

***Periclimenes tonga* sp. nov., a commensal shrimp associated with a scyphozoan host from Tonga (Crustacea: Decapoda: Palaemonidae)**

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**Abstract**—A new species of commensal palaemonid shrimp, *Periclimenes tonga* sp. nov., from Tonga, is described and illustrated. The species is of particular interest as it was associated with a scyphozoan host. It is most closely related to *P. granulimanus* Bruce and may be readily distinguished from that species by the absence of an epigastric spine, less dissimilar second pereopods with feebler tuberculation of the major chela, and the non-prehensile ambulatory pereopods.

**Introduction**

The pontoniine shrimp genus *Periclimenes* Costa, 1844, contains many species that are associated with a wide variety of marine invertebrate hosts. The Coelenterata are particularly conspicuous as host animals, with many shrimps being associated with the Scleractinia, Actinaria, Gorgonacea and Alcyonacea. Only a single species, *Periclimenes holthuisi* Bruce, 1969, has so far been reported to live in association with a scyphozoan host,—in this case, *Cassiopeia* sp. *P. holthuisi* is also often found on actinarian, cerianthid and scleractinian hosts. The discovery of a second species of this genus associated with Scyphozoa is therefore of interest. No other palaemonid shrimps are known to associate with medusae, but shrimps of the family Hippolytidae and possibly the Pandalidae have been reported to do so (Hayashi and Miya, 1968).

***Periclimenes tonga* n. sp.**

Figs. 1-5

**MATERIAL EXAMINED:** 1 ovig. ♀: Nuapapu Island (southside), Vava'u Group, Tonga, 18° 42'S., 174° 04'E., 5-50 ft, 26 July 1985, coll. R. Van Syoc *et al.*

**DESCRIPTION:** A medium-sized species of *Periclimenes* of subcylindrical, slender body form (Fig. 1).

Rostrum slender, tapering, horizontal, equal to about half postorbital carapace length, slightly concave ventrally, extending to distal margin of proximal segment of antennular peduncle (Fig. 2A); dorsal carina well developed with nine acute, evenly spaced teeth and single smaller subterminal tooth distally, first tooth situated on carapace, second at level of posterior orbital margin; lateral carinae feebly developed; ventral carina obsolete, lower margin setose with single minute distoventral tooth, slightly proximal to level of distodorsal tooth. Carapace generally smooth, epigastric and supraorbital spines absent; orbit feebly developed; inferior orbital angle (Fig. 5A) bluntly produced, slightly up-turned distally, with inner flange; antennal spine sub-marginal, not exceeding inferior orbital angle; hepatic spine slightly larger than antennal, at distinctly lower level and

Bruce, A.J. 1988

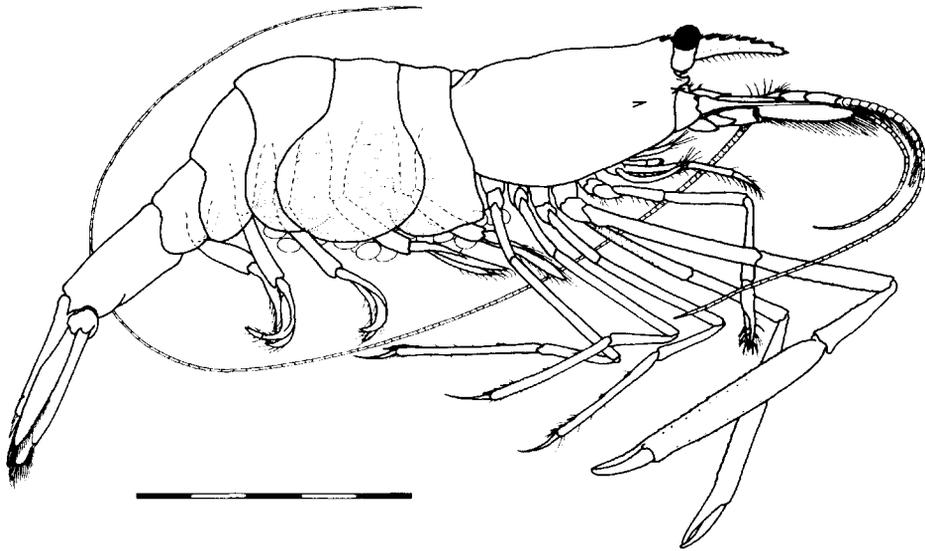


Fig. 1. *Periclimenes tonga* n. sp., ovigerous female, holotype. Scale bar in mm.

posterior to level of first rostral tooth; anterolateral angle not produced, bluntly rounded (Fig. 2B).

Abdomen generally smooth, third tergite not posterodorsally produced; sixth segment about 2.0 times length of fifth and 2.0 times longer than anterior depth, posterolateral angle acutely produced, posteroventral angle more bluntly produced; pleuron of first segment anteroventrally angular, remaining pleura broadly rounded, second and third enlarged. Telson (Fig. 2F) subequal to length of sixth abdominal segment, about 4.0 times longer than anterior width, sides straight, posteriorly convergent, emarginate at about half length, one pair of small dorsal spines only at about 0.15 of length, dorsal surface with numerous simple setae; posterior margin (Fig. 5G) about 0.3 of anterior width, angulate, with central portion slightly produced but without median point; lateral spines small, about twice length of dorsal spines, subdorsally situated; intermediate spines long and slender, about 0.15 of telson length, 5.0 times length of lateral spines; submedian spines about 0.4 of intermediate spine length, bilaterally setulose.

Antennules slender, peduncle exceeding rostrum by two distal segments; proximal segment about 3.0 times longer than distal width, slightly tapering distally; stylocerite short and acute, not reaching half segment length, statocyst normally developed, without statolith, medial margin with small ventral tooth at 0.5 of length, distolateral border (Fig. 5B) strongly produced, angular, with plumose setae, far exceeding distal tooth of lateral margin; intermediate and distal segment length subequal to about 0.65 of proximal segment length; distal segment more slender than intermediate, about 1.7 times longer than central width; upper flagellum biramous, with eight proximal segments of rami fused; shorter ramus with four free segments, 21 groups of aesthetascs present; longer ramus filiform, of 38 segments; lower flagellum slender, filiform, with 34 segments, far exceeded by longer ramus of upper flagellum (Fig. 2C).

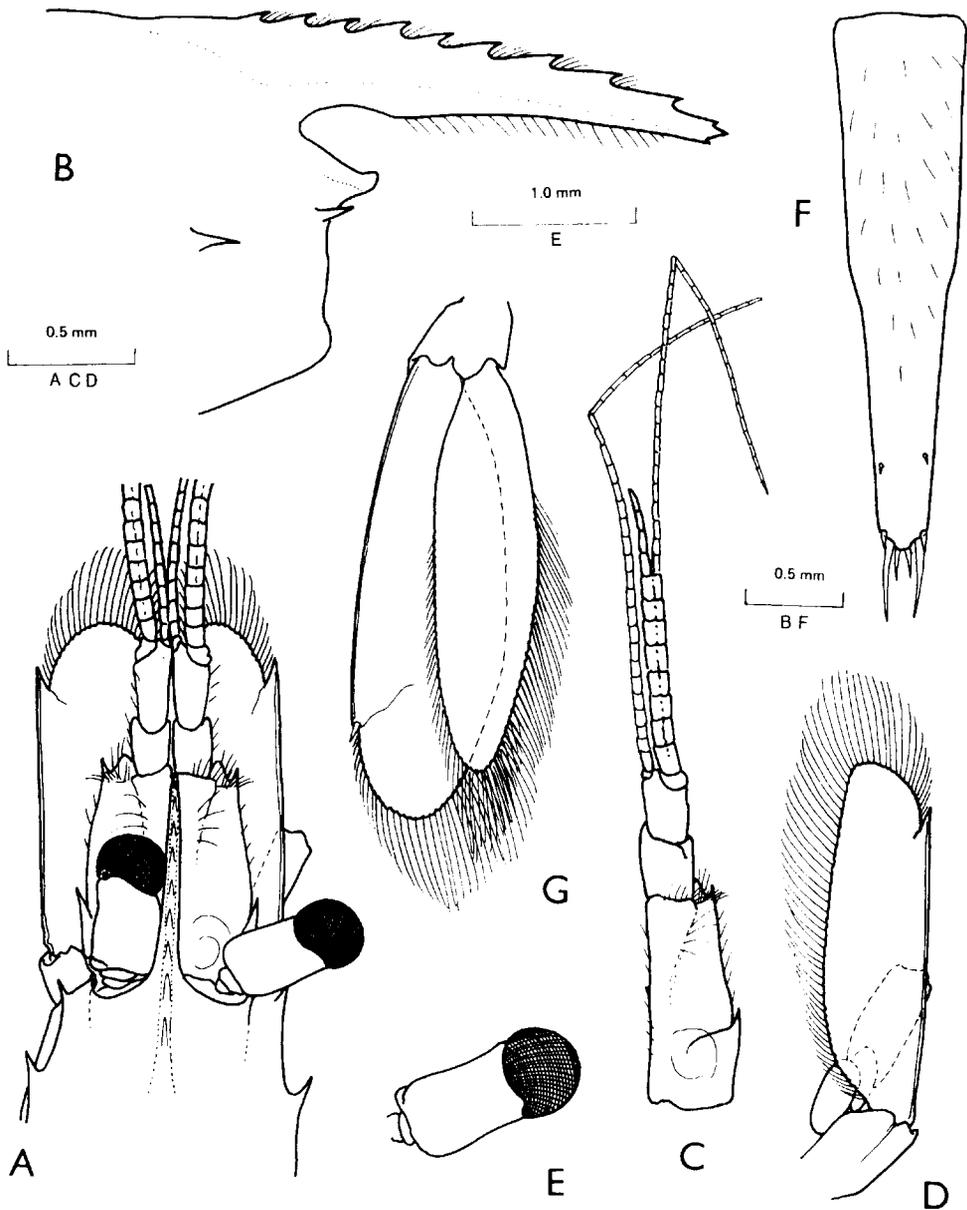


Fig. 2. *Periclimenes tonga* n. sp., ovigerous female, holotype. A, anterior carapace, eyes, and antennae, dorsal. B, anterior carapace and rostrum, lateral. C, antennule. D, antenna. E, eye. F, telson. G, uropod.

Antenna with robust unarmed basicerite; merocerite and ischiocerite well developed; carpocerite 2.5 times longer than central width, compressed, not exceeding proximal segment of antennular peduncle; flagellum slender, elongate, about six times postorbital carapace length; scaphocerite well developed, lamella extending well beyond distal end of antennular peduncle, about 3.5 times longer than greatest width, at 0.3 of length, anterior margin (Fig. 5C) broadly rounded laterally, bluntly angled medially, far exceeding strong tooth situated at distal end of straight lateral border (Fig. 2D).

Eye well developed with globular cornea, with posterior accessory pigment spot; stalk about 1.5 times longer than central width, subcylindrical, slightly narrower than corneal diameter (Fig. 2E).

Mouthparts typical of *Periclimenes* species. Mandible (Fig. 3A) moderately robust, without palp; molar process (Fig. 3BC) stout, with four stout blunt teeth distally and two dense patches of short setae; incisor process distally obliquely truncate, with three large acute teeth and one small subterminal medial denticle. Maxillula (Fig. 3D) with feebly bilobed palp, lower lobe with small ventral process bearing single minute uncinata seta; upper lacinia moderately broad, with six stout spines distally, lower spines feebly serrate, with numerous spiniform setae and normal setae ventrally; lower lacinia robust, tapering, with long spines distally and setae ventrally. Maxilla (Fig. 3E) with non-setose, slender subcylindrical palp; basal endite broad, distinctly bilobed, distal lobe distinctly larger than proximal, lobes with 13 and 12 slender simple setae respectively; coxal endite obsolete; scaphognathite normal, about 3.2 times longer than central width, anterior lobe feebly pointed anteriorly, posterior lobe narrow, distally rounded. First maxilliped (Fig. 3F) with slender, subcylindrical palp with two simple setae distally; basal endite broad, coxal endite obsolete with single long slender seta, medial border straight, sparsely fringed with slender, simple setae; exopod with well developed flagellum with plumose setae distally, caridean lobe well developed, elongate, narrow, with numerous marginal setae; epipod small, triangular, feebly bilobed. Second maxilliped (Fig. 3G) of usual form; dactylar segment with numerous strongly biserrate spines, propod with longer spines and setae distomedially; exopod well developed with plumose setae distally; with subrectangular epipod. Third maxilliped (Fig. 3H) slender, endopod extending to distal end of carpocerite; ischiomerus and basis completely fused, combined segment about 9.0 times longer than central width, feebly tapering distally, with notch at ischio-basal junction medially, ischiomerus section with numerous long slender simple setae medially, ischial portion with submarginal row of short hooked setae ventrally, basal portion sparsely setose medially; penultimate segment about 8.5 times longer than central width, about 0.65 of length of combined ischiomerus—basal segment, with numerous groups of long spiniform setae medially; terminal segment tapering, about 6.0 times longer than proximal with numerous group of serrulate spines and setae ventromedially, about 0.5 of length of ischiomerus segment; exopod well developed, with plumose setae distally, not exceeding distal border of antepenultimate segment of endopod; coxa feebly produced medially, with large oval lateral plate; rudimentary arthrobranch present, without epipod. Bec ocellaire not developed. First three thoracic sternites relatively broad, unarmed; fourth without finger-like median process, fifth with low transverse ridge with median notch, posterior to second pereopods; posterior sternites broad, unarmed.

First pereopod (Fig. 4A) slender, extending beyond scaphocerite by length of chela;

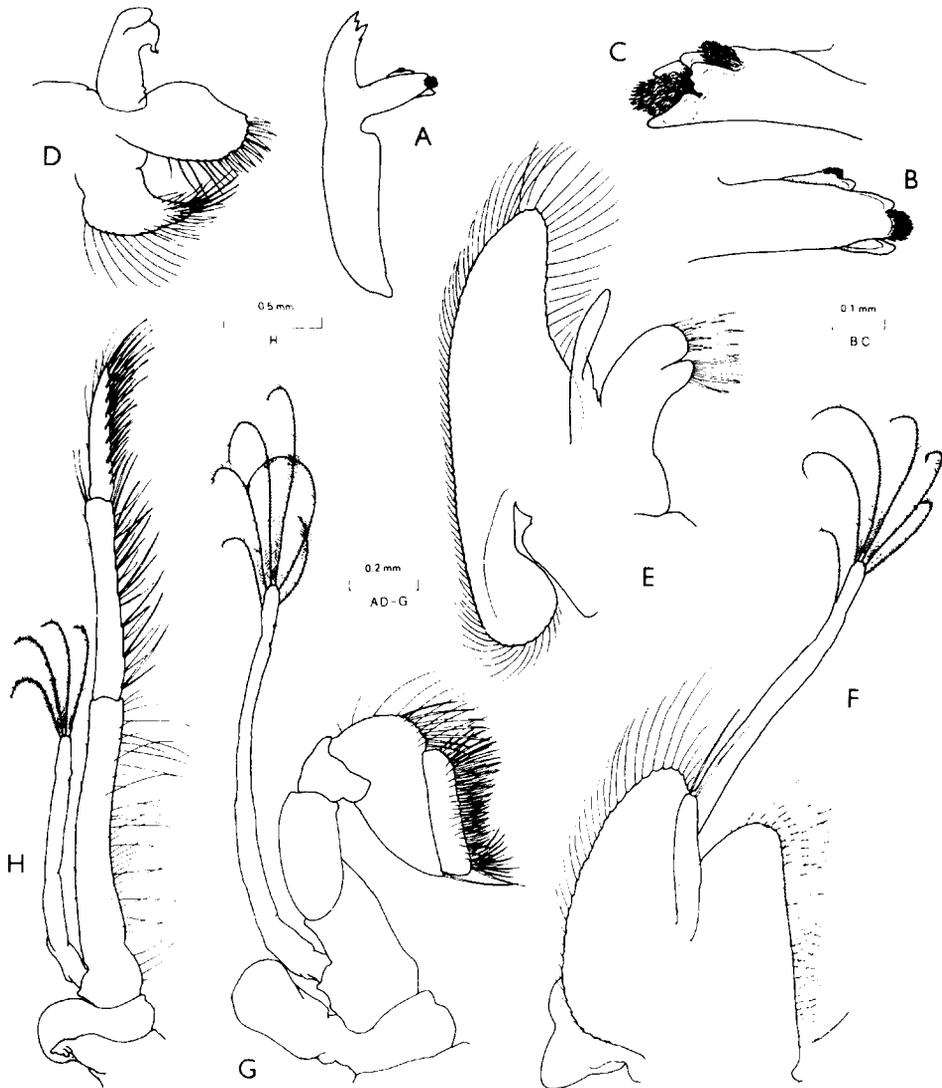


Fig. 3. *Periclimenes tonga* n. sp., ovigerous female, holotype. A, mandible. B, same, molar process, ventral aspect. C, same, dorsal. D, maxillula. E, maxilla. F, first maxilliped. G, second maxilliped. H, third maxilliped.

chela (Fig. 4B) with palm subcylindrical, slightly compressed, about 2.5 times longer than proximal depth, with numerous transverse rows of short serrate setae proximally; fingers slender, subequal to palm length, gaping, without distinct cutting edges and with feebly hooked, small, acute tips, conspicuous groups of setae medially and laterally on dactyl and fixed finger; carpus slender, about 6.4 times longer than distal width, slightly tapered proximally; merus subequal to carpus, subcylindrical, uniform, about 11.0 times

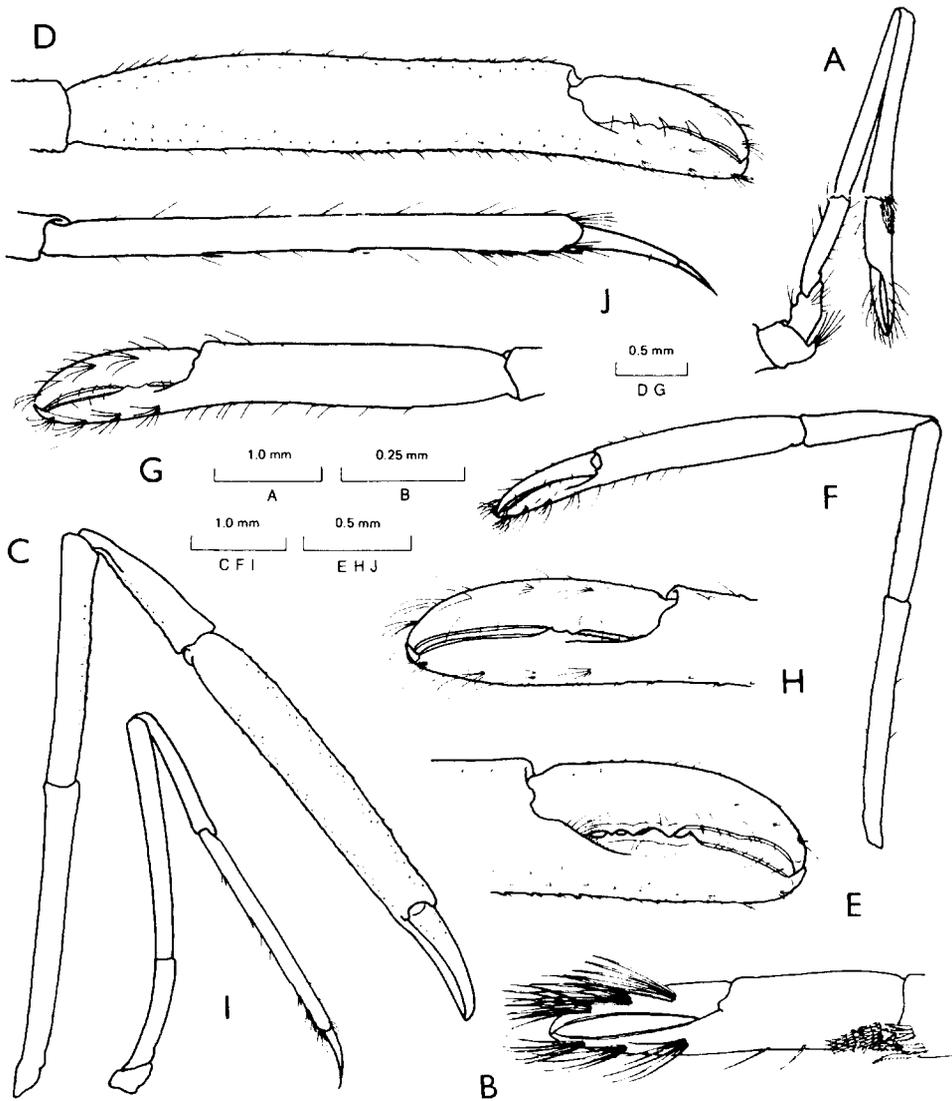


Fig. 4. *Periclimenes tonga* n. sp., ovigerous female, holotype. A, first pereiopod. B, same, chela. C, major second pereiopod. D, same, chela. E, same, fingers. F, minor second pereiopod. G, same, chela. H, same, fingers. I, third pereiopod. J, same, propod and dactyl.

longer than wide; ischium about 0.45 of merus length, sparsely setose; basis 0.3 of merus length, setose; coxa robust, with distinct setose ventral process.

Second pereiopods moderately unequal, similar; generally slender. Major second pereiopod (Fig. 4C) exceeds scaphocerite by 0.3 of merus, chela subequal to 1.25 of postorbital carapace length; chela (Fig. 4D) with palm subcylindrical, slightly compressed, about 5.5 times longer than central depth, minutely tuberculate with small acute

tubercles, dactyl about 0.35 of palm length, 4.0 times longer than proximal depth, with three small teeth proximally on laterally situated cutting edge, distal half entire; tip acute, hooked; fixed finger similar, with four teeth proximally, distal two larger and more acute than proximal two; fingers (Fig. 4E) feebly tuberculate, sparsely setose; carpus about 0.45 of palm length, about 4.4 times longer than central width, tapering proximally, feebly expanded distally, unarmed, with small acute tubercles ventrally; merus about 0.75 of palm length, about 7.8 times longer than distal width, very feebly tapered proximally, distoventral angle unarmed, lower margin minutely tuberculate; ischium about 0.5 of palm length, 1.25 times length of merus, about 8.5 times longer than distal width, slightly expanded distally, glabrous, unarmed; basis and coxa without special features. Minor second pereopod (Fig. 4F) similar to major but smaller, exceeding scaphocerite by about half length of carpus, chela subequal to 0.87 of postorbital carapace length and 0.94 of length of palm of major pereopod; palm (Fig. 4G) subcylindrical, feebly compressed, slightly swollen proximally about 5.25 times longer than deep, feebly tuberculate, particularly ventrally; dactyl (Fig. 4H) about 0.55 of palm length, about 5.5 times longer than proximal depth, cutting edge lateral, with single large acute tooth at proximal third, distal cutting edge entire, tip acutely hooked, sparsely setose; fixed finger generally similar, cutting edge with one acute tooth, with four smaller teeth proximally at about one third of length, opposing dactylar tooth; carpus about 0.6 of palm length, about 4.5 times longer than central width, unarmed; merus 0.88 of palm length, 6.5 times longer than distal width, feebly tuberculate ventrally, without distoventral tooth; ischium 1.17 of palm length, about 11.0 times longer than central width; basis and coxa normal.

Ambulatory pereopods slender, third exceeding carapocerite by half length of carpus. Third pereopod (Fig. 4I) with dactylus slender (Fig. 5D), corpus compressed, about 3.8 times longer than proximal depth, simple, lower border concave, without dorsal setae and with single small distolateral and distomedial setae, unguis slender, simple, very acute, about 0.5 of corpus length and 7.0 times longer than proximal width; propod (Fig. 4J) about 3.5 times longer than dactyl, 13.4 times longer than deep, uniform, with one pair of slender distoventral spines, three further pairs of slender ventral spines on distal fifth and single spines at 0.3 and 0.6 of length; carpus about 0.6 of propod length, unarmed; merus subequal to propod, about 12.5 times longer than distal width; ischium about half length of merus, basis and coxa normal. Fourth and fifth pereopods similar to third. Propod of fifth pereopod (Fig. 5E) with several pairs of elongate, slender, serrulate ventral spines distally and transverse row of shorter similar distoventral setae laterally.

Uropods (Fig. 2G) normal, extending well beyond posterior telson spines, propodite feebly armed posterolaterally; exopod 3.0 times longer than central width, lateral border feebly convex with very small distolateral tooth with much larger mobile spine medially (Fig. 5F); endopod 4.0 times longer than wide, distinctly shorter than exopod. Ova are moderately numerous, about 100, and small.

**TYPE:** The single ovigerous female specimen is designated as holotype and deposited in the collection of the California Academy of Sciences, San Francisco, California, registration number IZ 060144.

**MEASUREMENTS (mm):** Total body length (approx.) 16.5; carapace and rostrum, 5.7; postorbital carapace, 3.7; second pereopod, major chela, 4.75; minor chela, 3.4; length of ovum 0.5.

**HOST:** *Cassiopeia* sp. [Coelenterata, Scyphozoa]

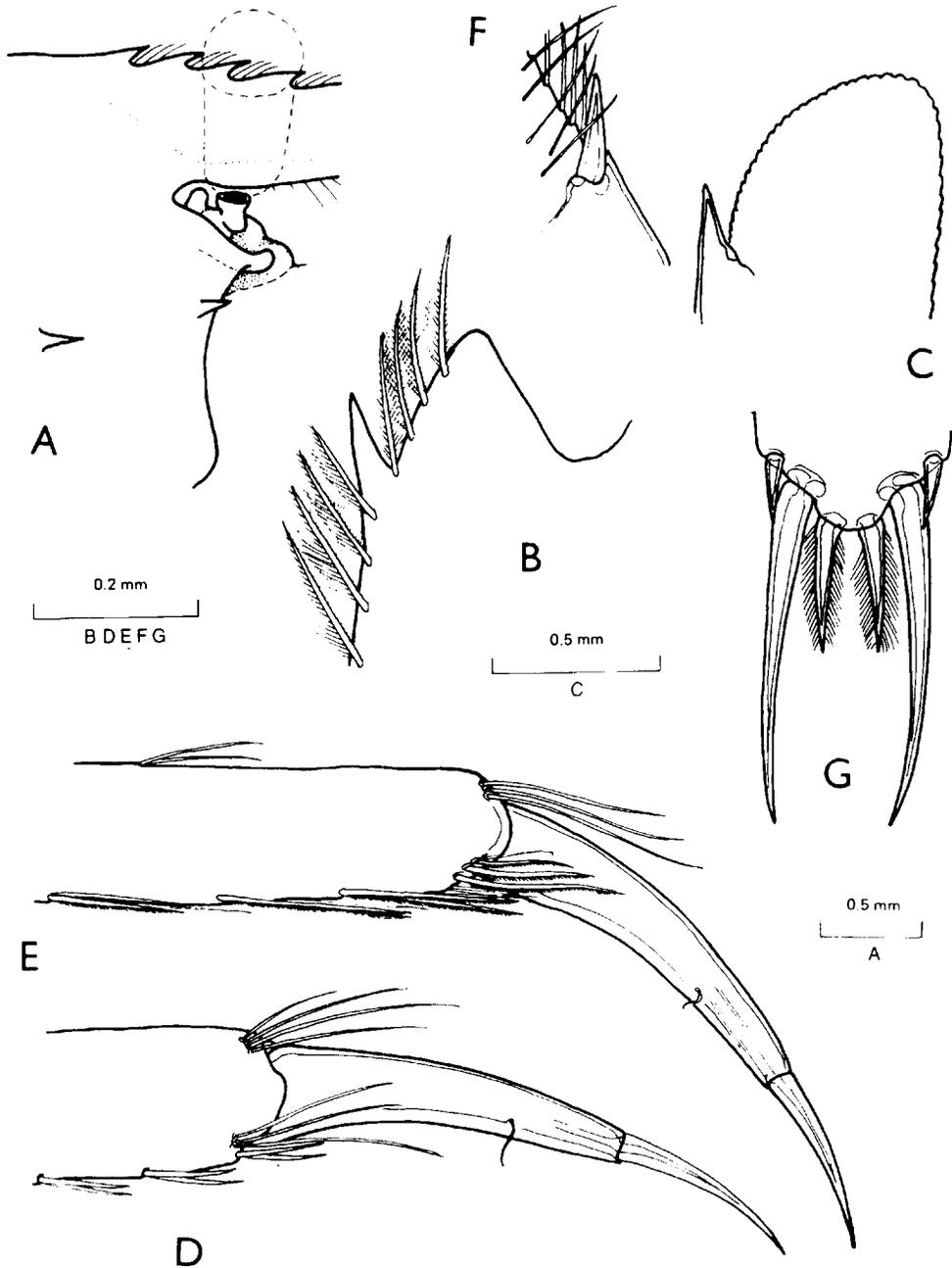


Fig. 5. *Periclimenes tonga* n. sp., ovigerous female, holotype. A, orbital region. B, distolateral angle of proximal segment of antennular peduncle, ventral aspect. C, distal end of scaphocerite. D, distal propod and dactyl of third pereiopod. E, same, fifth pereiopod. F, posterolateral tooth and spine of exopod of uropod. G, posterior telson spines.

COLORATION: No data

SYSTEMATIC POSITION: *Periclimenes tonga* appears to occupy a rather isolated position in the genus, without close relationships to any of the major species groups. It is most closely related to *P. granulimanus* Bruce, first reported in association with antipatharians from near Nosy Bé, Madagascar (Bruce, 1978). It can be readily distinguished from *P. granulimanus* by the absence of an epigastric spine, the less marked dissimilarity between the second pereopods, with much feebler tuberculations of the major chela and the more slender, longer and less curved dactyls of the ambulatory pereopods, together with more feeble spinulation of the propod. In *P. granulimanus* the distal propod and dactyl of the ambulatory propod appear to form a prehensile mechanism which is not apparent in *P. tonga*.

### Discussion

The discovery of a second species of *Periclimenes* in association with a scyphozoan host is of particular interest in view of the rareness of these associations. *P. holthuisi* was first reported in association with actinarians in Hong Kong (Bruce, 1969, 1982) and was subsequently reported in association with *Cassiopeia* in Zanzibar waters (Bruce, 1972). *Cassiopeia* is unusual amongst the jellyfish in that it is commonly found with its oral surface uppermost on the sea floor in shallow tropical waters, where it looks very like an unattached anemone. Anemones are the common hosts for *P. holthuisi*, but this species may also occur in association with scleractinian corals and cerianthids (Bruce and Svoboda, 1983). It is noteworthy that *P. tonga* is found in association with the same scyphozoan host, which must present some particular attraction to commensals, perhaps by its benthic habitat, sedentary nature, or dense array of tentacles. No other species of palaemonid shrimp has been reported in association with scyphozoan hosts. Fortunately, there are no doubts over the association in the cases of *P. tonga* and *P. holthuisi* as, in both cases, the shrimps were observed *in situ* by the collectors.

Hippolytid shrimps have also been reported in association with scyphozoans (*Mastigopus* spp.) but, in these cases, the evidence is less satisfactory, being based on the associations found in trawl-caught material (Hayashi and Miyake, 1968). The association of *Latreutes anoplonyx* Kemp with jellyfish seems sufficiently frequent to suggest that they may be commensally associated, but this is less probable for the other species, *Latreutes mucronatus* (Stimpson), which is a common inhabitant of sea grass or algal beds. The pandalid shrimp *Chlorotocella gracilis*, also reported to associate with *Mastigopus*, may be commonly found in association with gorgonians and hydroids. It would appear that further careful examination of free-swimming jellyfish by scuba divers might produce more interesting data on these associations.

### ACKNOWLEDGMENT

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