus* from Port Alexander, Angola.

Key to the South African Species.

1. Upper margin of rostrum with teeth only at base . . . *martia.*
2. Whole upper margin of rostrum with teeth . . . . . *longirostris.*

Plesionika martia (M. Edw.)

Fig. 126, *f–m.*

1910. Stebbing, *l. c.*, p. 392.

1920. de Man, *l. c.*, p. 113 (in key), and var. *semilaevis*, p. 116, pl. 10, figs. 24, 24, *a*, *b*.

1925. Balss, D. Tiefsee Exp., xx, p. 278.

1925. Calman, Fish. Mar. Biol. Surv., Rep. iv, Spec. Rep. 3, p. 17.

1926. Schmitt. Biol. Res. "Endeavour," v, p. 377.

1939. Calman, *l. c.*, p. 197.

1940. Chace, *l. c.*, p. 190, fig. 57.

Whole integument, including telson and uropods, under a low magnification appearing squamose; this appearance caused by numerous short, more or less transverse series of pits; these are probably setiferous or spiniferous in freshly moulted specimens, but on the exposed parts of the body appear to be easily rubbed off; in

protected parts, such as the base of the rostrum and below the post-rostral crest, and near the lower margin of 6th abdominal segment, elongate lanceolate scale-like spines, mixed with less numerous plumose setae, arise from the pits. Rostrum $1\frac{1}{4}$–$2\frac{1}{2}$ times length of rest of carapace, bending downwards and then slightly upwards in a gentle curve, armed above at base only with 5–10 (usually 7–8) teeth, decreasing in size backwards, the hinder 3 or 4 post-orbital; ventral margin with a large number of fine teeth. Carapace smooth, with post-antennal spine and sharp pterygostomial point. A well-marked submarginal keel or raised line across postero-lateral corner. Abdominal segments not carinate. Telson subequal to 6th segment and to inner ramus of uropod, with 3–4 pairs of (inconspicuous) dorso-lateral spinules. Eyes large, ocellus not separate from cornea. Apical spine and lamellar part of antennal scale extending about equally far. 2nd pair of legs symmetrical, wrist multi- (20–24) articulate. Dactyls of 3rd–5th legs short. Hind margin of sternite of abdominal segments 1 and 2 in juv. and ♂ each with a slight projection, which usually ends in two little points on segment 1 and one point on segment 2; projections suppressed in ♀♀ over 57 mm. in length. Endopod of pleopod 1 ♂ at least $\frac{1}{3}$ length of exopod, somewhat curved or concave, apex rounded, outer margin (facing the exopod) setose, inner finely spinulose, with coupling-hooks distally; in ♀ relatively smaller, ovate, both margins densely setose. Appendix interna on pleopods 2–5 ♀ distally triquetral, inner surface bearing a keel with coupling-hooks; appendix interna on pleopod 2 ♂ oval with a patch of coupling-hooks on its median surface; appendix masculina ovate, inner margin strongly setose.

Length (tip of telson to orbit) ♂ up to 76 mm., ♀ 88 mm. (Calman: total length 108 mm.). Smallest ovigerous ♀ examined 70 mm.; smallest ♂ with both appendix masculina and appendix interna developed 40 mm. Deep red. Kemp says the carapace is purplish dorsally, and the eyes black. Eggs light blue (Alcock).

Localities.—Off Cape Peninsula, 240–249 fathoms (Stebbing); 35° 10′ S., 23° E., 500 metres (Balss); Natal coast, 260–270 fathoms (Calman); off Cape Point, 250–470 fathoms, off East London, Cape Morgan, and Bashee River, 250–400 fathoms (S. Afr. Mus.); off Delagoa Bay (Gilchrist's Marine Survey).

Distribution.—Eastern Atlantic and Mediterranean, Indian Seas, Hawaiian Is., Southern Australia. var. *semilaevis*: Indo-Pacific to Japan and Australia.

Remarks.—*P. semilaevis* is regarded by de Man as a variety, in

which the rostrum is relatively shorter; in his key (1920, *l. c.*) he distinguishes *semilaevis* with rostrum 34–47 per cent. of the length (as measured above) from *martia* with rostrum 45–67 per cent. of the length. Balss and Calman regard it merely as a synonym of *martia*.

All the South African specimens, both from the Cape Point and the East London areas, appear to belong to the typical *martia* form.

Judging by the number of specimens (most of them badly damaged) caught by the s.s. *Pieter Faure*, the species is commoner in the East London area than in the Cape Point area.

No attention seems to have been paid to the character of the integument in descriptions of the species of this genus. In the present species it is so conspicuous that the absence of all mention of it is rather surprising.

Parasites.—The Bopyrid Isopod *Palaegyge plesionikae* Brnrd. is found in the branchial cavity, the ♂ sometimes amongst the pleopods.

Plesionika longirostris (Borrad.)

Fig. 126, *n*.

1914. Stebbing, *l. c.*, p. 37.

1920. de Man, *l. c.*, p. 114 (in key).

Integument regularly but sparsely pitted; the specimens are not too well preserved, but apparently only setae, no lanceolate spines, arise from the pits. No submarginal keel at postero-lateral corner of carapace. Rostrum about twice the length of rest of carapace, bending downwards and then upwards in a gentle but pronounced curve; armed above proximally with 6 teeth (2 being really post-orbital) followed by a number (*ca.* 22) of small teeth extending almost to tip; below with about 40 small, closely-set teeth. Abdominal segments not carinate. Telson distinctly shorter than 6th segment. Eye large, ocellus not separate from cornea. Antennal scale as in *martia*. 2nd pair of legs symmetrical. Dactyls of 3rd–5th legs short.

Length (tip of telson to orbit) about 30 mm. (Borradaile: ♀ 130 mm.).

Localities.—Off Durban, 185 fathoms (Stebbing); off Gt. Fish Point, 40 fathoms (S. Afr. Mus.).

Distribution.—New Britain.

Remarks.—The identification of these small and obviously immature specimens with Borradaile's species rests solely on the similarity of the rostrum. Three specimens were sent to Stebbing; and all three

were returned by him intact and undissected; his account of the mouth-parts is taken from a slide labelled "*Parapandalus longirostris*," but which includes the carapace and rostrum of a small specimen of *martia*. There are 2 other specimens, also juveniles.

Borradaile's statement that the rostrum is armed "above and below with movable spines" has been commented upon by Stebbing, and, in the case of *Parapandalus serratifrons*, by de Man (*l. c.*, p. 147).

Gen. Heterocarpus M. Edw.

1914. Stebbing, Ann. S. Afr. Mus., xv, p. 38.

1920. de Man, *l. c.*, pp. 102, 108 (list of species), 152 (key to species).

Carapace rigid, with post-rostral keel usually extending to hind margin, and three, more or less fully developed, lateral keels. Rostrum armed with fixed teeth above and below. No ocellus behind cornea. Lateral process of ant. 1 acute. Posterior lobe of mx. 2 rounded. Mxp. 3 with exopod. 2nd pair of legs more or less unequal in length, wrist multiarticulate. Epipods on legs 1–4. Gills 12, plus 7 epipods.

Key to the South African Species.

1. None of the abdominal segments keeled or produced (3rd slightly gibbose). Rostrum dentate dorsally . . *tricarinatus.*
2. Segment 3 bluntly keeled. Rostrum dorsally smooth, except for one tooth above eye . . . . . *laevigatus.*
3. Segments 3–5 keeled and acutely produced. Rostrum dorsally dentate . . . . . *dorsalis.*

Heterocarpus tricarinatus Alck. & And.

Fig. 127, *c*, *d*.

1914. Stebbing, *l. c.*, p. 39.

1920. de Man, *l. c.*, pp. 155 (in key), 161, pl. 13, fig. 38, *a–d*, pl. 14, fig. 38.

1925. Balss, D. Tiefsee Exp., xx, p. 287.

1939. Calman, John Murray Exp., vi, p. 204.

Integument tomentose, formed by ovate-lanceolate scale-like spines. Rostrum subequal to rest of carapace, gently curved upwards, with 9 (7–11, Calman: 14) teeth below, 6 (7–9) teeth above; post-rostral crest continued backwards nearly to hind margin of carapace, with 5 teeth. Post-ocular lateral ridge continued nearly to hind margin, post-antennular ridge forming a buttress to the suborbital spine, post-antennal ridge fading out about midway across branchial region. Abdominal segments smooth, not keeled or produced, but

(as in de Man's specimens) segment 3 slightly gibbose. Telson 1½–2 times length of 6th segment, with 4 pairs of dorso-lateral spinules. Lateral process of ant. 1 extending to end of 2nd peduncular joint. Antennal scale half length of carapace. 2nd pair of legs very unequal, left much longer than right. 5th leg shorter than 3rd or 4th; dactyls

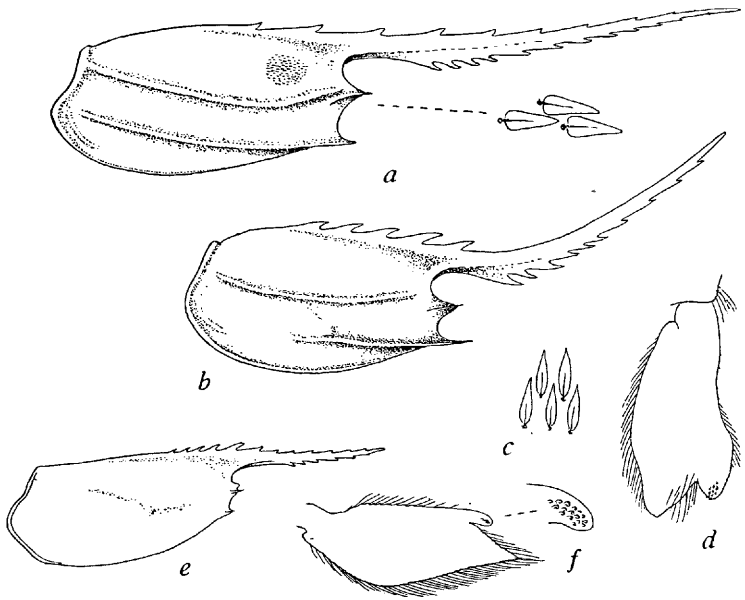


FIG. 127.—*Heterocarpus dorsalis* Bate. *a*, carapace, tomentum only partly indicated, with some of the scale-spines further enlarged.
Heterocarpus laevigatus Bate. *b*, carapace.
Heterocarpus tricarinatus Alck. & And. *c*, scale-spines from integument. *d*, endopod of pleopod 1 ♂.
Chlorotocus crassicornis (Costa). *e*, carapace. *f*, endopod of pleopod 1 ♂, with lobe bearing coupling-hooks further enlarged.

of 3rd–5th legs rather long and slender (typically *ca.* ⅓ length of 6th joint). Endopod of pleopod 1 ♂ (fig. 127, *d*).

Length (tip of telson to orbit) ♂ up to 92 mm., rostrum 27 mm. (de Man); ovig. ♀ 73 and 21 mm. resp. (Alcock).

Locality.—Off East London, 310 fathoms (Stebbing).

Distribution.—Arabian Sea; East Indies.

Remarks.—The single ♂ (returned by Stebbing) is the only specimen known from South Africa. The dactyls of the 3rd–5th legs are shorter than in the typical form (*ca.* ⅕ length of 6th joint), but not so short as in *lepidus* de Man.

Heterocarpus laevigatus Bate

Fig. 127, *b*.

1914. Stebbing, *l. c.*, p. 40.

1920. de Man, *l. c.*, pp. 154 (in key), 159, pl. 13, fig. 37, *a*, *b*.

Integument pitted (presumably tomentose in life). Rostrum longer than carapace, strongly curved upwards, one tooth at base above eye, rest of dorsal margin smooth, ventral margin with 10 teeth (Bate: 6; Alcock and Anderson: 11–13); post-rostral crest extending nearly to hind margin of carapace, with 4 (5) teeth. Post-ocular lateral ridge extending nearly to hind margin; post-antennular ridge forming a short buttress to the spine; post-antennal ridge fading out at about hinder third of carapace, anteriorly the branchiostegal spine projects forwards as far as eye; near lower hind corner of carapace a short curved submarginal ridge. Abdominal segments smooth, not keeled, except 3rd which is gibbose and bluntly keeled. Lateral process of ant. 1 extending to end of 2nd peduncular joint. Antennal scale $\frac{2}{3}$ length of carapace. Left leg of 2nd pair longer than the right. Dactyls of 3rd–5th legs short and rather stout.

Length (tip of telson to orbit) ♂ up to 126 mm., rostrum 55 mm.; ♀ 123 and 42 mm. resp (Alcock).

Locality.—Off East London, 408 fathoms (Stebbing).

Distribution.—Arabian Sea; East Indies.

Remarks.—The single South African specimen is immature, measuring (as above) 40 and 22 mm. respectively.

Heterocarpus dorsalis Bate

Fig. 127, *a*.

1914. Stebbing, *l. c.*, p. 40 (*alphonsi* Bate).

1920. de Man, *l. c.*, pp. 156 (in key), 171, pl. 15, figs. 43, 43, *g*.

1925. Balss, D. Tiefsee Exp., xx, p. 285, fig. 66.

1939. Calman, John Murray Exp., vi, p. 206.

Integument tomentose, formed by cuneiform scale-spines. Rostrum as long as or longer than (up to $1\frac{1}{2}$–2 times) carapace, relatively longer in juv. than in adult, straight or slightly curving upwards, dorsal teeth usually 12–14 (range: 7–16), of which 2, occasionally 3, are on the post-rostral crest; ventral teeth usually 11–14 (6–15) (S. Afr. specimen: $\frac{2+7}{12}$); post-rostral crest continued to hind margin, with a small pit at hinder third of carapace, and behind it often a small

tubercle (both present in the S. Afr. specimen); post-ocular ridge continued to hind margin, post-antennular ridge forming a short buttress to the spine, post-antennal ridge continued to hind margin (or almost); a slight submarginal ridge at lower hind corner of carapace. Abdominal segments 3, 4, and 5 each carinate and produced in a sharp point, carina on 3rd segment fluted; a pair of inconspicuous tubercles on each side of median line on segments 1 and 2 (also on segments 3–5 in de Man's fig. 43, *b*). Telson $1\frac{1}{3}$ times length of 6th segment. Lateral lobe of ant. 1 extending to about middle of 2nd peduncular joint. Antennal scale $\frac{2}{3}$ length of carapace, the lamellar tip extending well beyond the spine. Left leg of 2nd pair longer than the right. Dactyls of 3rd–5th legs slender, rather long.

Length (tip of telson to orbit) ♂ up to 117 mm., rostrum 32 mm.; ♀ 129 and 36 mm. resp. South African ♀ 83 and 40 mm. resp.

Locality.—Off Durban, 440 fathoms (Stebbing).

Distribution.—East Indies; east coast of Africa; *alphonsi*: Indian Seas, Philippine Is., Japan.

Remarks.—The single South African specimen is a non-ovigerous ♀. In view of the large number of specimens studied by de Man, it seems that *alphonsi* should be regarded as a synonym, at the most as a variety, of *dorsalis*.

Gen. Chlorotocus M. Edw.

1914. Stebbing, *l. c.*, p. 41.

1920. de Man, *l. c.*, pp. 102 (in key to genera), 110 (list of species), 181.

Like *Plesionika*, but with the wrist of 2nd leg composed of only two unequal jointlets. Rostrum with fixed teeth. A small suborbital lobe above the post-antennular spine, but no supra-orbital spine.

Chlorotocus crassicornis (Costa)

Fig. 127, *e*, *f*.

? 1910. Stebbing, *l. c.*, p. 393 (*incertus* Bate).

1914. *Id.*, *l. c.*, p. 42, pl. xi (Crust., pl. 75).

1920. de Man, *l. c.*, p. 183 (comments on certain features).

1925. Calman, Fish. Mar. Biol. Surv., Rep. iv, Spec. Rep. 3, p. 16.

1939. *Id.*, John Murray Exp., vi, p. 207.

Integument closely and finely pitted (presumably tomentose in life). Carapace smooth, post-rostral crest extending about $\frac{2}{3}$ towards hind

margin, anteriorly with 4 teeth, preceded by 6–8 teeth on rostrum, which has 4–6 teeth on ventral margin. Abdominal segments not carinate, hind margin of 6th segment dorsally spinulose between the lateral points; lower margins of pleurae of segments 1–5 rounded, but lower hind corner of 5th segment quadrate. Telson with 5 pairs of dorso-lateral spinules, and a pair of large movable spines flanking the abruptly narrowed apical point. Ocellus absent. Antennal scale slightly more than half length of carapace, the spine extending beyond the lamellar tip. Mxp. 2 with 7th joint attached as a strip laterally to the 6th joint (contrast *spinicauda* de Man). Endopod of pleopod 1 ♂ (fig. 127, *f*).

Length (tip of telson to orbit) up to 43 mm., rostrum 13 mm.; another specimen 47 and 9 mm. resp. (Calman: total length 78 mm.).

Localities.—35° S., 18° 37′ E. (western slope of Agulhas Bank), 150 fathoms (Bate: *incertus*); off Cape Point, 80 and 150 fathoms, and off Durban, 185 and 205 fathoms (Stebbing, and Calman); off Cape Point, 180 fathoms, and Algoa Bay, 58 fathoms (S. Afr. Mus.).

Distribution.—Mediterranean, Zanzibar, Andaman Is.

Remarks.—Calman says the type of *incertus* is no longer extant, and Bate's species therefore remains uncertain.

A specimen 27 mm. long (measured as above) has 10 teeth dorsally, 7 on rostrum, 1 above hind margin of orbit, and only 2 on post-rostral crest.

The South African Museum registered number of one of Stebbing's specimens was recorded as "A1269" instead of "A3942"; the locality, however, is not in doubt.

Family HIPPOLYTIDAE.

1906. Calman, Ann. Mag. Nat. Hist. (7), xvii, p. 29 (key to genera).

1910. Stebbing, *l. c.*, p. 390.

1914. Kemp, Rec. Ind. Mus., x, pp. 81 *sqq.* (key to Indo-Pacific genera).

1915. Stebbing, Ann. S. Afr. Mus., xv, p. 89.

1916. Kemp, Rec. Ind. Mus., xii, pp. 385 *sqq.*

1925. *Id., ibid.*, xxvii, p. 330.

1937. Gurney, "Discovery" Rep., xiv, pp. 351 *sqq.* (larval stages).

1947. Holthuis, Siboga Exp. monogr., xxxix*a*, 8, pp. 3–77 (key to genera, list of species).

Rostrum long or short. Supra-orbital spine present or absent. Mandible with or without incisor process, and with or without palp.

Mxp. 2 with 7th joint attached laterally to 6th. Exopod of mxp. 1 with flagellum. Mxp. 3 with or without exopod. Exopods absent from all legs. Epipods 1–7 pairs. First pair of legs usually not much longer than the others, but sometimes sexually dimorphic, chelate; 2nd pair with carpus (wrist) composed of two or more jointlets. Telson tapering more or less acutely. Gills 5–6, with a varying number of epipods.

Remarks.—The majority of the members of this family are inhabitants of shallow water. There is a considerable amount of normal variation in some forms, especially in the shape and armature of the rostrum; and sexual dimorphism is often well marked.

Key to the South African Genera (after Calman, and Kemp).

I. Arthrobranchs on legs 1–4. Mandibular palp 3-jointed. Wrist of 2nd legs multiarticulate.
  A. A movable tooth at base of uropod (fig. 128, *a*) . . *Saron.*
  B. No movable tooth at base of uropod . . . *Merhippolyte.*

II. No arthrobranchs on legs.
  A. Mandible with palp.
    1. 2nd pair of legs symmetrical, wrist with 6–8 jointlets.
      a. Mandible without incisor process (S. Afr. species), palp 3-jointed. Supra-orbital spine very large . . . . *Alope.*
      b. Mandible with (small) incisor process, palp 2-jointed. Supra-orbital spine, if present, not large . . . . . *Spirontocaris.*
    2. 2nd pair of legs strongly asymmetrical, wrist with 4 jointlets. Outer margin of antennal scale serrate . . . . . *Leontocaris.*
  B. Mandible without palp.
    1. Mandible with incisor process. Supra-orbital spine present . . . . . *Hippolyte.*
    2. Mandible without incisor process. Supra-orbital spine absent.
      a. Dactyls of 3rd–5th legs uniunguiculate.
        i. Wrist of 2nd legs with 3 jointlets.
          α. Body stout. Antero-lateral corner of carapace serrate. Rostrum often very deep (fig. 131, *a*) . . . *Latreutes.*
          β. Body slender. Antero-lateral corner of carapace spiniform. Rostrum elongate (fig. 131, *d*) *Angasia.*

ii. Wrist of 2nd legs multiarticulate. Antero-lateral margin of carapace not serrate. Rostrum slender . *Hippolysmata.*

b. Dactyls of 3rd–5th legs 4-unguiculate (fig. 132, *j*). Wrist of 2nd leg with 3 jointlets . . . . . *Gelastocaris.*

Gen. SARON Thallwitz

1914. Stebbing, Ann. S. Afr. Mus., xv, p. 34.

1947. Holthuis, *l. c.*, pp. 6, 25.

Arthrobranchs present on legs 1–4. Mandible with incisor process and 3-jointed palp. Wrist of 2nd leg with more than 7 jointlets. A movable tooth at base of uropod (fig. 128, *a*). Mxp. 3 with exopod.

Remarks.—Two species, both Indo-Pacific. Stebbing (*l. c.*) by a slip says the movable tooth is at the base of the "second peraeopods."

Saron marmoratus (Olivier)

Fig. 128, *a*, *b*.

1869. Bianconi, Spec. Zool. Mosambic., fasc. xix/xx, p. 343, Crust., pl. 3, fig. 2 (*Hyppolite* [sic] *kraussii*).

1878. Hilgendorf, MB. Ak. Wiss. Berlin, p. 836 (*Hippolyte kraussii* Bianc.).

1914. Kemp, *l. c.*, p. 84 (references).

1914. Stebbing, *l. c.*, p. 34 (references).

1916. Kemp, *l. c.*, p. 385.

1935. Boone, Bull. Vanderbilt Mar. Mus., vi, p. 187, pl. 51.

1937. Gurney, *l. c.*, p. 390, figs. 106–112 (larval stages).

1940. Kubo, J. Imp. Fish. Inst. Tokyo, xxxiv, p. 80, figs. 5, 6.

1947. Holthuis, *l. c.*, p. 25.

Carapace deep, 3 teeth on post-rostral crest, the hindmost one above or behind middle of length of carapace; no supra-orbital spine; orbit oval in shape; rostrum more or less strongly curved upwards, 2 teeth proximally and 2 distally on upper margin, 6 (5–7) on lower margin, the proximal ones projecting strongly downwards and obliquely forwards; rostrum in dorsal view not very wide at base; tufts of setae at bases of post-rostral teeth, and in a few places on carapace. Upper apex of 3rd peduncular joint of ant. 1 produced in a triangular horizontal (and slightly curved outwards) process (not an upturned spine as in *neglectus*). Fingers and thumbs of 2nd chelae shorter than palm, which is usually equal to (not longer than) last jointlet of wrist,

their opposed margins smooth (serrulate in *neglectus*). 4th joint of 3rd–5th legs with 2 spines on lower distal margin (only 1 in *neglectus*). Last thoracic sternite with a bifurcate process projecting forwards, less developed in ♀ than in ♂ (not developed at all in small ovig. ♀

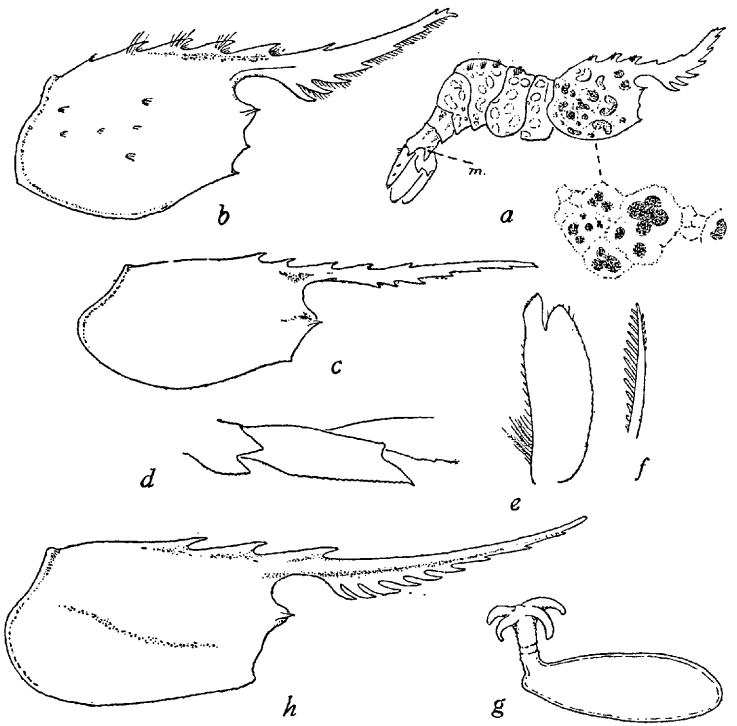


FIG. 128.—*Saron marmoratus* (Olivier). *a*, whole animal to show colour pattern, with portion of carapace further enlarged. (*m.*, movable tooth.) *b*, carapace. *Merhippolyte agulhasensis* Bate. *c*, carapace. *d*, inner view of 2nd and 3rd joints of 1st leg, setae omitted. *e*, endopod of pleopod 1 ♂, setae omitted from outer margin. *f*, spine from pit on wrist of 1st leg. *g*, *Faba*, a parasite attached to the abdomen, length of sac 2·5 mm. *Merhippolyte calmani* Kemp & Sewell. *h*, carapace.

seen by Stebbing). Abdominal sternites 1–3 ♂ each with a pair of prong-like processes on hind margin, sternites 4–6 each with a median spiniform process, that on 6th minute; in ♀ all sternites unarmed, except for the minute point on 6th sternite. Peduncles of pleopods L-shaped in cross-section; endopods larger than exopods; the 5th pleopod smaller than the others, and in ♀ taking no part in forming the incubatory pouch, without appendix interna in both sexes; in ♂ appendix interna strongly developed on pleopod 2 (no appendix

masculina), absent on pleopod 3, and reduced on pleopod 4; in ♀ appendix interna on pleopods 2 and 3 short, arising at about middle of inner margin of endopod, on pleopod 4 strongly developed, with a long row of coupling-hooks, thus together with its fellow firmly closing the incubatory pouch behind.

Length ♂ up to 68, ♀ 65 mm. Marbled and mottled with more or less circular, oval, or crescentic markings, or rings, of varying shades of brown, with faint intervening reticulation; no two specimens exactly alike in pattern.

Localities.—Mozambique (Bianconi, Hilgendorf, Stebbing); Delagoa Bay (coll. K. H. B. 1912, and C. J. van der Horst).

Distribution.—East coast of Africa, Red Sea, Indian coasts, East Indies, Pacific, Australia.

Remarks.—In the males of this prettily marked species the 3rd maxillipeds and 1st pair of legs often attain a relatively large size, measuring (Kemp, 1914) 60 or 70 per cent. or even 88 per cent. of the total length of the animal. In a Delagoa Bay ♂ 68 mm. in total length (53 mm. tip of telson to orbit) the 1st leg measures 48 mm.

Gen. Merhippolyte Bate

1910. Stebbing, *l. c.*, p. 391.
1912. Kemp and Sewell, Rec. Ind. Mus., vii, pp. 20–22.
1914. Kemp, *l. c.*, p. 88, and p. 122 (Indo-Pacific species).
1947. Holthuis, *l. c.*, p. 6.

Arthrobranchs present on legs 1–4. Mandible with incisor process and 3-jointed palp. Wrist of 2nd legs with more than 7 jointlets. No movable tooth at base of uropods. Mxp. 3 with exopod. Gills 12, plus 5–7 epipods.

Key to the South African Species.

1. 4–6 rostral and post-rostral teeth, teeth on ventral margin of rostrum equally spaced . . . . . *agulhasensis.*
2. Only 3 dorsal teeth, ventral teeth on rostrum proximally close together . . . . . *calmani.*

Merhippolyte agulhasensis Bate

Fig. 128, *c–g.*

1910. Stebbing, *l. c.*, p. 391.
? 1923. Odhner, Medd. Göteb. Mus., xxxi, p. 5.

1925. Balss, D. Tiefsee Exp., xx, p. 288.

1925. Calman, Fish. Mar. Biol. Surv., Rep. iv, Spec. Rep. 3, p. 17.

Carapace smooth, no supra-orbital spine, antero-inferior corner quadrate or with a small point, rostrum with 5 (rarely 4 or 6) teeth above, of which 2 are on the post-rostral crest, and 5 (4–6) below, the latter more or less equally spaced, tip bidentate. Abdominal segments not keeled; 6th segment 1½ times the 5th; postero-inferior angle of 4th ending in a short but sharp point, of 5th in a longer acute point; 1st and 2nd sternites in ♂ each with a pair of spines, 3rd with a single median spine, in ♀ sternites smooth. Telson a little longer than 6th segment, with 2 pairs of dorso-lateral spinules. Cornea large, ocellus distinct but contiguous with cornea. Lower margin of 2nd and 3rd joints of 1st leg distally produced, on the 3rd joint forming a sharp point (fig. 128, *d*). On inner (lower) surface of wrist of 1st leg near apex a shallow pit surrounded by strongly ctenate spines (fig. 128, *f*) in both sexes. Epipods on legs 1–4.

Length (tip of telson to orbit) ♂ up to 53 mm., ♀ 56 mm.; smallest ovig. ♀ 37 mm.; smallest specimen examined 20 mm. Bright red (s.s. *Pieter Faure* log-book).

Localities.—West slope of Agulhas Bank, 150 fathoms (Bate); off Cape Point, 318 metres, and False Bay, 70 metres (Balss); off Cape Peninsula and Knysna, 131 and 116 fathoms (Stebbing); Natal coast, 260 fathoms (Calman); from off Saldanha Bay around Cape Peninsula to Agulhas Bank as far east as Algoa Bay, 22–256 fathoms, and off East London, 195 fathoms (S. Afr. Mus.). Port Alexander, Angola (Odhner).

Remarks.—Bate's figure certainly exaggerates the size of the point at the postero-inferior corner of 4th abdominal segment, but not (or only slightly) that of 5th segment. Odhner states that his specimens resembled more *calmani* than *agulhasensis* in this respect; moreover, he says the 6th abdominal segment was 2–2½ times the length of 5th. Possibly his 2 specimens, with only 4 rostral teeth dorsally, represent a different species.

This species is abundant around the Cape Peninsula, but the largest number taken in any one haul by the s.s. *Pieter Faure* was off Saldanha Bay. Ovigerous ♀♀ were taken mostly in March and April, but also in September.

Twelve specimens from off Cape Hangklip, 50 fathoms, are interesting because of their small size: ♂ (with appendix masculina as well as appendix interna) 27 mm., and ovig. ♀♀ 24–28 mm. They do not appear to differ in any other respect from the larger specimens.

They were taken in October, and the s.s. *Pieter Faure* log-book records the eggs as being green.

Parasites.—Two specimens of the Saldanha Bay lot have each a parasite of the genus *Faba* attached to the 1st abdominal sternite. The external part of the parasite is in the one case oval (2·5 mm. long), in the other kidney-shaped (7 mm. long); they are both attached by a four-pronged anchor embedded in the abdominal muscles of the host (fig. 128, *g*). (See Nierstrasz and Brandis, Proc. U.S. Nat. Mus., lxxvii, Art. 9, p. 1, 1930.) The systematic position of these parasites is doubtful, but provisionally they have been regarded as Epicaridean Isopods (see also *Leontocaris*).

Merhippolyte calmani Kemp & Sewell

Fig. 128, *h*.

1912. Kemp and Sewell, *l. c.*, p. 20, pl. 1, figs. 1–4.

1914. Kemp, *l. c.*, p. 88.

1939. Calman, John Murray Exp., vi, p. 209.

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 385.

Carapace smooth, no supra-orbital spine, antero-inferior corner subrectangular; 2 dorsal teeth behind orbit on post-rostral keel which is feeble and does not extend to hind margin, and one tooth on base of rostrum which is longer than carapace, curved upwards and rather deep proximally, dorsal margin in front of basal tooth quite smooth; lower margin with 9 (or 10) teeth, the proximal ones close together. Abdominal segments not keeled dorsally, 6th segment twice length of 5th in ♂, a little more in ♀; postero-inferior angle of 4th segment rounded, of 5th acute; 1st and 2nd sternites each with a pair of denticles in ♂, smooth in ♀. Telson subequal to 6th segment, with 2 pairs of dorso-lateral spinules. Cornea large, width equal to $\frac{1}{4}$ length of carapace (excl. rostrum), no ocellus. Lower margin of 2nd and 3rd joints of 1st leg not produced; inner surface of 5th joint (wrist) with a pit surrounded by strongly ctenate spines in both sexes. 2nd leg extending a little beyond apex of antennal scale (by about the length of its chela). Epipods on legs 1–4. Endopod of pleopod 1 ♂ as in *agulhasensis*.

Length (tip of telson to orbit) ♂ 60 mm., rostrum 22 mm.; ♀ 55 mm. (to orbit, rostrum broken). Red (s.s. *Pieter Faure* log-book).

Locality.—Off Cape Morgan, 250–320 fathoms (S. Afr. Mus.).

Distribution.—Indian Ocean (9° 14′ N., 75° 45′ E.), 237 fathoms; Maldives, 494 metres.

Remarks.—One ♂ and one ovig. ♀ were preserved as "samples" out of some 200 specimens (*fide* log-book) collected at the above locality by the s.s. *Pieter Faure*. Kemp and Sewell's original 2 specimens were both ♀♀, and smaller than the present specimens; Calman's 2 specimens were also ♀♀.

Gen. Alope White

1919. Stebbing, Ann. Durban Mus., ii, p. 121 (references).

1947. Holthuis, *l. c.*, p. 7.

No arthrobranchs on legs. Mandible with incisor process (in the genotype) or without (as in *australis*), with 3-jointed palp. Wrist of 2nd leg with 6–8 jointlets. Mxp. 3 with small exopod. Carapace smooth, supra-orbital spine large. No movable tooth at base of uropod. First leg and 3rd–5th legs rather stout.

Remarks.—Two species; the genotype is restricted to New Zealand.

Alope orientalis (de Man)

Fig. 129, *a*.

1890. de Man, Notes Leyden Mus., xii, p. 122, pl. 6, fig. 16 (*Hetairocaris o.*).

1919. Stebbing, *l. c.*, p. 121, pl. 19 (*australis*).

1921. *Id.*, Ann. Durban Mus., iii, p. 22, fig. 5 (mandible) (*australis*).

1927. Hale, Crust. S. Austral., pt. 1, p. 49, fig. 41 (*australis*).

1947. Holthuis, *l. c.*, p. 33.

Rostrum with (4) 5 dorsal teeth, 2 being post-orbital, no ventral teeth, tip not teaching end of basal joint of ant. 1; supra-orbital spine reaching to base of enlarged portion of eye-stalk. Lateral process of basal joint of ant. 1 not reaching far beyond apex of joint, usually distinctly shorter. A strong tooth-like projection between bases of 3rd and 4th legs, its hinder end flanked on each side by a setiferous spine; a forwardly directed bifurcate process between bases of 5th legs, much less developed in ♀ than in ♂. Abdominal segments dorsally rounded. Peduncles of pleopods L-shaped in cross-section (as in *Saron*); endopod of pleopod 1 in ♀ much larger than exopod, in ♂ slightly larger, with apex unequally bifid; appendix interna on pleopods 2–5 in both sexes, also appendix masculina on pleopod 2 ♂, pleopod 5 taking part in closing the brood chamber in ♀.

Length ovig. ♀ 24–32 mm. Pale greyish or creamy-white, with

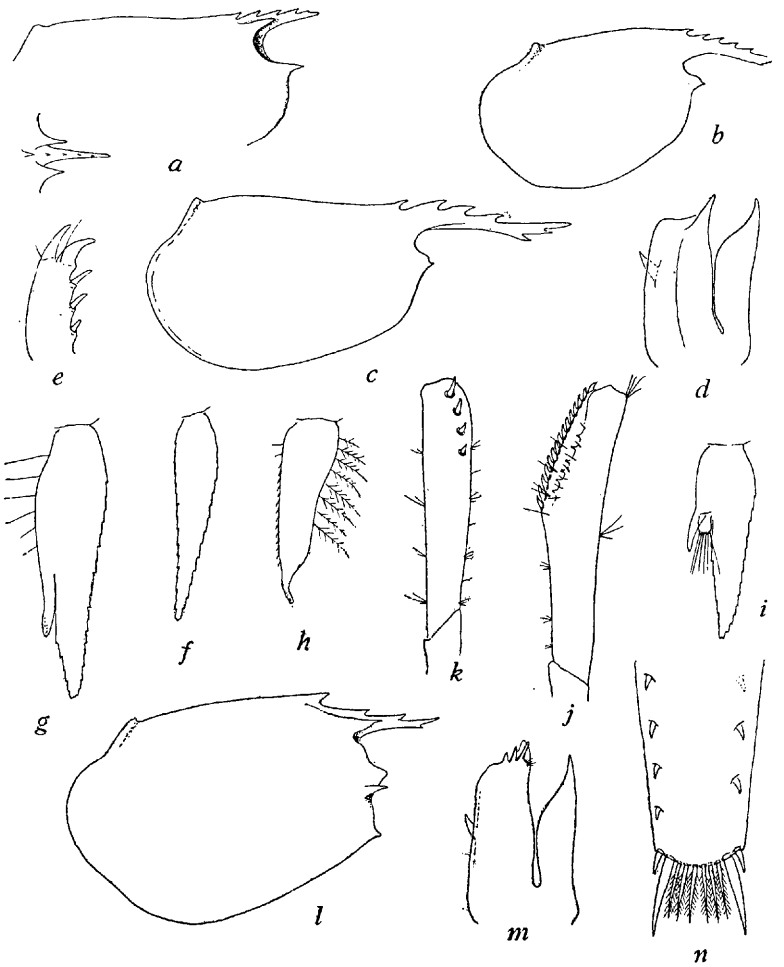


FIG. 129.—*Alope orientalis* (de Man). *a*, carapace, with dorsal view of base of rostrum.

Spirontocaris pax Stebb. *b*, carapace of allotype, False Bay.

Spirontocaris ctenifera n. sp. *c*, carapace. *d*, basal joint of ant. 1. *e*, dactyl of 3rd–5th legs. *f*, endopod of pleopod 1 ♀, setae omitted. *g*, endopod of pleopod 2 ♀, setae partly omitted. *h*, endopod of pleopod 1 ♂. *i*, endopod of pleopod 2 ♂, setae on endopod omitted. *j*, inner view of 4th joint of 3rd and 4th legs ♂. *k*, outer view of the same, ♀.

Spirontocaris saldanhae Brnrd. *l*, carapace. *m*, basal joint of ant. 1. *n*, telson, proximal spine on right side apparently torn out.

small red or brown spots nearly uniformly distributed, antennae white, legs banded with red, eyes black.

Localities.—Isezela, Natal (Stebbing); Durban (S. Afr. Mus.); Port St. Johns (coll. T. A. Stephenson); Impengazi, north of St. Lucia Bay (Coll. T. A. Stephenson).

Distribution.—Burma; Caroline Is.; west, south, and south-east Australia.

Remarks.—Stebbing's 1921 suggestion that a 5-dentate plate on the molar may be the incisor process is scarcely acceptable, as this process is on the innermost edge of the obliquely truncate apex of the mandible, not on the outermost edge (and nearest the palp) where the incisor process should be, and where there is in fact a small tubercle, not represented in Stebbing's figure.

Gen. Spirontocaris Bate

1904. Rathbun, Harriman Alaska Exp., x, p. 56.

1914. Kemp, Rec. Ind. Mus., x, p. 93, and p. 123 (Indo-Pacific species listed).

1915. Stebbing, Ann. S. Afr. Mus., xv, p. 91 (references).

1921. *Id.*, Ann. Durban Mus., iii, p. 19.

1936. Lebour, Proc. Zool. Soc. Lond., i, p. 89 (generic characters).

1940. *Id.*, J. Mar. Biol. Assoc. Plym., xxiv, p. 505 (larval stages).

1941. Hale, B.A.N.Z. Antarct. Res. Exp., B, iv, pt. 9, p. 267.

1947. Holthuis, *l. c.*, pp. 7, 36 (sens. strict.).

No arthrobranchs on legs. Mandible with incisor process usually small or reduced, palp 2-jointed. Wrist of 2nd leg with 6–7 jointlets. Mxp. 3 with or without exopod. Rostrum long or short, shallow or deep; supra-orbital spine, when present, not large. Telson with 4–6 pairs of dorso-lateral spinules. Gills 6 plus 4–6 epipods.

Remarks.—Holthuis agrees with certain Russian authors in dividing this genus into *Spirontocaris* s.s., *Eualus*, *Lebbeus*, and *Birula*. *Spirontocaris* s.s. has 2–4 supra-orbital spines; consequently the South African species are more strictly referable to *Eualus* and *Lebbeus*. Without expressing an opinion on this division, for which in practice there appears to be much to be said, I retain *Spirontocaris* sensu lato.

Key to the South African Species.

1. Without supra-orbital spine. Mxp. 3 with exopod . . (*Eualus*).
   a. Rostrum with 2 teeth ventrally.
      i. Basal joint of ant. 1 without tooth on lower inner margin. Epipods on 1st and 2nd legs . . *pax*.

ii. Basal joint of ant. 1 with tooth on lower inner margin (fig. 129, *d*). Epipods on 1st–3rd legs .	*ctenifera.*
b. Rostrum smooth ventrally	*makrognathus.*
2. With 1 supra-orbital spine on each side. Mxp. 3 without exopod (*Lebbeus*)	*saldanhae.*

Spirontocaris pax Stebb.

Fig. 129, *b*.

1915. Stebbing, *l. c.*, p. 91, pl. 24 (Crust., pl. 88).

1923. Odhner, Medd. Göteb. Mus., xxxi, p. 24.

Rostrum short, shallow, with 4 teeth above and 2 below in the type, 5 and 3 resp. in the allotype (Odhner also: 5 above). Carapace deep, antennal tooth well developed, no supra-orbital spine. Incisor process of mandible well developed. Abdomen dorsally rounded, 3rd segment not acutely produced. Epipod and small exopod on mxp. 3. Epipods on 1st and 2nd legs. Wrist of 2nd leg with 6 jointlets (in allotype basal jointlet obscurely divided). Legs 3–5 with apex of 5th joint overlapping base of 6th, dactyl with apical spine as well as unguis (or the distal spine much shorter than unguis). Telson in allotype with 4 pairs of dorso-lateral spinules (type: 6 on one side, 3 on the other).

Length ♀ 14·5 mm. (carapace 4 mm.); Odhner's ♀ 16 mm.

Localities.—False Bay, 20 and 30 fathoms (Stebbing); off Cape Barracouda, 72 metres (Odhner).

Remarks.—The type, probably dissected and mounted on a slide, is not in the South African Museum. I have seen only the allotype, an ovig. ♀, from which the number of epipods, not mentioned by Stebbing, has been determined. The mandible of the allotype resembles Stebbing's figure.

Spirontocaris ctenifera n. sp.

Fig. 129, *c–k*.

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 385 (cf. *pectinifera* Stmpsn.).

Carapace with antero-lateral corner rounded, no supra-orbital tooth, one post-orbital tooth, rostrum shorter than rest of carapace, straight, with 3 teeth above and 2 below. Lateral process of basal joint of ant. 1 as long as 1st joint, latter with strong tooth on lower inner margin, outer apices of 1st and 2nd joints and upper apex of 3rd joint

each with a spine. Mandible with small 2-jointed palp. Mxp. 3 not (proportionately) larger in ♂ than in ♀, with exopod and epipod, exopod about half length of the antepenultimate joint. Finger and thumb of 1st chela nearly meeting throughout their length. Wrist of 2nd leg with 7 jointlets. 4th joint of 3rd and 4th legs in ♂ somewhat fusiformly expanded, with a comb-like series of close-set short stout spines on distal half of lower outer (posterior) margin, and on the inner surface with a series of small papilla-like denticles; in ♀ not expanded, with 4 graduated stout spines distally on outer (posterior) surface; 4th joint in 5th leg without spines. Dactyls of 3rd–5th legs with 4 spines in addition to unguis, the most distal one stouter than the unguis. Epipods (mastigobranchs) on 1st, 2nd, and 3rd legs (and setobranch on 4th leg). Appendix interna on pleopods 2–5 in ♀ arising about midway along endopod; appendix masculina on pleopod 2 ♂ very short, with long setae on truncate apex; endopod of pleopod 1 ♂ lanceolate, with spaced plumose setae on inner margin, small spinules on outer margin, and coupling-hooks on the narrowed apex. Telson with 4 pairs of dorso-lateral spinules, 3 unequal pairs on apex.

Length ♀ up to 14 mm., ♂ smaller.

Localities.—Algoa Bay (S. Afr. Mus. 2 ovig., 2 non-ovig. ♀♀, 2 ♂♂); Durban (S. Afr. Mus. 1 ovig. ♀).

Remarks.—These small specimens were at once conspicuous for the remarkable comb-like structure on the 3rd and 4th legs of the ♂, similar to that of *cranchii* and *occulta* (see Lebour, *l. c.*, 1936, pp. 93, 96, pl. 5, figs. 1–6). They differ from *occulta* in having an epipod (mastigobranch) on 3rd leg and setobranch on 4th leg, and 2 ventral teeth on rostrum.

These specimens were (1947) provisionally assigned to *pectinifera* Stmpsn. on the assumption that the specific name referred to the pectination on the 4th joint of 3rd and 4th legs. Neither Stimpson's (1860, Proc. Ac. Nat. Sci. Philad., p. 35) nor Balss' (1914, Abh. Bayer. Ak. Wiss., II Suppl. Bd., pt. 2, p. 42) papers were available. From Holthuis' Siboga Report (p. 37), however, it appears that *pectinifera* is a species of *Spirontocaris* s.s. with supra-orbital spines, and that the specific name refers to the pectinate lateral margins of the abdominal pleurae.

From Rathbun's synopsis (1904, Harriman Alaska Exp., x, p. 60) the only species with which the present specimens are comparable are *pusiola*, *herdmani*, *stoneyi*, *avina*, and *macilenta*. The shape of the rostrum excludes the last three; *herdmani* is known from the west

coast of North America, but *pusiola* is a North Atlantic species recorded as far south as Spain.

No description of *pusiola* is available to me, and Lebour did not compare *occulta* with *pusiola*. I therefore describe these specimens as a new species. Perhaps further material will show that it is synonymous with *makrognathus*, inadequately described from a single ♀ which may possibly have been abnormal in having no ventral teeth on the rostrum. The armature of the telson, however, differs.

The ovig. ♀ from Durban has 4 dorsal teeth on rostrum (in addition to the post-rostral one). Otherwise it agrees with the other specimens. One ovig. ♀ from the Natal coast, 40 fathoms, has rostral formula $\frac{4}{1}$, one of the dorsal teeth post-rostral, no supra-orbital tooth, wrist of 2nd leg with 6 jointlets, and other characters as given above.

Spirontocaris makrognathus Stebb.

1921. Stebbing, *l. c.*, p. 19, pl. 4.

Rostrum short, shallow, with 5 teeth dorsally, smooth ventrally, no supra-orbital tooth. Mandible with palp (? 2-jointed), incisor process ?. Mxp. 3 with small exopod, ? epipod. Epipods on legs ?, wrist of 2nd leg with 7 jointlets. Dactyls of legs 3–5 with unguis only. Telson with 2 pairs of dorso-lateral spinules, and only 1 pair of small apical spines.

Length of carapace 13 mm.

Locality.—Durban (Stebbing).

Spirontocaris saldanhae Brnrd.

Fig. 129, *l–n*.

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 385.

♀. Carapace with small point at antero-inferior corner; supra-orbital tooth strong; one post-rostral tooth, preceded by 2 on the short shallow rostrum, which reaches to end of eyes and about half-way along antennal scale; apex acute, one ventral tooth a little distance from it. Lateral process of basal joint of ant. 1 as long as basal joint, latter with 3 spines on upper distal margin, and a tooth on lower inner margin; outer apices of 2nd and 3rd joints each with a spine; outer flagellum stout, setose. Mandible with 2-jointed palp. Mxp. 3 extending well beyond end of antennal scale, without exopod, with epipod. 1st leg extending to or slightly beyond end of antennal scale, finger and thumb meeting throughout their length. Wrist of 2nd leg

with 7 jointlets. 4th joint of 3rd–5th legs without spines; apex of 6th joint of 5th leg with brush of spines; dactyls with 6 spines, the apical one not stouter than unguis. Epipods (mastigobranchs) on 1st–3rd legs, setobranch on 4th leg. Telson with 4 spines on left, and 2 (3) on right side, a short and a long spine at each corner, apical margin evenly convex, with 6 plumose spines between, and shorter than, the large lateral ones.

Length 23 mm.

Locality.—Off Constable Hill, Saldanha Bay, 145 fathoms (S. Afr. Mus).

Remarks.—Differs from *occulta* Lebour 1936 (which has 7 jointlets in wrist of 2nd leg) in having a supra-orbital tooth and a mastigobranch on 3rd leg (with setobranch on 4th), as well as its larger size. The telson also is unusual.

Appears to belong to *Lebbeus* White, if this genus is separated from *Spirontocaris* s. l., and to the third group of species mentioned by Holthuis (1947, *l. c.*, p. 38).

Gen. Leontocaris Stebb.

1905. Stebbing, Mar. Invest. S. Afr., iv, p. 98.

1910. *Id.*, *l. c.*, p. 391.

No arthrobranchs on legs. Mandible with incisor process and small 1-jointed palp. Mxp. 3 without exopod or epipod. Epipods present only on mxp. 1 and 2. Rostrum long. No supra-orbital spine. 1st legs very slender, 5th joint elongate. 2nd legs strongly asymmetrical, in one of them the 6th joint elongate and robust, dactyl enlarged, chopper-shaped, wrist in both with 4-jointlets. Gills 6 plus 2 epipods.

Remarks.—One species in South Africa, one species in the Irish Sea.

Leontocaris paulsoni Stebb.

Fig. 130, *a–c*.

1905. Stebbing, *l. c.*, p. 99, pl. 26.

1910. *Id.*, *l. c.*, p. 391.

Carapace smooth, with sharp antennular angle and a conspicuous buttressed antennal spine; dorsally 6 teeth, of which 2 post-rostral and separated by a distinct gap from the 4 rostral ones, apex of rostrum tridentate, 6–8 teeth on ventral margin. Abdominal segments

dorsally rounded, 3rd produced in a sharp downwardly curved tooth; segments 5 and 6 each with a spiniform tooth above the rounded postero-inferior corner. Telson rather flattened, with 7 pairs of lateral

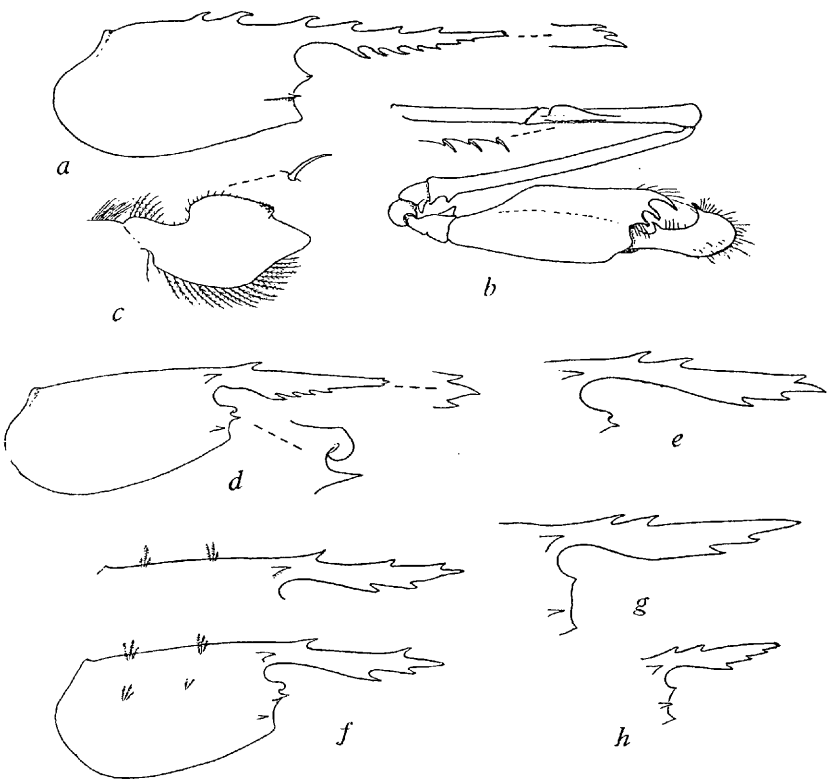


FIG. 130.—*Leontocaris paulsoni* Stebb. *a*, carapace, with tip of rostrum further enlarged. *b*, inner view of 2nd leg (3rd joint onwards). *c*, endopod of pleopod 1 ♂.
Hippolyte kraussiana (Stimpson). *d*, carapace with apex of rostrum and sub-orbital process further enlarged (Knysna). *e*, rostrum of juv. 13 mm. long (Knysna). *f*, carapace (Still Bay), with dorsal profile and rostrum of a Knysna specimen.
Hippolyte ventricosa M. Edw. *g*, rostrum, after Kemp. *h*, rostrum, after Hilgendorf (*mossambicus*).

spinules, and an apical pair. Cornea small, not wider than stalk. Outer margin of antennal scale serrate in distal half, apical spine scarcely extending as far as lameller tip. Mxp. 2 with lobate epipod (cf. *L. lar* Kemp, 1910, p. 114). Second pair of legs asymmetrical, the enlarged one being either the right or the left (48 and 52 per cent. resp.), the normal-shaped one with 4th joint only a little

longer than 3rd (Stebbing's figure is not quite accurate, as Kemp 1910 suggested); 4th joint of the enlarged leg with a keel and some fine serrations on inner surface proximally (Stebbing said "grooved"), 6th joint folding internally (medianly) to the long basal jointlet of 5th joint, its upper margin keel-like, ending in the 3-pronged thumb, finger chopper- (or bill-hook) shaped. Dactyl of 3rd–5th legs short (scarcely, as Stebbing said, "very small"), curved, setose. Pleopod 1 ♂ with endopod broadly oval, excavate proximally on inner margin, which is bordered with simple spine-setae, and farther distally a group of coupling-hooks. Outer margin of outer ramus of uropod serrate in distal half.

Length up to 46 mm. Smallest ovig. ♀ 28 mm. Pink or reddish.

Localities.—Off Cape Peninsula, 131 fathoms (Stebbing); off Cape Peninsula and off Saldanha Bay, 131–145 fathoms (S. Afr. Mus.).

Remarks.—Ovigerous ♀♀ were caught in March and April.

The epipod on mxp. 2, which Stebbing did not mention, is much more lobate than in Kemp's figure of *lar* (1910, pl. 17, fig. 8), and, as Kemp suggested, probably forms a functional podobranch.

Parasites.—Two of the specimens caught off Saldanha Bay carry parasites of the genus *Faba*, like those found on *Merhippolyte agulhasensis* (*q.v.*); one of the specimens has one parasite attached to the 1st abdominal sternite, the other has two parasites attached to the body-wall (both on same side) above the gills within the branchial cavity.

Gen. Hippolyte Leach

1910. Kemp, Fish. Irel. Sci. Invest. [1908], i, p. 100.

1910, Stebbing, *l. c.*, p. 390.

1914. *Id.*, Trans. Roy. Soc. Edin., 50, p. 289.

1914. Kemp, Rec. Ind. Mus., x, p. 95, and p. 125 (Indo-Pacific species).

1936. Gurney, Proc. Zool. Soc. Lond., i, p. 25.

1947. Holthuis, *l. c.*, pp. 14, 53.

No arthrobranchs on legs. Mandible with incisor process and molar, but no palp. Mxp. 3 with exopod, but no epipod. Epipods present on mxp. 1 and 2 only. Rostrum long. Supra-orbital spine present. Lateral process of basal joint of ant. 1 acute; 3rd peduncular joint normal (*i.e.* without movable plate). Chela of 1st leg rather short and stout. Wrist of 2nd legs with 3 jointlets. 3rd–5th legs in ♂ subprehensile, the 6th joint expanded in the middle. Telson with 2 pairs of dorso-lateral spinules. Gills 5 plus 2 epipods.

Key to the South African Species.

1. Apex of rostrum tridentate	*kraussiana.*
2. Apex of rostrum acuminate	*ventricosa.*

Hippolyte kraussiana (Stimpson)

Fig. 130, *d–f.*

? 1843. Krauss, Südafrik. Crust., p. 56 (*ensifera*, non M. Edw.).

1910. Stebbing, *l. c.*, pp. 390 (*ensifera*), 391.

1914. Lenz in Lenz and Strunck, D. Südpol Exp., xv, p. 319, pl. 20, figs. 1–4 (*Virbius capensis*).

1915. Stebbing, Ann. S. Afr. Mus., xv, p. 89 (*kraussianus*).

Carapace smooth, glabrous, supra-orbital tooth strong, suborbital margin produced in a rounded knob above the antennal tooth, a conspicuous submarginal pterygostomial tooth; rostrum in adult reaching to end of antennal scale, with 1 or 2 teeth above proximally, 4 or 5 teeth below, and a tridentate apex; in juv. reaching not quite to end of scale, with 2 teeth above and 1 below, with tridentate apex (Stebbing did not mention the number of dorsal teeth in 13 mm. juv., but his specimen and another of same size both have 2). Abdominal segments dorsally rounded, 3rd segment distinctly gibbous but not produced, 6th segment $1\frac{1}{2}$ times as long as deep; a small tuft of setae just in front of the rounded-quadrate postero-inferior corner of 5th segment (if setae matted together they may look like a spine). Telson with 2 pairs of dorso-lateral spinules, and 3 graduated pairs on truncate apex. Lateral process of basal joint of ant. 1 extending to end of basal joint, which has no outer distal spine; outer flagellum with 10–12 thick joints and 2 slender distal joints. Antennal scale about $3\frac{1}{2}$ times as long as broad, lamellar apex reaching far beyond spine on outer margin. Wrist of 2nd leg with 1st jointlet equal to 2nd plus 3rd (Stebbing), but usually 1st and 3rd subequal, 2nd shorter, distinctly longer than broad. 3rd–5th legs decreasing in length, in adult the *posterior* surface of 4th joint on 3rd and 4th legs with 4 (3–5) stout spines, on 5th leg with 1 distally, 5th joint in all three legs with 1 spine proximally; dactyl with 8–9 spines (5–6 in juv.) on inner margin in addition to the apical spine and unguis. Adult ♂ not seen.

Length up to 32 mm.

Localities.—Simon's Bay (Stimpson; Lenz); Knysna and East London (Stebbing); Still Bay (S. Afr. Mus.); False Bay (Univ. Cape Town Ecolog. Surv.).

Remarks.—The above description is based on 7 specimens (2 returned by Stebbing).

Although there is little doubt that *V. capensis* Lenz is the same species, Lenz said the "lower orbital margin" was produced in a tooth as in *H. varians*; but his figure shows only a single tooth, whereas in *varians* (Kemp, *l. c.*, 1910, pl. 13, fig. 1) there are 2 *sharp* teeth, the upper one corresponding with the distinctive *rounded* process of the present specimens.

Neither Stebbing nor Lenz refer to the stout spines on the 4th (and 5th) joints of 3rd–5th legs. As these are inserted on the flat surface, not on the margin of the limb (as it usually lies when detached from the animal), they are easily overlooked unless the limb be turned to get a surface view. I could not trace them in the two juveniles (13 mm.), so possibly Lenz's single specimen was also young.

The identity of Krauss' specimens is beyond conjecture; if they are still in existence they should be re-examined. *H. ensiferus* M. Edw. is the genotype of *Latreutes* (*v. infra*).

There are also in the South African Museum 20 specimens from Still Bay, mostly ovig. ♀♀. The largest ovig. ♀ is only 18 mm. in length. The rostral formula varies, *e.g.* $\frac{2}{0}$, $\frac{1}{1}$, $\frac{2}{2}$ (8 specimens), $\frac{2}{6}$, $\frac{4}{4}$ etc. The number of specimens with dorsal teeth 1, 2, 3, 4 is resp. 1, 15, 3, 1; and that of specimens with ventral teeth 0, 1, 2, 3, 4, 5, 6 is resp. 1, 3, 9, 5, 1, 1, 1. Other characters are in agreement with the above description of *kraussiana*, including the spines on 4th and 5th joints of 3rd–5th legs; the proportions of the jointlets in the wrist of 2nd leg are, mostly, as given by Stebbing (1st ≡ 2rd + 3rd).

In two respects, however, these specimens differ. The lateral process of basal joint of ant. 1 extends only half-way, or at most $\frac{2}{3}$, along the basal joint; outer flagellum with 6–8 thick and 2–3 thin joints. There are little tufts of 2–3 plumose setae on the carapace and abdomen; they vary in position, but usually there are 2 dorso-lateral pairs and 1 lateral pair on carapace (fig. 130,*f*), and dorso-lateral pairs on each abdominal segment, also ventro-laterally on 5th segment, a median tuft at base of telson, and one at its apex.

Such plumose setae are figured by Paulson (Red Sea Crust., pl. 18, fig. 1) for his *Virbius proteus* (? = *H. orientalis* Heller; see Kemp, *l. c.*, p. 97, and Gurney, Trans. Zool. Soc. Lond., 1927, p. 394). Where present they are very conspicuous, and one would have expected Stebbing, or Lenz, or Kemp (1914, for *ventricosa*) to have remarked upon them.

It would appear, however, that they cannot be used as a specific

character. The above described specimens from Knysna showed no traces of them, even on 5th abdominal segment where they might perhaps have escaped abrasion. On the other hand, two specimens recently received from Knysna (amongst Zostera, green when alive) have plumose setae on the carapace, and a short basal process on ant. 1.

Lastly, I have seen a few specimens, collected by the University of Cape Town Ecological Survey in False Bay (near Stimpson's locality), with moderately short basal process of ant. 1, and the smaller number of thick joints in outer flagellum (8, sometimes 9), some of which (♀♀) have the tufts of plumose setae and some (♀♀ and ♂♂) have not. The rostrum has 2 basal dorsal teeth as described by Stimpson (*cf.* fig. 130, *e*).

Evidently far more material of these small shrimps is required, as Kemp says, before the species can be satisfactorily defined.

It may be noted that *proteus* also has a short basal process on ant. 1.

Hippolyte ventricosa M. Edw.

Fig. 130, *g*, *h*.

1837. Milne Edwards, Hist. Nat. Crust., ii, p. 371.

1861. Heller, SB. Ak. Wiss. Wien, xliii, p. 277 (*orientalis*).

1878. Hilgendorf, MB. Ak. Wiss. Berlin, p. 836, pl. 4, fig. 1 (*Virbius mossambicus*).

1914. Kemp, *l. c.*, p. 96, pl. 2, figs. 1–3 (*ventricosus*).

1916. *Id.*, Rec. Ind. Mus., xii, p. 391.

1927. Gurney, Trans. Zool. Soc. Lond., xxii, p. 391, figs. 94, 95 (rostrum, ant. 1).

1947. Holthuis, *l. c.*, p. 55, figs. 7–9.

Rostrum with 1 or 2 dorsal teeth, 2–3 ventral teeth, apex acuminate. Suborbital margin produced above the antennal spine in Holthuis' figure, but seemingly not so in Kemp's figure. 3rd abdominal segment gibbous but not produced, 6th segment $1\frac{1}{2}$ times as long as deep. Antennal scale not more than 3 times as long as wide (Kemp). 1st joint of ant. 1 with outer distal spine; outer flagellum with 11 thick joints, 6 slender joints. Wrist of 2nd leg with 1st jointlet the longest, 2nd as broad as long, 3rd not as long as 1st (Kemp) or almost as long (Hilgendorf); dactylus of 3rd leg with 16 spines. Telson with 8 apical spines.

Length up to 24 mm.

Locality.—Zambesi (Hilgendorf).

Distribution.—Red Sea, Southern India and Andaman Is., East Indies; Suez Canal; Australia.

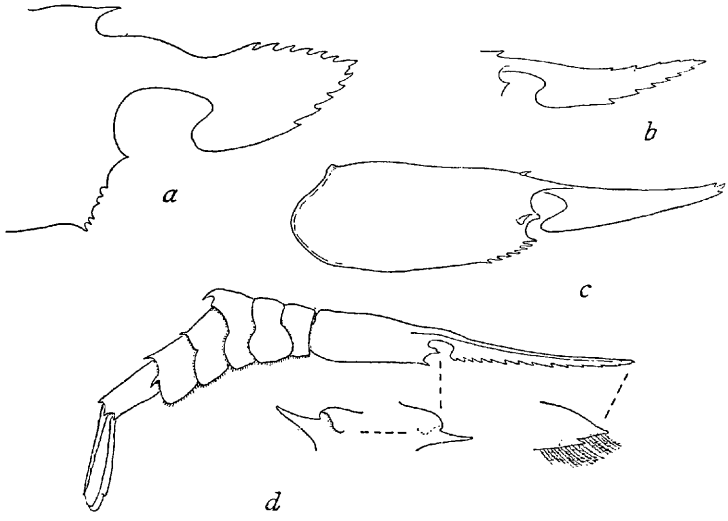


FIG. 131.—*Latreutes mucronatus* (Stimpson). *a*, anterior part of carapace, with rostrum, ♀, after Lenz (*natalensis*). *b*, rostrum of ♂, after Kemp.
Latreutes pygmaeus Nob. *c*, carapace of ♀.
Angasia armata (Paulson). *d*, whole animal ♀, with apex of rostrum, and outer and inner views of suborbital process further enlarged.

Remarks.—Kemp identified Hilgendorf's species with M. Edwards'. The locality is probably near the mouth of the river.

Kemp's figure shows no projection of the suborbital margin above the antennal spine; Hilgendorf's figure is too small to be reliable.

Gen. LATREUTES Stimpson

1914. Kemp, Rec. Ind. Mus., x, p. 98, and p. 125 (list of Indo-Pacific species).

1916. *Id.*, *ibid.*, xii, p. 396.

1936. Gurney, Proc. Zool. Soc. Lond., 1935, pt. 4, p. 792, pl. 6, figs. 37–41 (larval form).

1937. *Id.*, "Discovery" Rep., xiv, p. 398 (larval form).

1947. Holthuis, *l. c.*, pp. 16, 59.

No arthrobranchs on legs. Mandible without incisor process and without palp. Mxp. 3 with exopod. Epipods present on at least the first 3 pairs of legs. Rostrum rather long, usually deep, often very

deep, especially in ♀, with a "heel" posteriorly. No supra-orbital spine. Antero-lateral margin of carapace serrate. Lateral process of basal joint of ant. 1 anteriorly rounded. Wrist of 2nd leg with 3 jointlets.

Remarks.—The species are mostly based on the character of the rostrum, which, however, is even more variable than in *Hippolyte* or *Spirontocaris* (Kemp).

Key to the South African Species.

1. Body stout. 2nd legs reaching beyond eyes to apex of rostrum . . . . . *mucronatus.*
2. Body very slender. 2nd legs not reaching end of eyes . *pygmaeus.*

Latreutes mucronatus (Stimpson)

Fig. 131, *a*, *b*.

1914. Kemp, *l. c.*, p. 101, pl. 3, figs. 8–15, pl. 4, figs. 1, 2 (synonymy).

1914. Lenz in Lenz and Strunck, D. Südpol Exp., xv, p. 320, pl. 21, figs. 1–11 (*natalensis*).

1916. Kemp, *l. c.*, p. 396.

1921. Balss, K. Sv. Vet. Ak. Handl., lxi, no. 10, p. 10.

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 385.

Body rather stout. Carapace smooth with 1 post-rostral fixed tooth (rarely 3–4). Rostrum (measured from hind margin of orbit) 1½–2 times as long as greatest depth in ♀, 2½–4 times in ♂; dorsal teeth 7–15 in ♀, 4–8 in ♂, ventral teeth 4–15 in ♀, 0–9 in ♂ (Kemp); antero-lateral margin of carapace with 11–14 serrations in ♀, 6–7 in ♂. Upper flagellum of ant. 1 longer and thicker in ♂ than in ♀, 1st peduncular joint twice as long as wide. Antennal scale narrower proportionately to length in ♂ than in ♀, but not more than 4½ times as long as wide. 2nd legs reaching about to end of rostrum, wrist with 1st and 3rd jointlets subequal, each about half length of 2nd. Dactyls of 3rd–5th legs spinose on inner margin. Epipods on first 4 legs (Kemp, pl. 4, fig. 1). Telson with 2 pairs of dorsal spinules, and 2 unequal spines on either side of the abruptly narrowed apex.

Length up to 135 mm.

Locality.—Durban, surface (Lenz).

Distribution.—Red Sea, south-east coast of Arabia, Southern India, Andaman Is., East Indies, N.W. Australia, China and Japan.

Remarks.—In view of Kemp's demonstration of the variability of this species, I consider *natalensis* Lenz an obvious synonym.

Latreutes pygmaeus Nob.

Fig. 131, *c*.

1904. Nobili, Bull. Mus. d'Hist. Nat. Paris, p. 230.

1906. *Id.*, Bull. Sci. Fr. Belg., xl, p. 37, pl. 3, fig. 4, *a–h*.

1914. Kemp, *l. c.*, p. 99, pl. 2, figs. 7, 8, pl. 3, figs. 1–7.

1916. *Id.*, *l. c.*, p. 396.

1921. Balss, K. Sv. Vet. Ak. Handl., lxi, no. 10, p. 10.

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 385.

Body very slender. Carapace with 1 movable post-rostral spine; antero-lateral margin with 4–6 or 7 serrations; a movable spine behind the orbital tooth. Rostrum with tridentate apex; according to Kemp either wholly unarmed, or with 1–3 dorsal and 1–3 ventral denticles, all in the distal third. Basal joint of ant. 1 three times as long as wide. Antennal scale very narrow, at least six times as long as wide. 2nd legs not reaching to end of eyes; middle jointlet of wrist the longest, 3rd the shortest. Dactyls of 3rd–5th legs spinose on inner margin. Epipods on first 4 legs. Telson as in *mucronatus*.

Length up to 22 mm.

Locality.—Delagoa Bay (coll. C. J. van der Horst, 1933, 1 ovig. ♀).

Distribution.—Red Sea, south-east coast of Arabia, Southern India, Andaman Is., N.W. Australia.

Remarks.—The movable spine behind the orbital tooth is not represented in Kemp's figure; it is not mentioned in Nobili's original diagnosis (1904), but I have not seen his two 1906 papers. In other respects there is complete agreement between the present specimen and the description.

Gen. Angasia Bate

1860. Stimpson, Proc. Ac. Nat. Sci. Philad., p. 26 (*Tozeuma* [sic], etym. τοξευμα).

1864. Bate, Proc. Zool. Soc. Lond., 1863, p. 498 (*Angasia*) (date of public.: *fide* Neave's Nomenclator).

1904. Baker, Trans. Roy. Soc. S. Austral., xxviii, p. 147 (*Angasia*).

1914. Kemp, Rec. Ind. Mus., x, p. 105, and p. 126 (list of Indo-Pacific species) (*Tozeuma*).

1927. Stephensen, Vid. Medd. Dansk naturf. For., lxxxiii, p. 296 (key to species) (*Tozeuma*).

1927. Hale, S. Austral. Crust., pt. i, p. 52 (*Tozeuma*).

1937. Gurney, "Discovery" Rep., xiv, p. 377 (*Tozeuma*, larval stages).

1947. Holthuis, *l. c.*, pp. 17, 61.

No arthrobranchs on legs. Mandible without incisor process, without palp. Mxp. 3 without exopod. No epipods on legs. Body slender. Rostrum elongate. No supra-orbital spine (according to Nobili *erythraeum* has one); antennal spine present and antero-lateral angle of carapace spiniform. Lateral process of basal joint of ant. 1 acute; upper flagellum uniramous. Wrist of 2nd leg with 3 jointlets.

Remarks.—It would seem that, because Stimpson unfortunately gave the derivation of his generic name, the spelling *Tozeuma* must be regarded as a printer's error; the correct spelling should have been *Toxeuma*. And, as Henderson and Kemp point out, this means the adoption of Bate's generic name, as *Toxeuma* is preoccupied by Walker, 1833.

A. pavonina Bate and other South Australian species are very brilliantly coloured.

Angasia armata (Paulson)

Fig. 131, *d*.

1875. Paulson, Red Sea Crust., p. 99, pl. 15, fig. 2, *a–o* (*Tozeuma a.*).

1893. Henderson, Trans. Linn. Soc. Lond., v, p. 437, pl. 40, figs. 18–20 (*A. stimpsonii*).

1906. Nobili, Ann. Sci. Nat. zool. Paris (9), iv, p. 42.

1914. Kemp, *l. c.*, p. 106 (*Tozeuma a.*).

1916. *Id.*, Rec. Ind. Mus., xii, p. 399, fig. 4 (late larval stage) (*Tozeuma a.*)

1917. Borradaile, Trans. Linn. Soc. Lond., 2nd ser. zool., xvii, p. 402 (*Tozeuma a.*).

1927. Stephensen, *l. c.*, p. 297 (*Tozeuma a.*).

1947. Holthuis, *l. c.*, p. 61, figs. 10, 11.

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 386.

Rostrum about as long as carapace plus first 3 abdominal segments, smooth above, with 14 (Kemp: 20–24) teeth enveloped in plumose setae on ventral margin. Abdomen strongly bent, 1st and 2nd segments feebly keeled, 3rd strongly keeled and ending in an uncinate tooth, 4th and 5th keeled and ending in acute points, a lateral acute tooth on 5th segment, 6th segment with a medio-dorsal, a lateral, and a postero-inferior tooth. Telson longer than 6th segment, with 3 pairs of dorso-lateral spines, apex subacute (bifid in Paulson's figure). Antennal scale half length of rostrum, 6–7 times as long as wide. Wrist of 2nd leg with 1st jointlet distinctly longer than 3rd, which is a little longer than 2nd. 3rd–5th legs with a slender subapical

spine on lower margin of 4th joint, lower margin of 6th joint with 6–7 spines (each accompanied by a seta or two), dactyls with 4–5 teeth, increasing in size distally.

Length ovig. ♀ (tip of telson to orbit) 42 mm., rostrum 20 mm. (Kemp: 77 mm.).

Locality.—Delagoa Bay (S. Afr. Mus., ex Gilchrist's Survey).

Distribution.—Red Sea, Burma, Andaman Is., Ceylon, Maldives, Seychelles and Cargados Carajos Archipelago; East Indies; Japan.

Gen. Hippolysmata Stimpson

1914. Kemp, Rec. Ind. Mus., x, pp. 112 (key to Indian species), 128 (list of Indo-Pacific species).

1915. Stebbing, Ann. S. Afr. Mus., xv, p. 94 (*Exhippolysmata*).

1916. Kemp, Rec. Ind. Mus., xii, p. 401.

1919. Stebbing, Ann. Durban Mus., ii, p. 119.

1921. *Id.*, *ibid.*, iii, p. 20.

1933. Balss, Mitt. Zool. Mus. Berlin, xix, p. 85.

1935. Gordon, J. Linn. Soc. Lond., xxxix, p. 319 (importance of mouth-parts).

1947. Holthuis, *l. c.*, pp. 19, 67.

No arthrobranchs on legs. Mandible without incisor process or palp. Mxp. 3 with exopod and epipod. Epipods, sometimes rudimentary, on first 4 legs. Rostrum shorter or longer than rest of carapace, slender. No supra-orbital spine, pterygostomial spine present, or reduced, or absent. Lateral process of basal joint of ant. 1 acute; upper flagellum (*i.e.* the shorter, thicker one) uniramous (in *Lysmata* biramous). Wrist of 2nd leg with more than 10 jointlets. Gills 6 plus 2 epipods (4 more or less rudimentary).

Remarks.—Kemp (1916) was disinclined to concede full generic rank to *Exhippolysmata*, and thought that *Lysmatella* Borrad. 1915 should also be included in *Hippolysmata*. Balss (1933) wished to retain *Exhippolysmata* as a genus. Holthuis (1947) adopts the former arrangement.

There is need of much more collecting of these small shrimps and revision of the material. Stebbing described two n. spp. from Natal, but further material seems to show that these two forms differ in exactly the characters which Kemp (1914) pointed out as separating *kükenthali* and *vittata*, and should be identified with these latter species. As regards one of Stebbing's species (*marleyi*) Holthuis has come to the same conclusion.

Key to the South African Species.

1. Rostrum shorter than carapace. Telson apically blunt (*Hippolysmata*).
   a. Antero-lateral angle of carapace with a small spine. Lateral process of basal joint of ant. 1 scarcely half length of basal joint . . . . . *vittata.*
   b. Antero-lateral corner of carapace without spine. Lateral process of basal joint of ant. 1 as long as basal joint . . . . . *kükenthali.*
2. Rostrum longer than carapace. Telson tapering to a fine point (*Exhippolysmata*) . . . . . *tugelae.*

Hippolysmata vittata Stimpson

Fig. 132, *a–c.*

1860. Stimpson, Proc. Ac. Nat. Sci. Philad., p. 26.

1888. Bate, Rep. H.M.S. *Challenger*, xxiv, p. 608, pl. 110, fig. 1 (*Nauticaris unirecedens*).

1907. de Man, Trans. Linn. Soc. Lond. (2), ix, p. 423, pl. 33, figs. 49, 50.

1914. Kemp, *l. c.*, p. 113, pl. 6, figs. 6–10.

1921. Stebbing, *l. c.*, p. 20, pl. 5 (*durbanensis*).

1947. Holthuis, *l. c.*, p. 67.

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 386.

Carapace with small spine at antero-lateral corner; one (or 2) post-rostral teeth, the rostrum proper with 5–9 (usually 6–8) teeth above, and 2–6 (usually 4–5) below; rostrum shorter than rest of carapace, nearly straight. Lateral process of basal joint of ant. 1 scarcely half length of basal joint, latter without tooth on lower inner margin. Finger and thumb of 1st chela meeting only at their tips. Wrist of 2nd leg with 15–24 jointlets. 4th joint of 3rd and 4th legs with 4–5 spines on outer (posterior) surface, extending along whole length of joint, of 5th leg without spines. Dactyls of 3rd–5th legs with 2–5 spines in addition to the apical unguis. Apex of telson with 2 unequal pairs of spines (the larger probably broken off in Stebbing's specimen).

Length up to 34 mm. Translucent with narrow longitudinal red stripes on carapace and abdomen, a transverse band on 1st and on 4th abdominal segments dorsally, telson and inner ramus of uropod with red stripes, eggs pale green (Kemp). A specimen in the South African Museum is stated by the collector to have had red longitudinal lines, but no transverse bands.

Locality.—Durban (Stebbing, and S. Afr. Mus.).

Distribution.—Red Sea, Persian Gulf, India, Andaman Is., East Indies, to Japan.

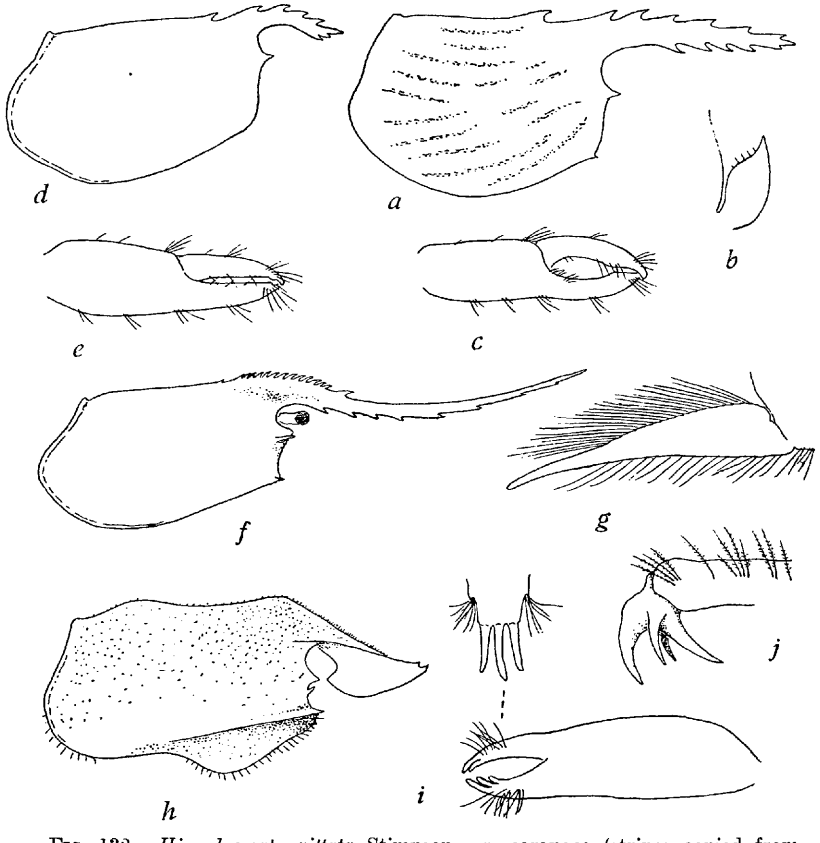


FIG. 132.—*Hippolysmata vittata* Stimpson. *a*, carapace (stripes copied from Stebbing's figure of *durbanensis*). *b*, lateral process of basal joint of ant. 1. *c*, chela of 1st leg.

Hippolysmata kükenthali (de Man). *d*, carapace. *e*, chela of 1st leg.

Hippolysmata (*Exhippolysmata*) *tugelae* Stebb. *f*, carapace. *g*, endopod of pleopod 1 (♂ and ♀), setae actually plumose.

Gelastocaris paronae (Nob.). *h*, carapace, lower border drawn as if pulled out, normally bent under lateral ridge. *i*, chela of 1st leg, with apex of finger further enlarged. *j*, dactyl, and apex of 6th joint of 3rd–5th legs.

Remarks.—Endopod of mxp. 1 is not quite like Gordon's figure (*l. c.*, fig. 11, *d*). as the ultimate joint is not more than half the length of the penultimate; the latter has a few plumose setae on inner surface.

Hippolysmata kükenthali (de Man)

Fig. 132, *d*, *e*.

1902. de Man, Abh. Senckenberg. Ges., xxv, p. 850 (*Hippolyte k.*), and p. 849, pl. 26, fig. 56 (as *Merhippolyte orientalis* Bate ?).

1914. Kemp, *l. c.*, p. 115, pl. 6, fig. 11 (chela) (references).

1919. Stebbing, *l. c.*, p. 120, pl. 18 (*marleyi*).

1921. *Id.*, *l. c.*, p. 22 (*marleyi*).

1947. Holthuis, *l. c.*, p. 69.

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 386.

Carapace with antero-lateral corner rounded; one post-rostral tooth, rostrum more or less curved, with 4–6 teeth above, 1–3 below. Lateral process of basal joint of ant. 1 as long as basal joint, latter without tooth on lower inner margin. Finger and thumb of 1st chela meeting throughout their length. Wrist of 2nd leg with 19–21 jointlets. 4th joint of 3rd and 4th legs (♀) with 2 slender adpressed spines on outer surface distally, 5th leg without spines. Dactyls of 3rd–5th legs, and telson as in *vittata*.

Length up to 32 mm. "Golden-brown on white with irregular lines and curves" (Stebbing: *marleyi*). Broadly banded transversely with bright red (Kemp, and S. Afr. Mus. specimen).

Localities.—Isezela, Natal (Stebbing); Durban and Delagoa Bay (S. Afr. Mus.).

Distribution.—Ceylon, East Indies.

Remarks.—The Delagoa Bay specimen has the rostrum less curved than in the Durban specimen here figured, a minute point on the antero-lateral corner of carapace, a minute tooth on lower margin of basal joint of ant. 1, and 2 adpressed spines on 4th joint of 5th as well as 3rd and 4th legs. Otherwise it agrees with the above.

The endopod of mxp. 1 is similar to that of the South African specimens of *vittata*.

Hippolysmata (*Exhippolysmata*) *tugelae* Stebb.

Fig. 132, *f*, *g*.

1915. Stebbing, *l. c.*, p. 94, pl. 25 (Crust., pl. 89).

1916. Kemp, *l. c.*, p. 402.

Carapace with pterygostomial spine as well as the antennal spine; above the latter the suborbital margin has a small rounded lobe (not indicated in Kemp's figures of *ensirostris*, not even in his fig. 7 on

pl. 7, *l. c.*, 1914); rostrum longer than carapace, gently curved upwards, with elevated basal crest extending on to carapace, one small tooth on carapace followed by 12–14 (or 15) teeth, closely set but slightly spaced anteriorly, and the foremost one separated by a distinct gap; rest of dorsal edge of rostrum smooth; ventrally with 7–9 teeth (in one case 5, in one other case 11). Finger and thumb of 1st chela when closed in contact throughout their length. 3rd joint of 2nd leg with strongly curved spine-seta on its lower margin, wrist with 12–13 jointlets. 4th joint of 3rd–5th legs with a series of strong spines on lower margin (*ca.* 8 on 3rd and 4th legs, 6 on 5th), 6th joint of 5th leg with serrate spines distally; dactyls slender, 3–4 spines on inner margin proximally. Rudimentary epipods on 1st–4th legs. Endopod of pleopod 1 narrow, tapering, the apical third not fringed with setae. Telson tapering to a fine point with a pair of subapical spinules, 2 pairs of dorso-lateral spines.

Length up to ♀ 74 mm. (tip of telson to orbit 49, rostrum 25), ♂ 50 (32 + 18 resp.).

Localities.—Off Tugela River, Natal, 12 fathoms, and off Cape Henderson (north of East London), 26 fathoms (Stebbing).

Remarks.—Only one specimen was caught off Cape Henderson, but 24 were caught off the Tugela River. There are 19 ♀♀ (17 of them ovig.) and 3 ♂♂ from the latter locality in the South African Museum. The ♂♂ have both appendix interna and appendix masculina on pleopod 2, and the endopod of pleopod 1 is similar to that of the ♀, and without coupling-hooks. Possibly they are not quite mature.

The spines on the 4th joints of 3rd–5th legs were overlooked by Stebbing, but they are shown in Kemp's (1914) figure of *ensirostris.*

The endopod of mxp. 1 was correctly figured by Stebbing, except that the penultimate joint is stouter, and carries on its inner surface numerous long plumose setae.

H. tugelae is very closely allied to *ensirostris* Kemp, but is distinguished by the perfectly smooth dorsal edge of the rostrum in front of the basal crest, which carries a larger number of teeth than in the Indian species. See also Holthuis, 1947, *l. c.*, p. 74.

Gen. Gelastocaris Kemp

1914. Kemp, *l. c.*, p. 106.

No arthrobranchs on legs. Mandible without incisor process or palp. Mxp. 3 without exopod. Epipods on first 4 legs. Rostrum in dorsal view triangular, deeply lamellate in lateral view. No supra-

orbital spine; antero-lateral margin of carapace (below antennal spine) not serrate. Lateral process of basal joint of ant. 1 curving upwards and protecting the small eyes laterally, apical margin of basal joint curving upwards and protecting the eyes anteriorly. Upper flagellum of ant. 1 uniramous. 1st leg slender, chela with apical interlocking spines. Wrist of 2nd leg with 3 jointlets. Dactyls of 3rd–5th legs very short, 4-unguiculate (2 in middle line, one on each side).

Gelastocaris paronae (Nobili)

Fig. 132, *h–j*.

1905. Nobili, Boll. Mus. Torino, xx, no. 506, p. 2, text-fig. (*Latreutes p.*).

1914. Kemp, *l. c.*, p. 107, pl. 5, figs. 1–11.

1916. *Id.*, *l. c.*, p. 401.

1925. *Id.*, *l. c.*, p. 337.

1947. Holthuis, *l. c.*, p. 63.

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 386.

Animal robust and depressed. Integument shortly pilose, chiefly conspicuous on anterior part of carapace, telson and uropods. Carapace saddle-shaped, a post-orbital tooth and below it a spine, a post-antennal spine, antero-inferior margin rounded (sometimes with a minute denticle), lower margin anteriorly flexed inwards, the ridge from the post-antennal spine appearing to be the lower lateral border of carapace. Rostrum broadly triangular in dorsal view, in lateral view deeply lamellate, apex bidentate. Outer margin of antennal scale spinulose. Finger and thumb of 1st chela spoon-shaped, with 3–4 (Kemp says 2–3) interlocking spines, and lateral tufts of plumose setae. Wrist of 2nd leg with 2nd jointlet longest, 1st slightly longer than 3rd. 3rd–5th legs stout, with plumose setae. Telson broadly triangular, 2 pairs of dorso-lateral spinules, apex with slender median point, flanked on each side by 2 unequal spines. Outer ramus of uropod broadly oval, inner also broad but more ovate.

Length ♀ up to 21 mm.

Locality.—Delagoa Bay (coll. K. H. B. 1912, 2 ovig. ♀♀).

Distribution.—Zanzibar, Ceylon, Andaman Is., N. Australia, East Indies.

Remarks.—The two Delagoa Bay specimens agree with Kemp's description. His likening of the animal to an Idoteid Isopod is very apt. The specimens were dredged off Lourenzo Marques in about 2 fathoms on a very muddy bottom, together with *Alpheus notabilis* Stebb.

Family PROCESSIDAE

1910. Stebbing, *l. c.*, p. 387.

1920. de Man, Siboga Exp. monogr., xxxix *a*, 3, pp. 192 *sqq.*

Rostrum short, unarmed. Mandible without incisor process or palp. Mxp. 2 with 7th joint attached laterally to 6th joint. Mxp. 3 large, pediform, with exopod. Exopods absent from all legs (*Processa*), or present only on 1st leg (*Nikoides*). No epipods on legs. 1st pair of legs asymmetrical, one simple, the other chelate. 2nd pair of legs unequal, one much longer than the other, both chelate, 4th and 5th joints multiarticulate. Telson channelled. Gills 5+2 epipods.

Gen. Processa Leach

1815. Leach, Mal. Podophth. Brit., text to pl. 41 (1st July).

1816. Risso, Hist. Nat. Crust. de Nice, p. 84 (*Nika*).

1905. Stebbing, Mar. Invest. S. Afr., iv, p. 89 (synonymy).

1910. *Id.*, *l. c.*, p. 387.

1920. de Man, *l. c.*, p. 197 (list of species).

1922. *Id.*, Siboga Exp. monogr., xxxix*a*, 4, p. 44.

1923. Gurney, J. Mar. Biol. Assoc. Plym., n.s., xiii, p. 245 (larval stages).

1936. Lebour, Proc. Zool. Soc. Lond., ii, p. 609 (specific characters and development).

1937. Gurney, *ibid.*, p. 85 (key to species).

1941. Lebour, Ann. Mag. Nat. Hist. (xi), 7, p. 401.

With the family characters. No exopods on any of the legs.

Remarks.—*P. edulis* (Risso) is one of the edible shrimps of commercial importance in the Mediterranean.

Key to the South African Species.

1. Body and 3rd–5th legs slender. 5th abdominal segment with hind corner rounded . . . . . *austroafricana.*
2. Body and 3rd–5th legs stout. 5th abdominal segment with hind corner dentate . . . . . cf. *edulis.*

Processa austroafricana Brnrd.

Fig. 133, *a–d.*

1905. Stebbing, *l. c.*, p. 91 (*canaliculata*, non Leach).

1910. *Id.*, *l. c.*, p. 387 (*canaliculata*, non Leach).

? 1918. *Id.*, Ann. Durban Mus., ii, p. 61 (*Processa* sp.).

1923. Odhner, Medd. Göteb. Mus., xxxi, p. 24 (*canaliculata*, non Leach) (? p. 5).

1925. Balss, D. Tiefsee Exp., xx, p. 294 (part *canaliculata*).

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 386.

Rostrum about $3\frac{1}{2}$ times in length (median line) of rest of carapace, reaching about to end of eyes, apically bidentate, lower point longer

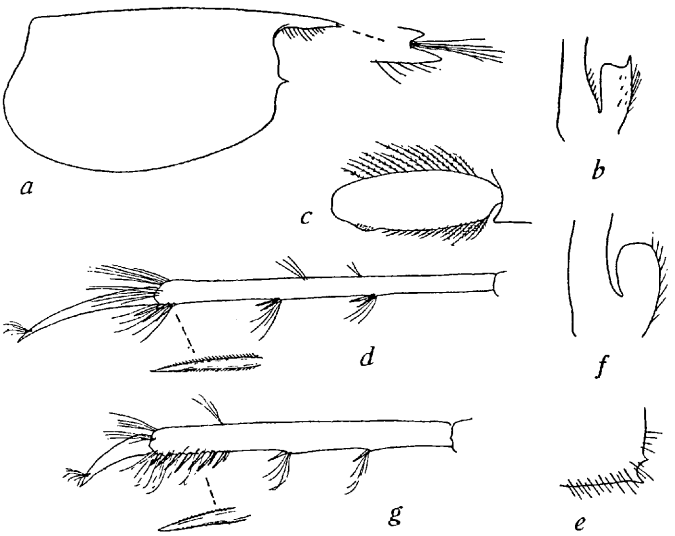


FIG. 133.—*Processa austroafricana* Brnrd. *a*, carapace, with apex of rostrum further enlarged. *b*, lateral process of basal joint of ant. 1. *c*, endopod of pleopod 1 ♂. *d*, 6th joint and dactyl of 5th leg, with spine further enlarged. *Processa* cf. *edulis* (Risso). Algoa Bay specimen. *e*, postero-inferior corner of 5th abdominal segment, left side. *f*, lateral process of basal joint of ant. 1. *g*, 6th joint and dactyl of 5th leg, with spine further enlarged.

than upper, with tuft of setules; antennal spine distinct, antero-lateral corner of carapace rounded. Lateral process of basal joint of ant. 1 short, quadrangular, inner corner rounded, outer acute (cf. *australiensis* Baker, 1907, Trans. Roy. Soc. S. Austral., xxxi, p. 185, pl. 25, fig. 2, *a*); 2nd peduncular joint $1\frac{1}{2}$–$1\frac{2}{3}$ as long as 3rd; inner flagellum at least as long as body. Antennal scale $\frac{1}{2}$–$\frac{3}{4}$ median length of carapace (excl. rostrum). Eyes large, wider than antennal scale. Mxp. 3 extending beyond antennal scale by at least whole of apical joint, usually by apical joint and half the penultimate joint. Right leg of 1st pair chelate, left simple; 4th joint (measured along its longest margin) of chelate leg subequal to wrist plus chela. Right leg of 2nd

pair usually longer than left; the mero-carpal bend of the former being beyond apex of shorter (outer) flagellum of ant. 1, of the latter below the eye. 3rd–5th legs slender; 3rd joint of 3rd and 4th legs with 2 spines, 4th joint with 5 movable but more or less adpressed spines; joints of 5th leg without spines; 4th joint of 4th leg longer than 6th, 5th a little more than twice length of 6th, dactyl half length of 6th; in 5th leg 4th and 5th joints subequal, 6th shorter, 6th $2\frac{1}{2}$ times length of dactyl, its lower margin with 2 pairs of spines, and 3 at apex, these spines doubly and distinctly serrate (fig. 133, *d*). All dactyls slender. Endopod of pleopod 1 ♂ oval, apically rounded, the spinulose lobe sometimes more prominent than in fig. 133, *c*; of ♀ lanceolate. Postero-inferior corner of 5th abdominal segment rounded-quadrate, without any denticle. Telson dorsally channelled, with 2 pairs of conspicuous dorso-lateral spines, 3 unequal pairs on apex.

Length up to ♀ 38 mm. "Eyes blue, ova green" (s.s. *Pieter Faure* log-book).

Localities.—Off Cape St Blaize, 40 fathoms, off Knysna, 30 fathoms, Algoa Bay, 10–16 fathoms (Stebbing); Cape Infanta and St. Sebastian Bay, 61 and 72 metres (Odhner); off Cape Agulhas, 120–126 metres (Balss); Agulhas Bank from Cape Agulhas to Algoa Bay and Gt. Fish Point, 20–26 fathoms (S. Afr. Mus.).

Remarks.—The South African specimens agree in nearly all respects with *canaliculata* as described and figured by Lebour. They differ chiefly in the basal process (stylocerite) of antenna 1 which resembles that of *australiensis*, and also the constantly fewer spines on 4th joints of 3rd and 4th legs.

They differ from *australiensis* in having no denticle on hind corner of 5th abdominal segment, and a longer 4th joint on the chelate 1st leg. In these respects they resemble the South Australian *gracilis* Baker, but without a direct comparison of actual specimens it would be unwise to presume specific identity.

Some 300 specimens have been examined, and the above characters appear to be constant. None were observed with both left and right legs of the 1st pair chelate, such as Rathbun (1904, Harriman Alaska Exp., x, p. 110) has recorded.

This species is common on the Agulhas Bank, but apparently does not extend very far east of Algoa Bay. Stebbing's record is the only one from the Natal coast. Ovigerous ♀♀ were taken from June to December.

Processa cf. *edulis* (Risso)

Fig. 133, *e–g*.

1936. Lebour, *l. c.*, p. 611, pl. 2, figs. 1–6, pl. 3, figs. 1–8, pl. 4, figs. 8–10 (specific characters, synonymy).

1941. *Id.*, *l. c.*, pp. 408, 409 (differential characters).

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 386.

Amongst numerous slender specimens from Algoa Bay a single ovig. ♀ was at once conspicuous on account of its robust form and short legs. It appears to be referable to *edulis*, but with only a single specimen the identification can be regarded only as provisional.

Lateral process of basal joint of ant. 1 apically rounded, the 2nd and 3rd peduncular joints subequal, and the inner flagellum much shorter than the body. Spines on 4th joint of 3rd and 4th legs 5; 5th joint of 4th leg not twice as long as 6th; 5th joint of 5th leg shorter than 6th, latter with 2 single spines far apart on lower margin and 7 close together distally, each of the proximal two in this series accompanied by a shorter spine (*i.e.* 2 pairs followed by 5 single ones), the spines obscurely serrulate (fig. 133, *g*); all dactyls stout, much shorter than 6th joints. Postero-inferior corner of 5th abdominal segment with 1 denticle on right, 2 on left side.

Length 25 mm.

Locality.—Algoa Bay, 10 fathoms (S. Afr. Mus.).

Distribution.—*P. edulis*, as defined by Lebour, is known from the Mediterranean, English Channel, and Irish Sea.

Remarks.—The University of Cape Town Ecological Survey has recently captured two specimens in 15–19 metres on the west side of False Bay. Lebour (1936) says that at Plymouth the larger, more slender species *canaliculata* occurs chiefly on the outer ground, whereas the smaller more robust species *edulis* occurs closer inshore.

Family GLYPHOCRANGONIDAE.

1908. Stebbing, Ann. S. Afr. Mus., vi, p. 36.

1910. *Id.*, *l. c.*, p. 387.

1920. de Man, Siboga Exp. monogr., xxxix*a*, 3, pp. 212 *sqq*.

Body robust, integument indurated. Rostrum well developed, dorsally flattened, laterally spinose, proportionately longer in young than in adult. Carapace sculptured and carinate. Abdomen usually sculptured, the segments firmly interlocked. Telson strong, spine-like, quadrangular in cross-section. Eye-stalks short. Upper flagellum of

ant. 1 basally thickened in ♂. Antennal scale broadly oval with thickened midrib. Mandible without incisor process or palp. Mxp. 2 with 7th joint attached laterally to 6th joint. Mxp. 3 stout, pediform, coxal joint interlocking with pterygostomial margin of carapace, with exopod but no epipod. No exopods or epipods on legs. 1st leg stout, subchelate, the claw-like dactyl folding against upper surface of 6th joint, 3rd joint acutely produced medianly. 2nd leg minutely chelate, wrist multiarticulate. Dactyls of 4th and 5th legs sexually dimorphic (in some species). Gills 11 or 9 plus 2 epipods. Eggs few and large.

Gen. GLYPHOCRANGON M. Edw.

1908. Stebbing, *l. c.*, p. 36.

1920. de Man, *l. c.*, p. 214 (list of species, and key).

With the above characters. *Glyphocrangon* sensu stricto has large, deeply-pigmented eyes, and 11 gills on each side; the subgen. *Plastocrangon* Alcock, 1901, has small unpigmented eyes, and only 9 gills.

Key to the South African Species.

1. Side-plate of 5th abdominal segment trispinose (fig. 134, *d*).
   2 large teeth behind pterygostomial spine . . . *sculptus.*
2. Side-plate of 5th abdominal segment bispinose (fig. 134, *e*).
   a. No tooth behind suborbital spine . . . . *longirostris.*
   b. One tooth behind suborbital spine . . . . *dentatus.*

Glyphocrangon sculptus (S. I. Smith)

Fig. 134, *a–d*.

1908. Stebbing, *l. c.*, p. 37.

1910. *Id.*, *l. c.*, p. 387.

1920. de Man, *l. c.*, p. 218 (in key).

Integument finely setulose. Dorsal (1st) keel with 7 teeth in front of cervical groove and 4 behind, somewhat variable in size; subdorsal (2nd) keel with 7–8 teeth behind cervical groove, a group of 4–8 variable teeth in front of it, and a larger post-orbital tooth; dorso-lateral (3rd) keel with several small teeth and usually 2 larger ones behind cervical groove, sometimes almost smooth, a row of 5–8 small teeth between cervical groove and the strong suborbital spine; lateral (4th) keel behind cervical groove smooth or feebly crenulate, in front

of it with 2 large teeth, sometimes also a small one near the groove; lower part of carapace with low ridges, more or less distinct, disconnected and reticulate; small denticles scattered between the keels.

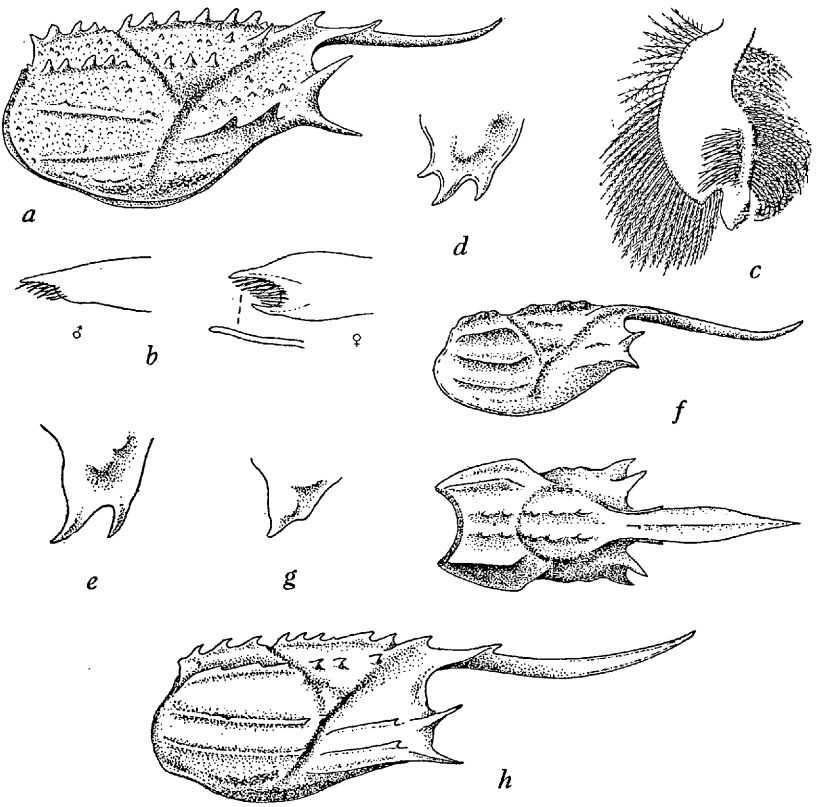


FIG. 134.—*Glyphocrangon sculptus* (S. I. Smith). *a*, carapace. *b*, apex of dactyl of 3rd and 4th legs, ♂ and ♀. *c*, endopod of pleopod 1 ♂, posterior view. *d*, side-plate of abdominal segment 5.
Glyphocrangon longirostris (S. I. Smith). *e*, side-plate of abdominal segment 5. *f*, lateral and dorsal views of carapace of juv. (carapace 17 mm., rostrum 6 mm.). *g*, side-plate of 5th abdominal segment of this juvenile.
Glyphocrangon dentatus Brnrd. *h*, carapace.

Pterygostomial projection spiniform. Abdomen dentate and tuberculate, the most prominent teeth being 3 (1 median and 1 dorso-lateral on each side) on 1st segment, a median one on segments 2 and 3, 2 median ones on segment 4, the hind one being keel-like, 2 on segment 5 flanked on each side by a keel-like tooth, 2 on segment 6, keel-like, usually with subsidiary denticles anteriorly, the hinder one ending in a strong

sharp point. Side-plate of segment 5 tri-spinose (fig. 134, *d*). Telson with a median tooth at base and denticles on the dorso-lateral and lateral keels proximally. Dactyl of 3rd leg unguiform, flattened dorso-ventrally, apex acute; dactyls of 4th and 5th legs cylindrical and surrounded by a tuft of long spine-setae arising from apex of 6th joint; on these two legs apex of dactyl in ♂ with slight swelling on outside, in ♀ swollen distally and bidentate; apex of the dactyl in 3rd–5th legs with a bunch of filiform setae, best developed on 4th and 5th legs in ♀ (fig. 134, *b*). A small setiferous median tubercle on 5th thoracic sternite. In ♂ a median tubercle on 1st abdominal sternite and a less conspicuous one on 2nd. Upper flagellum of ant. 1 longer and more swollen proximally in ♂ than in ♀. Endopod of pleopod 1 larger in ♂ than ♀, modified, the band of setae on a ridge on posterior surface apparently forming together with the marginal (inner) setae a kind of channel (fig. 134, *c*).

Length ♂ up to 92 mm., ♀ 111 mm. (tip of telson to orbit: 76 and 94 resp.); smallest ♂ with both appendix masculina and appendix interna 70 mm. (58 mm.). After many years in formalin the eyes are yellowish or orange-brown.

Locality.—Off Cape Point, 800–900 and 1000 fathoms (Stebbing, and S. Afr. Mus.).

Distribution.—East coast of N. America.

Remarks.—Only 3 ovig. ♀♀ amongst nearly three dozen specimens were taken, in July and August.

Parasites.—The Bopyrid Isopod *Bathygyge grandis* Hansen occurs in the branchial cavity.

Glyphocrangon longirostris (S. I. Smith)

Fig. 134, *e–g*.

1908. Stebbing, *l. c.*, p. 38.
1910. Kemp, Fish. Irel. Sci. Invest. [1908], p. 170.
1910. Stebbing, *l. c.*, p. 388.
1920. de Man, *l. c.*, p. 217 (in key).
1925. Balss, D. Tiefsee Exp., xx, p. 295.

In general similar to *sculptus*, but the 1st and 2nd keels on carapace and the sculpturing on abdomen usually more knobbly than dentate; only a very few, if any, denticles on the areas between the keels, the 3rd keel in front of cervical groove obsolete and the 4th keel with only one tooth behind the pterygostomial spine; median teeth and keel-like

teeth on abdomen less prominent, the two on segment 6 without subsidiary denticles and separated by only a shallow notch; side-plate of segment 5 bidentate (fig. 134, *e*). Rostrum in front of foremost tooth dorsally corrugate, giving the lateral margins in dorsal view a slightly crenulate appearance. Except that those of the 4th and 5th legs are enveloped in a brush of spine-setae on apex of 6th joint, the dactyls of 3rd–5th legs are alike, and show no sexual differences; they are dorso-ventrally flattened, more so than in *sculptus*, apices acute and only minutely setulose.

Length ♂ up to 94 mm., ♀ 110 mm. (tip of telson to orbit 74 and 90 resp.); smallest ♂ with appendix masculina as well as appendix interna 73 mm. (59 mm. to orbit); a specimen 62 mm. in length (48 to orbit) has the pleopods not sexually differentiated. Eyes dull orange-brown after many years in formalin.

Locality.—Off Cape Point, 660–800 and 900 fathoms (Stebbing, and S. Afr. Mus.).

Distribution.—East coast of N. America; west coast of Ireland; between Canaries and Cape Verde Is.

Remarks.—Although Stebbing seemed suspicious of the separation of this species from *sculptus*, there is no doubt that they are two distinct species. The difference in the dactyls of 3rd–5th legs, and the absence of sexual dimorphism in them in *longirostris*, is alone enough to justify specific rank.

Eight out of two dozen specimens are ovig. ♀♀, and were taken in July and August.

The smallest specimen examined, apparently belonging to this species and not to *sculptus*, measures 23 mm. in total length, 17 mm. to orbit; *i.e.* the rostrum is (approx.) 26 per cent. of the total length, compared with (approx.) 21–26 per cent. in adult. In dorsal view the rostrum is broader, more lanceolate than in adult.

Glyphocrangon dentatus Brnrd.

1926. Barnard, Trans. Roy. Soc. S. Afr., xiii, p. 128 (*gilesii* var. *dentata*).

1939. Calman, John Murray Exp., vi, p. 217, fig. 8 (*mabahissae*).

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 387 (*dentarus*, typ. err.).

Integument closely pitted (possibly pilose when alive), edges of keels more coarsely pitted. Rostrum only a little longer than rest of

carapace. 1st keel with 3 sharp teeth in front of cervical groove, 3 behind it; 2nd keel with 3 sharp teeth in front of cervical groove, behind divided into 3 low unequal portions (scarcely to be called teeth); 3rd keel in front of cervical groove forming a sharp tooth at base of suborbital spine and continued backwards to the groove, behind which it forms a smooth keel very faintly notched behind its middle and ending anteriorly in a small tooth, in front of which is another small tooth; 4th keel in front of cervical groove ending anteriorly in a sharp tooth below the tooth of 3rd keel, behind the cervical groove forming a smooth keel ending anteriorly in a sharp tooth overhanging the groove; 5th keel continuous with pterygostomial spine, and forming behind the cervical groove a low reticulate ridge; a similar ridge ventrally. Abdomen with low rounded knobs and sculpturing, but the 3 forwardly directed teeth on 1st segment strong. Antennal scale twice as long as broad. Dactyls of 3rd–5th legs as described for *assimilis* de Man (1920): on 3rd and 5th legs half as long as 6th joint, on 4th leg $\frac{2}{3}$ length of 6th joint, on 3rd leg dorsally grooved in distal half, on 4th and 5th legs grooved for nearly whole length.

Length 98 mm. (Barnard, 1926), present specimen ♂ 75 mm. (tip of telson to orbit 74 and 56 mm. resp.).

Locality.—Off coast of Portuguese East Africa (25° 59′ S., 33° 31′ E.), 540 metres (Barnard).

Distribution.—Zanzibar area, 640–658 metres.

Remarks.—The specimen on which *dentata* was based (1926), and which differed from *gilesii* W-Mason (see 1894, Illustr. Zool. "Investigator," pl. 7, fig. 4; 1901, Alcock, Cat. Ind. Deep-sea Crust., p. 132) only by the sharply tridentate posterior part of the 2nd keel, and longer rostrum, is not available to me for re-examination. A smaller ♂ specimen from the same locality is described above and figured.

My MSS. notes for the 1926 paper show that the longer rostrum was observed, although the fact did not appear in print. This was an unfortunate oversight, because Calman has recently described what appears to be the same form under the name *mabahissae*. In Calman's numerous (about 120) specimens the rostrum exceeds the carapace length by one-quarter to one-third. In the present specimen the excess is only about one-eighth. The dorsal keel is more sharply serrate than in Calman's figure, and there are only extremely faint indications of one or two granules between the dorsal and subdorsal keels. It is very likely that between the Zanzibar area and Portuguese East Africa intermediate specimens will eventually be captured.

Family ALPHEIDAE.

Cracker-shrimps.

1899. Coutière, Thèse pres. Fac. Sci. Paris, pp. 1–560, 6 pls. (definition, p. 322).

1905. *Id.*, Fauna Geogr. Mald. Laccad. Archip., ii, pp. 852-921, pls. 70–87, and text-figs.

1910. Stebbing, *l. c.*, p. 388.

1911. de Man, Siboga Exp. monogr., xxxix*a*, 1, pp. 133–465.

1915. *Id.*, *ibid.*, pls. 1–23.

1915. Stebbing, Ann. S. Afr. Mus., xv, p. 79.

1921. Coutière, Trans. Linn. Soc. Lond., 2nd ser., xvii, pp. 413–428, 5 pls.

1927. Hale, S. Austral. Crust., pt. 1, p. 44 (*Synalpheidae*).

1938. Gurney, Gt. Barrier Reef Exp. Rep., vi, pp. 44 *sqq.* (development).

Rostrum small, reduced, or absent, never spinose. Carapace sometimes with supra-orbital and pterygostomial teeth, but no antennal tooth; usually forming a hood over the short-stalked eyes and partially or wholly concealing them in dorsal view (except *Ogyrides*, where the eye-stalks are long). Mandible with incisor process and 2-jointed palp. Mxp. 2 with 7th joint attached laterally to 6th (less conspicuously so in *Ogyrides*). Mxp. 3 with exopod, epipod present or absent. 1st pair of legs usually strong, robustly chelate, often asymmetrical, especially in ♂. 2nd legs with usually 5 jointlets in wrist (3–4 in *Ogyrides*, 4 in *Arete*), minutely chelate. 5th leg with series (variable in the different genera) of spines on the outer (hinder) surface of 6th joint (both sexes); dactyls of 3rd–5th legs simple or with not more than 2 accessory denticles. Telson linguiform, usually rather short and broad; anal tubercles may be present. A movable scale at base of uropod in some genera. Gills 5 pleurobranchs (sometimes a rudimentary one on mxp. 3), 1 arthrobranch present, rudimentary, or absent on mxp. 3, plus 2–8 epipods.

Remarks.—Stebbing (1905, J. Linn. Soc. Lond., xxix, pp. 332–334) has given reasons for not accepting the proposal to substitute the name *Crangon* for *Alpheus*. Without access to the original works the question cannot be discussed here. According to Sherborne (Index), Neave (Zool. Nomencl.), etc., Weber (Nomencl. Entom. sec. syst. Fabricii, 1795) used *Alpheus* on p. 91 and *Crangon* on p. 94. If *Alpheus* was used correctly for the Crustacean in question, then it has

page precedence over *Crangon*, and precedes Fabricius' own use of it in 1798 (Entom. Syst. Suppl. See also *Alpheus*, *infra*). In any case, Hale's use of "Synalpheidae" as the family name is quite unacceptable, as there are several genera antedating Bate's genus.

Although free-living forms are found, the majority of the members of this family live more or less concealed under rocks or in crevices of corals, or they make their own burrows in sand and mud-banks.

Parasites.—Epicaridean parasites of the genera *Hemiarthrus*, *Bopyrella*, *Bopyroides*, *Argeia*, etc. are found in the branchial cavity (see Chopra, Rec. Ind. Mus., xxv, 1923, p. 416; Nierstrasz and Brandis, Vid. Medd. Dansk. nat. For., lxxxvii, p. 29). Also the curious parasite *Faba* (whose systematic position is doubtful; see Nierstrasz and Brandis, Proc. U.S. Nat. Mus., lxxvii, Art. 9, p. 1, 1930), which has already been recorded here (pp. 692, 701) on *Merhippolyte* and *Leontocaris*.

Key to the South African Genera.

I. Eye-stalks elongate, not concealed (fig. 135, *b*). 1st pair of legs symmetrical, not much stronger than 2nd pair . *Ogyrides.*

II. Eye-stalks short, more or less concealed (figs. 136–143). 1st pair of legs usually robust, at least in ♂.

A. A movable scale at base of uropod.

1. Rostrum well developed (figs. 136, 137).

a. Wrist of 2nd leg with 5 jointlets . . *Athanas.*

b. Wrist of 2nd leg with 4 jointlets . . [*Arete* *].

2. Rostrum absent (fig. 138) . . . . . *Betaeus.*

B. No movable scale at base of uropod.

1. No epipods on mxp. 3 or any of the legs. No round polished areas on base of finger and apex of 6th joint of 1st legs . . . *Synalpheus.*

2. Epipods on mxp. 3 and all legs (fig. 144, *c*). Linea impressa and round polished areas distinct on 6th joint of 1st leg (fig. 144, *d*, *n*) . . *Alpheus.*

Gen. Ogyrides Stebb.

1860. Stimpson, Proc. Ac. Nat. Sci. Philad., xii, p. 36 (*Ogyris*, preocc.).

1899. Coutière, *l. c.*, p. 332 (*Ogyris*).

1911. de Man, *l. c.*, p. 135 (*Ogyris*) (key to species).

1914. Stebbing, Ann. S. Afr. Mus., xv, p. 31.

* *Athanas mascarenicus* Richters 1880 from Mauritius is synonymous with one of the species of *Arete*, possibly *dorsalis* Stimpson (Coutière, *l. c.*, 1905, p. 868).

1915. Kemp, Mem. Ind. Mus., v, p. 284.

1922. de Man, Siboga Exp. monogr., xxxix*a*, 4, p. 14.

Rostrum very short or obsolete. Eye-stalks elongate, parallel. 1st legs shorter but very little thicker than 2nd legs, symmetrical; wrist of 2nd legs with 3–4 jointlets; 3rd and 4th legs strong, 5th leg slender. Exopods of mxp. 1 and 2 elongate. Mxp. 3 with penultimate (5th) joint longer than the ultimate (6th). Gills 5 plus 3 epipods (Kemp).

Remarks.—The elongate eye-stalks and elongate penultimate joint of mxp. 3 are quite exceptional in the family *Alpheidae.*

Key to the South African Species.

1. Antennal scale lanceolate, tapering to a sharp point . . *saldanhae.*
2. Antennal scale oval, lamellar part extending as far as apical spine . . . . . *occidentalis.*

Ogyrides saldanhae Brnrd.

Fig. 135.

1914. Stebbing, *l. c.*, p. 32 (*occidentalis*, non Ortmann).

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 387.

Carapace setulose, with plumose setae along lower margin; (6) 7–9 spines anteriorly (these spines appear to be articulated). Rostrum short, triangular. Eyes extending to end of antennal scale, not quite to ends of peduncles of ant. 1 and 2. Antennal scale lanceolate, with straight outer margin, inner margin obliquely bevelled off from apical point. A patch of strong spines on lower margin near base on 6th joint of 1st leg (fig. 135, *e*). Wrist of 2nd leg with 4 jointlets, but the basal one often with marginal notch indicating an incomplete division (5 jointlets). 3rd and 4th joints of 3rd leg each with a strong spine on lower margin in distal half. Dactyl of 3rd and 4th legs a thin cultrate plate, elongate oval, narrower in 4th than in 3rd leg, unguis absent, an apical tuft of setules (fig. 135, *f*). Dactyl of 5th leg ensiform with long, spaced plumose setae (fig. 135, *g*). A bifurcate sternal plate arising between bases of 4th legs, projecting forwards. Telson with slightly sinuous lateral margins, a long and a short spine in a notch in distal half of lateral margin, apex with long plumose setae, 2 pairs of dorso-lateral spines, and a line of spinules, 3 curved ridges on ventral surface at base.

Length up to 18 mm.

Locality.—Saldanha Bay, 10 fathoms (Stebbing, and S. Afr. Mus.).

Remarks.—Kemp, and de Man, have drawn attention to several features not described by previous authors, as a result of which a re-examination of the original material (if it exists!) of *alphaerostris* (Kingsley), *orientalis* (Stimpson), and *occidentalis* (Ortmann) would be welcome. The first-mentioned species has been described by Hay and Shore (Bull. Bur. Fish., xxxv, 1918, p. 389), but I have not seen the paper. Yokoya (J. Coll. Agr. Imp. Univ. Tokyo, ix, 1927, p. 171, pl. 7, figs. 1–16) described a specimen assigned to *orientalis*, and was

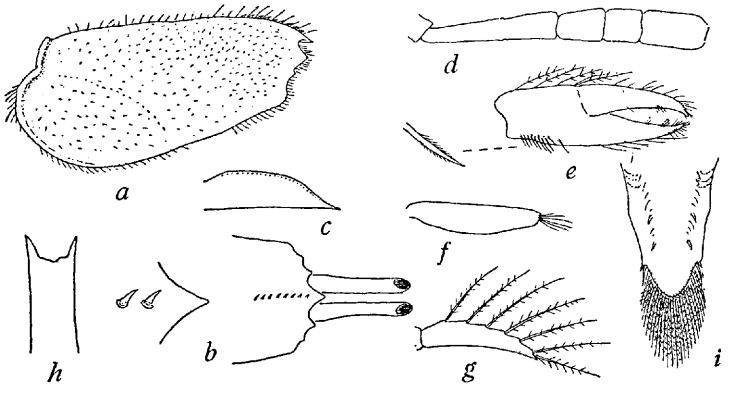


FIG. 135.—*Ogyrides saldanhae* Brnrd. *a*, carapace. *b*, dorsal view of front of carapace and eyes, rostrum and first 2 spines further enlarged. *c*, antennal scale, setae omitted. *d*, wrist of 2nd leg. *e*, chela of 1st leg. *f*, dactyl of 3rd leg. *g*, dactyl of 5th leg. *h*, sternal process between 4th legs. *i*, telson.

of opinion that *sibogae* should be synonymous. He described and figured the sternal process as a "thelycum," and, following Hay and Shore, considered that this character might justify a separate family *Ogyridae*.

To judge from descriptions, the present specimens resemble *sibogae* (de Man) in the antennal scale (de Man, *l. c.*, 1922, pl. 2, fig. 8, *b*) and the spines on 3rd leg, but the eyes are not so long in *sibogae*, and the dactyls of 3rd and 4th legs appear to be different. The shape of the antennal scale at once puts Stebbing's identification with *occidentalis* out of court.

Many specimens were caught, the largest a non-ovigerous ♀; none were obviously males.

The Amphipod recorded by Stebbing is not *P. mirabilis* but *P. capensis* Brnrd. 1925.

Ogyrides occidentalis (Ortm.)

1893. Ortmann, Plankton Exp. II. G.b., p. 46, pl. 3, figs. 4, 4, *a*, etc.
1913. Balss, Schultze Reise, v, p. 107 (*Ogyris o.*).
1916. *Id.*, Beitr. Kenntn. Meeresf. Westafr., ii, p. 20 (*Ogyris o.*).

Antennal scale oval, the lamella extending as far as the apical spine (Ortmann's fig. 4, *a*).

Locality.—Luderitzbucht (Balss).

Distribution.—Mouth of the Tocantins, Brazil; Gold Coast, Cameroons, Angola (north of Loanda).

Remarks.—Balss' material both from the West African coast and from Luderitzbucht should be re-examined; in the meantime the Luderitzbucht record should be accepted with reserve.

Gen. ATHANAS Leach

1899. Coutière, *l. c.*, *passim*, definition on p. 323.
1906. Sars, Arch. Math. Naturvid., xxvii, no. 10 (development).
1911. de Man, *l. c.*, p. 144 (key to species).
1915. Kemp, Mem. Ind. Mus., v, p. 289.
1922. de Man, Siboga Exp. monogr., xxxix*a*, 4, pp. 16–22.
1927. Gurney, Trans. Zool. Soc. Lond., pt. 2, p. 260 (larva).
1935. Boone, Bull. Vanderbilt Mar. Mus., vi, p. 119.
1936. Kubo, J. Imp. Fish. Inst. Tokyo, xxxi, p. 43.
1940. *Id.*, *ibid.*, xxxiv, p. 93.

Rostrum well developed. Supra-orbital tooth present or absent; infra- and extra-orbital teeth both present. Eye-stalks short, divergent, not wholly concealed by carapace. Upper flagellum of ant. 1 biramous. Antennal scale broadly oval. 1st legs robust, at least in ♂, often asymmetrical, directed forwards or bent-up, the hand reposing in the grooved 4th joint. Wrist of 2nd leg with 5 jointlets. 5th leg not more slender than 3rd or 4th leg. A movable scale at base of uropod. Gills 5 plus 7 epipods.

Remarks.—On account of growth-changes and sexual dimorphism it is often difficult, especially where there is very little material, and often only ♀♀, to determine the specific identity. None of the South African specimens can be definitely assigned to a particular species, and the following key is a key to the *specimens*, not to species.

Key to the South African Specimens.

Supra-orbital tooth present	Infra-orbital tooth smaller than extra-orbital	♀ St. James (Stebbing)	cf. *nitescens.*
		♂♀ Algoa Bay, East London, Durban	or *grimaldii.*
		♀ Umhlali	or *naifaroensis.*
	Extra-orbital tooth smaller than infra-orbital . . .	♂ Mozambique . .	cf. *djiboutensis.*
Supra-orbital tooth absent . .		♂ Umtwalumi ♀ Mozambique	cf. *minikoensis.*
Supra-orbital tooth not recorded, nor sex.		Durban (Stebbing)	cf. *grimaldii.*

Athanas, cf. *nitescens* Leach, or *grimaldii* Cout.

Fig. 136, *a–e.*

1915. Stebbing, Ann. S. Afr. Mus., xv, p. 88 (*Athanas* sp.).

1921. *Id.*, Ann. Durban Mus., iii, p. 18 (*grimaldii* Cout.).

♂ Algoa Bay. Supra-orbital tooth feeble, infra-orbital also small. Basal process of ant. 1 extending just beyond end of 2nd peduncular joint, a strong tooth on inner lower margin of 1st joint. 1st legs directed forwards, symmetrical, 3rd joint not grooved below, 4th joint ¾ and 5th joint ½ length of 6th (excl. thumb), 4th joint channelled below nearly to base, finger and thumb longer than 5th joint; in ♀ and immature ♂ (fig. 136, *c*) finger and thumb leave no gap when closed, cutting-edge of thumb convex, both cutting-edges crenulate or dentate; at a later stage (detached chela of ? ♀, fig. 136, *d*) the cutting-edges are strongly toothed; in fully adult ♂ (fig. 136, *e*) finger and thumb widely gaping, each cutting-edge with only one tooth in middle. Wrist of 2nd leg with 1st jointlet less than the other jointlets together, chela equal to last 2 jointlets together, finger and thumb equal to palm. Lower margin of 6th joint of 3rd and 4th legs with spaced spine-setae, of 5th leg with 3–4 similar spines proximally, distally with the spines close-set as in Kemp's figure (1910, Fish. Irel. Sci. Invest. [1908], pl. xix, fig. 5). Dactyls of 3rd–5th legs simple, or occasionally with a microscopic denticle at base of unguis. Telson with 2 pairs of dorso-lateral spines. Appendix interna on pleopod 2 not reaching end of endopod.

Length, a ♂ 17 mm. in length has the 1st leg (2nd joint to apex) 11·5 mm. in length.

Localities.—False Bay, St. James (Stebbing); Durban (Stebbing); Algoa Bay, East London, Durban (S. Afr. Mus.).

Distribution.—nitescens: Europe and Mediterranean to Cape Verdes; *grimaldii:* Cape Verdes to Lagos.

Remarks.—The South African specimens have all been found at

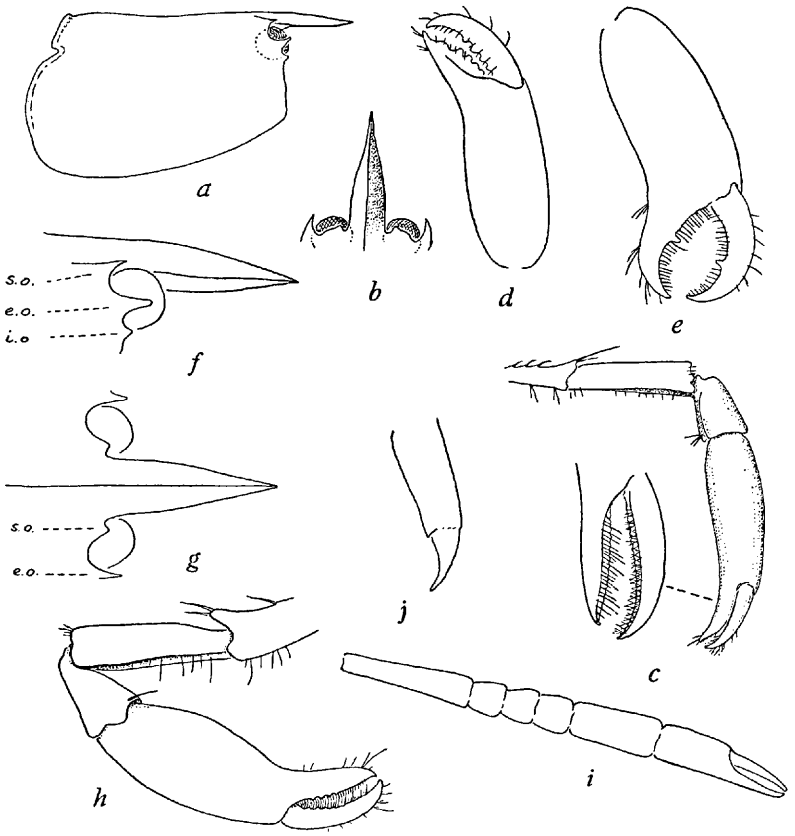


FIG. 136.—*Athanas* cf. *nitescens* Leach. *a*, carapace. *b*, dorsal view of rostrum. *c*, outer view of 1st leg of ♀ and not fully-grown ♂, with finger and thumb further enlarged. *d*, chela of 1st leg of ? ♀. *e*, chela of 1st leg of adult ♂. *Athanas* cf. *naifaroensis* Cout. *f*, *g*, lateral and dorsal views of rostrum. *h*, 1st leg of ♀ (symmetrical). *i*, wrist and chela of 2nd leg ♀. *j*, dactyl of 3rd leg. (*e.o.*, *i.o.*, *s.o.*, extra-, infra-, and supra-orbital spines.)

shipping centres (St. James is not far from Simonstown). They all belong to the *nitescens* group, but with so little material it is impossible to say whether they are *nitescens*, *grimaldii*, or some other species. Moreover, it can scarcely be claimed that *grimaldii* is really distinct from *nitescens*; *e.g.* Lenz and Strunck (1914) find the accessory

denticle on the dactyls of 3rd–5th legs in Mediterranean examples of *nitescens* as well as in *grimaldii*.

Athanas, cf. *naifaroensis* Cout.

Fig. 136, *f–i*.

1905. Coutière, F. Geogr. Mald. Laccad. Archip., ii, p. 859, fig. 131 (♀).

1922. de Man, *l. c.*, p. 16, pl. 2, fig. 9.

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 387.

♀. Supra-orbital tooth small, not so acute and prominent as in *naifaroensis*, infra-orbital smaller than extra-orbital tooth. 1st leg (fig. 136, *h*) symmetrical. Wrist of 2nd leg with 1st jointlet less than the others combined, chela equal to last 2 jointlets together, finger and thumb equal to palm. Dactyls of 3rd–5th legs with microscopic denticle.

Length 15 mm., 4th–6th joints of 1st leg 7 mm., 6th joint of 1st leg 4 mm.

Locality.—Umhlali, Natal (coll. Prof. T. A. Stephenson, 1 ovig. ♀).

Remarks.—This ♀ corresponds very closely with the Algoa Bay ♂ described above. As can be seen from Kemp's table (1915) only *naifaroensis* (Maldives) and *grimaldii* have symmetrical and enlarged 1st legs in ♀. Stebbing's Durban specimen had asymmetrical 1st legs, but its sex was not recorded.

Athanas, cf. *minikoensis* Cout.

Fig. 137, *a–d*.

1905. Coutière, *l. c.*, p. 858, fig. 130 (♀).

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 388.

♂. Supra-orbital tooth absent, infra-orbital much smaller than extra-orbital tooth (as in *minikoensis* ♀). 1st leg (only the right present) (fig. 137, *c*), 3rd and 4th joints separate, both ventrally channelled; 5th and 6th joints fused. Dactyls of 3rd–5th legs without denticle, though the limits of unguis and joint are fairly distinct.

Length 16 mm., 3rd plus 4th joints 1st leg, and also 5th plus 6th, 6 mm.

Locality.—Umtwalumi, Natal (coll. Prof. T. A. Stephenson, 1 ♂).

Remarks.—Very like *minikoensis* (Minikoi Atoll) as regards carapace, but ♂ of Coutière's species unknown from the type locality. de Man (1911) compares an East Indies ♂ with that of *dimorphus* Ortmann

(1894, Semon's Austral. Reise, v, p. 12), but the exact character of the cutting-edges of the finger and thumb is not very clear.

An ovig. ♀ from Mozambique (K. H. B. 1912) agrees as regards the carapace. The 1st legs are symmetrical and scarcely enlarged.

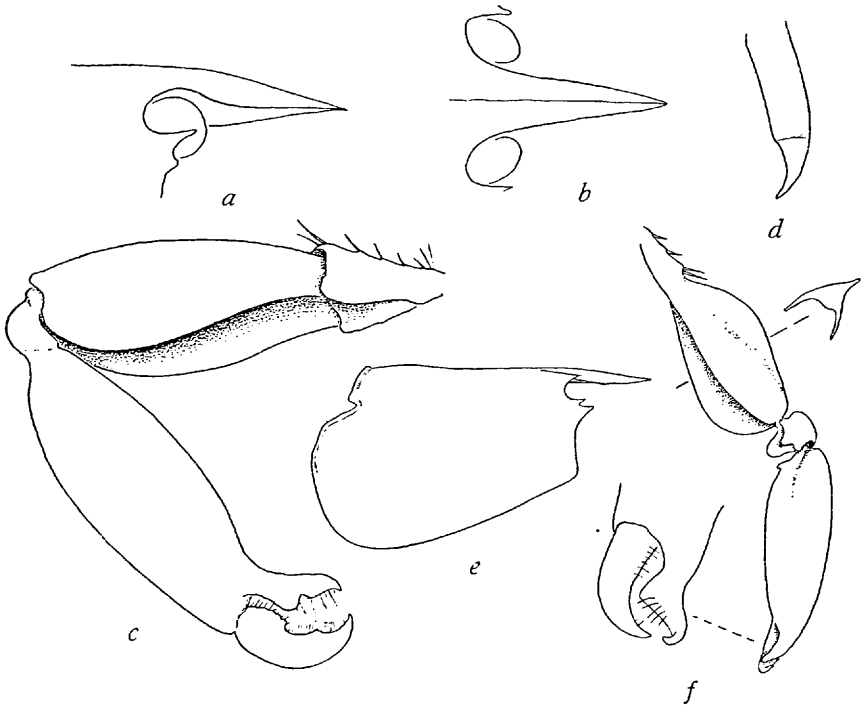


FIG. 137.—*Athanas* cf. *minikoensis* Cout. *a*, *b*, lateral and dorsal views of rostrum. *c*, 1st leg (right) ♂. *d*, dactyl of 3rd leg.
Athanas cf. *djiboutensis* Cout. *e*, carapace. *f*, inner view of left 1st leg ♂, with cross-section of 4th joint, and finger and thumb further enlarged.

Athanas, cf. *djiboutensis* Cout.

Fig. 137, *e*, *f*.

1897. Coutière, Bull. d'Hist. Nat. Paris, no. 6, p. 233.

1898. Borradaile, Proc. Zool. Soc. Lond., p. 1011, pl. 65, figs. 9, 9, *a–i* (*sulcatipes*).

1899. Coutière, *l. c.*, pp. 62, 177, figs. 4, 107.

1905. *Id.*, *l. c.*, p. 856, fig. 129.

1911. de Man, *l. c.*, p. 147 (in key).

1922. *Id.*, Siboga Exp. monogr., xxxix*a*, 4, p. 21.

1938. Gurney, Gt. Barrier Reef Exp. Rep., vi, p. 54, figs. 249–252 (larva).

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 388.

♂. Supra-orbital tooth present, infra-orbital larger than extra-orbital tooth. 1st leg greatly enlarged, slightly asymmetrical (Coutière); in present specimen only left leg available (fig. 137, *f*); 3rd and 4th joints fused, 4th broadly fusiform, both lower margins forming wide flanges, 5th not fused with 6th, lower margins forming lobe-like flanges; 6th longer than 4th, thumb angularly bent, cutting-edge forming a broad triangle, apex hooked, finger nearly evenly curved, its cutting-edge without any denticles. Dactyls of 3rd–5th legs simple.

Length 10 mm., 1st leg (3rd joint to apex as figured) 7 mm. Pale claret (K. H. B.).

Locality.—Mozambique (Island) (coll. K. H. B. 1912, 1 ♂).

Distribution.—Red Sea, Maldive Archipelago. East Indies, Funafuti Atoll (Ellice Group, Pacific).

Gen. Betaeus Dana

1852. Dana, Proc. Ac. Nat. Sci. Philad., vi, p. 16.

1899. Coutière, *l. c.*, *passim*, definition on p. 328.

1904. Rathbun, Harriman Alaska Exp., x, p. 108.

1911. de Man, *l. c.*, p. 173.

1927. Yokoya, J. Coll. Agr. Imp. Univ. Tokyo, ix, p. 173.

1936. Kubo, J. Imp. Fish. Inst. Tokyo, xxxi, p. 50.

Rostrum absent. Front of carapace more or less truncate, or emarginate, concealing the eyes; no supra-orbital spines. 1st pair of legs symmetrical or nearly so, robust, twisted so that the finger of the chela is ventral. Dactyls of 3rd–5th legs simple or with accessory denticle. A movable scale at base of uropod. Telson with anal tubercles (except in one species). Gills 5 plus 1 arthrobranch, and (usually) 8 epipods.

Richters described *B. utricola* (1880, Beitr. Meeresf. Maurit., p. 154, pl. 17, figs. 34, 35) from Mauritius.

Betaeus jucundus Brnrd.

Fig. 138.

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 388.

Carapace truncate and very slightly convex in front in dorsal view, surface faintly hollowed but no median V-shaped groove, hind lateral

margin with a notch. No tooth or projection on inner side of cornea on eye-stalk, no ophthalmic scales. Ocellar tubercle inconspicuous. 1st and 2nd joints of ant. 1 subequal (measured along inner margin), basal process extending almost to outer apex of 2nd joint, a strong ventral tooth on 1st joint. 2nd joint of ant. 2 with short dorsal and ventral spines, the dorsal smaller than the ventral; scale extending

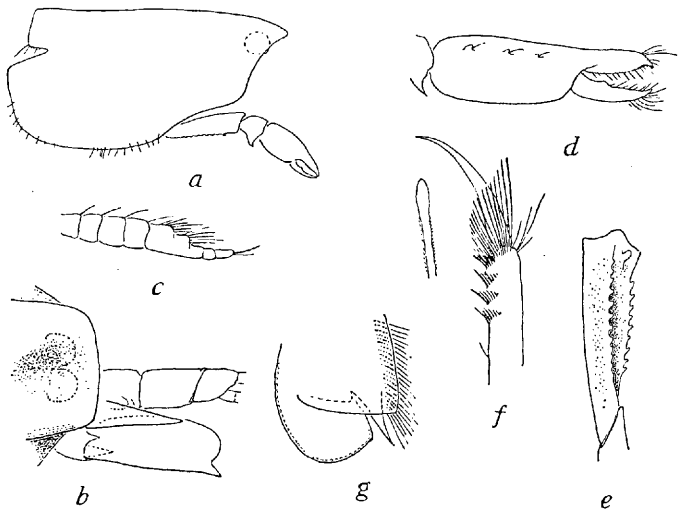


FIG. 138.—*Betaeus jucundus* Brnrd. *a*, carapace and 1st leg. *b*, dorsal view of anterior part of carapace, with base of 1st antenna, and antennal scale. *c*, upper flagellum of antenna 1. *d*, inner view of chela of 1st leg. *e*, lower (inner) view of 4th joint of 1st leg. *f*, dactyl and apex of 6th joint of 5th leg. *g*, dorsal view of outer ramus of uropod.

to end of 3rd joint. Mxp. 3 reaching slightly beyond middle of antennal scale. 1st legs symmetrical, 4th joint channelled below, both margins with blunt serrations and a larger blunt tooth in middle of the channel distally; palm with 3 little tubercles on inner surface each with a seta at its base, finger with a low tooth on cutting-edge. 1st jointlet of wrist of 2nd leg not quite equal to the others combined, 5th equal to 3rd plus 4th. 3rd joint of 3rd and 4th legs with strong spine on lower margin near apex; 4th joint of 3rd–5th legs with prominent spine in middle of lower margin; 5th joint with an apical spine; 6th joint with 4 spines on lower margin on 3rd leg, 3 on 4th leg, only 2–3 fine setae on 5th leg, but distally 4 series of finely serrulate spines and an apical brush of long spines; dactyls elongate, slender, curved, finely pointed, unarmed. Epipods on mxp. 3 and 1st–4th legs. No arthrobranch on mxp. 3 observed. Lower margins of

abdominal pleurae rounded, postero-inferior angle of 5th rounded-quadrate; a movable scale at base of uropod. Telson broadly linguiform, not quite twice as long as greatest breadth, 2 pairs of dorsal spines, the anterior pair in the anterior half, 2 unequal spines laterally, the curved apical margin with 16 plumose setae; anal tubercles distinct. Outer ramus of uropod with strong spine arising from ventral surface of diaeresis which is straight. Gills 5 plus 8 epipods (? arthrobranch).

Length ♀ 13 mm. Pale buff, semi-transparent, eggs green (K. H. B.).

Locality.—Keurbooms River estuary, Plettenberg Bay (K. H. B., Jan. 1931, 1 ovig. ♀).

Remarks.—This species is clearly distinct from *indicus* de Man (eyes, dactyls, etc.) and other species of which descriptions or figures are available. The dactyls seem to correspond with those of *harrimani* Rathbun.

Gen. Synalpheus Bate

1899. Coutière, *l. c.*, definition on p. 334.

1909. *Id.*, Proc. U.S. Nat. Mus., xxxvi, pp. 1–93 (key to groups and to American species).

1911 and 1915. de Man, *l. c.*, pp. 185 *sqq.* (list of Indo-Pacific species, and key) and plates.

1915. Stebbing, Ann. S. Afr. Mus., xv, p. 85.

1921. Coutière, *l. c.*, p. 414.

1922. de Man, Siboga Exp. monogr., xxxix*a*, 4, pp. 26–32.

1927. Gurney, *l. c.*, p. 261 (larva).

1938. *Id.*, *l. c.*, p. 48 (larva).

1940. Kubo, J. Imp. Fish. Inst. Tokyo, xxxiv, p. 87.

Eyes concealed. Rostrum short, spiniform. Supra-orbital spines smaller than or about equal to rostrum. Upper flagellum of ant. 1 feebly biramous; 1st peduncular joint long, its basal process well developed. Antennal scale narrow. 1st legs robust and symmetrical, at least in ♂; no round polished areas on base of finger or apex of 6th joint (see *Alpheus*), *linea impressa* (see *Alpheus*), if present, feebly developed. Wrist of 2nd leg with 5 jointlets. No epipods on mxp. 3 or any of the legs. No anal tubercles. No scale at base of uropod. Gills 5 plus 1 arthrobranch on mxp. 3, and 2 epipods (on mxp. 1 and 2). Eggs often large, and the development abbreviated.

Remarks.—All three South African species possess the ventral prolongation of the frontal margin below the rostrum. This character

is used in Coutière's 1909 group-key to separate the *paulsoni* and *brevicarpus* groups. That, however, does not imply that it does not occur in other groups. Reference to Coutière's 1899 work (p. 76, fig. 35) shows that it is found in certain species of the *neomeris* and *biunguiculatus* groups. But, as Stebbing remarked (1915, *l. c.*, p. 86, in regard to the relative lengths of ant. 1 and 2), there seems to be a "conspiracy of silence" in the descriptions of species to omit all reference to the subrostral character.

Key to the South African Species.

Rostrum with ventral prolongation (fig. 139, *e*).

1. Dactyls of 3rd–5th legs biunguiculate, the ventral tooth shorter than the dorsal one (fig. 139, *d*) . . . . *anisocheir.*
2. Dactyls biunguiculate, the ventral tooth obviously larger than the dorsal one (fig. 139, *i*, *k*).
   - *a.* Both teeth on dactyl acute . . . . . cf. *jedanensis.*
   - *b.* Both teeth spatulate . . . . . *charon.*

Synalpheus anisocheir Stebb.

Fig. 139, *a–d.*

1915. Stebbing, *l. c.*, p. 86, pl. 23 (Crust., pl. 87).

Rostrum with ventral prolongation. Supra-orbital spines almost as prominent as rostrum. 1st joint of ant. 1 subequal to 2nd plus 3rd, basal process extending to middle of 2nd joint. 2nd joint of ant. 2 with outer and inner (lower and upper) spines, spine of antennal scale extending almost to end of 3rd peduncular joint, and beyond apex of the lamellar part. Wrist of smaller 1st leg not longer than its apical width; small chela without brush of setae on finger. No projecting tooth on apex of 6th joint (overhanging articulation of finger) of larger 1st leg in type and some specimens, but in others (irrespective of age or sex) a well-marked triangular tooth; in one Durban specimen this tooth is acute and curves downwards towards the finger (*cf.* fig. 139, *h*). 1st jointlet of wrist of 2nd leg about as long as 2nd–4th jointlets together, 5th longer than any of the 3 preceding ones. 3rd–5th legs without spines on 4th joint; 6th joint of 5th leg in addition to marginal spines with oblique series of serrate spines in distal $\frac{2}{3}$ of outer (hinder) surface; dactyls biunguiculate, the ventral tooth shorter than but approximately as wide at base as the dorsal one. Telson with 2 pairs

of dorso-lateral spinules, anterior pair at middle of length, 2 unequal spines in notch on either side of the gently convex apical margin.

Length ♀ up to 26 mm., ova 2 mm. diam.

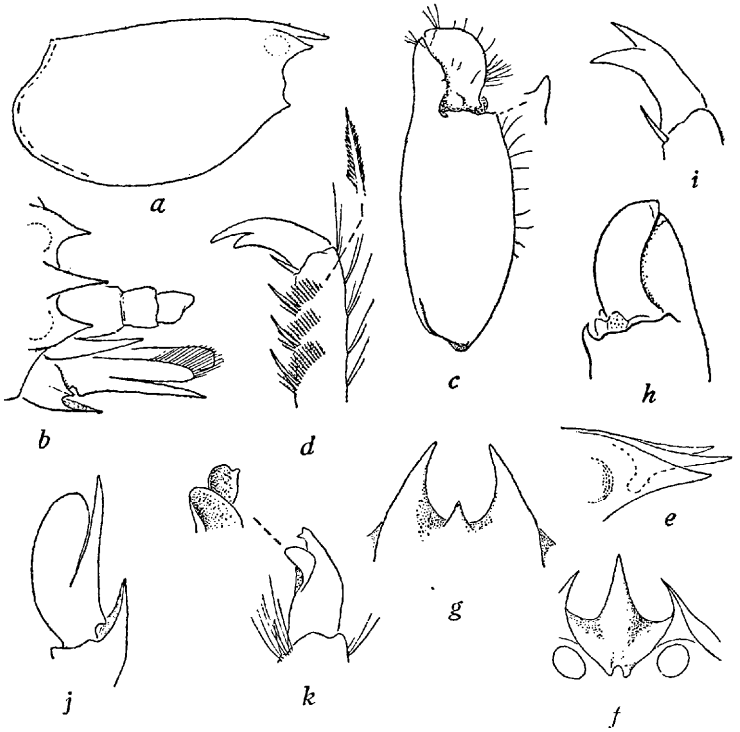


FIG. 139.—*Synalpheus anisocheir* Stebb. *a*, carapace. *b*, dorsal view of rostrum and bases of 1st and 2nd antennae. *c*, inner view of chela of 1st leg ♀, with tooth at end of hand as developed in some specimens. *d*, posterior view of dactyl and apex of 6th joint of 5th leg.

Synalpheus, cf. *jedanensis* de Man. *e*, lateral view of rostrum and supra-orbital spines, ventral prolongation dotted. *f*, view obliquely from in front and from below of rostrum, showing ventral prolongation, and eyes. *g*, dorsal view of aberrant rostrum. *h*, apex of 1st chela. *i*, dactyl of 3rd–5th legs.

Synalpheus charon (Heller). *j*, antennal scale. *k*, inner view of dactyl of 3rd–5th legs, with ventral view of apex further enlarged.

Localities.—Gordon's Bay, False Bay (Stebbing); Durban, and Natal and Zululand coast, littoral to 40 fathoms (S. Afr. Mus.). The University of Cape Town Ecological Survey has found this species at Langebaan, Saldanha Bay.

Remarks.—A few dissected parts of Stebbing's type specimen remain, and I have seen several juv. and ovig. ♀♀ from the other localities. The species is not unlike *hululensis* Cout. 1909.

Synalpheus, cf. *jedanensis* de Man

Fig. 139, *e–i*.

1911 and 1915. de Man, *l. c.*, p. 222, pl. 7, figs. 27, 27, *a–c*.

1922. *Id.*, *l. c.*, p. 27.

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 389.

Rostrum with ventral prolongation, and supra-orbital spines as in *anisocheir*. Antennae and chelipeds as in *anisocheir*, but larger chela of 1st leg with an acute tooth on apex of 6th joint overhanging articulation of finger. 3rd–5th legs, including serrate spines on 6th joint of 5th leg, as in *anisocheir*, but 4th joint of 3rd leg with 4 spines and 4th joint of 4th leg with 3 spines on lower margin. Dactyls biunguiculate, but the ventral tooth obviously larger than the dorsal one. Telson with the anterior pair of spines in front of middle.

Length ♀ up to 17 mm.

Locality.—Delagoa Bay, 4 fathoms (Gilchrist's Survey, 2 ovig. ♀♀ and one with aberrant rostrum).

Remarks.—One of the specimens, otherwise in agreement with the 2 ovig. ♀♀, has the rostrum much shorter than the supra-orbital spines (fig. 139, *g*). I think this is to be regarded as a casual aberration or the result of an early injury.

Synalpheus charon (Heller)

Fig. 139, *j*, *k*.

1861. Heller, SB. Ak. Wiss. Wien, xliv, p. 272, pl. 3, figs. 21, 22 (*Alpheus c.*).

1875. Paulson, Red Sea Crustacea, p. 104, pl. 13, figs. 4, 4, *a–g* (*Alpheus c.*).

1899. Coutière, *l. c.*, p. 263, figs. 331, 332, 332 *bis*.

1905. *Id.*, *l. c.*, p. 873.

1911 and 1915. de Man, *l. c.*, p. 245, pl. 8, figs. 37, 37, *a–c*.

1921. Coutière, *l. c.*, p. 416.

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 389.

Rostrum and supra-orbital spines as in *anisocheir*. Antennae also as in *anisocheir*, but lamellar portion of antennal scale broader, and no upper (outer) tooth on 2nd joint. 1st legs missing. No spines on lower margin of 4th joint of 3rd and 4th legs; 6th joint of 5th leg as in *anisocheir*; dactyls stout, with 2 unguiform or cowl-like teeth,

the smaller upper one with small subapical point on inner side. Telson with anterior pair of spines at middle of length.

Length ♀ 22 mm.

Locality.—Delagoa Bay (presumably) (Lourenzo Marques Mus., 1 ♀).

Distribution.—Red Sea, Maldives and Laccadives, Chagos, East Indies, Hawaiian Is.

Remarks.—The dactyls of 3rd–5th legs seem to be quite distinctive, but the unguis proper is not quite like Coutière's figs. 332, 332 *bis*, or Paulson's.

Gen. Alpheus Fabr.

1784. Fabricius, Mantissa Insect (*fide* Coutière, *l. c.*, 1899, pp. 6, 55).

1795. Weber, Nomencl. Entom. sec. syst. Fabr., p. 91.

1798. Fabricius, Entom. Syst. Suppl., pp. 380, 404.

1878. Hilgendorf, MB. Ak. Wiss. Berlin, p. 829, pl. 4, fig. 2 (epipods).

1891. Brooks and Herrick, Mem. Nat. Ac. Sci. Washington, v (development).

1899. Coutière, *l. c.*, *passim*, definition, p. 336; division into groups, p. 351.

1901. Alcock, Cat. Ind. Deep-sea Crust. Macrura, p. 139.

1910. Stebbing, *l. c.*, p. 388.

1911 and 1915. de Man, *l. c.*, pp. 299 *sqq.* (key to groups, list of Indo-Pacific species and key), and plates.

1927. Gurney, *l. c.*, p. 263 (larva).

1935. Boone, Bull. Vanderbilt Mar. Mus., vi, p. 126.

1938. Gurney, *l. c.*, pp. 44 *sqq.* (larvae).

Rostrum absent, or if present small. Front more or less rounded, supra-orbital spines if present small, hind margin of carapace notched. Eyes completely concealed, orbits more or less complete. Ant. 1 short, 1st joint and basal process reduced. Antennal scale not strongly developed, sometimes reduced to the spine only. 1st pair of legs unusually large, robust, and more or less strongly asymmetrical; 6th joint with impressed line (*linea impressa*) proximally delimiting an oval-triangular space (fig. 144, *d*, *e*); finger more or less external, always a small round polished area above the articulation fitting against a similar area on apex of 6th joint when the finger is extended (Coutière: plaques adhesives) (figs. 140, *h*, *l*; 144, *d*, *n*). No movable scale at base of uropod. Telson with well-developed anal tubercles (fig. 144, *b*). Gills 5, plus 1 arthrobranch, and 8 epipods (sometimes also a rudimentary pleurobranch on mxp. 3 (fig. 144, *c*)). Eggs

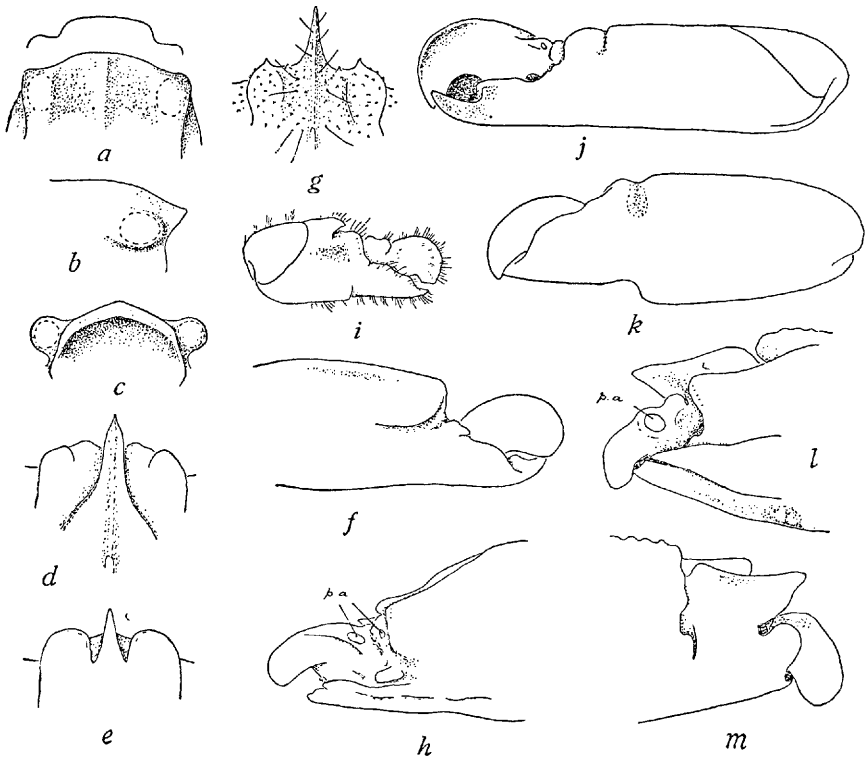


FIG. 140.—*Alpheus frontalis* M. Edw. Mauritius. *a*, dorsal view of front of ♀, with outline of same of ♂. *b*, lateral view of same, ♀. *c*, front view of same, ♀.

Alpheus insignis Heller. Mauritius. *d*, dorsal view of front (after de Man, 1902).

Alpheus macrochirus Richters. Mauritius. *e*, dorsal view of front. *f*, upper surface of large chela, setae omitted (both figures after Coutière, 1899).

Alpheus villosus (Oliv.). Mauritius. *g*, dorsal view of front. *h*, lower surface of large chela (both figures after Coutière, 1899).

Alpheus hippothoë de Man. Zanzibar. *i*, lower surface of large chela (after de Man, 1888).

Alpheus gracilipes Stimpson. Dar-es-Salaam. *j*, upper surface of large chela (after Coutière, 1899).

Alpheus leviusculus Dana. Mauritius. *k*, upper surface of large chela (after de Man, 1915).

Alpheus deuteropus Hilg. Zanzibar. *l*, *m*, upper and lower surfaces of apical portion of large chela (after Coutière, 1899).

(*p.a.*, polished areas, plaques adhesives.)

moderate or sometimes rather large; in most species a *Zoea* larva, but in some cases this stage is passed within the egg and the development is abbreviated.

Remarks.—The epipod on mxp. 3 consists of a short rod with hooked apex; the epipods on 1st–4th legs consist each of an anterior

setiferous tubercle and a posterior rod (Coutière: α and β resp.); the epipod on 5th leg consists only of the setiferous tubercle (not counted as an epipod by Alcock). One or more of the long filiform setae on one leg may be clasped by the hook on the preceding leg (fig. 144, *c*).

In some species the finger of the small chela is described as "Balaeniceps"-like (fig. 144, *f*). The lateral margins curve upwards and meet on the upper surface some little distance from the actual apex, and are densely clothed with setae, thus resembling the upper jaw of a Baleen-whale.

Habits, etc.—Cracker-shrimps derive their name from the noise produced by suddenly closing the finger and thumb of the large chela (Coutière, *l. c.*, 1899, p. 536).

All the species live concealed, either in definite burrows in mud-banks, or under rocks and amongst the crevices of corals. *A. frontalis* M. Edw. (Cuvier, Règne Anim. Crust., pl. 53, fig. 2), from Mauritius, lives in felted tubes made by Oscillariae (Richters, 1880).

The genus has not been recorded from the west coast of South Africa south of the Cameroons. On the south coast of South Africa the most westerly locality is Breede River estuary.

Classification.—Coutière (1899, *l. c.*, p. 351) and de Man (1911, *l. c.*, p. 307) have grouped the very numerous species into 5 groups, one of which is subdivided into 3. As these groups are characterized more by *combinations* of characters than mutually exclusive characters, they are not utilized here for purposes of the key. A list of the species, grouped according to the divisions of Coutière and de Man, is given.

In the key I have endeavoured to include also the species recorded from Mauritius (Richters, 1880) and Zanzibar (Hilgendorf, 1878), as some of these have already been recorded from South Africa, and eventually perhaps others also will be found within our limits.

The identification of specimens is no easy matter, particularly because the chelae so often break off and are lost, and collections often contain two or more species mixed up in one bottle with detached chelae and legs. Hence in the key the characters of the chelae are subordinated as far as possible to the less deciduous characters of the rostrum and hinder legs.

A. gracilis is not included, because I consider Stebbing's identification very uncertain. Certain features only, and those not all of great importance, are mentioned by Stebbing, and his figures do not supply the deficiencies (1919, Ann. Durban Mus., ii, p. 123, pl. 20). The true *gracilis* has biunguiculate dactyls on 3rd–5th legs. Stebbing's

specimen is not unlike *facetus* de Man. I have seen a specimen from St. Lucia Bay which apparently corresponds with Stebbing's specimen. It has a white medio-dorsal stripe, alternately broad and constricted, on the abdomen; spine on outer ramus of uropod pale; dactyls of 3rd–5th legs simple. But the chelae are missing; there are no supra-orbital spines.

Some other specimens, also from St. Lucia Bay, may be the true *gracilis*. They have 2 brown transverse bands on the carapace, a transverse brown band on each abdominal segment, and the spine on outer ramus of uropod black. The dactyls of 3rd–5th legs are biunguiculate, and supra-orbital spines are present; but the chelae are missing.

To help identification of the Mauritian and other species included in the key, and which may later be found in South African waters, figures are given of most of the species included in the key.

List of Species.

South African Species marked *.

GROUP *megacheles.*

deuteropus Hilg. Zanzibar.

GROUP *macrochirus.*

* *lottini* Guer. (*ventrosus* M. Edw.).
villosus (Oliv.). Mauritius.
macrochirus Richters. Mauritius (Coutière, 1899, p. 32, ? = *sulcatus* Kingsley).
* *luciae* Brnrd.
? *gracilis* Heller.

GROUP *crinitus—obesomanus.*

obesomanus Dana. Mauritius.

GROUP *crinitus—insignis.*

* *dissodontonotus* Stebb.
gracilipes Stimpson. Dar-es-Salaam.
insignis Heller. Mauritius.

GROUP *crinitus—crinitus.*

* *longecarinatus* Hilg.
frontalis M. Edw. Mauritius.

GROUP *brevirostris*.

* *rapacida* de Man.
* *notabilis* Stebb. ? in this group.

GROUP *edwardsii*.

* *bisincisus* de Haan.
* *crassimanus* Heller.
* *edwardsii* (Aud.).
* *malabaricus* Fabr.
* *parvirostris* Dana.
* *rapax* Fabr.
* *strenuus* Dana.
hippothoë de Man. Zanzibar (Hilgendorf: *pacifica*, non Dana. See Coutière, p. 32).
leviusculus Dana. Mauritius.

Key to the South African [Mauritian, etc.] Species.

Frontal margin broad, no rostrum (fig. 140, *a–c*) . . . [*frontalis*].
Rostrum, or at least a rostral point, present.
I. 2nd jointlet of wrist of 2nd leg at least twice as long as 1st jointlet (fig. 141, *d*).
A. Front rather broad. Apical joint of mxp. 3 oval (fig. 141, *c*) . . . . . *longecarinatus*.
B. Front narrow. Apical joint of mxp. 3 narrow. Finger of large chela hammer-head-shaped . [*obesomanus*].
II. 2nd jointlet of wrist of 2nd leg not longer than 1st jointlet.
A. Telson constricted in distal half. Chela (presumably the smaller chela) slender and elongate, palm 1½ times as long as finger . . . . *notabilis*.
B. Telson not markedly constricted, more or less broad.
1. Supra-orbital spines present (fig. 141, *e*).
a. Dactyls of 3rd–5th legs peculiar, short, stout (fig. 141, *h*, *i*) . . . *lottini*.
b. Dactyls of 3rd–5th legs simple . . [*deuteropus*].
c. Dactyls of 3rd–5th legs biunguiculate . *gracilis*.
2. No supra-orbital spines. Dactyls of 3rd–5th legs biunguiculate . . . . . [*macrochirus*].
3. No supra-orbital spines. Dactyls of 3rd–5th legs simple.
a. A flat tooth on either side of base of rostrum behind eyes (fig. 141, *k*) . . *dissodontonotus*.
b. No tooth flanking rostrum.
i. Outer margin of hand of large chela entire, not grooved . . *rapacida*.
ii. A narrow furrow across outer margin of hand of large chela (figs. 140, *j*, 142, *h*).

α. Rostral keel flanked by open grooves (fig. 140, *g*). Finger of small chela ♂ subulate . . . *rapax*.

β. Rostrum arising from a triangular flattened base between orbital hoods (fig. 140, *d*). Finger of small chela ♂ Balaeniceps-like.

* 4th joint of 3rd leg with apical tooth . . [*insignis*].

** 4th joint of 3rd leg without tooth . [*gracilipes*].

iii. An open groove across outer margin of hand of large chela (figs. 143, 144), sometimes feeble.

α. 4th joint of 3rd leg with tooth on lower distal margin.

* Carapace villose. An acute tooth on rostral keel at base of orbital hoods (fig. 140, *g*) . . [*villosus*].*

** Carapace glabrous. Rostral keel unarmed.

§ Basal joint of ant. 2 with ventral spine . . *parvirostris*.

§§ Basal joint of ant. 2 without ventral spine . [*hippothoë*].

β. 4th joint of 3rd leg without tooth. 4th joint of large chela with apical (or subapical) tooth on inner (upper) margin.

* Small chela Balaeniceps-like in ♂ only.

§ Rostrum subulate, more or less keeled dorsally.

† Margins of palm of large chela ending bluntly *crassimanus*.

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* Minute supra-orbital spines present.

†† Margins of palm ending more or less acutely *edwardsii*.

§§ Rostrum dorsally flattened . *bisincisus*.

** Small chela Balaeniceps-like in both sexes . . . *strenuus*.

*** Small chela not Balaeniceps-like.

§ Transverse groove on inner surface of palm of large chela extending as a longitudinal groove (fig. 142, *m*) . *malabaricus*.

§§ Transverse groove U-shaped, not extending into a longitudinal groove (fig. 140, *k*) . [*leviusculus*].

γ. 4th joint of 3rd leg without tooth. 4th joint of large chela without apical tooth on inner margin . . *luciae*.

Alpheus longecarinatus Hilg.

Fig. 141, *a–d*.

1878. Hilgendorf, MB. Ak. Wiss. Berlin, p. 833, pl. 4, figs. 3–7.
1911. de Man, *l. c.*, p. 315 (in key).
1921. Coutière, *l. c.*, p. 426.
1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 389.

Frontal margin broad, evenly convex, rostrum short, triangular, keel extending backwards $\frac{2}{3}$ length of carapace, flanked on orbital hoods by shallow depressions. Carapace with scattered setae, chiefly anteriorly. No supra-orbital spines. Basal process of ant. 1 short,

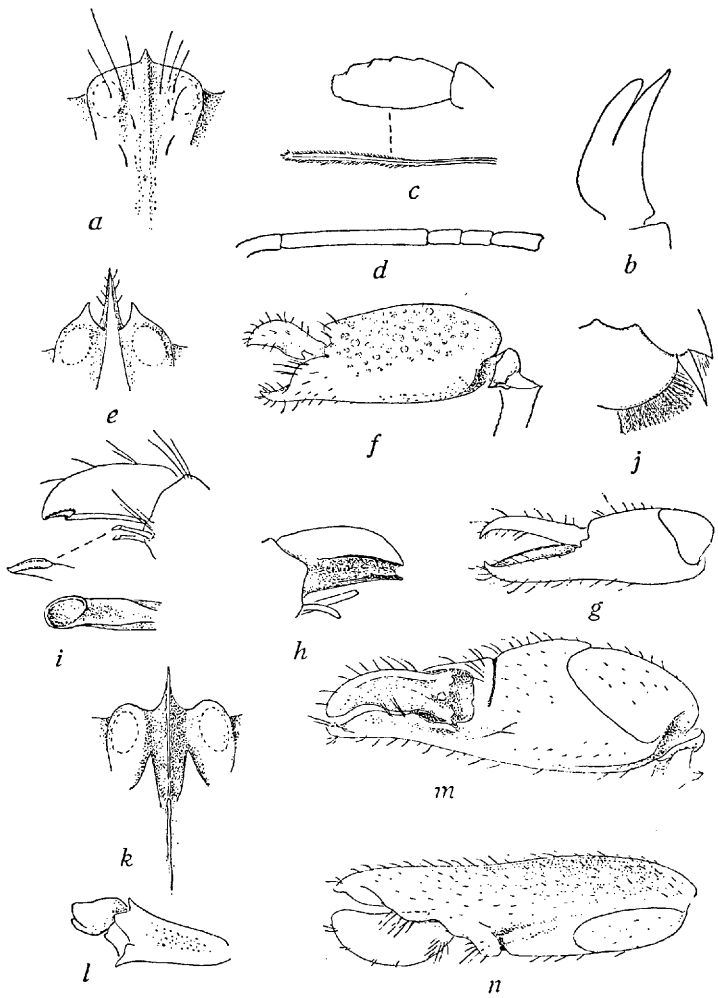

FIG. 141.—*Alpheus longecarinatus* Hilg. *a*, dorsal view of front. *b*, antennal scale, setae omitted. *c*, apical joint of mxp. 3, setae omitted, but one seta further enlarged. *d*, wrist of 2nd leg.

Alpheus lottini Guer. *e*, dorsal view of front. *f*, inner (upper) surface of chela. *g*, outer (lower) surface of smaller chela. *h*, outer surface of dactyl of 3rd and 4th legs. *i*, dactyl of 5th leg, with full view of ventral surface, and apex of a spine on 6th joint further enlarged. *j*, outer ramus of uropod, plumose setae cut short.

Alpheus dissodontonotus Stebb. *k*, dorsal view of front. *l*, upper (inner) view of 4th and 5th joints of large chela. *m*, lower surface of large chela, true profile of hand, but finger in oblique view. *n*, view of large chela from outer (lower) edge, showing true profile of finger and thumb, palm edge-on.

not reaching end of 1st joint. Basal joint of ant. 2 without ventral (external) spine; spine of antennal scale extending to end of 5th joint, lamellar portion a little shorter. Apical joint of mxp. 3 ovate-lanceolate but apically obtuse, with long setae. 4th joint of larger cheliped with tooth on inner margin, hand without transverse or longitudinal grooves; finger and thumb of smaller chela shorter than palm, not gaping. Wrist of 2nd leg with 2nd jointlet twice (Hilgendorf) or thrice (present specimen) as long as 1st, 5th a trifle longer than 1st, 3rd and 4th subequal, chela subequal to 4th plus 5th. 3rd–5th legs rather stout, movable spine on 3rd joint of 3rd and 4th legs unusually conspicuous, 4th joint with apical tooth, 5th joint with 3–4 spines and an apical tooth on lower margin; 6th joint on 5th leg with 5 spines on lower margin and only 2–3 small groups of serrulate spines distally; dactyls simple. Telson $1\frac{1}{2}$ times as long as basal width. Diaeresis of outer ramus of uropod curving towards base and then straight across towards inner margin. Arthrobranch on mxp. 3 smaller than in other species, no rudimentary pleurobranch. Eggs moderately large.

Length ♂ 20 mm., ovig. ♀ 22 mm. (Hilgendorf: ♀ 25 mm.).

Locality.—Delagoa Bay (Gilchrist's Survey).

Distribution.—Zanzibar; Amirante and Providence Groups.

Remarks.—Apparently this species has not been observed since its original description. It is therefore particularly unfortunate that neither of the present specimens has either the large or small chelae. The identity, however, is scarcely in doubt. The description of the chelae above is taken from Hilgendorf. He said there was a spine on the "trochanter" (3rd joint) of all legs. Such spines are present normally in *Alpheus* species on the 3rd and 4th legs, but I have not observed them on either the 1st, 2nd or 5th legs.

A. alcyone de Man 1902 (syn. *aculipes* Cout. 1905) is closely allied and very likely synonymous; it has biunguiculate dactyls on 3rd and 4th legs, and the lamellar portion of antennal scale much shorter than the spine.

Alpheus notabilis Stebb.

1915. Stebbing, *l. c.*, p. 80, pls. 20, 21 (Crust., pls. 84, 85).

1919. *Id.*, Ann. Durban Mus., ii, p. 122.

Stebbing (1915) compared the chela with Bate's *longimanus* (Japan), and later suggested that *notabilis* might be the same as *acutocarinatus* de Man (East Indies). The imperfection of the single specimen leaves its specific identity uncertain.

Rostrum subulate, setose, its keel extending $\frac{2}{3}$ length of carapace. No supra-orbital spines. Basal joint of ant. 2 with very short ventral spine; spine of antennal scale as long as the narrow lamellar part. Only one, presumably the smaller, of the 1st pair of legs known, palm nearly $1\frac{1}{2}$ times as long as finger, 8 times as long as wide, finger and thumb slender, subulate. No tooth on 4th joint in 3rd and 4th legs. Dactyls of 3rd–5th legs slender, acute. Telson $2\frac{1}{2}$ times as long as basal width, constricted in distal half, apical width half the basal width, apical margin strongly convex.

Length 30 mm.

Locality.—Delagoa Bay (Stebbing, and S. Afr. Mus.).

Remarks.—Two non-ovigerous ♀♀, smaller than the type and in poor condition, were collected by Gilchrist's Survey. With them, but disconnected, are two of the 3rd (or 4th) legs, and a slender chela resembling Stebbing's figure.

Alpheus lottini Guérin

Fig. 141, *e–j*.

1878. Hilgendorf, MB. Ak. Wiss. Berlin, p. 834 (*laevis* Randall).

1888. Bate, Rep. H.M.S. *Challenger*, xxiv, p. 555, pl. 99, fig. 3 (*laevis*).

1899. Coutière, *l. c.*, p. 429, pl. 5, fig. 1 (*laevis*) (*Zoea* stage).

1911. de Man, *l. c.*, pp. 311 (in key), 339 (*ventrosus*) (references).

1915. Stebbing, *l. c.*, p. 82 (references).

1919. *Id.*, Ann. Durban Mus., ii, p. 123.

1938. Gurney, *l. c.*, p. 44, figs. 193–198 (*ventrosus*) (larva).

Rostrum acute, somewhat triquetral in cross-section, more or less flattened dorsally, flanked by rather deep grooves. Supra-orbital spines present. Basal process of ant. 1 extending beyond apex of 1st joint. Lamellar portion of antennal scale extending to end of 5th joint, spine a little beyond. 1st pair of legs, no great difference in size between larger and smaller chelae, both chelae relatively smaller in ♀ than in ♂, 4th joint stouter in smaller than in larger chela, in both with tooth on inner apex, outer apex sharply rectangular but not produced, palm in both chelae smooth on both inner (upper) and outer (lower) surfaces, without transverse grooves, margins entire, "molar" process of finger of larger chela subcylindrical and obliquely truncate, finger of smaller chela subtriquetral. Wrist of 2nd leg with 1st jointlet longest, 2nd, 3rd and 4th subequal, or 2nd slightly longer or 4th slightly shorter than either of the other two resp., 5th a little

longer than 4th, chela subequal to 1st jointlet. 3rd–5th legs stout, especially the 3rd and 4th, no tooth on 4th joint of 3rd or 4th legs; dactyls of 3rd and 4th legs short, stout, grooved on outer surface causing a bidentate apex; dactyl of 5th leg grooved ventrally, with (in lateral view) subacute apex; 6th joint of 5th leg with only 4 groups of serrulate spines distally. Telson $1\frac{1}{2}$ times as long as basal width, latter $2\frac{1}{3}$–$2\frac{1}{2}$ times apical width. Outer ramus of uropod with strong spine (usually dark in colour) on outer margin at diaeresis, the line of which is scalloped. No rudimentary pleurobranch on mxp. 3. Eggs small and numerous.

Length ♀ up to 41 mm., smallest ovig. ♀ 19 mm. Pale olive or yellowish, with a darker orange or purplish stripe medio-dorsally, chelae deep orange with reddish spots on both upper and lower surfaces, especially towards the outer margin.

Localities.—Durban and Delagoa Bay (Stebbing); Delagoa Bay (coll. K. H. B. 1912; C. J. van der Horst).

Distribution.—Mauritius, Madagascar, Zanzibar, Red Sea, Seychelles, Indo-Pacific to California.

Remarks.—Distinguished from all other South African species by the dactyls of 3rd–5th legs and the presence of supra-orbital spines. It seems to prefer living among corals, where both Dr. C. J. van der Horst and myself found it at Delagoa Bay.

Stebbing (1915) thought that Bate's *Challenger* figure could not be easily reconciled with this species; but Bate's figures are known to be slightly inaccurate sometimes, and the synonymy is accepted by de Man. Bate's figure of the chela with its spots agrees with the present specimens.

Alpheus dissodontonotus Stebb.

Fig. 141, *k–n*.

1915. Stebbing, *l. c.*, p. 83, pl. 22 (Crust., pl. 86).

Rostrum spiniform, keeled, the keel extending back $\frac{2}{3}$ length of carapace, flanked on either side by a deep but rather broad groove, from the hind end of which projects a flat tooth extending forwards to level of hind margin of eye, an inconspicuous tubercle on the keel between bases of the two dorsal teeth. No supra-orbital spines. Basal process of ant. 1 reaching to end of 1st joint, latter without apical teeth. Spine of antennal scale extending slightly beyond lamellar part, which reaches to or slightly beyond apex of 5th joint. 1st pair of legs similar in both sexes (large and small chelae resp.), but

smaller in ♀ than in ♂; 4th joint with spiniform tooth on inner apex in larger chela, outer apex acutely produced in large and small chelae; owing to torsion (about 40°), finger and thumb of large chela lie in a different plane from that of palm, finger opening obliquely downwards (and outwards), palm with deep narrow transverse groove across outer margin, from which a shallow longitudinal groove runs proximally on inner (upper) surface, finger apically blunt, "molar" process flattened; small chela as in *crassimanus* ♀, finger and thumb subequal to palm, finger terete, slightly triquetral owing to a slight ridge on outer margin, less marked in ♀ than in ♂. 1st jointlet of wrist of 2nd leg a little longer (in type, but very little so in 2 other specimens) than 2nd, 3rd and 4th subequal, each shorter than 5th, chela very slightly shorter than 1st jointlet. 3rd–5th legs as in *crassimanus*, but a subapical tooth on lower margin of 4th joint in 3rd and 4th legs; dactyls simple. Telson as in *crassimanus*. Eggs rather large. (Rudimentary pleurobranch on mxp. 3 not determined with certainty.)

Length ♀ up to (approx.) 44 mm.

Localities.—Algoa Bay, 20 fathoms (Stebbing); Algoa Bay, 10 fathoms (S. Afr. Mus.); from stomach of Brotulid fish (*Bidenichthys capensis*), Still Bay (S. Afr. Mus.).

Remarks.—Differs from *bidens* (Oliv.) and *praedator* de Man in the dorsal teeth extending to level of hind margin of eyes, and the absence of denticles on upper apex of 1st peduncular joint of antenna 1 (*cf.* de Man, *l. c.*, pl. 17, figs. 80, 81).

Alpheus rapacida de Man

Fig. 142, *a–f.*

1908. de Man, Notes from Leyden Mus., xxx, p. 105.

1911 and 1915. *Id.*, *l. c.*, p. 394, pl. 20, fig. 91.

1921. Stebbing, Ann. Durban Mus., iii, p. 18.

Rostrum sharply triangular, flanked anteriorly by rather deep grooves, keel extending backwards to about middle of carapace. No supra-orbital spines. Basal process of ant. 1 extending to end of 1st joint. Lamellar portion of antennal scale extending distinctly beyond apex of 5th joint, but the spine only just exceeding the lamellar portion. Larger cheliped, 3rd and 4th joints serrulate on inner margin, the latter joint with apical tooth on inner and on outer margin, all topped with movable spinules; palm (to base of finger) about twice as long as wide, whole chela $3\frac{1}{3}$ (to nearly 3 according to de Man) times as long as wide, no transverse or longitudinal grooves, outer

edge somewhat flattened distally between a slight ridge from finger-hinge to the *linea impressa* and the narrow setiferous groove which extends the whole length of margin, a similar setiferous groove on

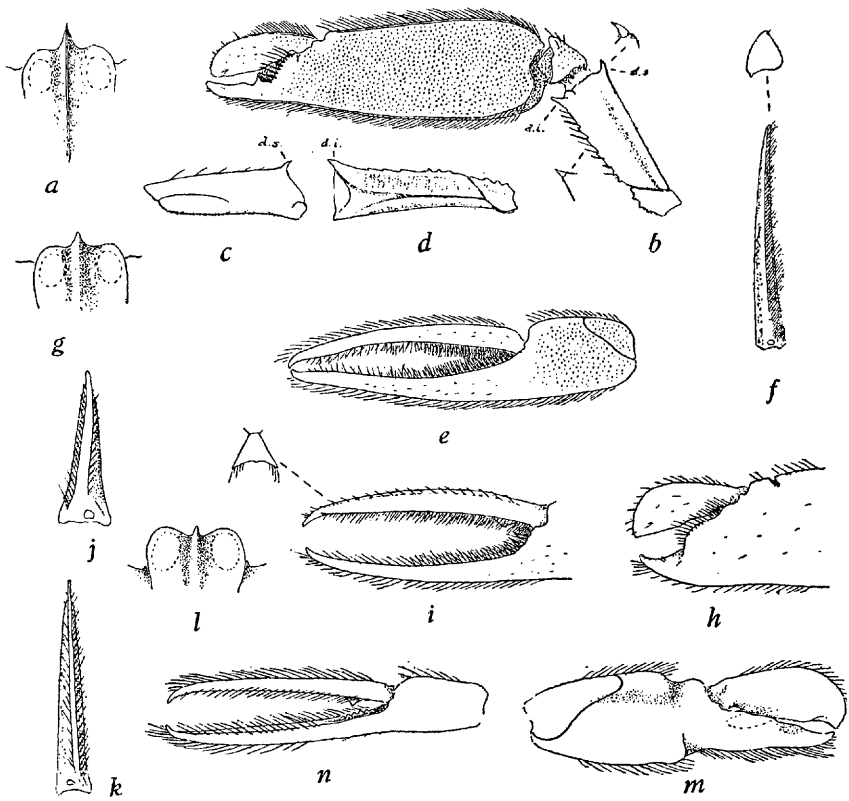

FIG. 142.—*Alpheus rapacida* de Man. *a*, dorsal view of front. *b*, inner (upper) view of large chela ♂. *c*, outer surface of 4th joint of same. *d*, lower surface of 3rd and 4th joints of same. *e*, outer (lower) view of small chela ♂. *f*, outer edge of finger of same, with cross-section.

Alpheus rapax Fabr. *g*, dorsal view of front. *h*, apex of large chela ♂. *i*, apex of small chela ♂, with cross-section of finger. *j*, *k*, outer edge of finger of large and small chelae respectively.

Alpheus malabaricus Fabr. *l*, dorsal view of front. *m*, lower (outer) view of large chela ♀. *n*, lower view of small chela ♀.

inner margin extending to apex of thumb, and a similar one on finger, "molar" process very little projecting, concave; 4th joint granulate on lower surface and on edge of margin bordering the narrow groove (fig. 142, *d*), 5th granulate on upper surface, 6th and base of finger granulate on both surfaces, tips of finger and thumb smooth; smaller

chela, 3rd and 4th joints as in larger chela, palm about 1½ times as long as wide, and half length of finger, finger and thumb ensiform, slender, gaping, inner margins setose, especially proximally, outer and inner margins of hand with setiferous groove and granulation as in larger chela. Wrist of 2nd leg with 2nd jointlet slightly longer than 1st, 5th only slightly longer than 3rd or 4th, which are subequal, chela a little longer than 5th jointlet. 3rd and 4th legs without tooth on 4th joint; dactyl of 3rd leg half length of 6th joint, shorter in 4th leg; 5th leg with serrulate spines on 6th joint extending half-way to base of joint. Telson twice as long as its greatest width, latter not twice the apical width, apical margin convex.

Length ♂ 60 mm., large and small chelae (3rd joint to apex) resp. 42 and 40 mm. ♂ brownish pink, irrorated with paler marks, cephalic groove paler, abdomen with 3 longitudinal sublateral and lateral stripes on each side of the darker median stripe; upper (inner) surfaces of chelae greenish brown mottled with paler, lower surface pale, finger and thumb of large chela orange; wrist and chela of 2nd legs violet; longer flagellum of antenna 1, and setae on mxp. 3. orange-sienna; 3rd–5th legs buff (Delagoa Bay specimen in formalin).

Localities.—Durban (Stebbing); off Zululand coast, 26 fathoms, and Delagoa Bay (S. Afr. Mus.).

Distribution.—East Indies, 0–36 metres.

Remarks.—Closely resembling *rapax* Fabr., but distinguished by the absence of a transverse groove on larger chela, and the outer edge of finger in both chelae sharp-edged with only a single row of setae in a fine groove.

Alpheus rapax Fabr.

Fig. 142, *g–k*.

1798. Fabricius, Syst. Entom. Suppl., p. 405.

? 1878. Hilgendorf, MB. Ak. Wiss. Berlin, p. 832 (*malabaricus*, non Fabr.).

1909. de Man, Mem. Soc. zool. Fr., xxii, p. 147, pl. 7, figs. 1–8 (synonymy).

1911. *Id., l. c.*, pp. 322 (in key) and 385.

1926. Barnard, Trans. Roy. Soc. S. Afr., xiii, p. 121 (*laps. cal.* credited to de Haan).

[Not *rapax* de Haan, nor Bate, nor Coutière, 1905.]

Very like *rapacida*. Rostrum short, triangular, flanked by rather deep grooves, but keel not extending back beyond limits of orbital

hoods. The spine of antennal scale extending beyond the lamellar portion, and both extending beyond 5th joint, the lamellar portion very narrow, scarcely as wide as spine. Larger cheliped, inner margin of 4th joint feebly serrulate, no apical tooth, no tooth on outer apex, hand similar to that of *rapacida*, but less elongate, with a distinct transverse groove or furrow on outer edge distally, outer edge of finger distinctly flattened and smooth between 2 rows of setae; smaller chela in general similar to that of *rapacida* but finger in ♂ feebly "Balaeniceps"-like, the setose edges approaching but not meeting near the apex, the outer edge flattened between 2 rows of setae as in larger chela. Finger of the smaller chela in cross-section quite different from that of *rapacida* (*cf.* fig. 142, *f*, *i*, *k*). Rudimentary pleurobranch present on mxp. 3.

Length ♂ 30 mm. (de Man: ♂ 51 mm., ♀ 46 mm.).

Locality.—Delagoa Bay (coll. K. H. B. 1912).

Distribution.—Zanzibar (if Hilgendorf's record is correctly interpreted), Red Sea, Mergui Archipelago, East Indies.

Remarks.—I have seen only 1 ♂ and 1 non-ovig. ♀. These specimens appear to correspond with *rapax* as described by de Man, but Coutière's figure of the smaller chela (1899, *l. c.*, fig. 284), with which de Man said his specimens corresponded, seems to be more noticeably "Balaeniceps"-like than in the present ♂. The outer edges of the fingers of both chelae is a feature not figured (unfortunately) by de Man.

Alpheus parvirostris Dana.

Fig. 143, *e–i*.

1852. Dana, U.S. Explor. Exp., Crust., p. 551, pl. 35, fig. 3.

1905. Coutière, *l. c.*, p. 906.

1911 and 1915. de Man, *l. c.*, pp. 330 (in key) and 432, pl. 23, figs. 106, 106, *a* (frontal region and small chela).

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 389.

Rostrum narrow, acute, on either side of which the frontal margin is obtusely prominent, keel feeble, not extending backwards beyond orbital hoods. No supra-orbital spines. Basal joint of ant. 2 with strong inferior spine extending at least to middle of 2nd peduncular joint of ant. 1; spine of antennal scale extending at least to end of 5th joint (of ant. 2), lamellar portion narrow and considerably shorter. 4th joint of both large and small chelipeds (♂) with a sharp tooth on inner upper margin, not at but a little distance proximal to

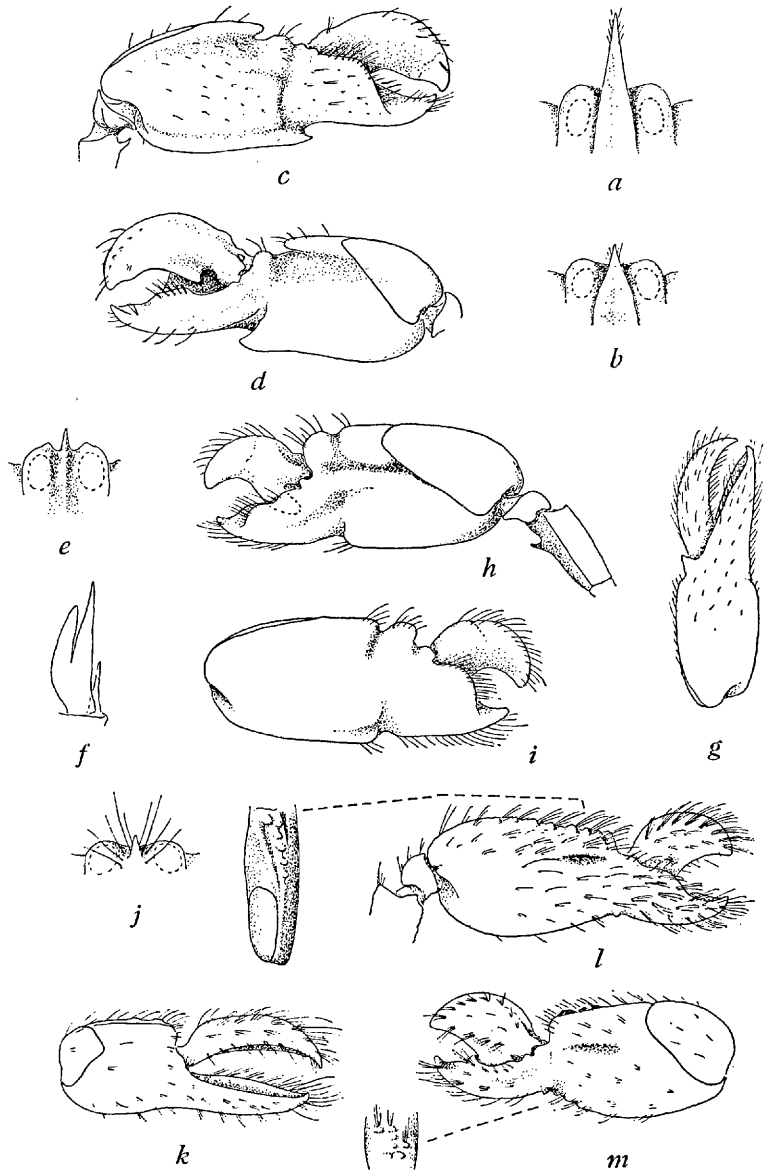

FIG. 143.—*Alpheus bisincisus* de Haan. *a*, *b*, dorsal view of front of ♂ and ♀ respectively. *c*, *d*, upper and lower surfaces respectively of large chela ♂. *Alpheus parvirostris* Dana. *e*, dorsal view of front. *f*, antennal scale. *g*, small chela ♂. *h*, *i*, lower and upper surfaces respectively of large chela ♂. *Alpheus luciae* Brnrd. *j*, dorsal view of front. *k*, lower surface of small chela ♂. *l*, *m*, upper and lower surfaces respectively of large chela ♂, with vertical views of outer and inner edges of hand.

apex, outer apex rectangular, not produced; hand of large chela with open transverse groove on outer edge, outer and inner margins ending bluntly (not produced), a deep longitudinal groove on lower (outer) surface between the transverse groove and the *linea impressa*, no longitudinal groove on inner (upper) surface; finger strong, blunt, "molar" process very strong; hand of small chela with nearly entire margins, finger and thumb about equal to palm, a rather prominent tooth on inner (upper) surface overlapping base of finger, finger rather strong, triquetral in cross-section, not "Balaeniceps"-like. Wrist of 2nd leg with 1st jointlet nearly twice as long as 2nd, 5th slightly shorter than 2nd, 3rd and 4th shortest, subequal, chela subequal to 1st jointlet. 3rd–5th legs with simple dactyls; 4th joint of 3rd and 4th legs with subapical tooth on lower margin. Telson with apical margin only slightly convex.

Length 13 mm.

Locality.—Mozambique (Island) (coll. K. H. B. 1912).

Distribution.—Red Sea, Maldives and Laccadives, Indo-Pacific to Japan.

Remarks.—Coutière (1905) stated that the species is widely distributed in the Indo-Pacific "depuis le Cap jusqu'aux îles Sandwich." I have not traced a record from "the Cape."

I have not seen Dana's original description and figures. Three ♂ specimens were taken amongst coral in rock-pools together with ♀♀ of *edwardsii* (K. H. B.).

Coutière (1899, *l. c.*, p. 32) identified Hilgendorf's *pacificus* (non Dana) with *hippothoë* de Man, but it might just as well be identified with *parvirostris* until Hilgendorf's material is re-examined.

Alpheus luciae Brnrd.

Fig. 143, *j–m.*

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 389.

Rostrum very short, setose, separated by deep but short grooves from the orbital hoods, which do not extend far backwards and are separated from pterygostomial portion of carapace only by shallow grooves. No supra-orbital spines. Basal process of ant. 1 reaching to end of 1st joint. Basal joint of ant. 2 with strong ventral spine; lamellar portion of antennal scale not extending as far as spine, the latter not quite reaching end of 5th joint. Apical joint of mxp. 3 elongate. 1st leg, no tooth on inner margin of 4th joint, hand of large chela with short deep longitudinal groove on both lower and upper

surfaces, inner margin with pairs of rounded tubercles near base of thumb, outer margin with 7–8 similar tubercles distally (the proximal ones obscure), finger strong, outer margin forming a smooth blunt keel between tufts of setae, whole chela with tufts and single setae, especially on upper surface. Wrist of 2nd leg with 1st jointlet subequal to 2nd plus 3rd, 3rd and 4th subequal, 5th shorter than 2nd, chela subequal to 2nd jointlet. 3rd–5th legs stout, especially the 3rd and 4th, 4th joint of 3rd and 4th legs without tooth on lower margin, 6th joint with 7 strong spines on lower margin; 6th joint of 5th leg with 6 spines, serrulate spines extending $\frac{2}{3}$ towards base; all dactyls simple. Telson $1\frac{1}{2}$ times as long as basal width. Diaeresis on outer ramus of uropod scalloped. Rudimentary pleurobranch present on mxp. 3.

Length 32 mm.

Locality.—St. Lucia Bay, Zululand (S. Afr. Mus.).

Remarks.—From the robustness of the chelae the single specimen would appear to be a ♂, but there is no appendix masculina on pleopod 2.

Apparently closely allied to *macrochirus* Richters (Mauritius, etc.), but with simple (not biunguiculate) dactyls. It resembles *idiocheles* Cout. 1905 in the stout 3rd and 4th legs, but the rostrum is different, and the large chela entirely different.

Alpheus crassimanus Heller

Fig. 144.

Common Cracker-shrimp.

? 1843. Krauss, Südafrik. Crust., p. 55 (*edwardsii*, non Aud., non M. Edw.).

1888. Bate, Rep. H.M.S. *Challenger*, xxiv, p. 554, pl. 99, figs. 2, 2, *k* (large [*sic*] chela).

1899. Coutière, *l. c.*, pp. 238, etc., fig. 293 (small chela), p. 434 (development).

1902. de Man, Abh. Senckenb. Ges., xxv, p. 880, pl. 27, figs. 62, 62, *a* (large chela).

1910. Stebbing, *l. c.*, p. 389 (also *edwardsii* Krauss).

1911. de Man, *l. c.*, pp. 328 (in key) and 417.

1915. Kemp, Mem. Ind. Mus., v, p. 299.

1926. Barnard, Trans. Roy. Soc. S. Afr., xiii, p. 121.

Rostrum short, triangular, its keel extending only a little beyond

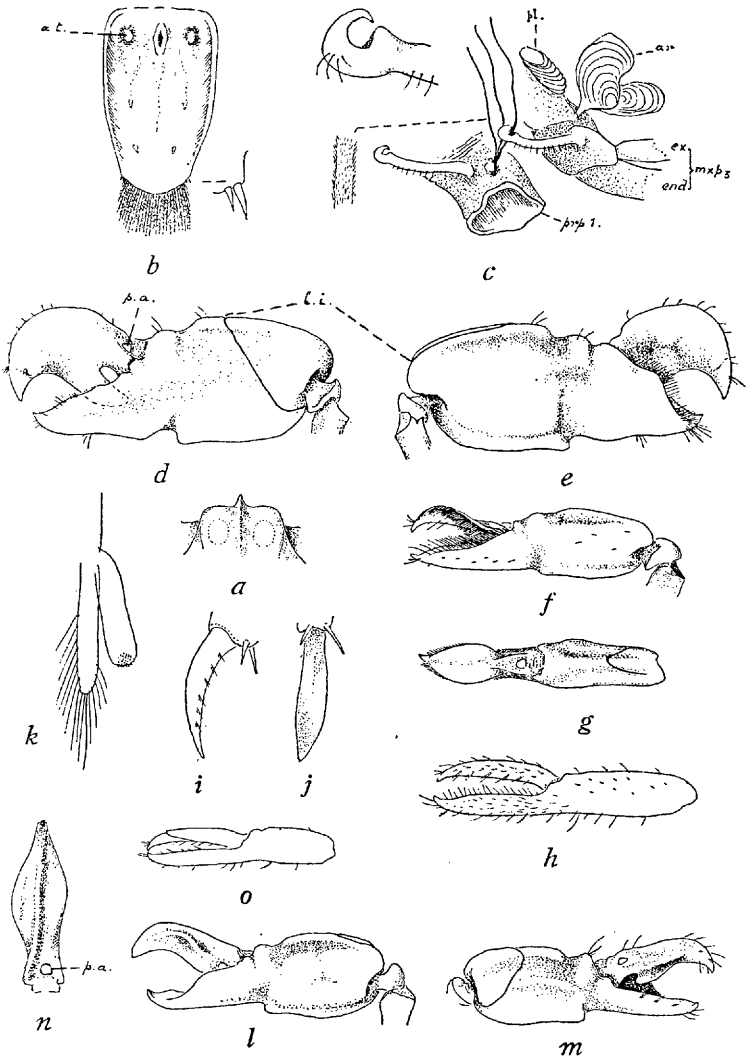

FIG. 144.—*Alpheus crassimanus* Heller. *a*, dorsal view of front. *b*, ventral view of telson to show anal tubercles, spines on dorsal surface dotted. *c*, bases of mxp. 3 and 1st leg, to show arthrobranch and rudimentary pleurobranch on former, and epipods, apex of rod and a portion of a filamentous seta further enlarged. *d*, *e*, outer and inner views of large chela. *f*, *g*, inner surface and outer edge of small chela ♂. *h*, small chela ♀. *i*, *j*, outer (lateral) and ventral views of dactyl of 3rd and 4th legs. *k*, pleopod 2 ♂.

Aberrant specimen from Knysna. *l*, *m*, upper and lower surfaces of large chela (right side) ♂. *n*, outer edge of finger of same, upper surface to the left. *o*, small chela of same specimen.

ar., arthrobranch. *a.t.*, anal tubercle. *end.*, *ex.*, endopod and exopod of mxp. 3. *l.i.*, linea impressa. *p.a.*, polished area. *pl.*, pleurobranch (rudimentary). *prp.* 1, 1st leg.

hind margin of eyes, with shallow open groove on either side. No supra-orbital spines. Basal process of ant. 1 not reaching apex of 1st joint. Spine of antennal scale reaching apex of 5th joint, lamellar part slightly shorter than spine. Large chela similar in ♂ and ♀, but smaller in the latter, 4th joint with sharp tooth on inner apex (fig. 144, *e*), outer apex not produced, outer and inner margins of palm ending bluntly before the transverse grooves, groove on inner (upper) surface extending proximally as a triangular depression, "molar" process of finger very strong, bluntly conical; small chela in ♂ "Balaeniceps"-like, no tooth on apex of 4th joint, finger flattened, beak-like, oval in external view, with thick marginal brushes of setae meeting behind the pointed apex, inner surface with sharp median keel, flanked with setae, thumb with thick marginal brushes, inner surface with sharp, slightly convex cutting-edge; in ♀ finger and thumb slightly longer than palm, terete, each with a sharp cutting-edge. 2nd leg about 1½ times length of carapace, wrist with 1st jointlet longest, 2nd longer than 5th, 3rd and 4th shortest, subequal, each shorter than 5th, chela subequal to 2nd jointlet. 3rd–5th legs becoming successively more slender; 3rd and 4th legs with a movable spine on lower surface proximally on 3rd joint, lower apex of 4th joint not acute or prominent, lower margin of 6th joint spinose and setose; dactyls on 3rd and 4th legs slender, ventrally concave; on 5th leg the 6th joint with transverse series of serrulate spines extending more than half-way from apex to base, dactyl narrower and more terete than on 3rd and 4th legs. Telson about 1½ times as long as broad, 2 pairs of dorsal spinules, anterior pair at about middle of length, postero-lateral corners not spiniform, with 2 unequal spines, apical margin gently convex. Diaeresis across outer ramus of uropod straight. Rudimentary pleurobranch present on mxp. 3. Eggs small and numerous.

Length ♂ up to 52 mm., ♀ 55 mm. In a ♂ 50 mm. long the large chela (base of 6th joint to apex of closed finger) measures 30 mm. with a width of 14 mm., in a ♀ of equal size 22 and 11 mm. resp. Smallest ovigerous ♀ observed (Delagoa Bay) 33 mm. Greeny-brown, olive-green, or smoky-grey, anterior parts of abdominal segments often white (producing a banded appearance), with or without longitudinal stripes (a median and 2 lateral) on each segment, the lower lateral stripe runs along the lower margins of the pleurae and is often edged with black, a black spot in middle of the side on segments 2 and 4; telson and uropods apically blackish (turning red in alcohol); chelae greeny-orange or greeny-brown, finger and thumb of large chela

orange, tips dull violet, palm with a more or less brilliant cobalt-blue patch on inner (upper) surface; other legs dull pinkish (K. H. B., *cf.* Kemp, 1915).

Localities.—Zwartkops estuary, Algoa Bay (Stebbing); Delagoa Bay (Barnard); estuaries of the Breede River (Port Beaufort), Kaffirkuils River (Still Bay), Keurbooms River (Plettenberg Bay), and Zwartkops River, Knysna lagoon and estuary, Port St. Johns, Umzimkulu River (Port Shepstone, Natal), Durban Bay, Delagoa Bay (S. Afr. Mus.).

Distribution.—Nicobar Is., coasts of India, East Indies, Red Sea, N. Australia.

Remarks.—Bate has mistaken the small chela for the large one; Heller figured only the smaller chela of ♂.

As this is the commonest species of Cracker-shrimp on the South African coast, it is probable that Krauss' material should be identified as *crassimanus*.

Aberration (fig. 144, *l–o*).—Along with many normal specimens from Knysna lagoon there is one ♂ specimen which appears to be an aberration of *crassimanus*; or it may represent a stage in regeneration after injury (*cf.* Wilson, 1903, Biol. Bull., iv, pp. 197–210). ♂ 52 mm. large chela 24 mm. (on right side); no spine on inner apex of 4th joint of 1st leg (as in *normal small* cheliped), finger beak-like with strong median keel and a lateral keel on each side; small chela as in normal small chela of ♀, but finger with only a slight indication of the lateral ridges and no marginal brushes of setae.

Alpheus edwardsii (Aud.)

1878. Hilgendorf, MB. Ak. Wiss. Berlin, p. 830, pl. 4, fig. 2 (epipods).

1902. de Man, Abh. Senckenb. Ges., xxv, p. 880, pl. 27, fig. 62, *b*, *c* (large chela).

1905. Coutière, *l. c.*, pp. 911, 912, pl. 86, figs. 50, 50, *a*, *b*.

1911. de Man, *l. c.*, pp. 327 (in key) and 414 (notes under *audouini*).

1927. Hale, S. Austral. Crust., pt. 1, p. 47 (*Crangon e.* var.).

[Not *edwardsii* M. Edw., nor Dana, nor Bate; probably not Krauss.]

Differs from *crassimanus* in having both margins of palm of large chela ending acutely (and more or less overhanging the transverse grooves; see de Man's figure (1902), and cf. *bisincisus*), and the margins of palm of small chela (♂) almost straight (not notched in profile).

Length smallest ovig. ♀ (Mozambique) 14 mm.

Localities.—Mozambique and Inhambane (Hilgendorf); off Zululand coast, 13 fathoms (S. Afr. Mus.); Durban, St. Lucia Bay, Delagoa Bay, Mozambique (S. Afr. Mus.).

Remarks.—At Mozambique the specimens were found amongst corals in rock pools (K. H. B. 1912).

Parasites.—A branchial parasite (*Bopyrella* sp.) was found in a specimen from Delagoa Bay.

Alpheus strenuus Dana

1852. Dana, U.S. Explor. Exp., Crust., p. 543, pl. 34, fig. 4.

1878. Hilgendorf, MB. Ak. Wiss. Berlin, p. 831.

1901. Lanchester, Proc. Zool. Soc. Lond., ii, p. 563 (*lobidens*, non de Haan).

1905. Coutière, *l. c.*, p. 913, pl. 87, figs. 53, 53, *a*, *b*.

1911. de Man, *l. c.*, pp. 329 (in key), 425.

Differs from *crassimanus* in having a more prominent rostrum, the 2nd leg more than $1\frac{1}{2}$ times length of carapace (sometimes twice length of carapace), and the small chela in ♀ resembling that of ♂ (*i.e.* "Balaeniceps"-like).

Locality.—Mozambique (Hilgendorf).

Distribution.—Red Sea, Maldives and Laccadives, East Indies, Pacific Islands.

Alpheus bisincisus de Haan

Fig. 143, *a–d*.

1849. de Haan, Fauna Japon., Crust., p. 179, pl. 45, fig. 3.

1905. Coutière, *l. c.*, pp. 910, 911 (var. *malensis*, pl. 86, figs. 48, 48, *a–d*).

1911 and 1915. de Man, *l. c.*, p. 405, pl. 22, fig. 95, and var. *variabilis*, p. 406, pl. 22, fig. 95, *a*.

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 390.

Rostrum flattened and feebly concave dorsally, no median keel, apex acute, setose, longer and narrower in ♂ than in ♀, flanked by deep grooves. No supra-orbital spines. Basal process of ant. 1 reaching apex of 1st joint. Large chela as in *crassimanus* but both margins of palm ending in blunt projections, "molar" process of finger flattened; similar in both sexes, but smaller in ♀; small chelae as in *crassimanus* ♂ and ♀ respectively. Chela of 2nd leg subequal to 1st jointlet of wrist. Other characters as in *crassimanus*.

Length ♂ 23 mm., ovig. ♀♀ 16–32 mm.

Localities.—Off Umtwalumi (north of Port Shepstone), Natal, 25 fathoms, and Durban Bay (S. Afr. Mus.).

Distribution (including varieties).—Japan, New Caledonia, East Indies, Maldives and Laccadives.

Remarks.—Variation in the proportions of the chelae have led to the institution of two or three varieties. The typical form, with which the present specimens seem to agree best, has the length of large chela 2·2–2·5 times the length of the finger. Neither Coutière nor de Man indicate any sexual difference in the size of the rostrum.

Alpheus malabaricus Fabr.

Fig. 142, *l–n*.

1798. Fabricius, Syst. Entom. Suppl., p. 405.

1893. Henderson, Trans. Linn. Soc. Lond., 2nd ser. zool., v, p. 434, pl. 40, figs. 1–3.

1911 and 1915. de Man, *l. c.*, p. 429, pl. 23, figs. 105 (varieties).

1915. Kemp, Mem. Ind. Mus., v, p. 301.

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 390.

[Not *malabaricus* de Haan, nor Ortmann, nor Hilgendorf.]

Rostrum very small, scarcely extending beyond level of the rather prominent rounded orbital hoods, no keel. No supra-orbital spines. Basal process of ant. 1 not quite reaching apex of 1st joint. Lamellar portion of antennal scale rather broad, reaching to apex of 5th joint, spine scarcely projecting farther. Large chela ♀, 4th joint with tooth on inner apex, margins of palm ending bluntly, "molar" process of finger large, bluntly conical; small chela ♀, 4th joint without tooth on inner apex, palm about $1\frac{1}{2}$ times as long as wide, finger and thumb at least $2\frac{2}{3}$ times as long as palm, straight or nearly so, sometimes slightly gaping, terete, finger with 1 largish tooth in middle of inner surface basally, thumb with several denticles in the corresponding position. Wrist of 2nd leg with 1st and 2nd jointlets subequal, 5th slightly longer than either 3rd or 4th, which are subequal. 3rd–5th legs, no spine on 4th joint of 3rd or 4th legs, all dactyls simple. Telson about $1\frac{2}{3}$ times as long as greatest width. Rudimentary pleurobranch present on mxp. 3 (♀). Eggs small and numerous.

Length ♂ 30 mm. (Henderson), ♀ (Delagoa Bay) 27 mm. Semi-transparent with reddish transverse bars, 4 on carapace and 7 on abdomen, internal organs showing through integument as blackish-green masses, tip of telson and uropods deep blue, chelae dull greenish,

dotted with reddish brown, tips of fingers and thumbs fawn or pink, 3rd–5th legs yellow (Kemp).

Locality.—Delagoa Bay (Gilchrist's Survey).

Distribution.—Coasts of India, East Indies, Japan.

Remarks.—The tooth at base of finger of small chela is not always present. Both large and small chelae are alike in the ♂ and ♀, though relatively smaller in the latter.

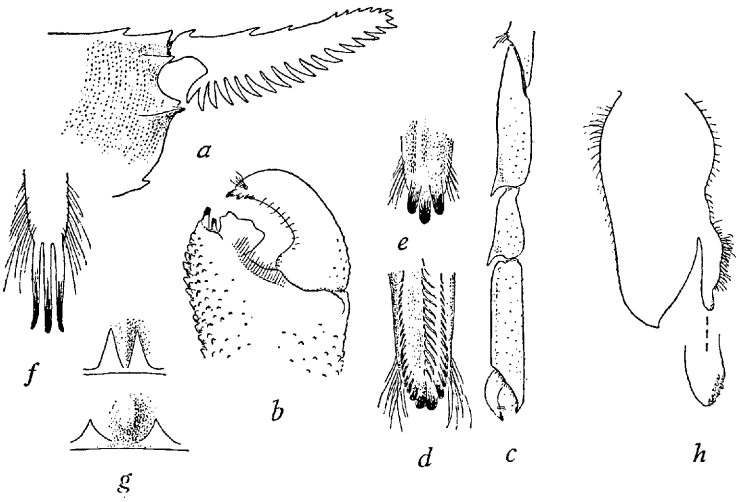

FIG. 145.—*Rhynchocinetes durbanensis* Gordon. *a*, front of carapace with rostrum. *b*, apex of chela of 1st leg of adult ♂. *c*, 1st leg of juv. ♂. *d*, *e*, inner view of apex of finger and thumb of chela of juv. ♂. *f*, apex of thumb of chela of 2nd leg. *g*, 2nd and 3rd thoracic sternites. *h*, endopod of pleopod 1 ♂.

FAMILY RHYNCHOCINETIDAE.

1917. Stebbing, Ann. Durban Mus., ii, p. 26.

1939. Burkenroad, Ann. Mag. Nat. Hist. (xi), 3, p. 310 (systematic position).

Rostrum compressed, dentate, more or less movably articulated with front of carapace. Lateral (horizontal or oblique) pleural sutures on anterior abdominal segments often present (in adult). Antennal spine present, supra-orbital present or absent. Eyes conspicuous, on short stalks. Mandible with incisor process and 3-jointed palp. Mxp. 2 with apical joint attached laterally to 6th joint. Mxp. 3 with exopod and epipod. Exopods absent from all legs; epipods present on all except the 5th. 1st pair of legs robust,

equal or unequal, chelate. 2nd pair of legs slender, equal, chelate, wrist not segmented. Telson tapering. Gills 10–11 plus 7 epipods. Pleopod 1 with appendix interna on endopod in ♂, sometimes also (abnormally) in ♀.

Gen. Rhynchocinetes M. Edw.

1917. Stebbing, *l. c.*, p. 26 (references).

1925. Kemp, Rec. Ind. Mus., xxvii, p. 263.

1927. Hale, S. Austral. Crust., pt. 1, p. 54.

1936. Gordon, Proc. Zool. Soc. Lond., i, p. 75 (revision, key to species).

1939. Burkenroad, *l. c.*, p. 310 (habits and larval stages).

1941. Gurney, J. Linn. Soc. Lond., xli, p. 113, figs. 8–10 (larval stages and systematic position).

1941. Hale, B.A.N.Z. Antarct. Res. Exp., B, iv, pt. 9, p. 269.

The only genus, with the above characters, is remarkable for the articulated and movable rostrum. This feature is paralleled by *Pantomus* in the *Pandalidae*. In the Madeiran species *rigens* Gordon the articulation is incomplete and movement restricted. An appendix interna on 1st pleopod ♂ is also an unusual feature. The 3rd maxillipeds and 1st pair of legs are often elongated in old males (Kemp, p. 264).

Five species are known from the Indo-Pacific (incl. west coast of S. America) and one from the Atlantic. Brightly coloured with spots or linear markings.

Rhynchocinetes durbanensis Gordon

Fig. 145.

1917. Stebbing, *l. c.*, p. 27, pl. 6 (*typus*, non M. Edw.).

1936. Gordon, *l. c.*, p. 83, figs. 5, *b*, *c*, 7, *c*, *d*.

Integument finely striate. Carapace with 2 post-rostral teeth, supra-orbital, antennal and pterygostomial spines present, orbit bounded below by a small angular projection above the antennal spine. Rostrum with 3 spaced teeth proximally and 7 distally above, 16–17 teeth below. Abdomen strongly humped at 3rd segment, no lateral sutures on 1st–3rd segments, no tooth on hind margin laterally on 4th and 5th segments. Spiniform tooth on outer apex of 1st peduncular joint of ant. 1 reaching to end of 2nd joint, basal process not reaching so far, about to middle of 2nd joint. Exopod of mxp. 3

extending to middle of antepenultimate joint (of mxp. 3). 1st leg, upper apices of 4th and 5th joints acute, upper margin of 6th bluntly carinate, finger and thumb gaping when closed, apices with dark stout spines, 3 on thumb, several decreasing in size proximally on finger, 3rd–6th joints granulate especially in adult ♂. 2nd leg slender, finger and thumb armed as in 1st leg but spines relatively longer, those on thumb almost as long as thumb itself. 3rd–5th legs, 3rd and 5th joints each with 1 movable adpressed spine on lower surface, 4th joint with 4 spines; dactyls biunguiculate, with 3 spinules on lower margin. Pleopod 1 ♂ with appendix interna, with coupling-hooks; pleopod 2 ♂ with the appendix interna longer than the appendix masculina. Telson with 3 pairs of dorso-lateral spinules. No arthrobranch on segment of 4th leg. 2nd and 3rd sternites each with 2 slender triangular teeth, set transversely, those on 3rd sternite farther apart than those on 2nd.

Length ♂ up to 77 mm. (Gordon). A Durban specimen after a month in formalin was pinkish with linear markings and ocelli (as in Stebbing's figure) of a darker red or red-brown, the colour deepest on the bands converging on the hump of 3rd abdominal segment; eye-stalks red, cornea black; antennal scale white with red external margin; uropods pink with darker external margins; legs pink, basal joints with darker bands; peduncles of pleopods red.

Locality.—Durban (Stebbing, Gordon; and S. Afr. Mus.).

Remarks.—Stebbing's figure shows a specimen, presumably ♂, in which the right 1st leg is robust, with relatively short wrist, and expanded hand, the finger almost semicircularly curved (whether the left was similar was not mentioned). A ♂, 75 mm. long, has the 1st pair of legs equal, granulate, with the finger curved, and a strong tooth-like process on the thumb (fig. 145, *b*).

Family GNATHOPHYLLIDAE.

1917. Borradaile, Trans. Linn. Soc. Lond., 2nd ser. zool., xvii, p. 408 (characters).

1920. de Man, Siboga Exp. monogr., xxxix *a*, 3, p. 187 (list of genera and species).

Carapace broad, abdomen humped. Rostrum compressed, serrate. Only the antennal spine present on carapace. Basal process of ant. 1 well developed; outer flagellum thickened basally, with very short cleft at end of thick part. Antennal scale apically rounded. Mandible simple, without incisor process or palp. Mxp. 2 with 7th joint

attached laterally to, or fused with, 6th joint. Mxp. 3 with some or all of the joints broadly expanded, with exopod and epipod. No exopods or epipods on legs. 1st and 2nd pairs of legs chelate, more or less dissimilar, the 2nd pair the larger, with unsegmented wrist. Telson with 2 pairs of lateral spines, apex with 2 pairs of unequal spines and a median pair of plumose setae. Gills 6 plus 3 epipods (a vestige of a pleurobranch on mxp. 3, as well as the arthrobranch, in *Hymenocera*).

Key to the South African Genera.

1. 3rd and 4th joints of mxp. 3 fused, broad. Outer flagellum of ant. 1 thick but not foliaceous . . . . . *Gnathophyllum.*
2. 3rd and 4th joints of mxp. 3 articulated, the three terminal joints (4th–6th) foliaceous. Outer flagellum of ant. 1 foliaceous. Hand of 2nd leg with foliaceous expansion *Hymenocera.*

Gen. GNATHOPHYLLUM Latr.

1819. Latreille, Nouv. Dict. Hist. Nat., 2nd ed., xxx, p. 72 (*Gnatophyllum* [sic], emend. Desmarest 1823).

1917. Borradaile, *l. c.*, p. 409.

1920. de Man, *l. c.*, pp. 187, 188.

1920. Stebbing, Ann. Durban Mus., ii, p. 275.

1940. Armstrong, Amer. Mus. Novit. no. 1096, p. 6 (key to species).

Rostrum short. 3rd and 4th joints of mxp. 3 fused, with notch on inner margin, broadly expanded, 5th and 6th joints small. The 2nd, 3rd, and 4th joints of mxp. 2 thick and muscular, the sutures obscure, 7th joint obsolete or indistinguishably fused with the scimitar-like 6th, inner margin of which bears a double row of palisade-like spines. No foliaceous expansions on 2nd legs. Outer flagellum of ant. 1 thick but not foliaceous. Mandible cylindrical. Dactyls of 3rd–5th legs biunguiculate.

Gnathophyllum fasciolatum Stimpson

Zebra Shrimp.

Fig. 146.

1860. Stimpson, Proc. Ac. Nat. Sci. Philad., p. 28.

1880. Richters, Meeresf. Mauritius, p. 161, pl. 17, figs. 18–20, 22 (*zebra*).

1917. Borradaile, *l. c.*, p. 409, pl. 59, figs. 8, *a–d* (mouth-parts).

1920. de Man, *l. c.*, p. 189, pl. 16, figs. 48, 48, *a–e.*

1920. Stebbing, *l. c.*, p. 275 (*americanus* Guérin).

1925. Balss, D. Tiefsee Exp., xx, p. 294 (*americanum*).

1940. Kubo, J. Imp. Fish. Inst. Tokyo, xxxiv, p. 84, figs. 7–9 (*americanum*).

1940. Armstrong, *l. c.*, pp. 6, 7, 8 (in key), fig. 4, A, B (ant. 1, scaphocerite) (*americanum*).

Rostrum compressed, on a broad triangular base, 5 teeth dorsally excluding the apex, the hindmost tooth in front of hind margin of

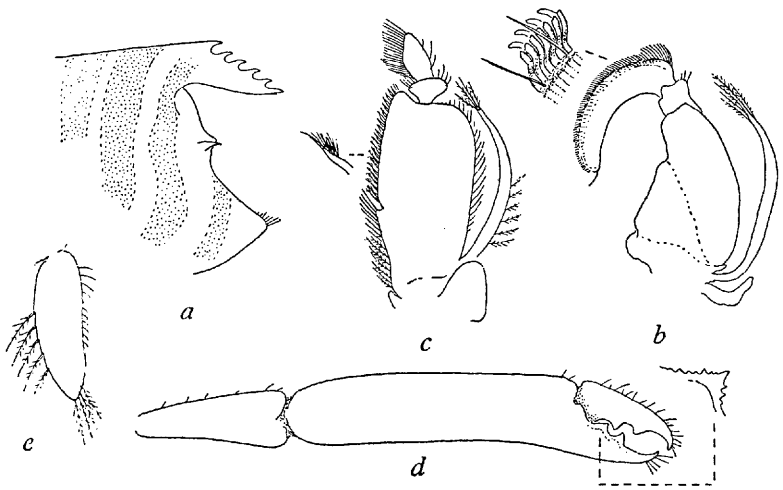

FIG. 146.—*Gnathophyllum fasciolatum* Stimpson. *a*, front of carapace and rostrum. *b*, 2nd maxilliped, with portion of margin of apical joint further enlarged. *c*, 3rd maxilliped. *d*, 2nd leg ♂. *e*, endopod of pleopod 1 ♂.

orbit, often a minute denticle near the tip ventrally. Antennal spine distinct, antero-lateral corner of carapace prominent. Outer flagellum of ant. 1 thicker and more densely setose in ♂ than in ♀. 1st legs extending beyond antennal scale by about the length of chela. 2nd legs much longer, especially in ♂, hand elongate, finger and thumb in ♀ and immature (or small-sized) ♂ with entire or feebly denticulate cutting-edges, in large ♂ each with 2 strong teeth, the proximal one on thumb being serrate.

Length up to 20 mm. (Stimpson), Mauritian specimens 15 mm. Buff or brownish or reddish with darker (dark red to blackish) transverse bars, 6 on carapace; 6th abdominal segment and tail-fan pale, legs and hands of large chelae with dark bands across middle of the joints, cornea black.

Localities.—Port St. Johns (S. Afr. Mus.); Durban (Stebbing); St. Lucia Bay, and Delagoa Bay (S. Afr. Mus.).

Distribution.—Mauritius, Seychelles, Chagos, Red Sea, East Indies, Pacific.

Remarks.—Regarded by some authors as synonymous with *americanum* from the Gulf of Mexico. Armstrong has compared specimens from the Pacific and West Indies and finds no significant difference, and therefore follows Nobili (1907) and Rathbun (1901) in regarding *americanum* as circumtropical. See Holthuis, 1949, Zool. Med., xxx, p. 244, figs. 5, 6 (*americanum*).

Gen. Hymenocera Desm.

1823. Desmarest, Dict. Sci. Nat., xxviii, pp. 259, 275.

1917. Borradaile, *l. c.*, pp. 409, 410.

1920. de Man, *l. c.*, pp. 188, 191.

Rostrum well developed. Mandible flattened. 3rd joint of mxp. 3 narrow, movably articulated with 4th, 4th–6th joints (or only 5th and 6th) expanded, foliaceous. 2nd and 3rd joints of mxp. 2 not clearly distinct, but 4th–7th distinctly articulated. Outer flagellum of ant. 1 foliaceous. 1st legs with hand slender, styliform, finger and thumb short and feeble. 2nd legs strong, hands with foliaceous expansions on inner margins. Dactyls of 3rd–5th legs biunguiculate.

Hymenocera elegans Heller

Fig. 147.

1861. Heller, SB. Ak. Wiss. Wien, xliv, p. 264, pl. 3, figs. 9–14.

1878. Hilgendorf, MB. Ak. Wiss. Berlin, p. 828.

1902. de Man, Abh. Senckenb. Ges., xxv, p. 822, pl. 25, fig. 52 (spines on mxp. 3).

1917. Borradaile, *l. c.*, p. 410, pl. 59, fig. 10, *a–f* (mouth-parts).

1920. de Man, *l. c.*, p. 191, pl. 16, fig. 49 (tail-fan).

1942. Ward, Mauritius Inst. Bull., ii, p. 58.

1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 390.

Rostrum with 7 (6–8) teeth above, the hindmost 3 in adult (2 in juv.) being really post-rostral (on the carapace), 1 or 2 below (excl. apical point). Basal process of ant. 1 reaching to middle or nearly to end (excl. spine on outer apex) of 1st peduncular joint. 4th–6th joints of mxp. 3 foliaceous, 4th wider than 3rd, 5th widest, shape not exactly alike on the two sides. 4th and 5th joints of 2nd leg with 2 apical spines, 6th joint with spine on outer apex, finger serrate, whole inner margin of palm and thumb with foliaceous expansion (not symmetrical on the two legs). Pleurae of 1st and 2nd (and to a lesser extent 3rd

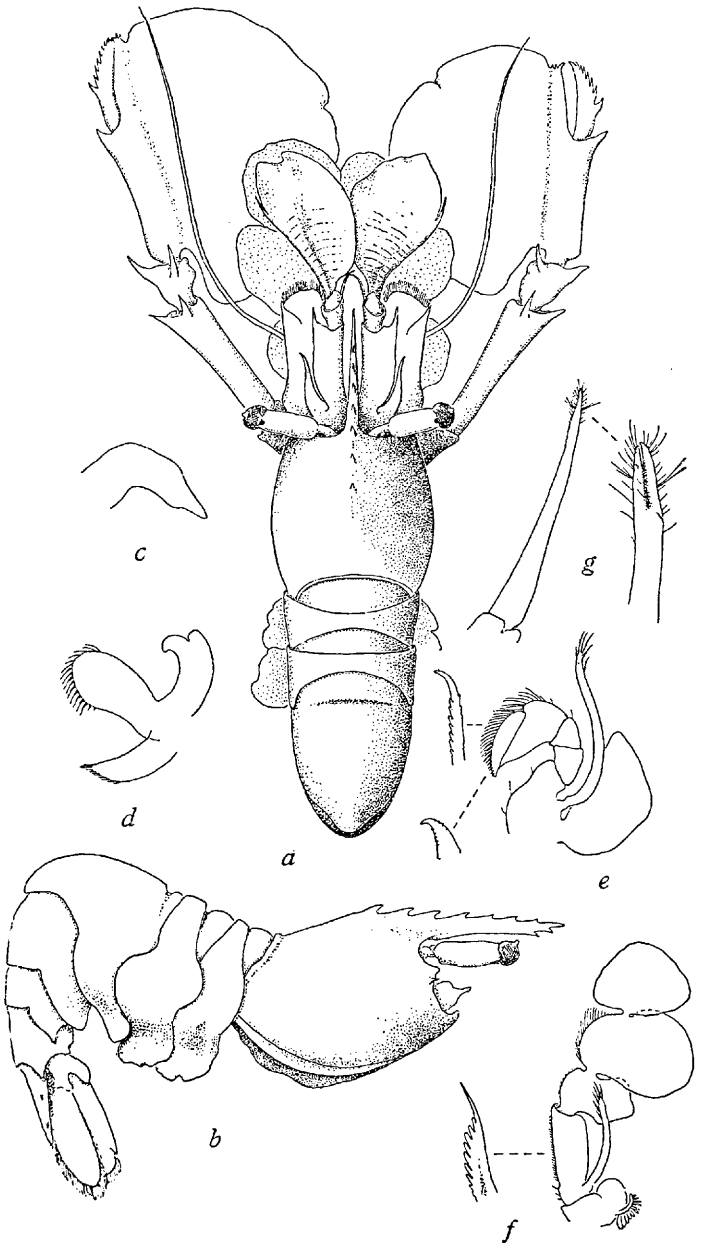

FIG. 147.—*Hymenocera elegans* Heller. *a*, dorsal view, lobes of the 3rd maxillipeds lightly dotted, projecting pleurae of 1st and 2nd abdominal segments partly omitted on right side. *b*, lateral view. *c*, mandible. *d*, 2nd maxilla. *e*, 2nd maxilliped with marginal spines further enlarged. *f*, 3rd maxilliped (right side), with marginal spine further enlarged. *g*, hand of 1st leg, with finger and thumb further enlarged in lateral view.

also) abdominal segments curved outwards, somewhat foliaceous, with irregular margins.

Length ♂ up to 40 mm. (de Man), ♀ up to 55 mm. (Hilgendorf). Semi-transparent with dirty grey spots (Heller); with blue ocelli (Hilgendorf).

Locality.—Delagoa Bay (coll. C. J. van der Horst, 1 ♂, 1939).

Distribution.—Red Sea, Seychelles, Chagos, Matemmo (presumably Matema Is., near Ibo, Portuguese East Africa), East Indies.

Remarks.—Hilgendorf recorded his specimens from under stones. Professor van der Horst also found his specimen under a stone: "it was a most beautiful animal and moved its chelae, etc., slowly and constantly, making an impression of floating leaves."

Family PALAEMONIDAE.

1900. Coutière, Ann. Sci. Nat., ser. 8, xii, p. 249 (wrongly dated in Stebbing, 1910 and 1915).

1910. Stebbing, *l. c.*, p. 383.

1915. *Id.*, Ann. S. Afr. Mus., xv, p. 72.

1917. Borradaile, Trans. Linn. Soc. Lond., 2nd ser. zool., xvii, pp. 323 *sqq.* (*Pontoniinae*).

1922. Kemp, Rec. Ind. Mus., xxiv, pp. 113 *sqq.* (key to genera of *Pontoniinae*).

1923. Sollaud, Bull. Biol. Fr. Belg., lvii, p. 509 (development of *Palaemoninae*).

1924. Gurney, "Terra Nova" Rep., zool., viii, p. 120 (larval stages).

1925. Kemp, Rec. Ind. Mus., xxvii, pp. 284 *sqq.* (key to genera of *Palaemoninae*).

1938. Gurney, Gt. Barrier Reef Exp. Rep., vi, pp. 1–44 (larval stages).

1941. Gurney and Lebour, J. Linn. Soc. Lond., xli, p. 135 (larval stages).

Rostrum compressed, usually dentate. Carapace with antennal, with or without hepatic and branchiostegal spines. Eyes well developed. Mandible with or without palp, incisor process and molar separated by a cleft. Mxp. 2 with 7th joint attached laterally to 6th. Mxp. 3 with exopod, with or without arthrobranch and pleurobranch. 1st legs with small chelae (in one Pontoniine genus, *Thaumastocaris*, the wrist is segmented). 2nd legs with larger and more robust chelae, wrist unsegmented. No epipods on legs. Telson tapering. Gills 6–7 plus 2 epipods.

Remarks.—The family includes marine, estuarine, and purely fluviatile species. The River Prawns are tropical and subtropical.

Key to the South African Genera.

I. Ant. 1 with 3 flagella. Mxp. 3 with pleurobranch. Telson with 4 apical spines (*Palaemoninae*).
  A. Mandible with palp.
    1. Hepatic spine usually present, branchiostegal spine absent (fig. 148, *a*, *i*). Fluviatile and estuarine . . . . . *Palaemon.*
    2. Hepatic spine absent, branchiostegal spine usually present (fig. 149, *a*, *l*). Marine, estuarine, fluviatile . . . . . *Leander.*
  B. Mandible without palp. Hepatic and branchiostegal spines present. Rostrum dentate . . . [*Palaemonetes*].

II. Ant. 1 with 2 flagella (outer one only slightly cleft). Mxp. 3 without pleurobranch. Telson with 6 apical spines (*Pontoniinae*). Mandible without palp in S. African genera.
  A. Dactyls of 3rd–5th legs simple or biunguiculate, without basal protuberance (fig. 151, *e*).
    1. Rostrum curving downwards, smooth (fig. 150, *a*). In bivalve Mollusca (*Pinna*) . . . *Anchistus.*
    2. Rostrum straight, dentate.
      a. Carapace not depressed. Free-living or associated with Sea Anemones . *Periclimenes* subgen. *Ancylocaris.*
      b. Carapace depressed. 3rd–5th legs stout. Associated with corals . . . *Harpilius.*
  B. Dactyls of 3rd–5th legs simple or biunguiculate and with basal protuberance (fig. 151, *l*, *m*, *o*).
    a. Rostrum compressed, dentate. Dactyls of 3rd–5th legs with single claw, protuberance hoof-shaped (fig. 151, *l*, *m*). In corals . . *Coralliocaris.*
    b. Rostrum depressed, non-dentate. Dactyls of 3rd–5th legs biunguiculate, with flat basal protuberance (fig. 151, *o*). In bivalve Mollusca (*Tridacna* and *Meleagrina*) . . *Conchodytes.*

Gen. PALAEMON Fabr.

River Prawns.

1898. Hilgendorf, Deutsch Ostafrika. Decap. Crust., p. 25 (key to East African species).

1900. Coutière, *l. c.*, p. 249.

1904. de Man, Trans. Linn. Soc. Lond., 2nd ser. zool., ix, pp. 299–324 (West African species).

1908. Stebbing, Ann. S. Afr. Mus., vi, p. 39 (*Macroterocheir*).

1910. *Id., l. c.*, pp. 384, 385 (*Palaemon, Eupalaemon, Parapalaemon, Macroterocheir*).

1910. Henderson and Matthai, Rec. Ind. Mus., v, p. 277 (Indian species).

1912. de Man, Rev. Zool. Afric., i, p. 413 (Congo species).

1915. Kemp, Mem. Ind. Mus., v, p. 265 (Chilka Lake species, and habits).

1926. Schmitt, Bull. Amer. Mus. Nat. Hist., liii, p. 27 (*Macrobrachium*, Congo species).

1940. Kubo, J. Imp. Fish. Inst. Tokyo, xxxiv, p. 5 (Japanese species).

Carapace with antennal and hepatic spines, but no branchiostegal (pterygostomial) spine. Ant. 1 with 3 flagella, the outer flagellum being cleft almost to base. Mandible with 3-jointed palp (1 exception). Mxp. 3 with pleurobranch. Dactyls of 3rd–5th legs simple. Telson with 4 apical spines. Appendix interna on pleopods 2–5, also appendix masculina on pleopod 2. Gills 6 plus 2 epipods.

Remarks.—The species of this genus are found in rivers and estuaries. They seem to be subject to considerable variation, and the separation of the species is often a puzzling and difficult matter.

P. lepidactylus is a distinct and easily recognizable species; but I am not at all sure that the specimens of the other species which I have seen are correctly identified. I have given descriptions of them, and indicated the points in which they seem to differ from other descriptions of the species to which they have been assigned.

Far more intensive collecting is necessary before the taxonomy of the South African species can be satisfactorily elucidated. Nothing is known about the life-history or the growth-changes. At present one can only describe *specimens*, not species.

Key to the South African Species.

I. 2nd legs robust (fig. 148, *b*, *c*), unequal in ♂, slightly so in ♀, 5th joint shorter than 4th. A ventral tooth between bases of uropods in both sexes. Hand, finger, and thumb of both 2nd chelae with scale-like granules, distinctly imbricate in ♂ (fig. 148, *d*), less so in ♀. 3rd–5th legs stout . . . . . *lepidactylus.*

II. 2nd legs slender (fig. 148, *h*), similar or unequal in ♀, 5th joint as long as or longer than 4th. No ventral tooth between bases of uropods.* 3rd–5th legs slender.

A. Carapace smooth.

1. ♂ finger and thumb of 2nd leg subequal to palm (fig. 148, *h*) . . . . . "*sundaicus.*"

2. ♂ finger and thumb of 2nd leg much shorter than palm . . . . . *delagoae.*

B. Carapace granulate or minutely spinulose, at least anteriorly (fig. 148, *i*).

1. One of the 2nd legs larger than the other in ♂, 5th joint short, scarcely longer than 4th.

a. ♂ finger of 2nd leg longer than palm, only the palm with felty pubescence . . *dolichodactylus.*

b. ♂ finger of 2nd leg shorter than palm, whole leg except finger and thumb with felty pubescence (*cf.* fig. 148, *h*) . . . *petersii.*

2. 2nd legs subequal in ♂, 5th joint long, longer than 4th.

a. Rostrum shorter than antennal scale. Finger and thumb of 2nd leg ♂ without denticles on inner edge (except 1 or 2 near base) . . . . . "*idae.*"

b. Rostrum as long as antennal scale. Finger and thumb of 2nd leg ♂ with a double row of denticles along inner edge . *rudis.*

Palaemon (*Macroterocheir*) *lepidactylus* Hilg.

Scaly-armed River Prawn.

Fig. 148, *a–d.*

1878. Hilgendorf, MB. Ak. Wiss. Berlin, p. 838, pl. 4, figs. 14–16.
1880. Miers, Ann. Mag. Nat. Hist. (5), v, p. 384 (*sed loc.* ?).
1898. Hilgendorf, *l. c.*, p. 32, fig. B (*P.* (*Macrobrachium*) *l.*).
1900. Coutière, *l. c.*, p. 272, pl. 10, pl. 11, figs. 13, 13, *a.*
1908. Stebbing, *l. c.*, p. 40 (*Macroterocheir l.*).
1910. *Id.*, *l. c.*, p. 386 (*Macroterocheir l.*).
1913. Calman, Proc. Zool. Soc. Lond., p. 926.

Carapace smooth. Rostrum in ♂ $2\frac{1}{2}$–$2\frac{3}{4}$ times, in ♀ 2–$2\frac{1}{4}$ times in post-orbital length of carapace, depth (incl. teeth) less than ($\frac{1}{2}$–$\frac{2}{3}$) the width of basal joint of ant. 1; with 10–13, usually 11–12, teeth (excl. tip of rostrum) above, of which 4–5 are post-orbital, and 1–3, usually 2, below. 2nd legs stout, subequal in ♀, but very robust and unequal in ♂

* Present, however, in the East African *P. lar.*

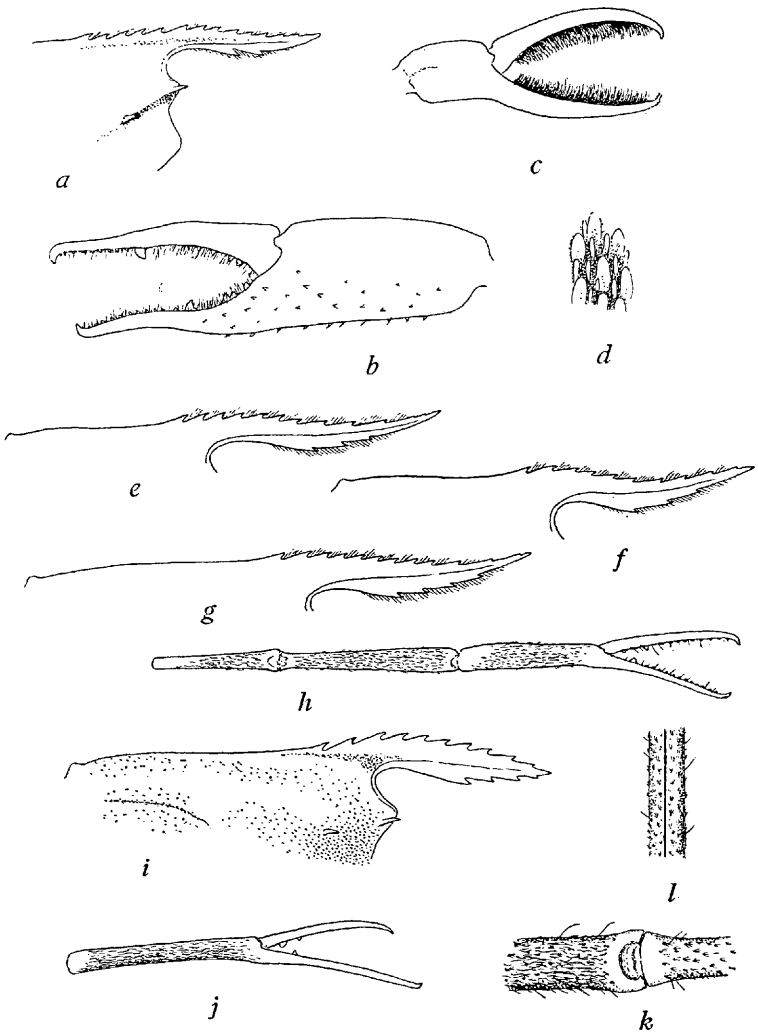

FIG. 148.—*Palaemon lepidactylus* Hilg. *a*, front of carapace and rostrum. *b*, chela of larger 2nd leg ♂, only the larger tubercles drawn in. *c*, chela of smaller 2nd leg ♂. *d*, detail of imbricate scale-like granules.
Palaemon "sundaicus." *e*, *f*, *g*, rostrum of a juv. 60 mm. total length, of a ♀ 88 mm., and of a ♂ 112 mm. respectively. *h*, 2nd leg of ♂.
Palaemon "idae." ♂, Isipingo. *i*, rostrum and part of carapace. *j*, chela of right 2nd leg. *k*, outer surface of junction of 6th joint and finger of same. *l*, inner edge of thumb of same.

(either the right or the left the larger), 5th joint shorter than 4th; the larger one in ♂ tuberculate and granulate, the granules on the upper and outer surfaces of wrist and hand, and on finger and thumb, becoming flattened scale-like and imbricate; finger and thumb a little longer than palm, sparingly setose on their opposed margins; thumb with 1–4 blunt teeth on inner margin proximally, a strong tooth slightly before the middle, and a double row of 12–14 (sometimes as many as 24) tubercular teeth distally, mostly in pairs but often irregular; finger similar, the big tooth slightly beyond middle, a double row of 6–12 (or more) tubercles distally; smaller cheliped in ♂ similarly granulate, finger and thumb nearly twice as long as hand, more or less gaping, opposed margins without teeth but usually densely setose. In ♀ 2nd legs nearly alike, with granulation similar to that of ♂ but the scale-like granules not so close as to be imbricate, finger and thumb in both legs subequal to palm, not gaping, sparsely setose, opposing margins cultrate, entire. 3rd–5th legs stout, 6th joint of 5th leg equal to the distance between the *antennal* spines on carapace. Telson with medio-dorsal tuft of setae near base. A laterally compressed tooth ventrally between bases of uropods.

Length ♂ up to 140 mm., ♀ 87 mm.; larger chela ♂ 190 mm. (a specimen in South African Museum 117 mm. in length has the larger cheliped from base of 3rd joint to tip of finger 130 mm.), ♀ (from base of 3rd joint) 50 mm. Male from Umgeni Lagoon (preserved a short while in formalin) buff with dark blue-green markings on carapace, a diffuse band of same colour along side of abdomen continued on to telson, similarly coloured but more diffuse markings medio-dorsally on anterior abdominal segments, eyes ultramarine.

Localities.—Quilemane and Tete, Portuguese East Africa (Hilgendorf); Umgeni River, Durban (Stebbing, and S. Afr. Mus.); Amatikulu River, 20 miles inland, Zululand (Natal Mus.); Barberton, Transvaal (Stebbing); Levubu River, a tributary of the Limpopo River (coll. C. J. van der Horst); Olifants River, Transvaal (S. Afr. Mus.); Nahoon River, East London, and Kei River (East London Mus.).

Distribution.—Tanganyika Territory. The closely allied, if not identical (see Calman, *l. c.*, 1913), *hilgendorfi* Cout. inhabits Madagascar; and the Malaysian *lepidactyloides* de Man is regarded by Roux (1923, Cap. Zool., II, 2, p. 11) as a variety.

Remarks.—Two ovigerous ♀♀ from Umgeni River were taken in March.

Palaemon (*Eupalaemon*), cf. *sundaicus* Heller

Smooth River Prawn.

Fig. 148, *e–h*.

1897. Weber and de Meijere, Zool. Jahrb., x, p. 165.
1898. Hilgendorf, *l. c.*, p. 30.
1900. Coutière, *l. c.*, pp. 250, 251, 273, pl. 14, figs. 44–46, *a*.
1910. Stebbing, *l. c.*, p. 384.
1915. *Id.*, *l. c.*, p. 73.
1918. Kemp, Mem. Asiat. Soc. Bengal, vi, p. 261.
1923. Roux, Cap. Zool., II, 2, p. 6.
1923. Stebbing, Fish. Mar. Biol. Surv., Rep. iii (1922), Spec. Rep. 3, p. 8, pl. 14 (*Urocaridella borradailei*).
1926. Barnard, Trans. Roy. Soc. S. Afr., xiii, p. 121 (*sundaicus*).
1940. Kubo, *l. c.*, p. 20, fig. 11.
1947. Barnard, Ann. Mag. Nat. Hist. (xi), 13, p. 390.

Carapace smooth, feebly pitted on branchial region, less so in juv. and ♀ than in ♂. Rostrum in ♂ $1\frac{1}{3}$ times, in ♀ $1\frac{1}{8}$–$1\frac{1}{10}$ in post-orbital length of carapace, in juv. equal to or slightly longer than carapace, extending beyond end of peduncle of ant. 1, in ♂ to end of antennal scale, in juv. and ♀ slightly beyond, apex slightly up-turned, depth (incl. teeth) subequal to width of basal joint of ant. 1; with 10–13, usually 11–12, teeth above, of which 2 are post-orbital, 3–4 below. 3rd joint of 1st legs setose. 2nd legs slender, subequal in both sexes, 5th joint longer than 4th; in ♂ longer than body, all joints smooth (non-granulate), but covered with a short felt-like pubescence, finger and thumb subequal to palm, not gaping, thumb with 1 tooth, finger with 2 teeth near base, rest of opposing margins with a row of tubercles on either side of a median keel or cutting-edge; in ♀ shorter than body, similar to ♂ but glabrous or with very feeble development of the felt on the palm, finger and thumb with a minute denticle near base, cutting-edges relatively more prominent and not flanked by rows of tubercles. 3rd–5th legs slender, 6th joint of 5th leg equal to distance between the *hepatic* spines on carapace. Telson as in *lepidactylus*. No ventral tooth between bases of uropods.

Length ♂ up to 112 mm., ♀ 105 mm.; 2nd leg ♂ 130 mm., ♀ 77 mm. Smallest ovigerous ♀ 67 mm. Semi-transparent, slightly pinkish (as preserved in formalin), speckled with pinky-brown dots, a series of darker spots in middle of side of abdomen (one on hind margin of each segment), 2nd legs brownish, eyes black.

Localities.—Durban ("in See," probably = harbour or upper end of Bay) and Umgeni River (Weber and de Meijere); Umlaas River (Stebbing); Umhlotuzi River (Stebbing, as *Urocaridella*); Durban harbour, Umkomaas River, and mouth of Mtunzini River, Zululand (S. Afr. Mus.); Delagoa Bay (Barnard); Port St. Johns (S. Afr. Mus.); Buffalo River, East London (E. Lond. Mus.).

Remarks.—Ovigerous ♀♀ were taken from January to March.

Apparently Coutière himself saw no specimens from Natal. I have not seen his paper, and cannot compare the present specimens with his description of *sundaicus*. One of the ♂♂ was reported on by Stebbing, and there is also in the Museum a ♀ identified by him as *sundaicus*.

Hilgendorf (1898) and de Man (1904, p. 306) say the 2nd legs are not covered with woolly pubescence.

Hilgendorf says that *sundaicus* adult ♂ is distinguished from *mossambicus* by the smooth carapace, no felt on 2nd leg or 3rd joint of 1st leg, shorter chelae without rows of tubercles. Except that the carapace is not rough (even antero-laterally) these specimens therefore resemble *mossambicus*.

Henderson and Matthai (*l. c.*) agree with von Martens that *sundaicus* and *idae* are synonymous, but in Hilgendorf's key (1898) *idae* has finger and thumb *shorter* than palm, and a shorter rostrum.

The Delagoa Bay specimen (Barnard, 1926) is no longer available to me for checking the identification.

From Stebbing's description and figures it is perfectly clear that his "Urocaridella" was a *Palaemon*, and from the shape of the rostrum it should probably be identified with the present species. The fluviatile habitat ought to have given Stebbing a hint as to its identity.

Palaemon (*Eupalaemon*) *delagoae* Stebb.

1915. Stebbing, Ann. S. Afr. Mus., xv, p. 74, pl. 16 (Crust., pl. 80).

♂. Carapace apparently smooth, but with scattered microscopic spinules antero-laterally, and obscurely pitted on branchial region. Rostrum extending beyond antennal scale, slightly up-turned (apical point broken), depth (incl. teeth) slightly less than width of basal joint of ant. 1; with 9 teeth above, of which 3 (Stebbing said 2, but the 4th last is directly above hind margin of orbit) are post-orbital, 5 below. 2nd legs slender but decidedly unequal (right 106 mm. from base of 3rd joint, left 88 mm.), 4th joint $1\frac{3}{4}$ times (larger leg) or $1\frac{1}{2}$ times (smaller leg) in length of 5th joint, palm shorter than 5th joint, finger

and thumb in smaller leg equal, $1\frac{1}{3}$ times in palm, in larger leg thumb $1\frac{3}{4}$ in palm, finger shorter; both legs with rows of little granules and tubercles arranged more or less longitudinally, as far as end of palm, a few on outer surface of base of finger and thumb; finger and thumb covered with fur both on inner and outer surfaces, thumb with 2–3 small teeth followed by a larger one at base, finger with 2 moderate teeth at base (all teeth less conspicuous in smaller leg), rest of inner margin without denticles, but a feeble median cutting-edge. 3rd–5th legs slender, 6th joint of 5th leg greater than distance between hepatic spines on carapace. Abdomen dorsally feebly pitted, and also pleurae of segments 1–3, pleurae of segments 4 and 5, and lateral parts of segment 6, telson, and exposed parts of uropods minutely but distinctly granulate. Telson with median tuft of setae near base. No ventral tooth between bases of uropods.

Length ♂ 75 mm. (measured straight.)

Locality.—Delagoa Bay (Stebbing).

Palaemon (*Eupalaemon*), cf. *idae* Hell. var. *idella* Hilg.

Rough-shelled River Prawn.

Fig. 148, *i–l.*

1898. Hilgendorf, *l. c.*, p. 28 (*idae*) and p. 29, fig. A (var. *idella*).

Carapace closely granulate over nearly whole surface, more so in ♂ than in ♀, hinder part of branchial region pitted in both sexes. Rostrum extending to end of peduncle of ant. 1, but shorter than antennal scale, nearly symmetrically lanceolate, dorsal margin evenly convex, apex not curving upwards, about $1\frac{3}{4}$ in post-orbital length of carapace; with 10–12 teeth above, of which 2–3 are post-orbital, 3–4 below. 2nd legs ♂ elongate, slender, not very unequal, 5th joint longer than 4th, longer than palm, finger and thumb shorter than palm (in the Isipingo ♂ the finger is shorter than thumb), 3rd–6th joints (excl. thumb) covered with felty pubescence, when denuded without granules (but the numerous little pits from which the setae and pubescence arise appear like granules on a cursory glance), finger and thumb covered all over with tufts of short setules, with a few longer setae (fig. 148, *k*), finger with 2 denticles, thumb with 1, near base, no other denticles, no proper cutting-edge but proximally a narrow groove which passes over gradually into a slight indication of a cutting-edge distally. In ♀, 2nd leg shorter than body, 4th, 5th, and palm of 6th joint increasing slightly in length, finger and thumb subequal to 4th joint, each with