

**ALPHEUS SOROR, A NEW SNAPPING  
SHRIMP CRYPTOSPECIES FROM SRI LANKA  
(CRUSTACEA: DECAPODA: ALPHEIDAE)**

**A. J. Bruce**

*Crustacea Section, Queensland Museum, P.O.Box 3300, South Brisbane 4101, Australia  
Email: abruce@broad.net.au*

**ABSTRACT.** - A new species of snapping shrimp from Sri Lanka is described and illustrated. *Alpheus soror* is a free living cryptospecies, closely related to *A. gracilipes* Coutière, an apparently widely distributed member of the *A. diadema* species group. The status of some alpheid cryptospecies is discussed.

**KEY WORDS.** - Natantia, Alpheidae, *Alpheus soror*, new species, Sri Lanka, cryptospecies.

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**INTRODUCTION**

The recent recognition of the importance of sibling species amongst decapod crustaceans, particularly on coral reefs, raises some difficult taxonomic problems. Information on the distributions of some widely distributed tropical species is not infrequently based on historical records of considerable antiquity: the original specimens are often in a poorly preserved state or even lost, and frequently without data on live colour patterns or habitat. Close examination of some of these taxa has indicated that complexes of closely similar species are involved. Where molecular data is available the existence of closely related species may be indicated (sibling species). In the absence of molecular information, the relationship may be convergent morphological resemblance only (cryptospecies). The resemblance may also be due simply to very close parallel morphological evolution. The importance of sibling species for systematics and zoogeography are discussed by Knowlton (1993) and Knowlton & Weigt (1997). The number of endemic species for restricted regions can be expected to rise significantly. *Alpheus gracilipes* Stimpson, 1860, is such a species, reported to range from the Red Sea to the Hawai'ian Islands. Using existing identification keys (e.g., Banner & Banner, 1981a), the present specimen from Sri Lanka would be identified as *A. gracilipes*. Attention was drawn to the potential distinctiveness of the Sri Lankan specimen through its conspicuous colour pattern, fortunately recorded on film. Further examination then revealed

minor morphological differences that can be used to separate specimens for which no colour information is available. The species is now described as new, but it is quite probable that some of the specimens reported in the literature of *A. gracilipes* may belong to this species and should be re-examined. The collection of further specimens from Tahiti, the type locality of *A. gracilipes*, with photographic records of their colour patterns, would facilitate the clarification of the details of the species' distribution and its morphology.

The holotype specimen is deposited in the Zoological Reference Collection (ZRC), National University of Singapore. The carapace length (CL) refers to the post-frontal carapace length.

## TAXONOMY

CLASS CRUSTACEA  
ORDER DECAPODA LATREILLE, 1803  
FAMILY ALPHEIDAE RAFINESQUE, 1815

*Alpheus soror*, new species  
(Figs. 1-3)

**Material examined.** - 1 adult female, holotype, off Trincomalee, Sri Lanka, coll. native collectors for R. Pethiyagoda, scuba, 1993, ZRC 1999.0089.

**Description.** - Medium sized, robust alpheid shrimp, of subcylindrical body form.

Carapace smooth, glabrous; rostrum slender in lateral view, acute, horizontal, reaching to middle of intermediate segment of antennular peduncle, broadly triangular in dorsal view, 2.0 x longer than width at level of frontal margin, centrally slightly depressed, concave, without median carina, distally T-shaped, ventral border concave, without setae, adrostral carinae sharply defined, uniformly slightly concave, reaching posteriorly well behind orbital hoods, orbital hoods well developed, unarmed, separated from rostrum by deep adrostral groove, with small feeble vertical anterior carina; frontal margin feebly produced, convex, unarmed, supraorbital teeth absent; pterygostomial angle rounded, cardiac notch distinct.

Abdomen without special features, smooth, glabrous. Telson c. 0.4 of CL, sparsely setose, 1.7 x longer than anterior width, broad, feebly concave lateral margins, posterior margin c. 0.6 of anterior width, anterior dorsal spines small, 0.08 of telson length, at 0.5 of telson length, posterior spines similar to anterior, asymmetrical, 2 on right, 0 on left, posterior margin with small lateral spine with larger spine medially, subequal to dorsal spines, with c. 15 marginal spinules, c. 24 long plumose setae.

Antennular peduncle short, robust; proximal segment c. as long as wide, with acute ventromedial tooth, stylocerite acute, exceeding anterior dorsal margin of segment; intermediate segment subcylindrical, 2.0 x longer than central width, subequal to length of proximal segment, distal segment c. 1.5 x longer than wide, 0.6 of proximal segment length, upper flagellum feebly biramous, with 22 proximal segments fused, shorter free ramus indistinctly segmented, c. 0.15 of fused rami length, lower ramus long, filiform, with c. 30 groups of aesthetascs.



Fig. 1. A. *Alpheus soror*, new species, holotype female, Trincomalee. Live specimen, photo Peter Ng. B. *Alpheus gracilipes* Stimpson, Dudley Point Reef, Darwin, Australia, NTM Cr.002507, photo A.J.Bruce

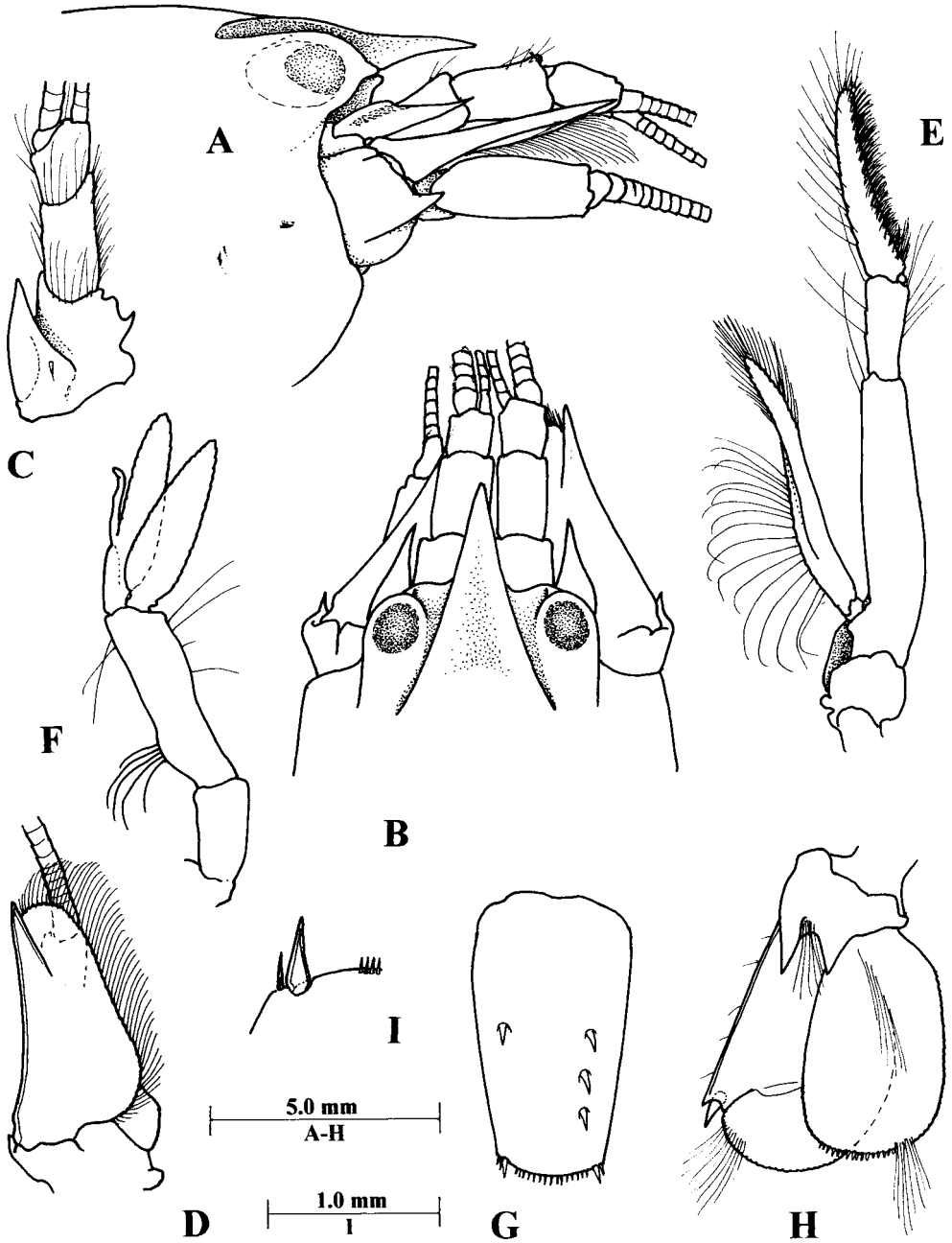


Fig. 2. *Alpheus soror*, new species, holotype female, Trincomalee. A. anterior carapace and appendages, lateral. B. same, dorsal. C. antennular peduncle, dorsal. D. antenna. E. third maxilliped. F. second pleopod. G. telson. H. same, right posterior spines. I. uropod.

Antenna with stout basicerite with strong lateral tooth, carpocerite robust, 2.6 x longer than central width, reaching to end of intermediate segment of antennular peduncle, not exceeding scaphocerite lamella, flagellum well developed, slender; scaphocerite reaching to end of antennular peduncle, lamella well developed, 2.0 x longer than wide, broadest proximally, lateral margin concave, with short stout distal tooth, slightly exceeding lamella.

Eyes with well pigmented cornea, completely covered by orbital hoods, without anteromedial process. With conspicuous blunt *bec ocellaire*.

Mouthparts: second and third maxillipeds only removed. Generally similar to those of *A. bannerorum* (Bruce, 1987). Second maxilliped with much larger, oval epipod, and third maxilliped with much larger better developed arthrobranch than in that species; endopod exceeding carpocerite by half terminal segment length, terminal segment 5.0 x longer than proximal width, tapering distally, without terminal spine, lateral margin sparsely setose, medial margin densely covered by groups of short spiniform setae; carpus c. 0.5 of terminal segment length, sparsely setose; ischiomerus and basis fully fused, combined segment c. 1.5 x terminal segment length, sparsely setose, exopod well developed, lateral margin slightly expanded with c. 18 long minutely setulose setae, numerous shorter plumose setae distally; coxa with large distally acute lateral plate, with hamate epipod laterally; with large arthrobranch.

First pereopods with chelae strongly asymmetrical. Major (left) chela c. 1.15 x CL, palm slightly compressed, smooth, glabrous, tapering slightly distally, 2.3 x longer than maximal width, with very feeble transverse groove on superior margin proximal to dactylus, inferior margin without transverse groove, dactylus c. 0.5 of palm length, slightly exceeding fixed finger, semicircular, compressed, distally subacute, cutting edge shallow concave, with low, feebly developed molar process posteriorly, ratios of dactylar length, 1 ; height, 0.45 ; molar process height, 0.1 ; angle, 157° (see Banner & Banner, 1981, p. 23); posterior molar process with few short setae, fixed finger distally subacute, exceeded by dactylus, deeply channelled with large fossa proximally; carpus very short, deeply excavate, unarmed; merus stout, c. 0.5 of palm length, ventrally excavate, c. 2.8 x longer than central width, distodorsal margin with stout acute tooth, with smaller acute medial distoventral, tooth, ventral medial border with 2 minutely spinulate tubercles; ischium, basis and coxa without special features.

Minor (right) chela c. 0.9 of CL, 0.8 of major chela length; palm subcylindrical, slightly compressed, 3.0 x longer than deep, smooth, glabrous, dactylus c. 0.4 of palm length, elongate, c. 4.2 x longer than maximal depth, with bilateral balaeniceps setal ridges, tip acute, slightly exceeding fixed finger, fixed finger cannulate, with acute hooked tip, cutting edges sparsely setose, without distinct setal fringes; Proximal segments similar to major chela.

Second pereopods slender, exceeding carpocerite by 4 distal carpal segments; with palm subcylindrical, slightly compressed, c. 1.8 x longer than wide, fingers similar, c. 1.2 x palm length, slender, cutting edges entire, with small acute hooked tips, sparsely setose; carpus 5 segmented, slender, c. 3.0 x chela length, segments in ratio 2: 1.5: 1: 2.8: 4.2, proximal segment longest; merus c. 22.0 x chela length, subcylindrical, c. 6.6 x longer than central width; ischium subequal to merus length, 6.4 x longer than central width; basis and coxa without special features.

Third pereopod moderately slender, exceeding carpocerite by distal half of propod and dactyl; dactyl slender, simple, compressed, c. 4.0 x longer than proximal depth, unguis clearly

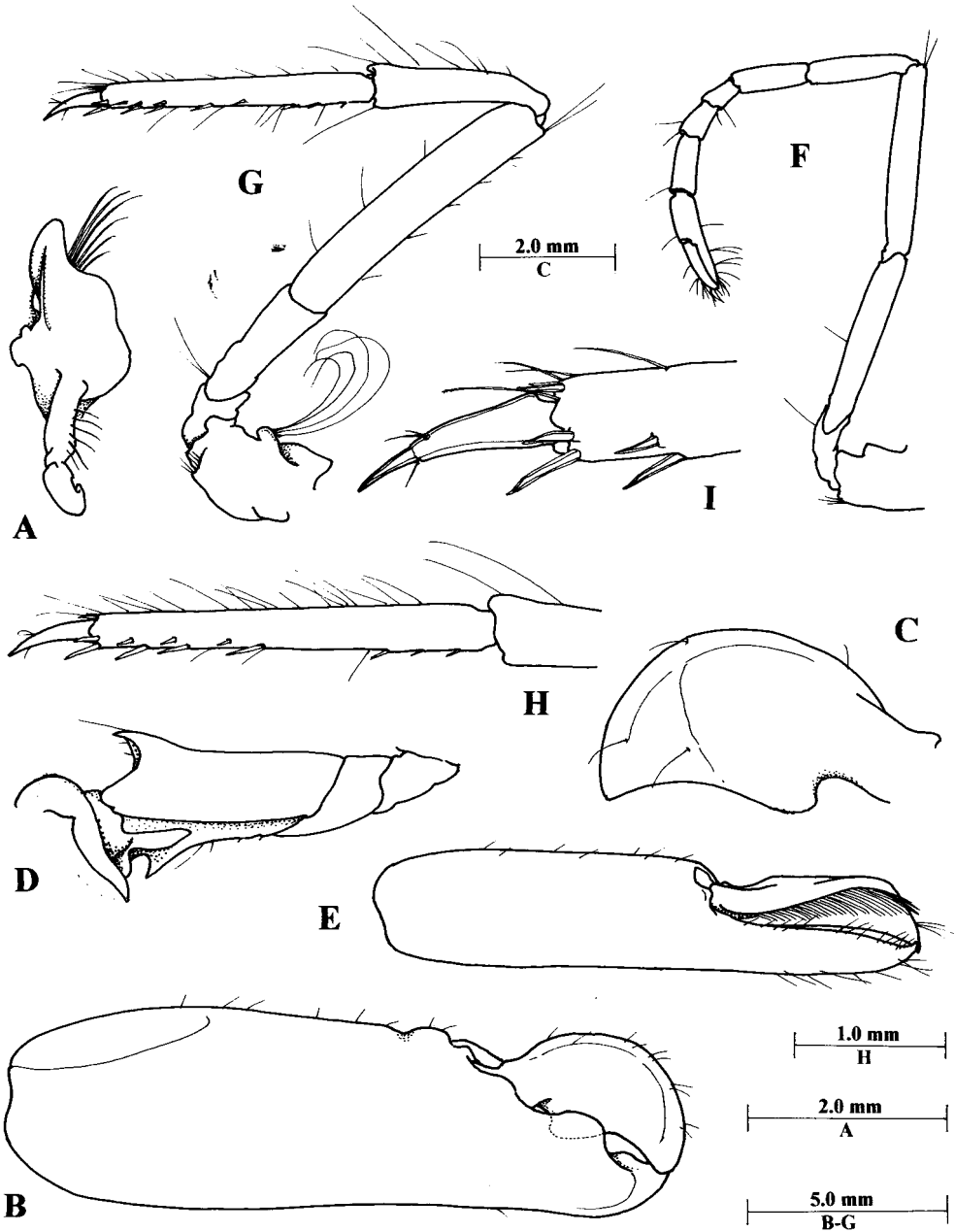


Fig. 3. *Alpheus soror*, new species, holotype female, Trincomalee. A. first pereiopod, major chela, (left). B. same, dactylus. C. same, merus. D. first pereiopod, minor chela, (right). E. second pereiopod. F. third pereiopod. G. same, propod and dactyl. H. same distal propod and dactyl. I. third maxilliped, lateral coxal plate and epipod.

demarcated, c. half of corpus length; propod 4.3 x dactyl length, 0.45 of CL, slender, tapering slightly distally, 9.0 x longer than proximal depth, dorsal margin with numerous simple setae, pair of spiniform setae distally, ventral margin with 7 spines, of decreasing size proximally, ventrolaterally with 4 smaller spines, sparsely setose; carpus c. 0.6 of propod length, tapering proximally, c. 4.5 x longer than distal width, unarmed; merus 1.1 x propod length, uniform, 6.0 x longer than central depth, unarmed; ischium c. 0.4 of merus length, with very small ventral spine; basis without special features; coxa robust, with setobranch. Fourth and fifth pereopods similar, with reduced spinulation.

Pleopods normal. Second pleopod with slender appendix interna on endopod, basipodite with ovigerous setae proximomedially.

Uropod with protopodite with large acute process dorsolaterally, with similar slightly smaller process medially, tuft of simple setae arising between teeth; exopod broad, c. 1.6 x longer than greatest width, lateral margin straight, with acute distal tooth, stout spine medially, with smaller medial tooth, dieresis well marked, posterior border without spinules, with row of long simple setae dorsolaterally; endopod suboval, c. 1.6 x longer than wide, posterior margin with c. 20 minute spinules, with short row of long simple setae medially, dorsal surface with central row of similar setae.

**Measurements.** - Total body length (approx.), 45 mm, postrostral carapace length, 15 mm, major chela, 17 mms; minor chela, 13.5 mm.

**Colouration.** - General body colour pale orange, antennae and flagella, pleopods and caudal fan similar. Cornea black, readily visible through carapace. Carapace with small scattered white patches dorsally, with similar larger patches on upper branchiostegite. Abdomen similar dorsally, with larger white spot on lower first, third, fourth, fifth and sixth pleura, two on second. Second segment with large conspicuous lateral ocellus: large central spot deep red, almost black centrally, surrounded by broad white ring, enclosed by a narrow orange-red border. First pereopods with fingers and distal palm orangish, rest of palm purple, carpus purple and white, merus purple banded with white. Second pereopods purple, distal carpal segments orangish. Third to fifth pereopods paler purple, dactyls orange.

**Habitat.** - Coral reefs, depth uncertain. No suggestion of any commensal associations.

**Systematic Position.** - A member of the diadema species group, closely related to *Alpheus gracilipes* Stimpson, 1861. Banner & Banner (1981) have provided a recent illustrated account of Australian specimens of *A. gracilipes*.

The new species can be distinguished from typical *A. gracilipes* by the following features:

1. Longer rostrum, reaching to middle of intermediate segment of antennular peduncle.
2. Adrostral carinae uniformly concave, more broadly divergent, (more narrowly convergent, biconcave in *A. gracilipes*).
3. Frontal margin convex, (not subacute as in *A. gracilipes*).
4. Orbital hoods less elevated, with poorly developed anterior carina, (strongly elevated with well marked anterior carina in *A. gracilipes*).
5. Distolateral tooth of scaphocerite only slightly exceeding lamella (far exceeding in *A. gracilipes*); distal lamella broad (narrow in *A. gracilipes*).
6. Major chela with dactyl only very slightly exceeding fixed finger, semicircular, palm with only very feebly developed dorsal transverse groove (strongly exceeding fixed finger,

lower than semicircular, palm with well marked dorsal transverse sulcus, in *A. gracilipes*). Dactylus with height 0.45, depth 0.1, and angle  $157^\circ$  (as opposed to 0.3, 0.95 and  $163^\circ$  in *A. gracilipes*).

7. Minor chela palm and fixed finger without long setae, (palm with numerous long setae in *A. gracilipes*).
8. Carpus of second pereopods with only minutely spinulate ventral tubercles, (with well marked spinuliferous tubercles in *A. gracilipes*).
9. Third pereopod with very small ventral ischial spine, propod without long spiniform distodorsal seta, dactyl less than quarter of propod length, (with well developed ischial spine, with long spiniform distodorsal seta and greater than one fourth of propod length in *A. gracilipes*).
11. Anterior dorsal telson spines at 0.5 of telson length, (distinctly less than 0.5 in *A. gracilipes*).

The easiest character with which to distinguish *A. soror* from *A. gracilipes* is the large ocellar spot on the side of the second abdominal segment.

**Etymology.** - From Latin *soror*, a sister, with regard to the close relationship of this species with *Alpheus gracilipes*.

**Remarks.** - *Alpheus gracilipes* Stimpson has been noted as one of the common alpheids of coral reefs (Miya, 1974) and also one of the most widely distributed, with a range extending from the Red Sea, East Africa and western Indian Ocean islands to Japan, Australia, east

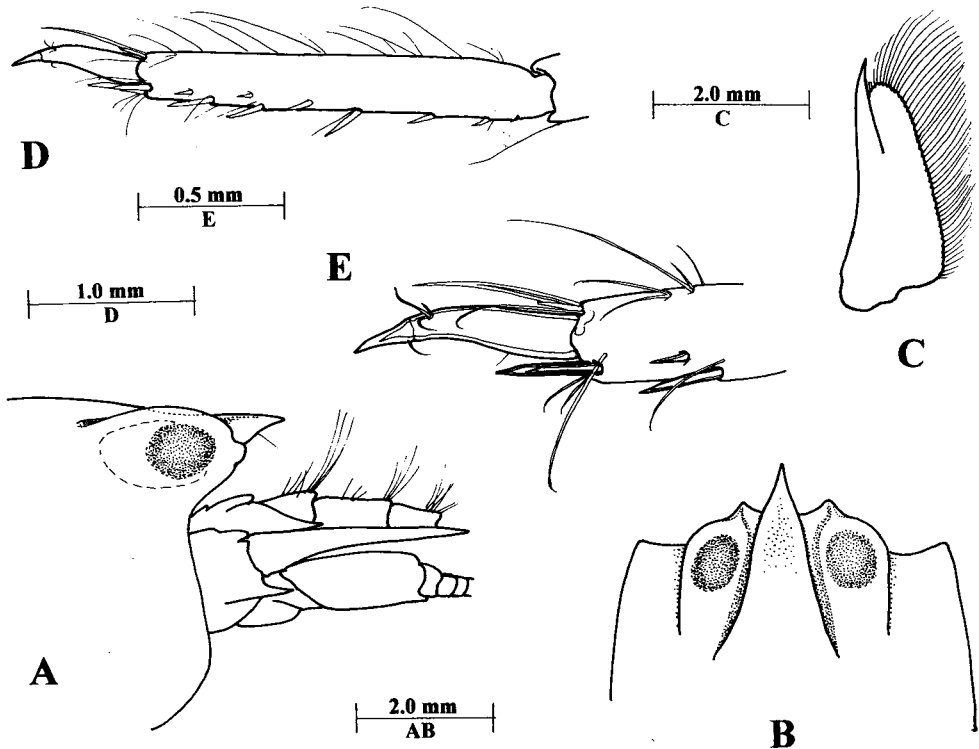


Fig. 4. *Alpheus gracilipes* Stimpson, ovigerous female, Hibernia Reef, Coral Sea, stn. HI-31, 0.5 m, QM W17956. A. anterior carapace and appendages, lateral. B. same, dorsal. C. scaphocerite. D. third pereopod, propod and dactyl.



to the Society Islands (type locality: Tahiti), Marquesas Islands and the Hawai'ian Islands, occurring largely among dead corals. The type material is no longer extant: the original description was brief, without note of colouration and unillustrated. A longer unillustrated redescription was also provided by Banner and Banner (1967). The colouration of the topotypic specimen, a small male, was not noted. Poupin (1998) recently noted that both type and neotype material have been destroyed by fire, the former in the 1871 Chicago conflagration and the latter in the Hawai'i Marine Laboratory fire in 1961. However, the latter specimen was only redescribed, as an aid "until a neotype can be described". There is still no neotype for this species at the present moment. The longer detailed and illustrated description provided by Banner & Banner (1981a), based on a specimen from Australia, is accepted as valid for *A. gracilipes* Stimpson, but without the original type material complete certainty is not possible.

Heller (1865) and Ortmann (1891) also reported *A. gracilipes* from Tahiti, and, more recently, by Banner & Banner (1967). Specimens have also been reported from Moorea by Naim (1980) and Kropp & Birkeland (1981). Most recently the French Polynesian records have been reviewed by Poupin (1998). Several authors, notably Miya (1974) and Banner & Banner (1967, 1981b) have commented on the variability in both morphology and colour pattern of specimens referred to this taxon. The specimen described by Coutière (1898) from Jibuti has conspicuous abdominal ocelli and "beau bleu" pereopods and may belong to *A. soror*, as may the ocellate material reported on by Banner (1953) from Hawai'i, suggesting a very extensive geographical distribution. No specimens *A. gracilipes* from Jibouti are identifiable in the collections of the Muséum National d'Histoire Naturelle, Paris (A. Anker, pers. comm., 14 April 1999). The Banners (1967), referring to their material from the Society Islands, including Tahiti, report that two morphological forms exist, with and without a balaeniceps chela in the male. This variability suggests there may well be further concealed species residing under the name of *Alpheus gracilipes*. The specimens reported by Miya (1974), with dark blue upper and lower spots on the first abdominal segment, small central lateral spot on the second, upper spot on the third and lateral spots on fourth and fifth segments, suggest that at least one further species is involved. The specimen illustrated in his pl 30C may well belong to *A. soror*, suggesting again a wider distribution of this species.

Recently it has been demonstrated that some "well known species" of alpheid shrimps actually consist of complexes of closely related taxonomically cryptic or sibling species. The widely distributed coral-associate *Alpheus lottini* Guérin ranges from the Red Sea to the western American seaboard. Knowlton & Weigt (1997) have recently demonstrated, for example, that the Pacific Ocean representatives of this taxon actually consist of several species. Two readily recognisable colour patterns were apparent but on the basis of molecular biological data three species of specific rank were distinguishable. Similar results have also been obtained from appropriate studies on other alpheids: Anemone associates *Alpheus armatus* Rathbun and three related sibling species (Knowlton & Keller, 1983, 1985); sponge associated *Synalpheus rathbunae* Coutière and two related sibling species together with another closely related species, *S. filidigitus* Armstrong (Duffy, 1996a); *S. brooksi* Coutière and three more sibling species (Duffy, 1996b). Free-living *Alpheus parvirostris* Dana and *A. bannerorum* Bruce also appear to be a further pair of sympatric cryptospecies distinguished most readily by their colour patterns (Bruce, 1987). The existence of free-living *Alpheus* sibling species has been demonstrated by Knowlton et al., (1993). These authors indicate that the species studied showed habitat preferences, which may have helped maintain genetic isolation. These preferences can exist, in freelifving species, on a very small scale. In Hong Kong, at low water spring tide level on one beach, *A. brevicristatus* De Haan was found in a small area

of about 25 square meters of soft deeper mud, surrounded by a region of shallower sandier mud occupied by other *Alpheus* species (personal observation). Distinguishing sympatric and allopatric species can present subtle problems. Knowlton and Jackson (1994) have recently suggested that the actual species diversity on coral reefs is three to five times greater than currently recognised. It would therefore not be surprising to find that similar species complexes occurred in some other well established "species". The principle difference in the present case is that, unlike the first three examples mentioned above, which all have commensal associations, there is no evidence of any such behaviour in any species of the *A. diadema* group of the Alpheidae, which all appear to be free-living inhabitants of the coral reef substrate. As no biochemical information is available, the present species is not called a sibling species, following the proposal of Knowlton (1986).

Several authors have commented on the importance of live colour pattern as an important criterion in the recognition of closely related species of carideans (Knowlton, 1986; Bruce, 1998). It may be mentioned here that alpheid shrimps recently identified as *A. gracilipes* Stimpson were of common occurrence on the shallow water reefs around Darwin, Northern Territory, Australia. These were of nondescript pale orangish colouration, flecked with white patches, without any conspicuous lateral abdominal or other eyespots. Numerous specimens were collected, which were very consistent in their colouration and morphology. To facilitate morphological comparison with *A. soror* some new illustrations of *A. gracilipes*, from Hibernia Reef, Western Australia, (fig. 4) are provided.

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