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Decapod Crustacea :  
Alpheidae

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## ABSTRACT

*Dredgings made by the MUSORSTOM Expedition off Lubang Island, near Manila, Philippine Islands, and one dredging near Manila harbor produced 19 species of alpheid shrimp, all of which were either new to science or new records for the Philippine Islands. The new genus and the new species are: Nennalpheus inarticulatus gen. and sp. nov., Alpheus compressus sp. nov., Alpheus foresti sp. nov. The new records are: Synalpheus albatrossi Coulière, S. gracilirostris De Man, S. stimpsonii (De Man), S. triacanthus De Man, S. trispinosus De Man; Alpheus aculocarinatus De Man, A. canaliculatus Banner and Banner, A. distinguendus De Man, A. hailstonei Coulière, A. macroskeles Alcock and Anderson, A. malabaricus leptopus De Man, A. nonalter Kensley, A. paraden-tipes Coulière, A. proseuchirus De Man, A. pustulosus Banner and Banner and A. spatulatus Banner and Banner.*

## RÉSUMÉ

*Les chalutages effectués au cours de la campagne MUSORSTOM, principalement au large de l'île Lubang, au sud-ouest de la baie de Manille, îles Philippines, ont fourni 19 espèces de crevettes alphéides qui, toutes, sont nouvelles pour la science ou pour les Philippines. L'une des espèces nouvelles appartient à un nouveau genre. Les formes nouvelles sont: Nennalpheus inarticulatus gen. et sp. nov., Alpheus compressus sp. nov. et Alpheus foresti sp. nov. Les espèces signalées pour la première fois de la région sont: Synalpheus albatrossi Coulière, S. gracilirostris De Man, S. stimpsonii (De Man), S. triacanthus De Man, S. trispinosus De Man; Alpheus aculocarinatus De Man, A. canaliculatus Banner et Banner, A. distinguendus De Man, A. hailstonei Coulière, A. macroskeles Alcock et Anderson, A. malabaricus leptopus De Man, A. nonalter Kensley, A. paraden-tipes Coulière, A. proseuchirus De Man, A. pustulosus Banner et Banner et A. spatulatus Banner et Banner.*

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The MUSORSTOM Expedition carried on dredgings in the waters off the Lubang Islands, southwest of the entrance to Manila Bay, and a single dredging off the entrance to Manila Bay. The dredgings produced 19 species of alpheid shrimp of the genera *Nennalpheus* gen. nov., *Synalpheus* and *Alpheus*, all of which are new records for the Philippine Archipelago, and include three species new to science; many of the captures represent new depth records for the individual species (1). All samples save two (which will be noted in the text below) came from waters over 100 m in depth and most came from about 200 m deep; the full details

on each station are given elsewhere in this volume. One sample came from a commercial shrimp trawl and was purchased in the Manila fish market. In the text the species within each genus are arranged alphabetically. All specimens, including the type series, will be deposited in the Muséum national d'Histoire naturelle except as noted. [We have added records of two additional specimens, one of *Nennalpheus sibogae* (De Man), and one of *Alpheus compressus* sp. nov. from the collections of the Universitetets Zoologiske Museum, Copenhagen, Denmark after this paper was accepted for publication.]

### List of Stations

Station 1. 18.3.76, 14° 28,0' N, 120° 42,0' E, 36 m:  
*Alpheus acutocarinalus* De Man, *Alpheus distinguendus* De Man,  
*Alpheus malabaricus leptopus* De Man.

Station 2. 19.3.76, 14° 02,8' N, 120° 18,8' E, 187 m:  
*Synalpheus triacanthus* De Man.

Station 5. 19.3.76, 14° 01,5' N, 120° 23,5' E, 215 m:  
*Synalpheus triacanthus* De Man.

Station 7. 19.3.76, 14° 01,0' N, 120° 20,0' E, 200 m:  
*Alpheus foresti* sp. nov.

Station 9. 19.3.76, 14° 01,8' N, 120° 17,6' E, 194 m:  
*Synalpheus triacanthus* De Man, *Alpheus foresti* sp. nov.,  
*Alpheus nonaller* Kensley.

Station 10. 19.3.76, 13° 59,8' N, 120° 18,2' E, 187 m:  
*Synalpheus triacanthus* De Man, *Alpheus foresti* sp. nov.

Station 11. 20.3.76, 13° 59,8' N, 120° 23,7' E, 230 m:  
*Synalpheus triacanthus* De Man.

Station 14. 20.3.76, 14° 00,2' N, 120° 17,2' E, 190 m:  
*Alpheus macroskeles* Alcock and Anderson.

Station 18. 21.3.76, 13° 56,3' N, 120° 16,2' E, 150 m:  
*Synalpheus albatrossi* Coulière, *Synalpheus neomeris* (De Man),  
*Synalpheus stimpsonii* (De Man), *Synalpheus triacanthus* De Man.

Station 20. 21.3.76, 13° 59,2' N, 120° 20,3' E, 208 m:  
*Nennalpheus inarticulatus* sp. nov., *Alpheus nonaller* Kensley.

Station 21. 21.3.76, 14° 01,0' N, 120° 22,8' E, 223 m:  
*Synalpheus triacanthus* De Man.

Station 24. 22.3.76, 14° 00,0' N, 120° 18,0' E, 189 m:  
*Synalpheus triacanthus* De Man, *Alpheus foresti* sp. nov.,  
*Alpheus nonaller* Kensley.

Station 25. 22.3.76, 14° 02,7' N, 120° 20,3' E, 200 m:  
*Nennalpheus inarticulatus* sp. nov., *Synalpheus triacanthus* De Man,  
*Alpheus foresti* sp. nov., *Alpheus macroskeles* Alcock and Anderson.

Station 26. 22.3.76, 14° 00,9' N, 120° 16,8' E, 189 m:  
*Synalpheus triacanthus* De Man.

Station 27. 22.3.76, 13° 59,8' N, 120° 18,6' E, 192 m:  
*Alpheus compressus* sp. nov.

Station 30. 22.3.76, 14° 01,3' N, 120° 18,7' E, 186 m:  
*Alpheus compressus* sp. nov., *Alpheus foresti* sp. nov.

Station 31. 22.3.76, 14° 00,0' N, 120° 16,0' E, 187 m:  
*Alpheus foresti* sp. nov.

Station 32. 23.3.76, 14° 02,2' N, 120° 17,7' E, 193 m:  
*Alpheus triacanthus* De Man, *Alpheus foresti* sp. nov.

Station 35. 23.3.76, 13° 59,0' N, 120° 18,5' E, 186 m:  
*Alpheus caudiculatus* Banner and Banner, *Alpheus nonaller* Kensley.

Station 36. 23.3.76, 14° 01,2' N, 120° 20,2' E, 210 m:  
*Alpheus nonaller* Kensley.

Station 50. 25.3.76, 13° 49,2' N, 120° 01,8' E, 415 m:  
*Alpheus macroskeles* Alcock and Anderson.

Station 51. 25.3.76, 13° 49,1' N, 120° 04,2' E, 200 m:  
*Alpheus foresti* sp. nov.

Station 56. 26.3.76, 13° 53,1' N, 120° 08,9' E, 134 m:  
*Synalpheus neomeris* (De Man), *Synalpheus trispinosus* De Man,  
*Alpheus proseuchirus* De Man, *Alpheus pustulosus* Banner and Banner.

Station 57. 26.3.76, 13° 53,1' N, 120° 13,2' E, 107 m:  
*Synalpheus neomeris* (De Man), *Alpheus proseuchirus* De Man.

(1) When we remarked in our recent paper that *Alpheopsis shearmii* (Alcock and Anderson), collected at 430 fathoms was the «deepest record for any alpheid.» (B&B, 1977: 209), we had overlooked BATE's report of *Alpheus avarus* Fabricius «from off Japan; depth 2,675 fathoms; bottom, blue mud;» (BATE, 1888: 544). The specimen BATE so determined was defective, but the other specimens he recognized as *A. avarus* may have been *A. strenuus* Dana. In any case, he considered the great depth at which the specimen was collected and stated the record was «probably due to some accidental circumstance» (*op. cit.* p. 539). We agree and suggest the questionable depth record of the species with questionable identification be hereafter ignored.

Station 60. 27.3.76, 14° 06.6' N, 120° 18.2' E, 129 m:  
*Alpheus hailstonei* Coutière.  
 Station 64. 27.3.76, 17° 00.5' N, 120° 16.3' E, 191 m:  
*Synalpheus albatrossi* Coutière.  
 Station 71. 28.3.76, 14° 09.3' N, 120° 26.2' E, 174 m:  
*Alpheus compressus* sp. nov.

Station 72. 28.3.76, 14° 11.8' N, 120° 28.7' E, 127 m:  
*Alpheus proseuchirus* De Man, *Alpheus spatulatus* Banner and Banner.

Station 73. 28.3.76, 14° 15.0' N, 120° 31.2' E, 76 m:  
*Alpheus proseuchirus* De Man.

Localité indéterminée : *Alpheus paradenitipes* Coutière.

## SYSTEMATIC ACCOUNT

### *Nennalpheus* gen. nov.

#### DIAGNOSIS

General body form as usual for members of the family. Rostrum triangular, acute and short, dorsally rounded and without carina. Without orbital hoods, with or without flattened orbital (or supra-corneal) teeth. Pterygostomial margin rounded and not protruding. Eyes well developed, visible at least in part in lateral view, concealed (or partially concealed?) in dorsal view. Orbitorostral process lacking.

Antennular peduncle relatively large, stylocerite with lateral tooth well developed; outer flagellum with base of several distinct articles, a setiferous lobe and the usual flagellar portion. Scaphocerite normal with tooth and squamous portion well developed; carpuccerite long; basicerite with infero-lateral projecting tooth (1).

Mouthparts similar to those found in *Alpheus*.

First pair of chelipeds symmetrical, with chelae enlarged and carried extended; chela proper carried in inverted position, with dactylus lying on sagittal plane of body but inferior to palm and pollex. Both fingers bearing rounded and exactly fitting teeth in proximal half; dactylus with slight but hardened rounded ridge or crest distal to teeth fitting into shallow but well-defined groove on pollex; distally fingers acutely hooked and crossing. Palm sub-cylindrical in section. Proximo-inferior margin of palm produced into small "heel" or knob to make carpo-propodal articulation. Carpus not cyathiform but in lateral view of a rounded sub-rectangular shape lying at angle to merus, with carpo-propodal articulation in inferior third of distal margin, merocarpal articulation in superior half of proximal margin; with distal margins extended into acute or rounded flat teeth. Merus triangular in section, somewhat twisted; ishiomerid articulation apparently not fully

fused. [Note: It may be possible that the chelipeds undergo marked changes with growth, similar to some species of *Althanas*; see discussion under *N. inarticulatus*, below.]

Carpus of second legs of five articles with the first article longer than sum of remaining four.

Third leg slender, with ischium bearing several strong spines; merus and carpus slender and unarmed; propodus bearing setae to slender spines; dactylus long, somewhat curved, simple.

Second pleopods of males bearing *appendix masculina* as in *Alpheus*; otherwise pleopods of males and females of similar size and development. Pleura of abdominal segments of similar size and development in both sexes, with first four rounded, fifth with posterior margin slightly projected and subacute. Posterior margin of sixth abdominal segment latero-ventrally either projecting into a triangular articulated pleuron or lappet or a small truncate process.

Telson slender, with dorsal and postero-lateral spines well developed; tip convex but not greatly produced; lacking in anal tubercles. Uropods normal.

Branchial formula as in *Alpheus*: 5 pleurobranchs, 1 arthrobranch, 8 epipodites with mastigobranchs on bases from third maxilliped to fourth pereopod, setobranchs from first to fifth pereopods.

#### TYPE SPECIES

*Alpheopsis sibogae* De Man (1910: 307; 1911: 181, pl. 5, fig. 18).

It was our original intent to use *N. inarticulatus*, described below, as the type species for this genus, but when we included DE MAN'S species in this genus we decided it would be better to use a species with an intact holotype as representative of the genus. Further reinforcing that decision was the later discovery of a second specimen of *N. sibogae* in the collection of Universitetets Zoologiske Museum, Copenhagen, Denmark. We were able to examine DE MAN'S sole specimen, a 16 mm male, through the

1. De Man, 1910, 1911, stated for *Alpheopsis sibogae* now *Nennalpheus*, that the basicerite was unarmed; a reexamination of his holotype showed that there is an acute angular projection similar to *N. inarticulatus* see fig. 1a.

courtesy of Dr. Sjouk PINKSTER of the Zoologisch Museum, Amsterdam; it was collected at 70 m in Sapeh Strait, Indonesia. The Danish specimen is a 15 mm female (carrying what appears to be two immature eggs) from Lombok Straits, slightly over 500 km west of the type location (Galathea Station 483, 8° 46' S, 115° 45' E, 12/9/51). Like the holotype, the female specimen is in good condition with symmetrical first chelipeds carried extended; the differences between it and the holotype are slight and only in the proportions: the chelae are 5.8 rather than 5.2 times as long as broad, and the meri of the third legs are 12.2 rather than 10.6 times as long as broad. These differences in proportion may be sexual, or may be merely within the range of normal variation.

## DISCUSSION

In most characteristics this genus shows close relationship to the genus *Alpheopsis* Coutière. The two genera are similar in body form, in branchial formula, in the development of the anterior portion of the carapace and the coverage of the eyes (the eyes are more exposed in *N. inarticulatus* but that is probably due to injuries suffered in the trawl), and in all appendages save the first cheliped. While the chelae are different in morphology, in both genera they are carried extended, not folded back under the cephalothorax.

It is the form of the chelipeds that separates this genus from all others, particularly in combination with other characteristics. The almost rectangular form of the carpus is unique within the family. In the form of the chela, this genus is closest to *Amphibetaeus* Coutière which also bears a low rounded ridge in the distal portion of the dactylus that fits into a corresponding cavity on the pollex, and carries adhesive plaques on the opposing palmar and digital surfaces. In *Amphibetaeus* the more proximal portion of the dactylus bears only one rounded tooth instead of serrate teeth; more important, however, is that the chelae are carried folded back under the body and show extreme asymmetry (see COUTIÈRE, 1899, figs. 217-218). *Amphibetaeus* also lacks a distinct rostrum, similar to *Betaeus*.

Some species in three genera carry their chelae in an inverted position with the propodal finger uppermost, at least when extended, as does *Nennalpheus*. Three species in *Athanas*, *A. borradalei* (Coutière), *A. verrucosus* Banner and *A. polynesica* Banner & Banner, would have the dactylus in a somewhat inverted position were the chelae extended; in these the fingers lack the low ridge and corresponding cavity, the palms are expanded and flattened, and the carpus is elongate and expanded to accommodate the flexure of the appendage; in addition, of course, the species have the other characteristics of

the genus, such as exposed carneas. *Arelopsis amabilis* De Man also carries the fingers on both chelae in an inverted position, but they are without the ridge and groove and are asymmetrical in development (B. & B. Aust. III); this genus is characterized by the ventral keel on the rostrum. Almost all members of the genus *Betaeus* Stimpson carry their fingers inverted, with chelae carried extended and of slight asymmetry, but they lack the ridge and groove of *Nennalpheus*; probably more important, none of these species have a distinct rostrum.

Another point of comparison might be the adhesive plaques which serve to hold the dactylus in the open position. *Amphibetaeus* has already been contrasted; the other genera are *Alpheus* Fabricius, *Metalpheus* Coutière, *Racilius* Paulson and possibly *Pomognathus* Chace (for the last genus the presence or absence of the plaques was not mentioned in the description). All four of these genera usually have the well-developed plunger and socket on the basal portions of the fingers and all save *Racilius* have well-developed orbital hoods. In *Racilius* the swollen orbital hoods are lacking but the single species in the genus is characterized by extreme lateral compression.

The two species placed in *Nennalpheus* have large chelipeds that are almost identical (for a possible small cheliped, see under *N. inarticulatus*, below). The only difference between the two species lies in the ridge or crest on the dactylus and the corresponding groove on the propodal finger which are slightly better developed in *N. sibogae* than in *N. inarticulatus*. *N. sibogae*, however, bears strong and definite corneal teeth, no trace of which are found in *N. inarticulatus*. Most important, however, are the presence of articulated pleura in *N. sibogae*, with both known specimens showing a line of articulation between the triangular lappet and the exoskeleton of the 6th abdominal somite (fig. 1 s); in *N. articulatus*, on the other hand, the posterolateral margin of the 6th abdominal somite protrudes in all four specimens as a flattened lobe with two low and slight cusps on its margin and without a trace of an articulation (fig. 1 g). We realize that the presence or absence of articulated pleura is usually considered as a characteristic constant within a genus; YALDWYN has separated *Belopsis* from *Betaeus* solely upon this characteristic. However, we believe that the presence of almost identical chelipeds on the two species far outweighs the presence or absence of articulations on these pleura. To us it is far easier to conceive of the evolutionary loss of a slight flexibility in these lappets as accorded by the feeble articulation than it is for the parallel but separate evolution of the unique chela and its even more strange carpus.

This new genus permits further speculation on

the evolution of the plunger and socket of the large chela as is found in the five "higher genera" of the family: *Alpheus*, *Metalpheus*, *Racilius*, *Synalpheus* Bate and *Pomagnathus* Chace. In the "lower genera" other than *Amphibetaeus* and *Nennalpheus* the fingers are either without armature or have relatively simple teeth. The low rounded ridge of the dactylus and corresponding groove of the pollex found here and in *Amphibetaeus*, both located distal to the middle of the fingers, with the more primitive proximal teeth found in *Nennalpheus*, are unlike the armature found in other lower genera. The adhesive plaques found in these two lower genera and all of the higher genera (save *Synalpheus* and possibly *Pomagnathus*) permit the heavy muscles of the palm to strain before the plaques release, permitting the violent closure of the fingers. It would take little evolution to move this crest and groove proximally, in the process losing the proximal serrate teeth, to a low crest and elongate groove such as found in *Alpheus chiragicus* Milne-Edwards or *A. distinguendus* De Man. This, then, could easily evolve into the semi-cylindrical plunger and deep socket as found in many other species such as *A. pacificus* Dana. COUTIÈRE, in his monograph (1899: 350) has placed the genus *Alpheopsis* as representing the stock of *Alpheus*; the development in *Nennalpheus* of the crest, groove and adhesive plaques is another step along the line. We are not suggesting that either *Amphibetaeus*, with its large chela carried in a flexed condition, or *Nennalpheus*, with its inverted chela and strange carpus, represent the direct evolutionary line towards *Alpheus*, but rather that they are derived from some early stem-form that was to give rise to *Alpheus*.

Because we postulate this genus is derived from the stem-form of *Alpheus*, but certainly not in the direct line, we have applied the Greek word *nennos*, uncle, as a prefix to *Alpheus*, the name of a Greek river and a Greek god.

***Nennalpheus inarticulatus* sp. nov.** (fig. 1)

Holotype: 30 mm male from MUSORSTOM st. 20, 27.3.76, 13° 59.2' N, 120° 20.3' E, 208-222 m.

Allotype: 31 mm ovigerous female from same station as holotype.

Paratypes: 29 mm ovigerous female and 30 mm male from MUSORSTOM, St. 25, 22.3.76, 14° 02.7' N, 120° 20.3' E, 191-200 m.

**DESCRIPTION**

Specimen torn, and with eyes and bases of antennules and antennae probably displaced anterior-

ly in reference to anterior carapace. Rostrum acute, without dorsal carina, as long as broad at base, reaching proximal end of first antennular article. Anterior margin gradually rounded, without teeth. Corneas and anteromedial lobes more than half exposed dorsally, with greater exposure when viewed laterally. Second antennular article 1.2 times as long as visible part of first, 2.5 times length of third and 2.8 times as long as broad; superior margin of first article projecting distally, and inferior margin bearing forward-sweeping plumose setae. Distal margins of all antennular articles minutely serrate and beset with some fine setae, more setae distally on first article than on distal two. Basal portion of outer flagellum of 6 articles, first article 2.5 times longer than second, other 5 articles nearly equal, inner branch short, setiferous but without visible articulations. Stylocerite with acute tip turned lightly outward and reaching to end of first antennular article. Scaphocerite with outer margin straight, squamous portion broad, reaching to middle of third antennular article, lateral tooth slightly longer. Carpocerite slender, reaching past antennules by length of third antennular article, basicerite with short acute lateral tooth.

Mouthparts as usual for family. Ratio of articles of third maxilliped beginning with base 10:3:5. Proximal article flattened, ribbon-like in midsection.

Chelipeds lacking on holotype and allotype; description based upon two chelipeds found loose in jar with paratypes (see discussion below). Large chela carried extended with dactylus in inverted positions, as in *Betaeus* (in the description below, all directions are given as the chela is actually carried, not as it "should be carried"). Chela slender and elongate, 5.2 times as long as broad with fingers occupying distal 0.4. Palm subcylindrical and of rather soft chitin, with a possible light, ill-defined depression on lower portion of lateral face, running from near carpal articulation to base of pollex (this may be an artifact from the soft chitin). Dactylus highly compressed and carinate, proximally bearing a well-developed adhesive plaque and corresponding to plaque on distal shoulder of palm; oppositional face bearing in proximal half 4 strong but rounded teeth and 2 less well-developed teeth that intermesh with similar teeth on pollex; next third of dactylus slightly swollen with oppositional margin slightly convex in profile, fitting into slightly concave hardened portion on pollex; distal to this both fingers bearing concave cutting edges and terminating in strongly hooked tips that cross. Palm proximally projected at inferior side into almost cylindrical knob to make articulation with carpus; middle of proximal surface of palm slightly concave. Carpus not cyathiform, sub-quadrangular in lateral view, but with concave superior and convex inferior

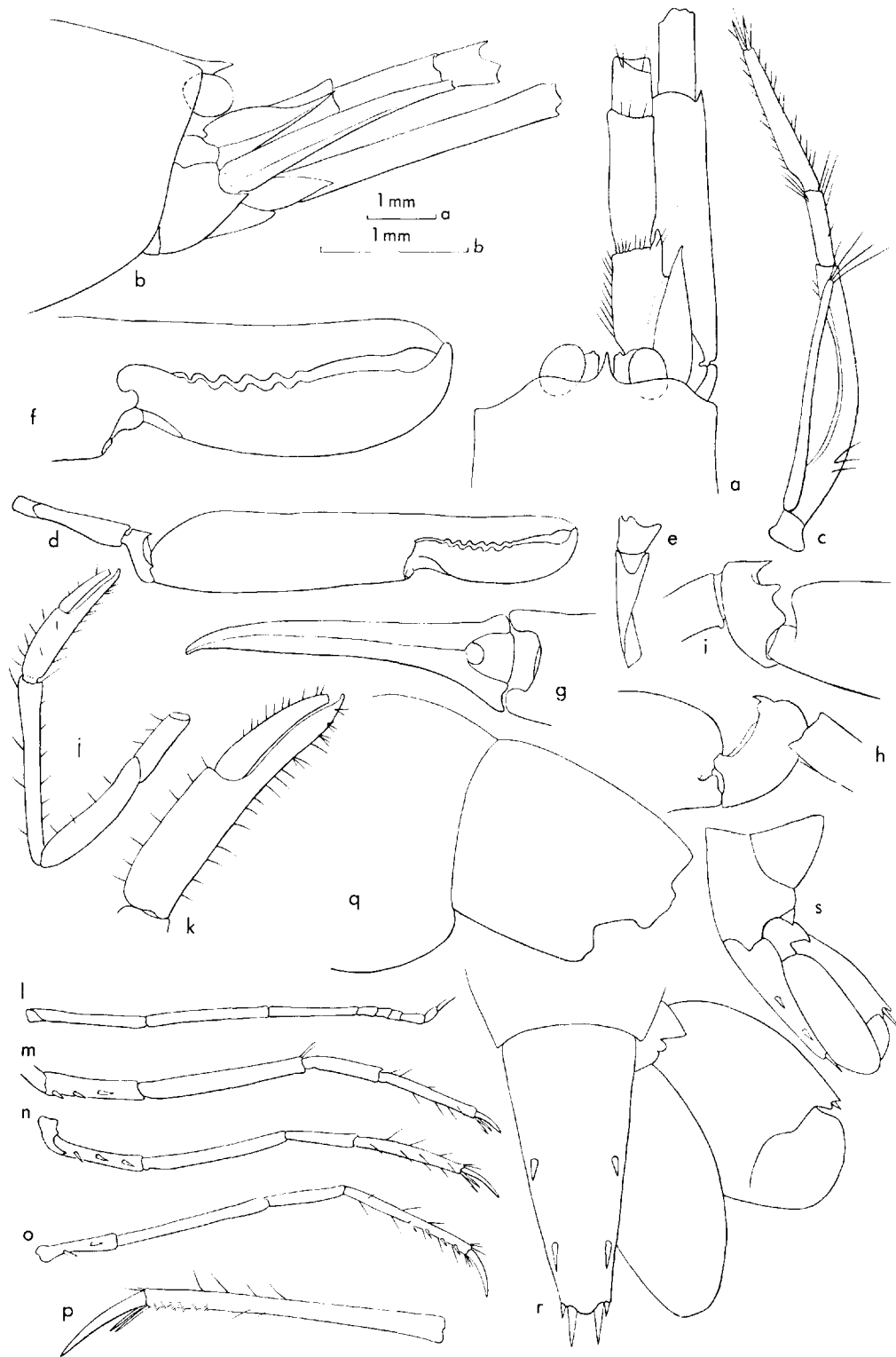


Fig. 1 a-r. *Nennalpheus inarticulatus* sp. nov., holotype, male 30 mm, St. 20.

**a, b**, Anterior region lateral and dorsal view; **c**, third maxilliped, lateral face; **d**, large cheliped, lateral face (chela loose in the vial St. 25); **e**, merus, large cheliped, inferior face; **f, g**, distal end of large chela, lateral and inferior face, enlarged; **h, i**, carpus of large cheliped, medial and inferolateral face; **j**, small chela, lateral face (chela loose in the vial St. 25); **k**, distal region of small chela, enlarged lateral face; **l**, second leg; **m**, third leg; **n**, fourth leg; **o, p**, fifth leg and enlarged propodus; **q**, sixth abdominal somite; **r**, telson and uropods.

Fig. 1 s. - Holotype of *Nennalpheus sibogae* (De Man), 16 mm: Posterior region of abdomen showing articulated sixth abdominal pleura. **a, b, c, f, g, h, i, k, p, q, r, s**, scale a; **d, e, j, l, m, n, o**, scale b.

surfaces, about twice as long as broad and lying at nearly a right angle to merus. Carpopropodal articulation evidently providing for superoinferior flexion, with distosuperior surface of carpus somewhat concave to receive rounded end of palm when chela is bent upward. Distal margins of carpus extended as several flat projections: that on infero-lateral margin as rounded lobe, that on midsuperior surface as broad but acute tooth, and those on medial sides as rounded tooth above and rounded shoulder below. Ischiomerus with articulation between articles with at most only slight capabilities for flexion; about a quarter as long and a third as broad as chela itself, three times as long as broad distally, with inferior margin flattened, superior margin rounded, somewhat narrowed and slightly twisted proximal to middle when viewed from superior or inferior aspect.

Small chela in vial similar to that of female of *Athanas dimorphus* Ortmann. Ratio of articles of small cheliped beginning with ischium and terminating with the chela as: 10:20:28:20. Palm 2.6 times as long as broad, 1.15 times as long as fingers; tip of dactylus broken; tip of pollex slightly curved, acute. Merus 7.4 times as long as broad, all articles bearing scattered fine setae.

Ratio of articles of second leg: 10:2.0:1.2:1.5:2.2.

Thoracic legs slender. Ischium of third leg 0.6 as long as merus and bearing 3 strong spines on infero-lateral surface. Merus 9 times as long as broad, inermous. Carpus 0.5 as long as merus, supero-distal margin slightly projected. Propodus 0.6 as long as merus, bearing on its inferior margin a few hairs and a pair of thin spines distally. Dactylus simple, 0.3 as long as propodus. Fourth and fifth legs similar except ischium of fifth legs bearing only 2 spines and propodus bearing usual brush of setae.

Pleura of sixth abdominal segment not articulated. Telson 6 times as long as posterior margin is broad. Dorsal spines large, distal pair placed anterior to middle. Inner spine of posterolateral pair strong, almost as long as tip is broad, 3 times as long as outer. Outer uropod with distal articulation.

## DISCUSSION

None of the four specimens in the type series are intact and we chose the one most complete as the holotype although it lacked the chelae. The two chelae described above are from Station 25 and were detached in the vial with the broken male and female specimens.

It is these loose chelipeds that present the difficulty. As indicated in the descriptions and figures (fig. 1 d-j) the chelipeds in the vial are profoundly dissimilar. In the two much smaller specimens of *N. sibogae* the chelipeds are symmetrical and similar

in both sexes. One would presume the same symmetry would obtain in this species as well; on the basis of this presumption, we have established the presence of symmetrical chelipeds as a criterion for the genus. If it be so, however, then the small cheliped in the vial must be from some other shrimp that was lost in the dredge haul, and if it were from an alpheid, it might well be from some species of the genus *Athanas*. In the vial for Station 25 were these two broken specimens, and one specimen each of *Alpheus macroskeles* Alcock and Anderson and *Synalpheus triacanthus* De Man, neither of which could have carried such a small chela, and no trace of any other specimen. In fact, in the entire MUSORSTOM collections that were given to us there were no specimens which would be expected to bear this type of cheliped.

Thus, there is a possibility that the small cheliped may have come from one of the two specimens of *N. inarticulatus*. It should be recalled that in *Athanas* it is not uncommon for both sexes to have small and rather primitively developed symmetrical chelipeds while young, then to develop asymmetrical chelipeds, and finally to develop massive symmetrical chelipeds when fully mature (see B. & B., 1960, especially figures 2, 3, 6, and B. & B., 1973, figures 6 and 9). Therefore it is possible, but not likely, that this cheliped is from these specimens and that this species may pass through a series of markedly different stages in chela development.

The separation between this species and *N. sibogae* is discussed under the genus. The name refers to the lack of an articulation at the base of the posterolateral extensions of the margins of the sixth abdominal segment.

The type series will be deposited in the collections of the Muséum National d'Histoire Naturelle, Paris.

## *Synalpheus* Bate

### *Synalpheus albatrossi* Coutière

*Synalpheus albatrossi* Coutière, 1909: 89, fig. 51; BANNER, 1953: 30, fig. 9.

## MATERIAL

2 specimens from St. 18; 2, St. 64.

## REMARKS

This species has only been previously reported from the Hawaiian Archipelago where it was collected in coral from sublittoral to 7 m and by dredging in 18-32 m.

***Synalpheus gracilirostris*** De Man

*Synalpheus gracilirostris* De Man, 1910: 291; 1911: 269, fig. 49; BANNER and BANNER, 1975: 372, fig. 26.

## MATERIAL

3 specimens from SL 57.

***Synalpheus neomeris*** (De Man)

*Alpheus neomeris* De Man, 1897: 734; 1898, pl. 35, figs. 61 a, d, e.

*Synalpheus neomeris*, COUÏÈRE, 1905: 869, pl. 70, fig. 1; DE MAN, 1911: 212, fig. 24; BANNER and BANNER, 1975: 357, fig. 22 [see for complete synonymy].

## MATERIAL

2 specimens from SL 18; 1, SL 56; 2, SL 57.

## REMARKS

This species has been collected commonly in association with alcyonarians. It is known from the Western Pacific and Indian Ocean to the Red Sea. Previously it has been reported to extend from the intertidal to 129 m, so this constitutes a new depth record.

***Synalpheus stimpsonii*** (De Man)

*Alpheus stimpsonii* De Man, 1888: 513, pl. 22, fig. 3.

*Synalpheus stimpsonii* BANNER and BANNER, 1966: 46, fig. 12; 1975: 292, figs. 2 m, 4 [see for complete synonymy].

## MATERIAL

2 specimens from SL 18.

## REMARKS

This species is often associated commensally with crinoids, but does not appear to be an obligate commensal. This collection extends the depth record from the previously reported maximum of 45 m.

***Synalpheus triacanthus*** De Man

*Synalpheus triacanthus* De Man, 1910: 301; 1911: 282, fig. 55.

## MATERIAL

1 specimen from SL 2; 1, SL 5; 1, SL 9; 1, SL 10; 1, SL 11; 2, SL 18; 13, SL 21; 6, SL 24; 11, SL 25; 1, SL 26; 2, SL 32.

## REMARKS

This species is very similar to *S. trispinosus* De Man. It differs by the dactylus of the large chela not overhanging the propodus, by a more slender small chela, being 3.5 instead of 2.5 times as long as broad, and by the lack of numerous spines on the meri of the third and fourth legs. The only record of this species is that of De Man from the East Timor Sea, Indonesia. He found it in association with a specimen of the gorgonian, *Solenocaulon* sp. from 112 m. This therefore constitutes a new depth record.

***Synalpheus trispinosus*** De Man (figs. 2 a-c)

*Synalpheus trispinosus* De Man, 1910: 300; 1911: 288, fig. 58.

## MATERIAL

1 specimen from SL 56.

## REMARKS

This sole specimen of *S. trispinosus* agrees well with DE MAN's original description except in two characteristics: First, the large chela bears two teeth above the dactylar articulation, while DE MAN described his specimens as having "a large, conical, though obtuse tooth or tubercle that is directed obliquely upward..." The collections made by the Hong Kong Fisheries Station in the South China Sea, presently available to us (BANNER and BANNER, 1979: 247), have four specimens that we have identified as this species; of these, three have the single tooth, but the fourth, otherwise identical, has two teeth. We therefore attach no significance to the variation. Second, DE MAN described and figured the telson as having the postero-lateral teeth extending further posteriorly than the convex posterior margin, in this specimen the teeth are slightly shorter than the convexity. This also we believe to be a variation. Finally, DE MAN did not remark upon the form of the dactylus of the large chela: here the superior margin of the dactylus is markedly convex, almost semicircular, somewhat convex on the inferior or opposite surface, and thickened or swollen in the middle, tapering towards the crest-like margins. The dactylus is remarkably similar to those of *S. pescadorensis* CouÏÈre and *S. quadriarticulatus* B. & B., and in all three the dactylus overreaches the tip of the pollex (see B. & B., 1975: 297, 301).

*S. trispinosus* has not been reported since DE MAN's original description of the species from Indonesian waters where it was collected up to 70 m in depth. This specimen therefore extends the depth record to 131 m.



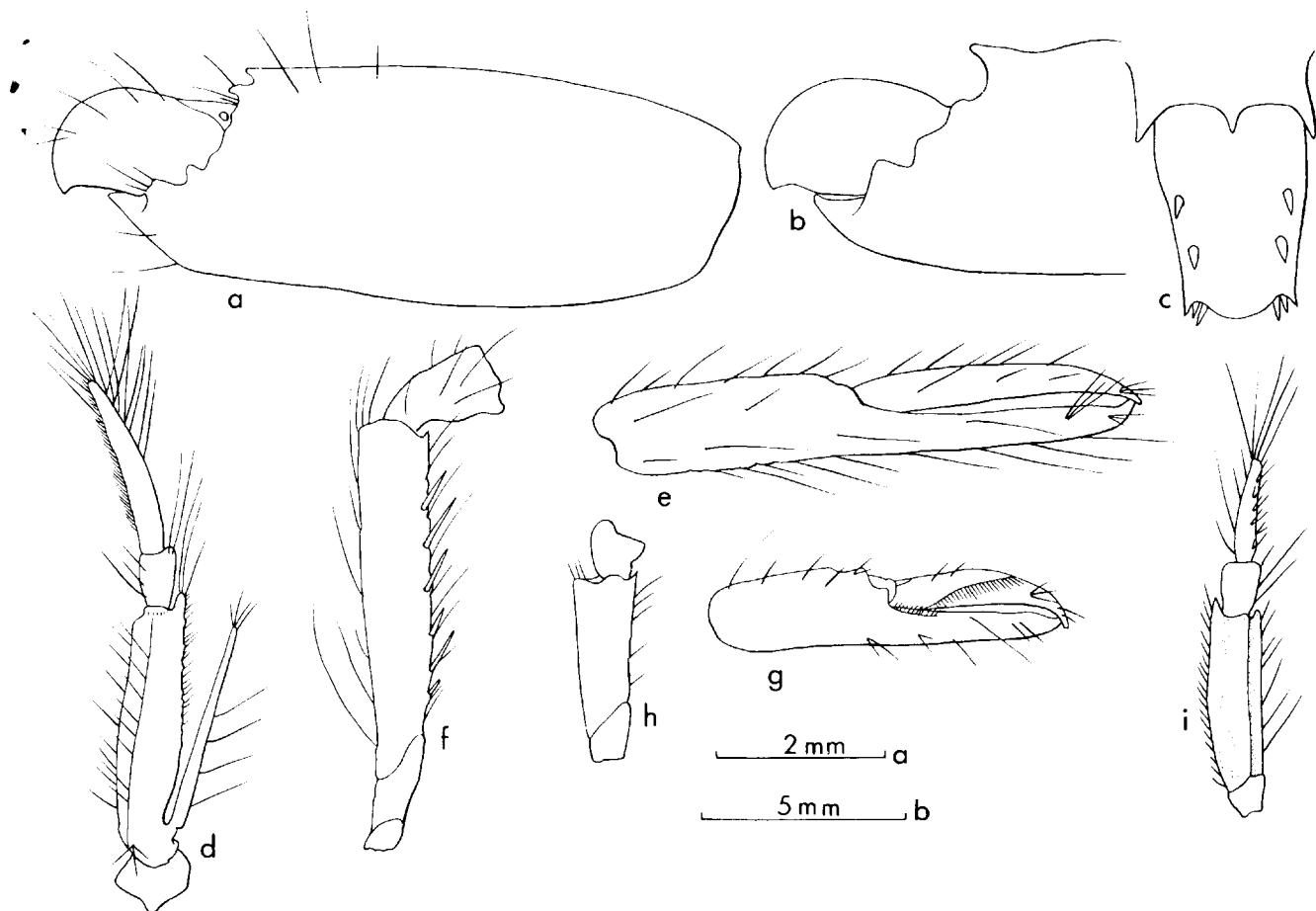


Fig. 2 a-c. — *Squalpheus trispinosus* De Man, male, 18 mm, SL 56; **a**, large chela, superomedial face; **b**, large chela, medial face; **c**, telson.  
 Fig. 2 d-f. — *Alpheus nonaller* Kensley, male 21 mm, SL 35; **d**, third maxilliped, ventral view; *id.*, female 21 mm, from GSM Sta. 67 (see text); **e**, **f**, small chela and merus, medial face.

Fig. 2 g, h. — *Alpheus prosenchirus* De Man, male 25 mm, SL 73; small chela and merus, medial face.

Fig. 2 i. — *Alpheus pustulosus* Banner and Banner, holotype (B&B, 1968: 143, fig. 2); third maxilliped, ventral view.  
**a**, **b**, **c**, **d**, **e**, **f**, **i**, scale a; **g**, **h**, scale b.

### *Alpheus* Fabricius

#### *Alpheus acutocarinatus* De Man

*Alpheus acutocarinatus* De Man, 1909a: 104; 1911: 401, fig. 94.  
 BANNER and BANNER, 1966: 120, fig. 43; BANNER and BANNER, Australia III (1).

#### MATERIAL

5 specimens from SL 1.

#### REMARKS

These specimens were collected from 31 m and DE MAN had specimens from as deep as 72 m. Its

known distribution includes Indonesia, Gulf of Thailand and in Australia off southern Queensland.

#### *Alpheus canaliculatus* Banner and Banner

*Alpheus canaliculatus* Banner and Banner, 1968: 141, fig. 1.

#### MATERIAL

2 specimens from SL 35.

#### REMARKS

This species was previously known from the holotype which was collected between northern

(1) BANNER and BANNER, Australia III, or B&B, Australia III, refers to the *Alpheid Shrimp of Australia*, Part III, now in press - see bibliography.

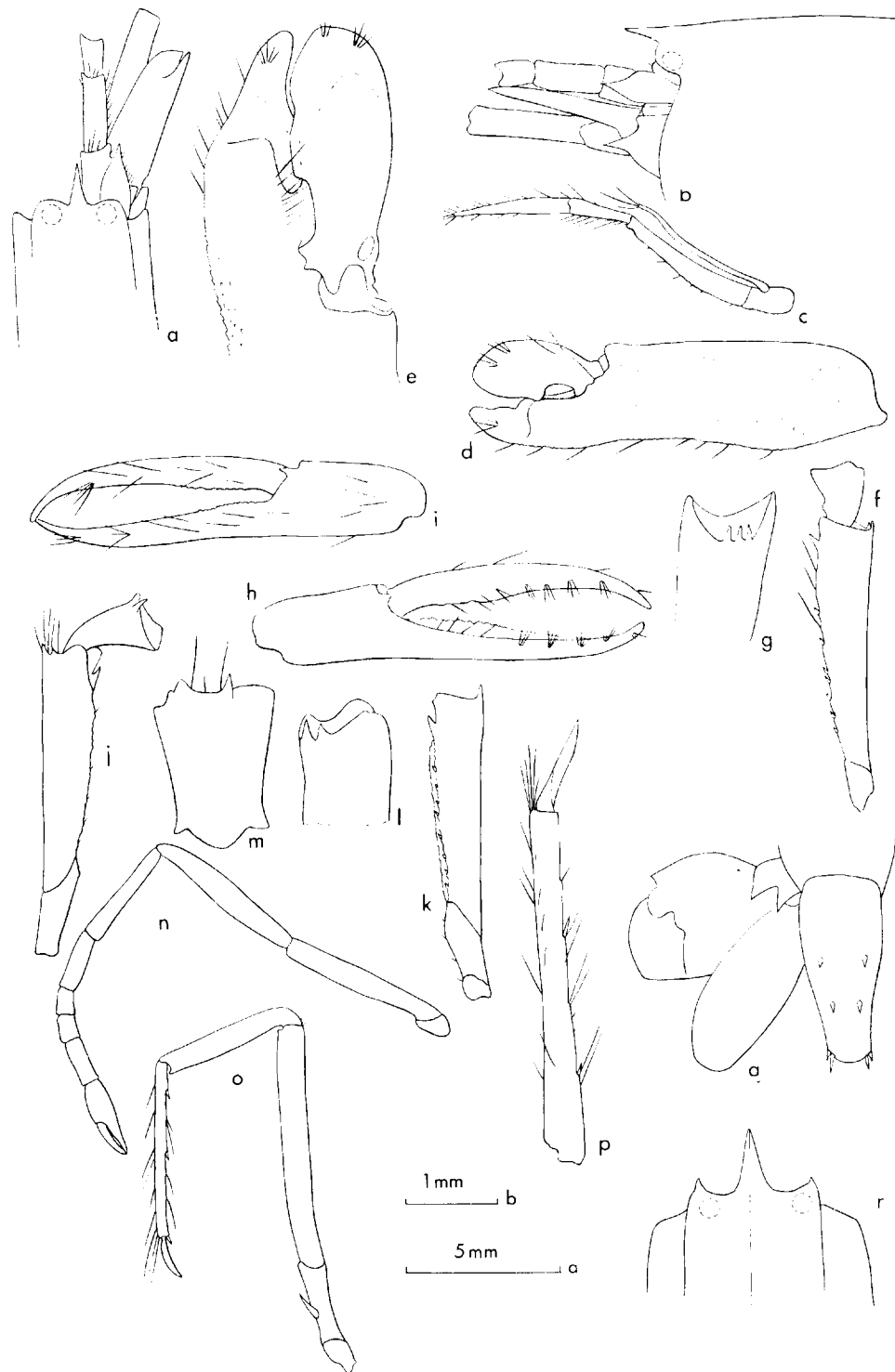


Fig. 3 a-q. — *Alpheus compressus* sp. nov., holotype, female 15 mm, SI. 37: a, b, anterior region, dorsal and lateral view; c, third maxilliped; d, e, large chela, medial face; distal end enlarged, superomedial face; f, merus, medial face; g, superodistal view of merus, enlarged; h, i, small chela lateral and medial face; j, merus and carpus, lateral face; k, merus, medial face; l, distal portion of merus, enlarged, lateral face; m, distal portion of carpus, enlarged, superior face; n, second leg; o, p, third leg with propodus and dactylus, enlarged; q, telson and uropods.

Fig. 3 r. — Paratype, female 55 mm from CSM SI. 64: anterior region of carapace, dorsal view. a, b, c, d, f, h, i, j, k, n, o, q, r, scale a; e, g, l, m, p, scale b.

Luzon and Hong Kong (20° N, 115° E), at 250 m, somewhat deeper than this specimen.

*Alpheus compressus* sp. nov. (fig. 3)

Holotype: 45 mm ovigerous female from SL 27, 22.3.76, 13° 59.8' N, 120° 18.6' E, 188-192 m.

Paratypes: 47 mm female from SL 30; 40 mm female from SL 71; 55 mm female from Hong Kong Fisheries research vessel Cape St. Mary SL 64, Trawl 198, 14.8.64, 81 m. (21° 40' N, 115° 00' E).

DESCRIPTION

Body highly compressed, with carapace 2.1 times as deep dorso-ventrally as wide laterally. Rostrum reaching to near end of first antennular article, and, like the body, highly compressed and narrow, dorsally rounded, without carina; lateral faces of rostrum steep, but at base gradually confluent with orbital hoods, without orbito-rostral grooves; orbital hoods rounded in contour, only slightly inflated, anterior margins rounded. Eyes with antero-medial lobe extending beyond anterior margins of orbital hoods. Second antennular article 1.1 times longer than visible part of first article and 3 times as long as broad; third article half as long as second article. Supero-distal margins of first and second antennular articles bearing stiff setae; both median and lateral margins of inferior surface of distal portion of first and entire length of second article bearing plumose setae. Stylocerite acute, reaching just past end of first antennular article, inferior margin with short plumose setae. Lateral margin of scaphocerite straight, lateral tooth reaching end of antennular peduncle and slightly past narrow squamous portion. Carpo-cerite reaching length of third article past that article. Inferior margin of basicerite with strong acute tooth, almost as long as stylocerite.

Ratio of articles of third maxilliped: 10:3.5:6.5. Third article tapering with tip narrow but truncate, and bearing stiff bristles on medial face, tip with long setae.

Holotype lacking large chela; description below taken from paratype from SL 71, a 40 mm ovigerous female. Large chela somewhat compressed, without sculpturing, 3.7 times as long as broad, with fingers occupying distal 0.3; dactylus lying at right angles to median plane of body (description given in terms of the "normal" position of the chela in other words the "superior" surface is actually lying laterally; this is done to avoid confusion in comparisons to chelae carried in normal positions). Surface finely granular, with granules becoming minute, forward-directed denticles along inferior margin and onto lower parts of lateral face; inferior margin with

scattered fine setae. Dactylus heavy, compressed, rounded at tip; oppositive face broadening proximally from tip and entirely confluent with plunger (except when seen from supero-medial aspect); plunger located 0.6 of length distal from articulation, low, broad, demarked only proximally, with oppositive face somewhat excavate. Pollex with bluntly rounded tip, distal portion of oppositive face with dull shearing edge; socket for plunger broad, deep and abrupt, and entirely open on distomedial margin; proximal to socket oppositive face flattened. Carpus cyathiform, 0.23 as long as merus, without teeth or projections. Merus 4.4 times as long as broad at distal end; infero-internal margin bearing 7 small spines and small, acute sub-terminal tooth; superior margin terminating in 3 narrow, acute teeth; infero-external margin distally rounded.

Small chela 5.4 times as long as broad, fingers almost 2 times as long as palm, not balaeniceps, proximal half of oppositive margins of fingers bearing many small cusps, distal portion smooth, tips curved and crossing. Palm 2 times as long as broad, with teeth flanking dactylar articulation on either side, medial tooth stronger and more acute. Lateral face glabrous, medial face and fingers bearing sparsely set long hairs directed forward, final half of fingers bearing several small patches of setae along both medial and lateral surfaces. Carpus cup-shaped, 0.6 as long as palm; disto-superior margin bearing 3 teeth with lateral tooth acute, connected medially by slight plate-like extension of second tooth (broken in specimen, but probably acute), third tooth medial from second, small and rounded. Merus 4.4 times as long as broad; infero-external margins bearing small irregular serrations from which emerge a few slight and short setae; superior margin bearing a few short setae and terminating in two acute teeth at carpal articulation, one superior, one supero-lateral; infero-internal margin also with serrations bearing 9 small weak spines and a strong acute subterminal tooth.

Ratio of carpal articles of second leg: 10:5:2:2:3.

Sole walking leg loose in jar, presumed to be third (see below). Ischium with strong spine. Merus inermous, 8.5 times as long as broad. Carpus almost 0.5 as long as merus, distal margin only slightly projected. Propodus 0.7 as long as merus; inferior margin bearing 2 slight spines (an additional 2 apparently broken off, possibly together with one at tip) and scattered fine setae. Dactylus spatulate, slightly excavate on inferior surface, 0.3 as long as propodus.

Telson 1 times as long as broad distally; lateral margins anteriorly convex, posteriorly concave; posterior margin rounded and projecting. Inner spine of postero-lateral pair almost 2 times as long as outer and reaching well beyond convexity of tip. Anterior pair of dorsal spines placed anterior to

middle. Transverse articulation of outer uropod bearing a large flap as well as a small scallop.

#### DISCUSSION

The MUSORSTOM paratype from St. 30 carries an intact fourth leg and a third leg lacking the propodus and dactylus. As the merus of the unattached leg of the holotype has the same length-breadth ratio as the third and is heavier than the fourth leg of the paratype (8.5 times as long as broad rather than 9.0) we have presumed the loose leg of the holotype to be the third. The MUSORSTOM paratype from St. 71 has only the large chela and one fifth leg which is lacking distal articles.

The paratype from the Cape St. Mary station is without chelipeds, but it agrees with the MUSORSTOM specimens in the markedly compressed body and the large flap on the outer uropod as well as the armature and proportions of the remaining appendages. However, this specimen possesses 2 small orbital teeth which are lacking in the MUSORSTOM specimen. In *A. collumianus* Stimpson and *A. gracilis* Heller the presence of orbital teeth is variable and without specific or subspecific significance (B. & B., Australia III), so this can be a variable character in this genus. Inasmuch as the Cape St. Mary specimen also came from the South China Sea and only about 1100 km distant from the MUSORSTOM specimens, in a similar depth and from a similar bottom, we are tentatively ascribing the difference to mere variation, not to a regional difference at the subspecific level.

While this species plainly belongs to the genus *Alpheus*, as is shown by the coverage of the eyes, the nature of the intact appendages, the caudal fan, etc., it is unique within the genus in its high degree of lateral compression of the body and the presence of the highly developed lobe at the distal articulation of the outer uropod. Of lesser systematic importance, but useful for identification are the distal teeth on the meri of both chelipeds and the carpus of the small cheliped.

We have assigned this species to the *brevirostris* Group although the large chela in some characteristics is an extension beyond any condition found in that group. In this species the chela, while somewhat compressed, lacks the great compression and quadrangular cross-section that is often found. In a number of the species in the *brevirostris* Group the plunger on the dactylus is low and confluent with the more distal margins, and the socket on the pollex is incomplete and open distally, but usually the plunger is not so heavy, the socket so discrete proximally and so open distally as this. In other characteristics, the species is in general similar to those of the *brevirostris* Group, as for example the

long fingers of the small chela, the spatulate condition of the walking legs and the somewhat linguiform telson. The lateral compression of the body and the suppression of orbito-rostral grooves, here again carried to extremes, are tendencies found in some species in the group. Even the likely habitat, soft mud, is more commonly invaded by members of the *brevirostris* Group than other subgeneric groups. Of course, the orbital teeth found in the Cape St. Mary specimen are otherwise unknown in the *brevirostris* Group. The characteristics given above will separate the species from other members of the group.

The corneas of the eyes are not large, and the orbital hoods are present, but not inflated as in so many other members of the group. This lack of inflation and the high, thin rostrum has led to the disappearance of the orbito-rostral grooves the steep sides of the rostrum merely curve to the flattened upper portion of the orbitals hoods which then gently curve laterally to meet the adjacent areas of the carapace.

The appearance of the setiferous lobe on the eyestalks beyond the margins of the orbitals hoods may reflect the condition in life, or may be the result of damage to the specimen from dredging (for further discussion see *A. foresti* below).

The deep, compressed body probably reflects some highly specialized habitat, as does the deep body of *Alpheus lollini* Guérin, and deep and highly compressed body of *Racilius compressus* Paulson, both of which are obligate commensals on living coral. An interesting parallel development in the pollex and dactylus is found between this species and *A. foresti*, described below, in that they both have low, heavy, plungers located distally on finger with a heavy socket that is entirely open distally; the two species even carry the dactylus at about 90° angle to the vertical plane of the body. Yet *A. compressus* is without palmar sculpture and is apparently related to the *brevirostris* Group while *A. foresti* has unique and heavy sculpturing which seems to be an extension of the normal sculpturing found in the *edwardsii* Group. This parallel development suggests it may be in response to some particular environmental requirement, but what that may be, as with the parallel body compression between *A. compressus* and the coral symbionts mentioned, is beyond speculation at present.

The source of the name is obvious. The holotype and paratype from St. 30 and 71 will be placed in the Muséum National d'Histoire Naturelle; the paratype from the Fisheries Research Station in Hong Kong will be placed in the Smithsonian Institution.

Subsequent to the preparation of the above description and discussion we have obtained one additional specimen, a 22 mm female lacking the

large cheliped from the Universitetets Zoologiske Museum, Copenhagen, Denmark; it was collected by the Danish Thai Expedition, SL 1163, 1/1967 (14 m, west of the Isthmus of Kra, peninsular Thailand, at 9° 14' N, 98° 22' E). The specimen is quite similar to the specimens described and like the MUSORSTOM specimen, lacks orbital teeth.

*Alpheus distinguendus* De Man

*Alpheus distinguendus* De Man, 1909b: 155, pl. 7, figs. 9-14; BANNER and SMALLEY, 1969: 47, fig. 3. (For complete synonymy see BANNER and BANNER, Australia III.)

MATERIAL

1 specimen from SL 1; 7 specimens from the Manila market.

REMARKS

These commercially trawled specimens constitute the first record of the species from the Philippines; the species has been caught in prawn trawls at 36 m in Australia. It has been reported from Japan, China, Singapore, Mergui Archipelago, and all parts of tropical and subtropical Australia; it is possible that its range is much greater (see B. & B., Australia III).

*Alpheus foresti* sp. nov. (fig. 4)

Holotype: 43 mm male from MUSORSTOM SL 25, 22.3.76, 142° 02.7' N, 120° 20.3' E, 191-200 m.

Paratypes: 1, 32 mm female from SL 7; 1, 31 mm male and 1, 40 mm female from SL 9; 3 males and 1 female, 35-45 mm from SL 10; 2, 33-45 mm males from SL 24; 2 males and 3 females from SL 25; 2 males and 1 female approximately 10 mm from SL 30; 1 male and 1 female 10 mm from SL 31; 2 females, 38-40 mm from SL 32; 1 male, 35 mm from SL 51; (other fragmentary specimens).

DESCRIPTION

Rostrum reaching near end of first antennular article, acute, flattened dorsally, margins overhanging orbito-rostral grooves, 2.6 times as long as broad at base. Orbital hoods thin, soft and evidently very transparent, so in almost all preserved specimens they are wrinkled and distorted. Corneas large, normal, but anterior margin of eyestalk proximal to pigmented cornea developed as rounded lobe with small conical tooth between lobe and cornea; lobe bearing a few short bristles; in intact specimens, this

lobe protrudes beyond margins of orbital hoods to varying degrees, lying dorsal to proximal portions of stylocerite. Second antennular article 2.0 times as long as broad, third antennular article 0.4 as long as second, inferior margin of antennules beset with setiferous bristles. Stylocerite with acute tip reaching beyond end of first antennular article, inferior margins bearing setiferous bristles. Scaphocerite of asymmetrical development in holotype and of variable development in paratype series; lateral margin straight, lateral tooth heavy, at times shorter, at times longer, than squamous portion; squamous portion broad, at times shorter or longer than antennular peduncle.

Ratio of articles of third maxilliped: 10:3.4:5.7.

Large chela highly compressed, almost 3 times as long as broad, with fingers occupying distal 0.3 and closing at almost 90° to vertical axis of body (description given in terms of "normal" rotation of chela with the dactylus uppermost). Transverse groove or saddle on superior margin of palm proximal to dactylar articulation reduced to strong proximal shoulder, distal shoulder only a slight convexity. Remnant of transverse groove continuing as small depression on lateral face that turns and runs proximally as heavy and broad but rounded groove lying parallel to superior margin of palm; in proximal third of palm groove broadening to form an ill-defined triangular depressed area with flattened floor. No remnant of superior transverse groove continued into medial face, but upper portion of face with slight, ill-defined and rounded longitudinal depression lying in distal half of palm. Sculpturing on inferior portion of outer face complex with depressed areas, grooves and three knobs. Broad shallow depressed area starting proximally below ridge demarking upper triangular depressed area and continuing distally to slight rise near mid-palm and then curving diagonally downward as a more abrupt groove, terminating in rounded emargination below dactylar articulation; profile marked with strong rounded knob proximal to emargination, and with second rounded knob overhanging groove slightly superior to margin at level of superior shoulder. Rounded ridge from second knob continued proximally to separate superior and inferior depressed areas. Third rounded knob also seen in profile proximal to first and separated from first by strong rounded emargination of margin; emargination continued into face in proximal direction for short distance. On medial face a large, shallow and vague depression lying about mid-palm; emargination between first and third knobs continued into face as U-shaped depression, with lower portion well defined and deep, superior portions gradually merging with palmar surface; emargination distal to first knob appearing only in profile, not continued into face. In superior

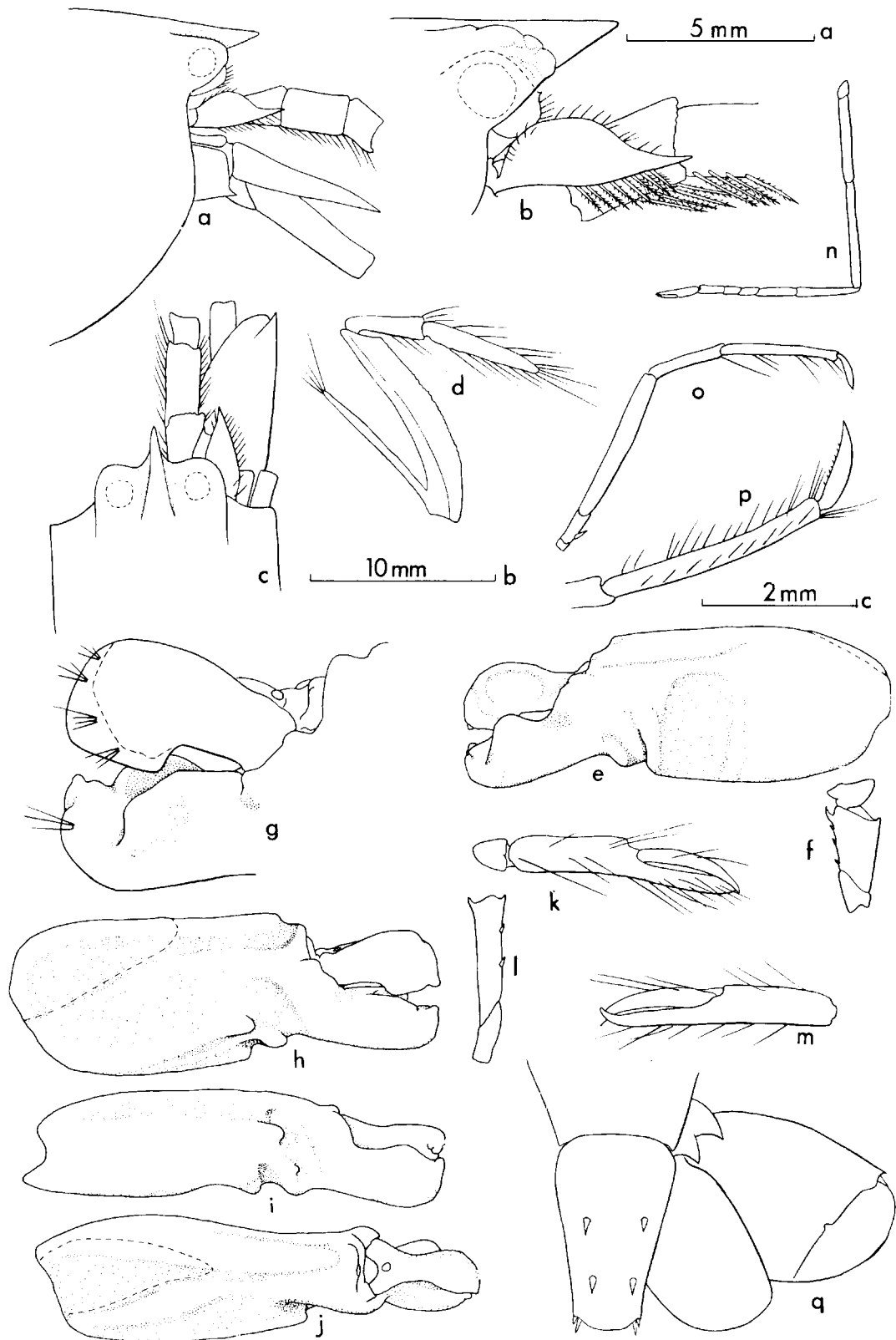


Fig. 4. — *Alpheus foresti* sp. nov., holotype: **a**, anterior region, lateral view; **b**, same as **a**, enlarged to show collapsed condition of orbital hoods and anteromedial process of eyestalk; **c**, anterior region, dorsal view; **d**, third maxilliped, lateral face; **e, f**, large chela and merus, medial face; **g**, distal region, large chela, medial face enlarged; **h, i, j**, large chela lateral, inferior and superior faces; **k, l**, small chela and merus, medial face; **m**, small chela, lateral face; **n**, second leg; **o, p**, third leg, propodus and dactylus enlarged; **q**, telson and uropods.

**a, c, d, g, p, q**, scale **a**.    **b**, scale **b**.    **e, f, h, i, j, k, l, m, n, o**, scale **c**.

view articulation of dactylus broader than palm immediately proximally. Dactylus heavy, with superior margin of dactylus uniformly rounded, with plunger located about 0.6 length distal from articulation, and with margin of plunger continuous as straight edge to tip. Pollex heavy and broad in proximal portions, and even broader at proximal end of socket; on medial face proximal margin of socket protruding as heavy bulla; socket continued towards medial side as deep rounded groove. Tips of both fingers massive and heavily calcified, that of dactylus with slightly protruding tooth, that of pollex with two slight rounded notches, one terminal, the other marking disto-lateral margin of socket. Merus 2 times as long as broad, superior margin slightly projecting distally, infero-internal margin with 3 slight spines and strong curved and acute tooth almost at end.

Small chela not sexually dimorphic, 6.5 times as long as broad with fingers and palm almost equal in length, fingers crossing at tips when closed. Margins bearing few long setae, distal portion of medial face with more hairs, but not hirsute. Merus 4 times as long as broad, inner margin bearing 2 small spines and a small acute tooth distally. Superior margin terminates in an acute tooth directed medially.

Carpal articles of second leg with ratio: 10:7:3:3:1.

Ischium of third leg with spine, merus 8 times as long as broad, inermous. Carpus 0.4 as long as merus, superior margin slightly projected, inferior margin with only setae distally. Propodus 0.6 as long as merus, inferior margin bearing no spines, but row of slender setae of varying length, supero-lateral face with row of about 9 setae (setae broken in holotype). Dactylus spatulate, 0.4 as long as propodus.

Telson about 3 times as long as distal margin is broad. Lateral distal pair of spines small, inner pair twice as long as outer. Anterior pair of dorsal spines placed anterior to middle.

## DISCUSSION

Most of the paratype series are lacking their large chela and only a few large chelae are loose in the jars. While these all show the sculpturing of the palm of the holotype, in some the ridges and grooves are less pronounced, and in some the fingers are longer and may carry stronger teeth at the tip; the plunger may be located closer to the middle of the dactylus. An intact female (of mature size but not ovigerous) has the same proportions and sculpturing of the chela as that of the male holotype so the differences are not sexual.

The sculpturing of the large chela is unique within the genus. We have interpreted this sculpturing as derived from that found in the *edwardsii* Group, with the superior saddle or groove being almost vestigial and marked by the persistent proximal

shoulder. The normal triangular or quadrangular depression on the superior portion of the outer face, which in some species may extend proximally along the length of the palm, has become the marked longitudinal groove and depression extending almost to the carpal articulation; the medial superior depression, normally connected with the transverse groove, has lost that connection and has become the ill-defined longitudinal depression. The inferior groove and proximal shoulder persist as the proximal inferior groove, but do not extend into a well-defined depression on the lateral face of the palm, while the normally slight mid-palmar depression of the outer face behind the dactylar articulation is greatly exaggerated and continues in a disto-inferior direction to produce the distal inferior shoulder that demarks the end of the pollex. The displacement of the heavy plunger of the dactylus to beyond the middle of the article and the great thickening of most of the walls of the socket of the pollex again are unique.

We do not know how to interpret the probable extension of the antero-medial lobe of the eyestalk beyond the anterior margin of the carapace (see fig. 4b). Unfortunately this species is rather soft bodied and the dredging process has badly distorted and injured most of the specimens; in some, for example, the eyes and the bases of the antennae have been entirely displaced and are hanging out of the carapace. However, in most specimens that are reasonably intact the ocular process is exposed as it is in the holotype. In one or two specimens the process is entirely covered by the carapace, but in these the bases of the antennules appear to be displaced dorsally. We believe, therefore, that the condition of the holotype is the condition found in life. Perhaps the same development may be characteristic of the other new species, *A. compressus*, but the four specimens of that species are even more distorted.

The presence of this prominence, at times developed into a spine, has been noted by COUÏÈRE in his thesis (1899: 111 *et seq.*; in his figures it is usually labeled *epc* (= *épine cornéenne?* when it has a spinous growth); he suggests that it may be protective. In this case the structure looks more sensory, especially its growth of hairs. This species lives in deep water where little light normally penetrates, and on a muddy bottom; it is possible that when the conditions in the surrounding environment limit the vision of the well-developed eyes, this secondary sensory structure may aid. However, *A. villosus* (Olivier), that lives deep in coral heads and has possibly non-functional eyes (their color is pink and the orbital hoods are covered with spines), has no comparable process.

Other species in the *edwardsii* Group have some

characteristics in common with this species: for example both *A. bisincisus* De Haan and *A. proseuchirus* De Man have dorsally flattened rostrums with concave margins overhanging the floor of the orbito-rostral groove (as do some members of other groups), and some mud-dwellers, such as *A. euphrosyne* De Man and *A. malabaricus malabaricus* Fabricius and its various subspecies, have flattened dactyli, but no species of the group show any tendency toward the development found in this large chela. We are at loss to suggest any phyletic relationship.

One further note can be given on this species: in one specimen in which the carapace was torn away, the contents of the thin-walled cardiac stomach could be seen. Most of the contents appeared to be pieces of sand—one piece, in fact, was black and looked like an irregular basaltic grain—but other objects were definitely foraminiferans of various genera.

This species is named in honor of Dr. Jacques FOREST, the organizer of the MUSORSTOM Expedition, the collector of these specimens and a fellow carcinologist who has been most helpful in our studies. The holotype and paratypes will be placed in the Muséum National d'Histoire Naturelle, Paris.

#### *Alpheus hailstonei* Coutière

*Alpheus hailstonei* Coutière, 1905: 879, pl. 74, fig. 48.

#### MATERIAL

1 specimen from SL 60.

#### REMARKS

*A. hailstonei* (as *hailstonei paucispinata* Banner) was reported from a dredge haul in the Hawaiian Islands that had the minimal depth of 538 m (BANNER, 1953: 54).

#### *Alpheus macroskeles* Alcock and Anderson

*Alpheus macroskeles* Alcock and Anderson, 1894: 453; 1899: pl. 9, fig. 5.

#### MATERIAL

1 specimen from SL 44; 1, SL 25; 1, SL 50.

#### REMARKS

The holotype came from 490 m in the Bay of Bengal, considerably deeper than these specimens.

We were in error when we reported in our earlier Philippine paper (1979: 224) that this species had not been reported since its original capture. It was reported with doubts by DE MAN from the Bali Sea (1911: 403), BALSS from the Red Sea (1915: 23), and CALMAN from the Gulf of Aden (1939: 208).

#### *Alpheus malabaricus leptopus* De Man

*Alpheus dolichodactylus leptopus* De Man, 1910: 289.

*Alpheus malabaricus leptopus*, DE MAN, 1911: 429, figs. 105 a, b, c.

#### MATERIAL

3 specimens from SL 4.

#### REMARKS

These 3 specimens are larger than those described by DE MAN, 25 to 35 mm in length, while DE MAN's largest specimen was 24 mm. They exactly resemble DE MAN's figures and description even in the squamous portion of the scaphocerite which slightly exceeds the length of the lateral tooth, and the meri of the third legs which are 7 to 7.5 times as long as broad, the same ranges as given by DE MAN.

These specimens came from 34 m; DE MAN reported that this subspecies occurred in Indonesian waters as deep as 289 m. The subspecies, according to DE MAN, was reported in error by ORTMANN under the name *A. dolichodactylus* (1) from Tokyo Bay (1890: 473).

#### *Alpheus nonalter* Kensley (figs. 2 d-f)

*Alpheus nonalter* Kensley, 1968: 172, fig. 15.

#### MATERIAL

1 specimen from SL 9; 2, SL 20; 1, SL 24; 1, SL 35; 1, SL 36.

#### REMARKS

Neither the third maxilliped nor the small cheliped of the female have been described for this species. The ratio of the articles of the third maxilliped is 10:2:7. The first article bears distally on supero-external margin a strong rounded tooth beset with a few long hairs at its tip. This tooth is variable and sometimes less projected than the one we have figured. The third article bears a brush of fine setae at its tip.

1. We were in error in two of our references to this subspecies (B&B, 1966: 148, 1968: 148) by calling it *A. m. dolichognathus* (a specific name in the genus *Automale*) instead of *A. m. dolichodactylus*.



The small chela of the female is not balaeniceps, and 6 times as long as broad, with fingers and palm nearly equal. Fingers cross at tip when closed, leaving a slight gape. Both the superior and inferior margins are beset with long forward-sweeping setae, sparsely placed. Merus 4.5 times as long as broad; superior margin beset with several long hairs, infero-internal margin slightly serrate and bearing 5 long and awl-shaped spines interspersed with long setae and distally bearing a small acute tooth. (Description and figures of 21 mm female from a collection of the Hong Kong Fisheries research vessel Cape St. Mary St. 67, Trawl 57, 16/9/63, 300 m, 15° 53.1' N, 109° 28.6' E).

***Alpheus paradentipes*** Coulière

*Alpheus paradentipes* Coulière, 1905: 880, pl. 74, fig. 17.

**MATERIAL**

1 specimen from undesignated locality.

***Alpheus proseuchirus*** De Man (fig. 2 g, h)

*Alpheus proseuchirus* De Man, 1908: 111; 1911: 407, fig. 96.  
2. *Alpheus proseuchirus*, BANNER and BANNER, 1966: 126, fig. 17.

**MATERIAL**

1 specimen from St. 56; 1, St. 57; 1, St. 72; 2, St. 73.

**REMARKS**

These specimens agree well with the original 6 specimens that DE MAN described from Indonesia. DE MAN did not have a small male cheliped so we have figured one from a 25 mm male from St. 73. The small chela is sexually dimorphic, the male having the typical balaeniceps condition. Chela 4.7 times as long as broad with fingers and palm nearly equal in length. Superior margin of palm bearing a transverse small groove proximal to dactylus with proximal edge of groove continuing as small, poorly-defined superior crest disappearing about middle of chela. Chela beset with sparse fine setae. Merus 2.6 times as long as broad, supero-distal margin inermous, infero-internal margin bearing fine, sparse setae and an acute tooth distally. Merus of third leg 7 times as long as broad in male and nearly 10 times in female.

DE MAN's specimens from Indonesia came from a depth range of 22-72 m; these dredges ranged from 96-131 m.

Having found these specimens so like the descriptions and figures of DE MAN, we question the identification of the specimen we reported under this name from the Gulf of Thailand (B. & B., 1966: 126, fig. 17) from mud at 60 m. In that specimen, a male of 15 mm, the small chela was more slender with fingers of different shape, and the dactylus of the fourth leg was simple (third leg was lost). Unfortunately, the specimen was destroyed by fire (B. & B., 1962: 238).

***Alpheus pustulosus*** Banner and Banner (fig. 2 i)

*Alpheus pustulosus* Banner and Banner, 1968: 143, fig. 2.

**MATERIAL**

1 specimen from St. 56.

**REMARKS**

This 12 mm male compares favorably with the type, which we have reexamined, with the exception that the chelipeds are more slender. The large chela is 5 times as long as broad instead of 4 times and the small chela is 8.8 times as long as broad instead of 7.8. The meri of both chelae are over 4.0 times as long as broad instead of 3.5. With so few specimens known, we are not at present attaching any significance to these variations.

In our original description we failed to remark upon or figure the third maxillipeds. In the holotype, like this specimen, the ratio of the articles is 10:3:6. The supero-external margin of the first article terminates in a strong acute tooth while the supero-internal margin terminates in a small rounded tooth. The tip of the third article bears a brush of long hairs. The acute tooth on the tip of the basal article is unusual in the *brevirostris* Group.

The only previous record of this species was that of the holotype dredged near Hong Kong (21° N, 111° E) from 55-75 m.

***Alpheus spatulatus*** Banner and Banner

*Alpheus spatulatus* Banner and Banner, 1968: 146, fig. 3.

**MATERIAL**

1 specimen from St. 72.

**REMARKS**

The only previous record is that of the holotype and paratypes taken from 75-95 m in the South China Sea, south and west of Hong Kong. These specimens were taken at 122-127 m.

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