

SYNALPHEUS DORAE, A NEW COMMENSAL ALPHEID SHRIMP FROM THE AUSTRALIAN NORTHWEST SHELF

A. J. Bruce

Abstract.—A new species of alpheid shrimp, *Synalpheus dorae*, is described and illustrated. It occurs in association with sponges of the genus *Reniera* on the Australian Northwest Shelf at depths of 37–82 m. The species is unusual in having only four carpal segments on the second pereopod and all 162 specimens collected appeared to be male.

A survey of the benthic fauna of the Australian Northwest Shelf carried out by the F.R.V. *Soela* of the Commonwealth Scientific and Industrial Research Organization's Fisheries Division in 1983–1984 provided abundant material of the family Alpheidae. The study of these shrimps was undertaken by Professor A. H. Banner and D. M. Banner and revealed numerous species new to the Australian fauna as well as many rare species and some undescribed species. On the death of Professor Banner the study was discontinued and the specimens returned to the Northern Territory Museum, Darwin. Amongst the material returned was one container with a note from Dora Banner enclosed, stating "This is definitely a new species. We had not had time to work on it." This material is now described below.

Synalpheus dorae, new species

Figs. 1–6

Material examined.—18 ♂, operation 7/12, 19°51.9'S, 117°0.78'E, 57–58 m, trawl, F.R.V. *Soela*, Cr. 0283, 10 Apr 1983, coll. P. Blyth, NTM. Cr. 005060.—136 ♂, sta NWS-22, 19°05.0'S, 118°57.8'E, 82 m, trawl, F.R.V. *Soela*, Cr. 0283, 24 Apr 1983, coll. A. J. Bruce, NTM. Cr. 005059.—1 ♂, locality D4, 19°29.6'S, 118°52.4'E, 37–38 m, trawl, F.R.V. *Soela*, Cr. 0583, 25 Oct 1983, coll. T. Ward, NTM. Cr. 005061.—7 ♂, locality D7, 19°29.7'S, 118°51.4'E, 40–41 m,

epibenthic sledge, F.R.V. *Soela*, Cr. 0583, 25 Oct 1983, coll. T. Ward, NTM. Cr. 005062.

Description.—A small-sized, robust alpheid shrimp of subcylindrical body form. Carapace smooth, glabrous, slightly compressed; rostrum small, blunt, short, depressed, slightly upturned, slightly exceeding orbital teeth, with distal dorsolateral setae, about 1.4 times longer than proximal setae, about 1.4 times longer than proximal width, reaching to about middle of proximal segment of antennular peduncle, without orbitorostral process, orbitorostral notch broadly rounded, orbital teeth triangular, slightly upturned distally, with simple setae laterally, anterolateral margin unarmed, very obliquely angular, posterior margin broadly rounded, cardiac notch distinct.

Abdomen subcylindrical, glabrous, first 4 pleura small, rounded in female, similar in male, but first pleuron with acute posteroventral tooth, fifth pleuron with acute ventral tooth; sixth segment about subequal to length of fifth, about 1.5 times longer than deep, posterodorsal margin unarmed, posteroventral angle well developed, acute, posterolateral angle acute. Telson about 1.6 times sixth segment length, triangular, distally truncate, about 1.25 times longer than proximal width, lateral margins straight, convergent, posterior margin about 0.28 of anterior width, 2 pairs of large, erect dorsal spines at 0.35 and 0.82, posterior spines slightly longer than anterior, about 0.27 of

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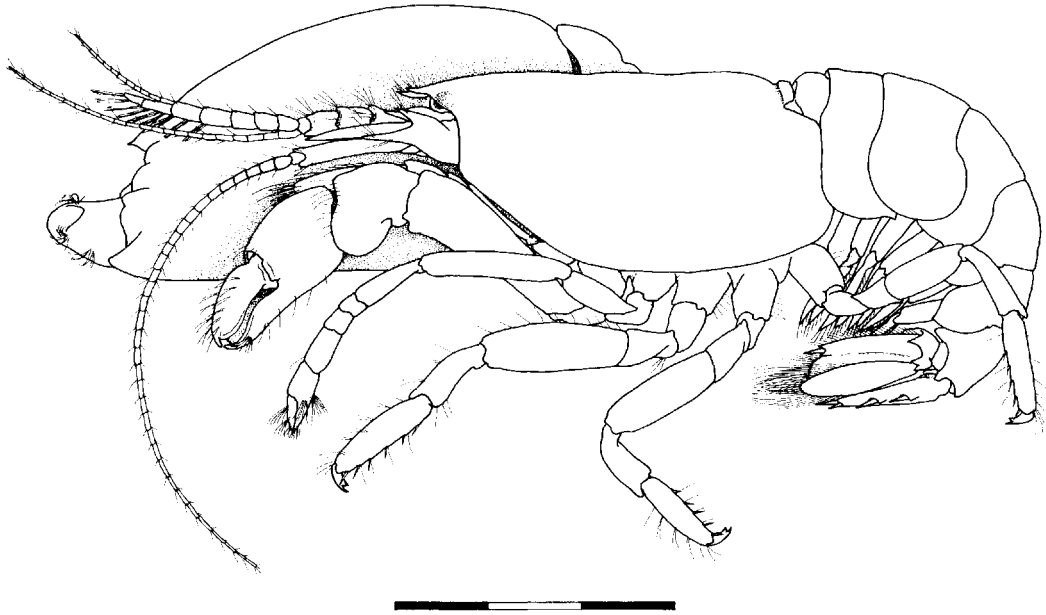


Fig. 1. *Synalpheus doriae* holotype male, Northwest Shelf, Western Australia. Scale bar in millimeters.

telson length; 2 pairs of posterior marginal spines, submedian slightly larger than lateral, about 0.21 of telson length, short median gap with 2 simple setae dorsally and 2 longer plumose setae ventrally; dorsal surface with sparse simple setae.

Antennule well developed; proximal segment of peduncle subcylindrical, with normal statocyst with granular statolith, stylocerite long, acute, reaching to about 0.8 of segment length, with short simple setae distolaterally; intermediate and distal segments subequal, cylindrical, together subequal to proximal segment length; upper flagellum biramous, rami fused for 5 segments, robust; short ramus with 2 stout segments, about 8 groups of aesthetascs; lower ramus with about 12 slender segments, length subequal to fused portion plus short ramus; lower flagellum short, slender, about 0.75 times carapace length, exceeding long ramus of upper flagellum.

Antenna with basicerite robust, with shorter acute dorsolateral and longer acute ventrolateral process, latter reaching or exceeding distal end of proximal segment of

antennular peduncle, both with sparse simple setae distolaterally; merocerite and ischiocerite short; carapocerite subcylindrical, slightly flattened, about 4.5 times longer than wide, sparsely setose laterally; flagellum short, robust, about 1.3 times carapace length; scaphocerite with very robust lateral spine, slightly exceeding antennular peduncle, distinctly exceeding carapocerite, about 4.7 times longer than proximal width, lamella greatly reduced, reaching to about 0.5 of lateral margin, spine with several short simple setae distolaterally.

Eyes normal, completely covered dorsally by orbital hood, cornea well pigmented.

Epistome normal, without special features.

Mandible (left) with corpus moderately slender; palp 2-segmented, proximal segment subcylindrical, proximally tapered, non-setose, distal segment oval, flattened, about 1.8 times longer than broad, distal margin with numerous short, plumose setae; molar process robust, obliquely truncate distally, margin densely fringed with short setae, with strong blunt tooth poste-

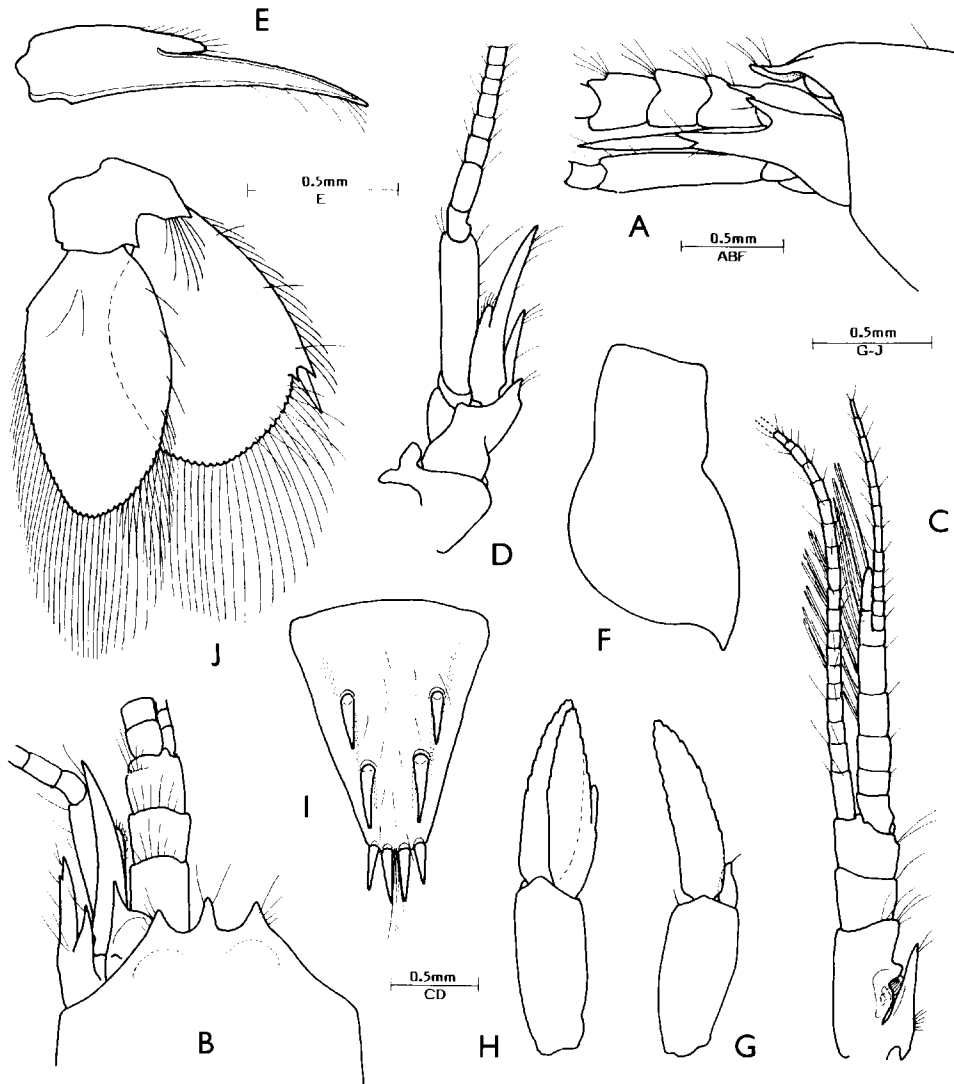


Fig. 2. *Synalpheus dorae* paratype male: A, Anterior carapace and antennal peduncles, lateral; B, Same, dorsal; C, Antennule; D, Antenna; E, Scaphocerite; F, First abdominal segment, lateral; G, First pleopod; H, Second pleopod; I, Telson; J, Uropod.

riorly; incisor process slightly expanded distally, truncate with 7 small irregular acute teeth, larger teeth laterally. Maxillula with bilobed palp, upper lobe long, acute, lower lobe short with distally setulose spine; upper lacinia broad with about 20 short simple acute marginal teeth, with numerous short denticulate setae submarginally; lower lacinia slender, curved, with several serrulate

setae distally. Maxilla with short simple subcylindrical, distally tapering non-setose palp; basal endite broad, produced medially, partly bilobed, with dense setal fringe medially; coxal endite simple, reduced, small acute lobe with several long setae; scaphognathite 4.0 times longer than broad, anterior lobe distally narrow, medial margin concave, 1.8 times longer than wide, posterior

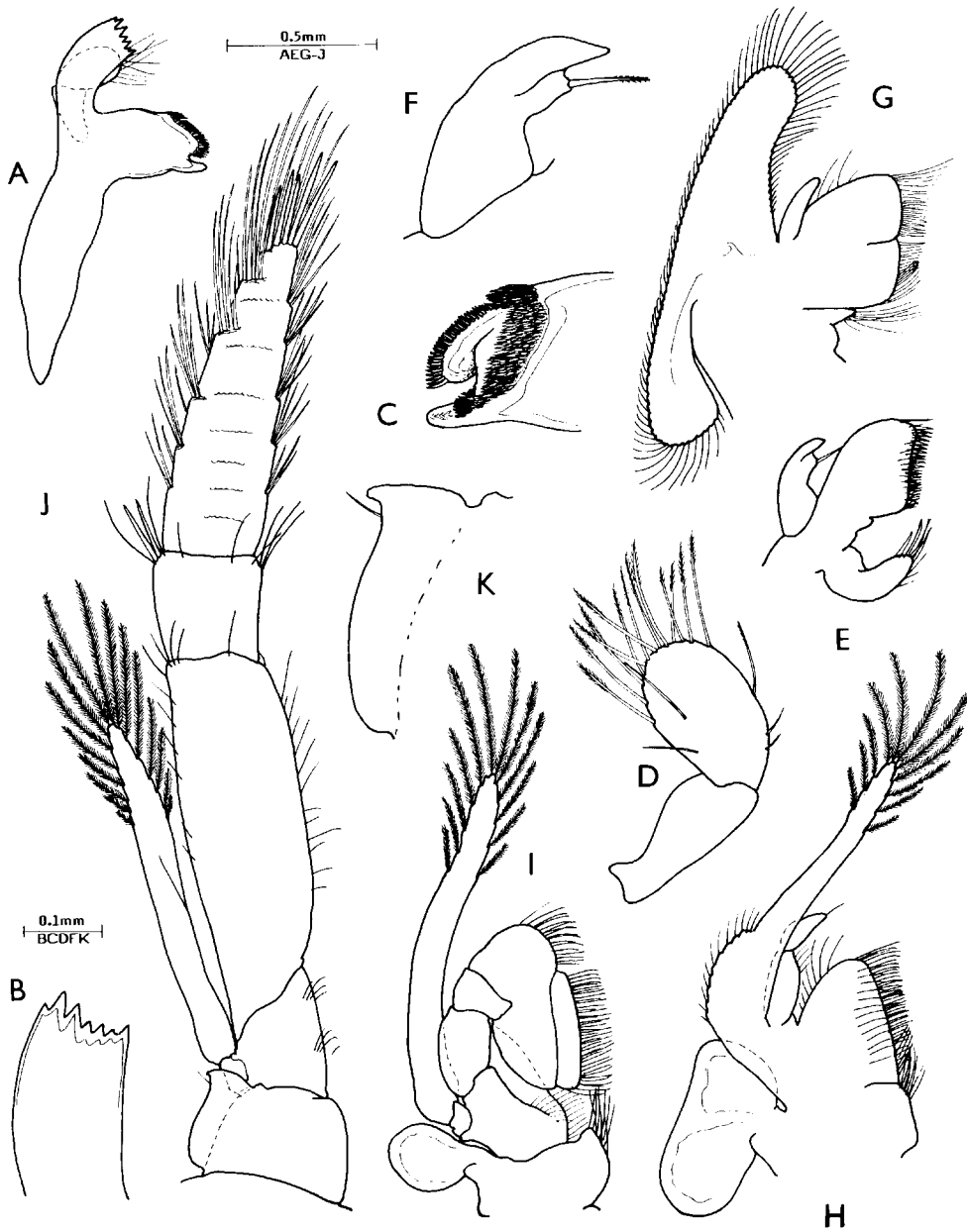


Fig. 3. *Synalpheus dorae* paratype male: A, Mandible; B, Same, incisor process; C, same, molar process; D, Same, palp; E, Maxillula; F, Same, palp; G, Maxilla; H, First maxilliped; I, Second maxilliped; J, Third maxilliped; K, Same, Lateral plate.

lobe about 0.35 of scaphognathite length. First maxilliped with 2-segmented palp, proximal segment about 2.2 times longer than broad, medial margin sparsely setose distally, distal segment about 0.8 of proximal segment length, 3.0 times longer than

wide, tapering slightly, with single short simple distal seta; basal endite normal medial margin densely setose; coxal endite simple, sparsely setose, 4 long setae distomedially; exopod with well developed flagellum with numerous plumose setae dis-

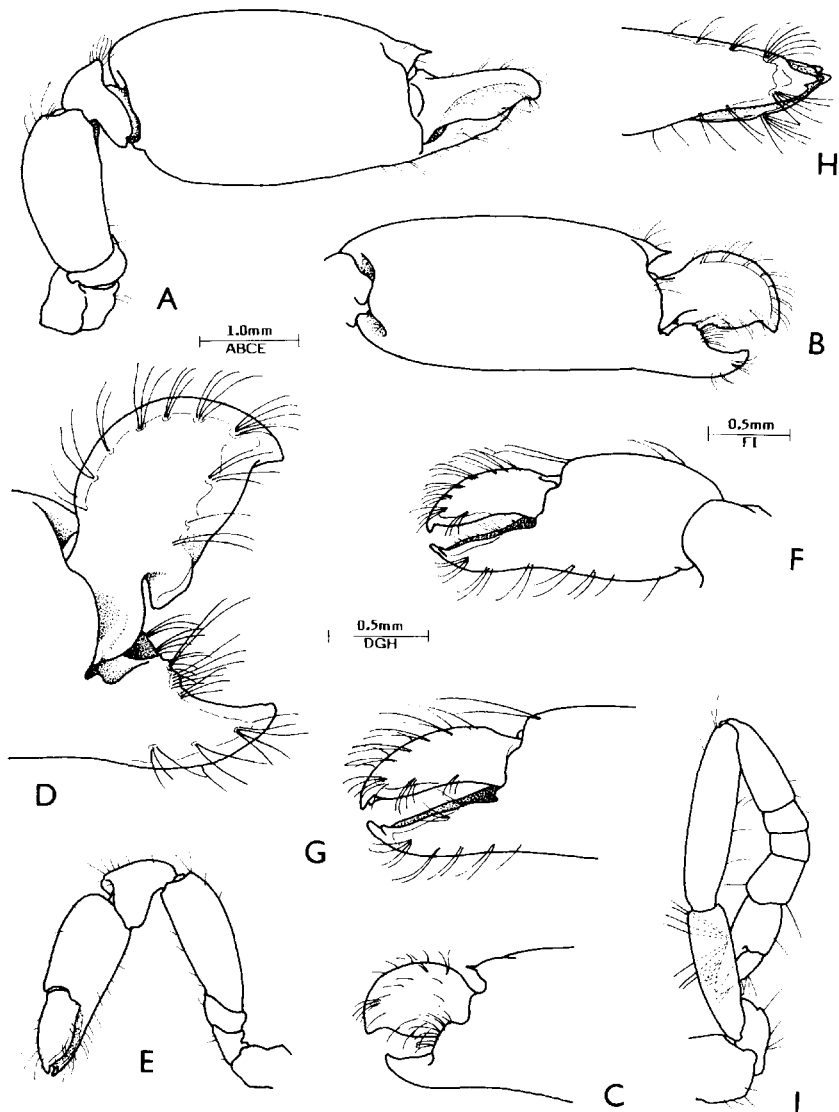


Fig. 4. *Synalpheus dorae* paratype male: A, Major first pereiopod; B, Same, chela, lateral; C, Same, fingers, medial; D, Same, fingers, lateral; E, Minor first pereiopod; F, Same, chela, lateral; G, Same, fingers; H, Same, ventral; I, Second pereiopod.

tally, caridean lobe small, feebly setose; epipod large, transversely oval, simple. Second maxilliped of normal form; dactylar segment narrow, about 4.6 times longer than broad, densely setose medially, propodal segment broad, distally rounded, sparsely setose, basis broad, medially excavate and setose, exopod flagellum well developed with numerous plumose setae distally; coxa

broad, medially produced with long setae distally, small rounded epipod without prodobranch laterally. Third maxilliped with endopod stout, exceeding carpocerite and antennular peduncle; isochiomer segment 3.0 times longer than central depth, slightly tapered proximally, ventromedially excavate, margins feebly setose; carpal segment about 0.27 of isochiomer segment length,

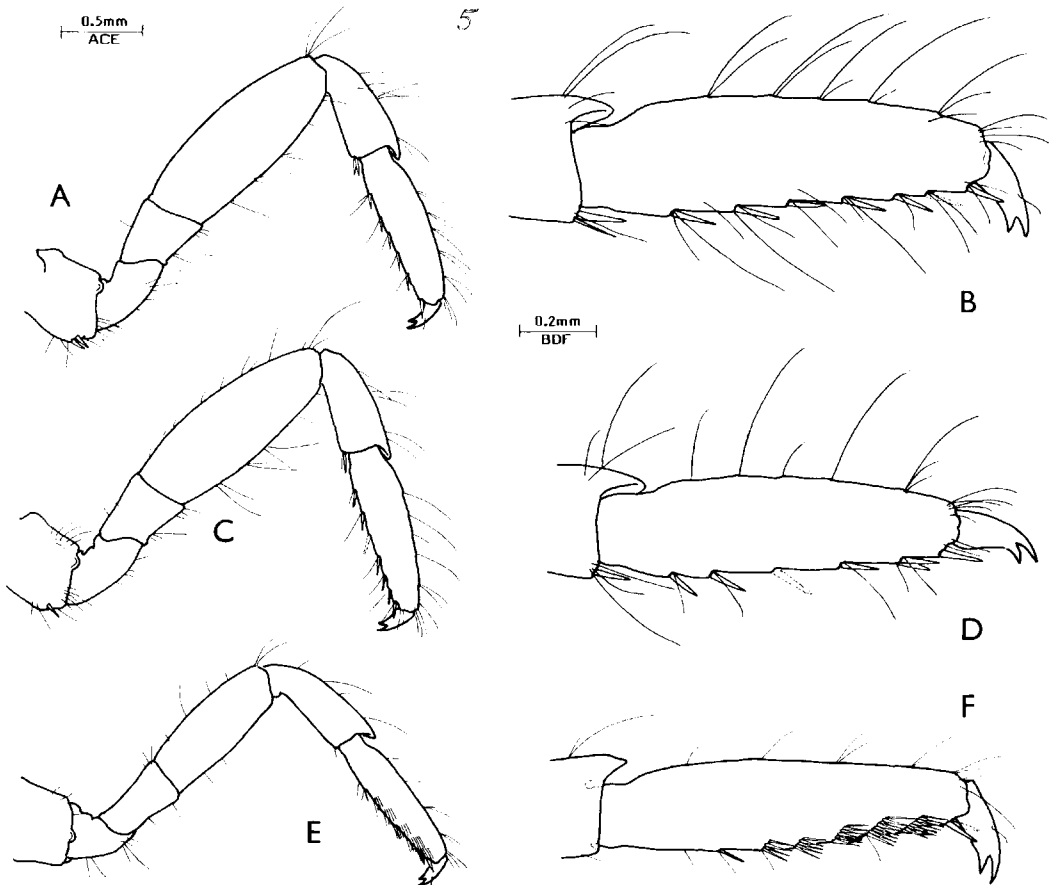


Fig. 5. *Synalpheus dorae* paratype male: A, Third pereiopod; B, Same, propod and dactyl; C, Fourth pereiopod; D, Same, propod and dactyl; E, Fifth pereiopod; F, Same, propod and dactyl.

as long as wide, subcylindrical, with 2 dorsolateral spines and several ventrolateral setae; distal segment about 0.3 times longer than proximal width, tapering distally, distal width 0.4 of proximal, length 0.83 of ischiomerus, with 7 transverse rows of serrulate spines medially and 8 stout, blunt, finely denticulate, distally; basis about 0.3 of ischiomerus length, sparsely setose, exopod with well developed flagellum reaching to about 0.85 of ischiomerus length, with numerous plumose setae distally; coxa stout, ventrally medially rounded, with long low dorsolateral plate with small recurved distal tooth, without epipod or arthrobranch.

Thoracic sternites narrow and unarmed, coxae of pereiopods in close apposition.

First pereiopods markedly unequal and dissimilar, apparently similar in males and females. Major chela enlarged, about 1.5 times carapace length, with palm subcylindrical, centrally moderately swollen, slightly dorsoventrally flattened, smooth, glabrous, about 1.8 times longer than greatest width, distodorsal angle produced, with slender acute tooth; dactylus strongly compressed, about 0.38 of palm length, semicircular, with stout acute distal tooth, molar process small, feebly produced, equal to 0.3 of cutting edge length, medial and lateral

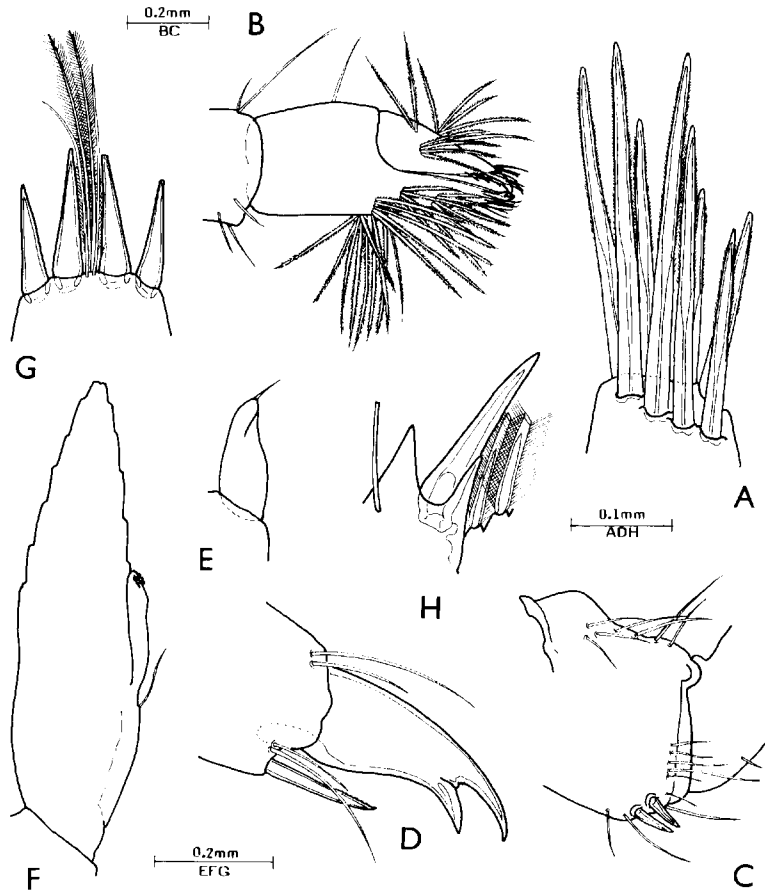


Fig. 6. *Synalpheus dorae* paratype male: A, Distal spines of terminal segment of third maxilliped endopod; B, Second pereiopod, chela; C, Third pereiopod, coxa; D, Same, dactyl; E, First pleopod, endopod; F, Second pleopod, endopod; G, Posterior telson spines; H, Distolateral spine of exopod of uropod.

surfaces of dactyl with numerous submarginal groups of 2–3 simple setae; fixed finger short, curved, blunt distally, deeply excavate proximally for reception of dactylar molar process and cutting edge, with groups of simple setae; carpus very stout about 0.14 of palm length, expanded and excavate distally, unarmed; merus robust, 2.0 times longer than greatest width, about 0.57 of palm length, unarmed; ischium, basis and coxa, all short, robust, without special features, basis without exopod, coxa as in major chela, without epipod and setobranch. Minor second pereiopod with chela about

0.4 of major chela length, about 0.5 of carapace length; palm about 1.4 times longer than deep, smooth, slightly swollen centrally, compressed with scattered long simple setae; dactylus about 0.75 of palm length, about 2.5 times longer than proximal depth, broadly subspatulate with thickened edge laterally, strong blunt hooked tooth distally with smaller tooth medially, with numerous groups of long simple setae dorsally; fixed finger deeply excavate, with strong blunt tooth distally with smaller tooth laterally, with long setae medially and laterally; carpus about 0.6 of palm length, 0.9 times lon-

ger than wide, expanded distally deeply excavate, unarmed; merus about 0.8 of chela length, 2.8 times longer than greatest width; ischium, basis and coxa without special features.

Second pereopod moderately robust, exceeding carapocrite by chela and distal carpal segment, chela with palm compressed, about 1.2 times longer than deep, sparsely setose, fingers slender, tapering, with small hooked tips, cutting edges entire, with dense groups of coarsely serrulate setae proximally, shorter simple setae distally, dactylus about 2.8 times longer than proximal depth, subequal to palm length; carpus with 4 stout segments, 4:1:1:2, proximal segment longest; merus about 0.9 of carpus length, 4.0 times longer than wide; ischium 0.7 of merus length, 3.4 times longer than central width, tapering proximally; basis 0.6 of ischium length, without exopod; coxa robust, without epipod or setobranch.

Third pereopod robust, exceeding carapocrite by about half propod length; dactyl with unguis not clearly demarcated from corpus, compressed, feebly curved, about 2.6 times longer than proximal depth, with well developed accessory tooth at 0.6 of dactyl length, shorter and stouter than terminal tooth; propod about 3.7 times longer than deep, compressed, 4.0 times longer than dactyl, with 2 robust distoventral spines and 6 ventral spines, with numerous long simple setae dorsally and ventrally, carpus about 0.6 of propod length, 2.2 times longer than distal width, slightly tapered proximally, with well developed distodorsal lobe, distoventral margin with 2 spines, one robust, one slender; merus 2.0 times length of carpus, 2.6 times longer than central width, unarmed; ischium about 0.33 of merus length as long as wide distally, tapered proximally, unarmed; basis 0.4 of merus length, unarmed; coxa robust with 2 submarginal ventral spines, without epipod or setobranch. Fourth pereopod similar to third; propod 0.8 of third propod length, with single distoventral spine, 5 ventral

spines; carpus with single distoventral spine; coxa with single distoventral spine. Fifth pereopod generally as third; propod 0.8 of third propod length, 4.2 times longer than central depth with 2 distoventral spines and 3 ventral spines and 5 transverse rows short of serrulate setae ventrolaterally; coxa without distoventral spine.

Male first pleopod with basipodite 2.2 times longer than wide, exopod 1.15 times length of basipodite, 4.0 times longer than proximal width; endopod small, 0.25 of exopod length, 2.5 times longer than wide, tapering distally, with single short simple distal setae. Second pleopod with basipodite 2.5 times longer than wide; exopod about 3.6 times longer than proximal width, 1.1 times length of basipodite; endopod subequal to exopod length, without appendix masculina, appendix interna at 0.4 of endopod length, about 0.25 of endopod length, 5.5 times longer than central width with few (3–5) concinnuli.

Uropod with stout protopodite, with large acute dorsolateral tooth, with long simple setae medially, and smaller dorsal tooth; exopod broad, 1.4 times longer than wide, oval, lateral margin convex with acute distolateral tooth with long mobile spine and small acute tooth medially, without distinct diaeresis, lateral margin with submarginal row of setae ventrally; endopod subequal to exopod length, 1.8 times longer than wide.

Types.—An intact specimen from sta NWS-22 is selected as holotype and the other specimens from that station are designated as paratypes, catalog number NTM. Cr. 005059. Paratypes are deposited in the collections of the National Museum of Natural History, Washington, D.C., catalog number USNM 234305, the Bishop Museum, Honolulu, catalog number S10804 and the Rijksmuseum van Natuurlijke Historie, Leiden, catalog number RMNH 37179.

Measurements.—Holotype male, total length (approx.) 10.0 mm; carapace length, 4.0 mm, major chela, 5.5 mm; minor chela

2.0 mm. Paratype male, total length (approx.), 8.2 mm; carapace length, 3.5 mm; major chela, 4.15 mm; minor chela, 1.9 mm.

Host.—The specimens from T/12 and NWS/22 were obtained from sponges. The 136 specimens from NWS/22 were all obtained from a single sponge host, identified as *Reniera* sp. (Haliclonidae).

Parasites.—One specimen, sta NWS-22, was infected by an abdominal bopyrid parasite, *Eophryxus* sp. (Isopoda: Hemiarthrinae).

Etymology.—The species is named in honor of the late Dora May Banner, in recognition of her great contribution to alpheid taxonomy.

Systematic position.—Morphological features of special significance in the assessment of the relationships of *S. dorae* are (i) the lack of an orbitorostral process, (ii) the absence of a dense setal brush on the dactyl of the minor chela, (iii) absence of a strongly produced frontal region extending far beyond eyes, (iv) lack of a reduced accessory spine on ambulatory dactyls, and absence of spines on merus of third pereopod, (v) lack of a rostrum markedly exceeding orbital teeth, and (vi) broad dentate fingers on minor chela. The first four items are characteristic of the “*Comatularum* Group” and the others of the “*Coutierei* Group,” a species group largely characterized by its lack of consistent characters (Banner & Banner 1975). *Synalpheus dorae* appears most closely related to some of the species of the ‘*Coutierei* Group’ and can be immediately distinguished from most of them by the presence of only four segments on the carpus of the second pereopod, all other species except two having five segments. The two species with a 4-segmented carpus are *S. quadriarticulatus* Banner & Banner, 1975, and *S. redactocarpus* Banner, 1953. The first species lacks an orbitorostral process but its presence or absence in *S. redactodactylus* is not recorded.

Synalpheus dorae is most conveniently distinguished from *Synalpheus quadriartic-*

ulatus by the telson, which bears two pairs of very large dorsal spines and two pairs of large subequal posterior spines, with the interspace between the submedian spines obsolete. In *S. quadriarticulatus* the dorsal spines are smaller, the posterior spines smaller, unequal, and the submedian spines well separated by a convex posterior margin. In addition the fingers of the minor chela are bidentate in *S. dorae*, simple in *S. quadriarticulatus*.

Synalpheus dorae is less closely related to *Synalpheus redactocarpus*, which has a well developed lamella on the scaphocerite and a telson lacking dorsal spines, with a well developed convex posterior margin with slender unequal posterior spines. In *S. redactocarpus* the orbital spines are longer, more acute and convergent, and the rostrum is longer and narrower. The palm of the major chela lacks a distodorsal spine and the fingers of the minor chela are less broadened and with simple finger tips.

In its general morphology *S. dorae* also shows a close resemblance to *Synalpheus pescadorensis* Coutière, 1905, from which it differs, in addition to the 4-segmented second pereopod carpus, in having a much smaller lamella in the scaphocerite and lacking a very long posterolateral process on the protopodite of the uropod.

The thoracic sternites in *Synalpheus dorae* are narrow and the coxae of the pereopods are medially flattened and apposed. The small spines on the coxa of the third and fourth pereopods project posteriorly in this position, a feature that does not appear to have been noted in other species of *Synalpheus*.

Remarks.—Of the 162 specimens available, only a few are obvious juveniles on account of their small size. The rest are of adult size for a small *Synalpheus* species, yet no ovigerous females are present and all intact specimens are of the usual male form, with an angular posterior tooth on the first abdominal pleuron, and in the morphology of the first and second pleopods (Dardeau

1984). Similar populations have been reported in other sponge-inhabiting *Synalpheus* species: *S. neptunus germanus* (Banner & Banner, 1975, 44 specimens), *S. paradoxus* (Banner & Banner, 1981, 241 ♂, 4 ♀), *S. crosnieri* (Banner & Banner, 1983, 144 ♂, 3 ♀). The condition was first noted in Atlantic species by Coutière (1909) in *S. pectiniger* Coutière, and Chace (1972) has also reported on a paucity of ovigerous females in some West Indian populations of *S. paraneptunus* Coutière, so the phenomenon is clearly of widespread distribution. Banner & Banner (1981) have suggested that toxic or pheromone-like metabolites produced by sponges may be the cause of abnormal *Synalpheus* populations. Progress in the study of these peculiar populations is clearly handicapped by the lack of any detailed knowledge of the sponge hosts of many species of *Synalpheus* and of the degree of host specificity in most of the sponge-associated species.

Acknowledgments

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Division of Natural Sciences, Northern Territory Museum, P.O. Box 4646, Darwin, Australia 5794.