

PALAEMON DEBILIS FROM HAWAII AND THE STATUS OF THE GENUS
PALAEMONETES (DECAPODA, PALAEMONIDAE)

BY

FENNER A. CHACE, Jr.

Department of Invertebrate Zoology, Smithsonian Institution, Washington, D. C. 20560, U.S.A.

Reprinted from: CRUSTACEANA, Vol. 23, Part 1, 1972



LEIDEN
E. J. BRILL

PALAEEMON DEBILIS FROM HAWAII AND THE STATUS OF THE GENUS
PALAEEMONETES (DECAPODA, PALAEMONIDAE)

BY

FENNER A. CHACE, Jr.

Department of Invertebrate Zoology Smithsonian Institution, Washington, D. C. 20560, U.S.A.

The possibility that *Palaemon debilis* might prove to be a variable species was suggested in the original description in which Dana (1852a: 26) proposed the name *attenuatus* for a variety with an unusually long rostrum. All of Dana's material came from the Hawaiian Islands. Subsequent records have extended the range of the species westward to the Red Sea and southeastward to the Tuamotu Archipelago and have demonstrated that either *P. debilis* is one of the most variable of decapod crustaceans or several taxa have been erroneously assigned to the species (see Holthuis, 1950: 66, for synonymy and references). Gurney (1939), in describing *Palaemonetes pacificus*, unwittingly showed that this mutability extended even to the presence or absence of a mandibular palp, a character that has generally been assumed to be of generic importance; reexamination of the type-specimen of this species (Gurney, 1940) disclosed that the mandible on one side bore a three-segmented palp, whereas there was no palp on the other mandible.

There seems to be no reference in the literature to a comparison of specimens of *Palaemon debilis* from other parts of its presumed range with material from Hawaii, the type-locality. The opportunity to make such a comparison arose from a routine study of collections recently received from Amadeo Timbol of the University of Hawaii. Examination of specimens of *P. debilis* in these and other collections from Hawaii led to the disturbing revelation that Hawaiian representatives of the species seem invariably to lack a palp on the mandible; at least, none was found in nearly 100 specimens examined from several Hawaiian localities, both marine and fresh-water. This would suggest that Dana's species is distinct from other populations in the Indo-Pacific region and that, indeed, it should be assigned to the genus *Palaemonetes* Heller, 1869.

Study of material from other Pacific islands indicates, however, that the Hawaiian populations may not be even specifically distinct. Of 25 specimens chosen at random from a large series from Raroia Atoll in the Tuamotu Archipelago, the mandibles were provided with a well-developed, three-segmented palp with a long, slender terminal segment (fig. 1a) in 13 specimens, whereas the mandibular palp was entirely lacking in 12. In specimens from another collection from Raroia Atoll, a three-segmented palp is present, but the terminal segment is not so long or

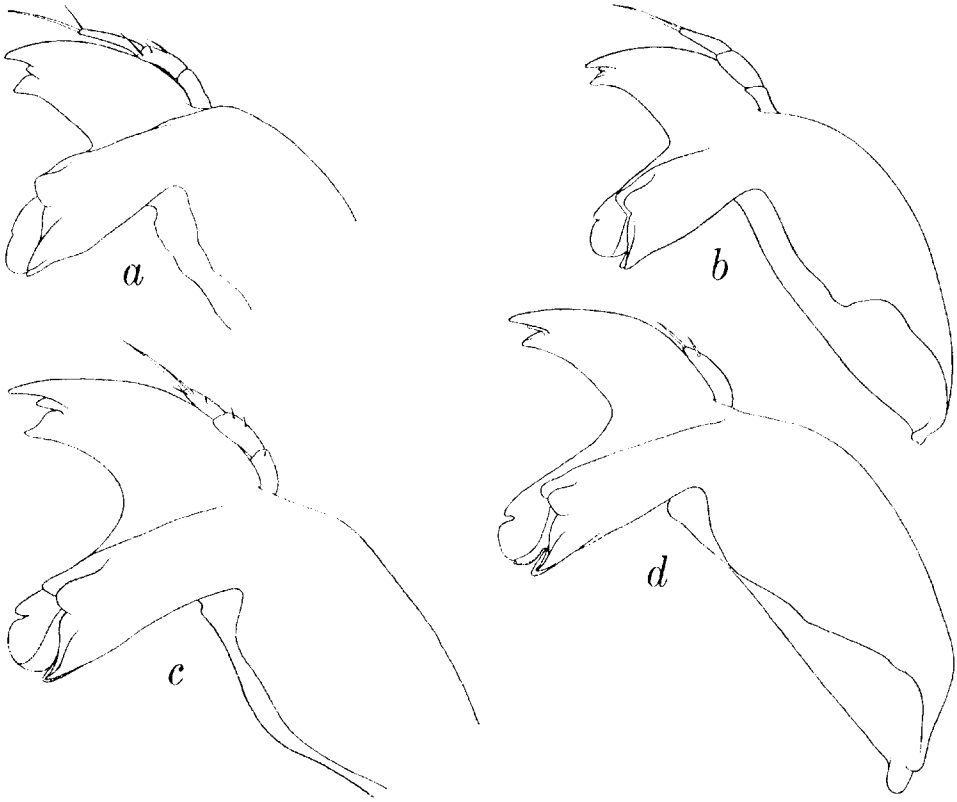


Fig. 1. Right mandibles of *Palaemon debilis* Dana: *a*, ovigerous female, carapace length 4.8 mm, from Tehakapikipiki Island, Raroia Atoll, Tuamotu Archipelago; *b*, female, carapace length 4.6 mm, from Oteteu Island, Raroia Atoll; *c*, ovigerous female, carapace length 5.8 mm, from Babelthuap, Palau Islands; *d*, male, carapace length 5.0 mm, from same lot. Magnifications: *a-d*, $\times 32$.

slender (fig. 1*b*). In most specimens examined from the Palau Islands, there is a three-segmented mandibular palp, but the terminal segment is relatively short (fig. 1*c*), and a very small percentage of the Palauan specimens have a two-segmented palp, a one-segmented palp (fig. 1*d*), or no palp at all.

It seems evident, therefore, that the form of the mandibular palp, or even its absence, is of minor importance in *P. debilis*. Whether or not other characters will eventually be found to distinguish separate species or subspecies in material currently assigned to *P. debilis* from various parts of its extensive range remains to be determined. That such distinctions will not be recognized easily is indicated by the variability displayed by populations at the Aldabra Islands (Borradaile, 1917: 404) and the Talaud Islands (Holthuis, 1950: 69), as well as by material in the Hawaiian collections that I have seen.

This disclosure of the variability in the mandibular palp in Dana's species tends to support the idea expressed by Kemp (1925: 315) that the genus *Palaemonetes*,

“being based on a single negative character [the absence of a mandibular palp], might well be imagined to possess small claim to a monophyletic origin and it is indeed possible that some of the species have been separately evolved from different forms of *Leander* [= *Palaemon*].” It seems best, however, not to relegate the well-known name *Palaemonetes* to the synonymy of *Palaemon* Weber, 1795, at least until the *Palaemon* complex is thoroughly reviewed. I hope that the following redescription of Hawaiian specimens of *P. debilis* will help to promote such a review. The figures have been prepared from a specimen from Hilo, Hawaii — the only exact locality mentioned by Dana (1825b: 585) even though he assigned a varietal name to the Hilo form — but the description partially covers the variability observed in specimens from various Hawaiian localities, except the extreme form found at Makalawena, which is mentioned under “Remarks”.

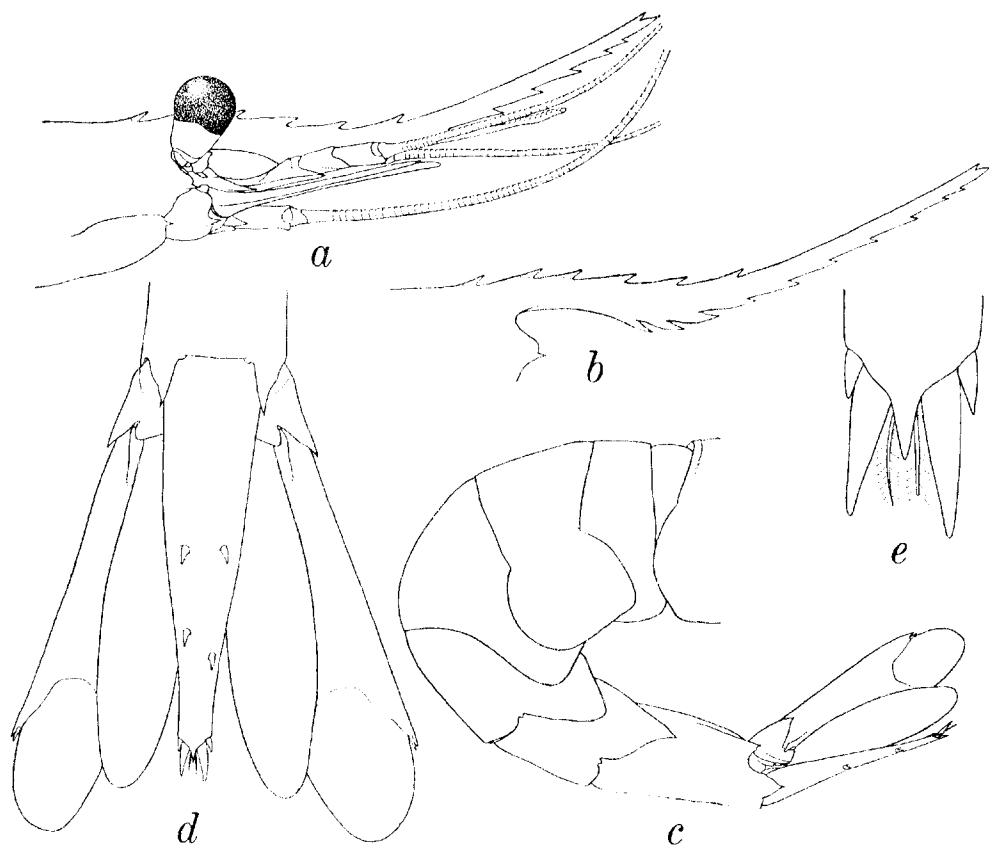


Fig. 2. *Palaemon debilis* Dana, male, carapace length 7.2 mm, from Hilo, Hawaii: *a*, anterior region; *b*, rostrum; *c*, abdomen; *d*, telson and uropods; *e*, end of telson. Magnifications: *a-c*, $\times 3.9$; *d*, $\times 7.8$; *e*, $\times 32$.

***Palaemon debilis* Dana, 1852a (figs. 1-4)**

Description of Hawaiian specimens. — Rostrum (figs. 2*a*, *b*) usually curved upward to varying degree, overreaching antennal scale by one-fifth to three-fifths of rostral length; dorsal margin armed with four to six (rarely two or three) teeth in basal portion, posteriormost nearly always situated on carapace posterior to level of posterior margin of orbit, and with one (rarely two) subapical teeth separated from basal series by unarmed interspace; ventral margin armed with four to ten teeth. Branchiostegal spine very slightly smaller than antennal spine, arising from anterior margin of carapace just ventral to branchiostegal suture; suture curving ventrally posteriorly.

Pleura of three anterior abdominal somites (fig. 2*c*) rounded, of fourth bluntly acute, of fifth sharply pointed; sixth somite with very small tooth at posteroventral angle. Sixth somite from one and three-fifths to two and one-fifth times as long as fifth and from four-fifths to one and one-fifth times as long as telson not including terminal spines. Telson (fig. 2*d*) with distinct dorsal spines, anterior pair inserted at about midlength of telson, posterior pair about midway between anterior pair and posterior end of telson; posterior margin (fig. 2*e*) drawn out to sharp point reaching to about midlength of mesial pair of two pairs of stout posterior spines and flanked on each side by plumose seta.

Eyes stout, cornea longer and broader than stalk.

Antennular peduncle (fig. 3*a*) with stylocerite not prominent, falling short of midlength of basal segment; distolateral spine of basal segment overreaching convex distal margin of lateral extension; second segment shorter than distal segment in dorsal midline; combined lengths of second and third segments slightly shorter than minimum length of basal segment. Dorsolateral antennular flagellum about five times as long as carapace, fused portion varying from two-fifths to one and one-half times as long as free portion; ventromesial flagellum about four times as long as carapace.

Antennal scale (fig. 3*b*) varying from three to nearly five times as long as wide; lateral margin nearly straight, distal tooth sharp and prominent but falling far short of distal end of blade. Antennal peduncle short, reaching about to end of proximal third of scale; basal segment armed with small but distinct lateral tooth; flagellum more than eight times as long as carapace.

Mouth parts as figured (figs. 3*c*-*b*). Mandible without palp, incisor process armed distally with two strong lateral and one short mesial teeth. Third maxilliped reaching about as far as end of first segment of antennular peduncle.

First pereopod (fig. 4*a*) reaching nearly as far as distolateral tooth of antennal scale; fingers nearly as long as palm; carpus about twice as long as chela; merus about nine-tenths as long as carpus; ischium about half as long as carpus. Second pereopod (fig. 4*b*) falling slightly short of or overreaching end of antennal scale by more than length of chela; fingers (fig. 4*c*) varying in length from one-half to four-fifths as long as palm, opposable margins armed with single blunt tooth or,

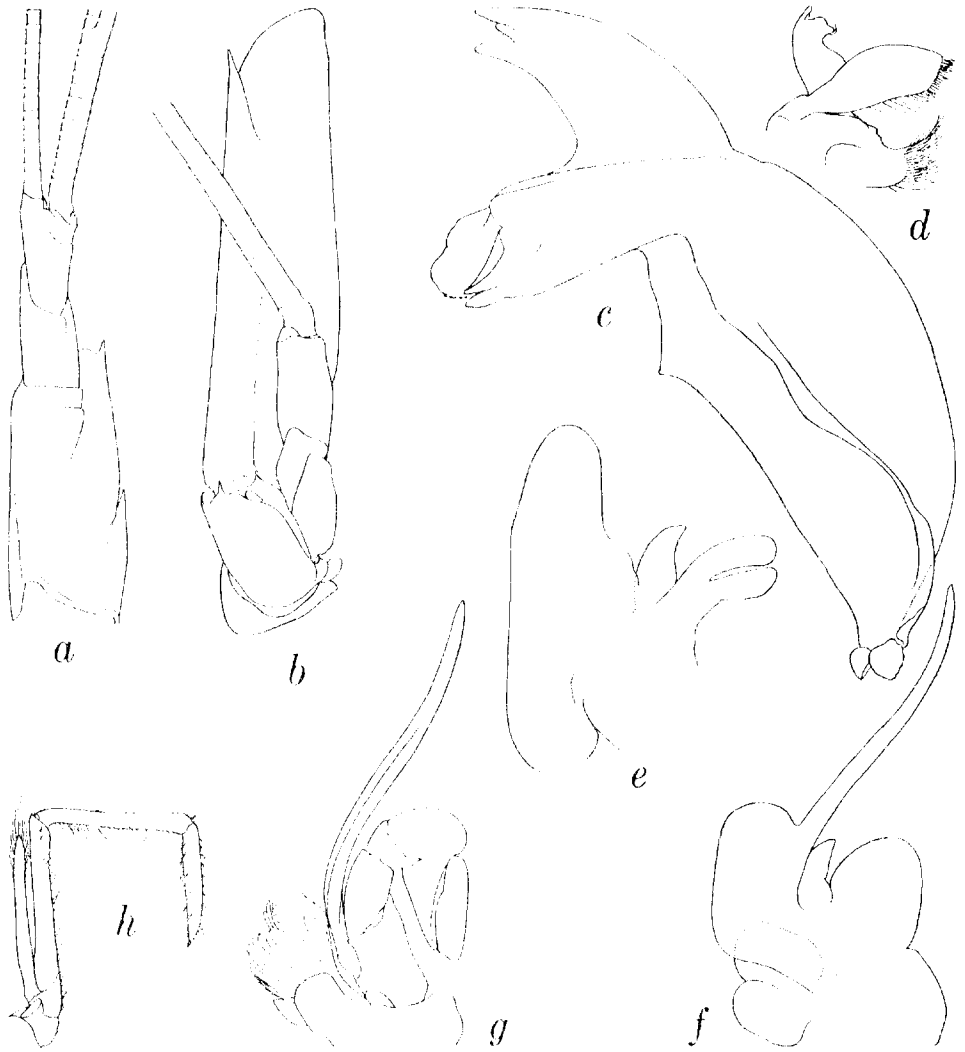


Fig. 5. *Palaemon debilis* Dana, male, carapace length 7.2 mm, from Hilo, Hawaii: *a*, right antennule; *b*, right antenna; *c*, right mandible; *d*, right first maxilla; *e*, right second maxilla; *f*, right first maxilliped; *g*, right second maxilliped; *h*, right third maxilliped. Magnifications: *a*, *b*, *h*, $\times 7.8$; *d*, *g*, $\times 16$; *e*, $\times 32$.

more often, unarmed; carpus varying in length from slightly shorter than to more than one and one-half times as long as chela; merus considerably shorter than carpus; ischium nearly as long as merus. Third pereopod (fig. 4*d*) reaching about as far as distolateral tooth of antennal scale; dactyl varying in length from less than one-fourth to fully one-half as long as propodus; merus about one and one-third times as long as propodus; ischium about one-half as long as merus. Fourth pereopod (fig. 4*e*) reaching about as far as end of antennal scale; carpus about two-thirds as long as propodus; merus slightly longer than propodus; ischium

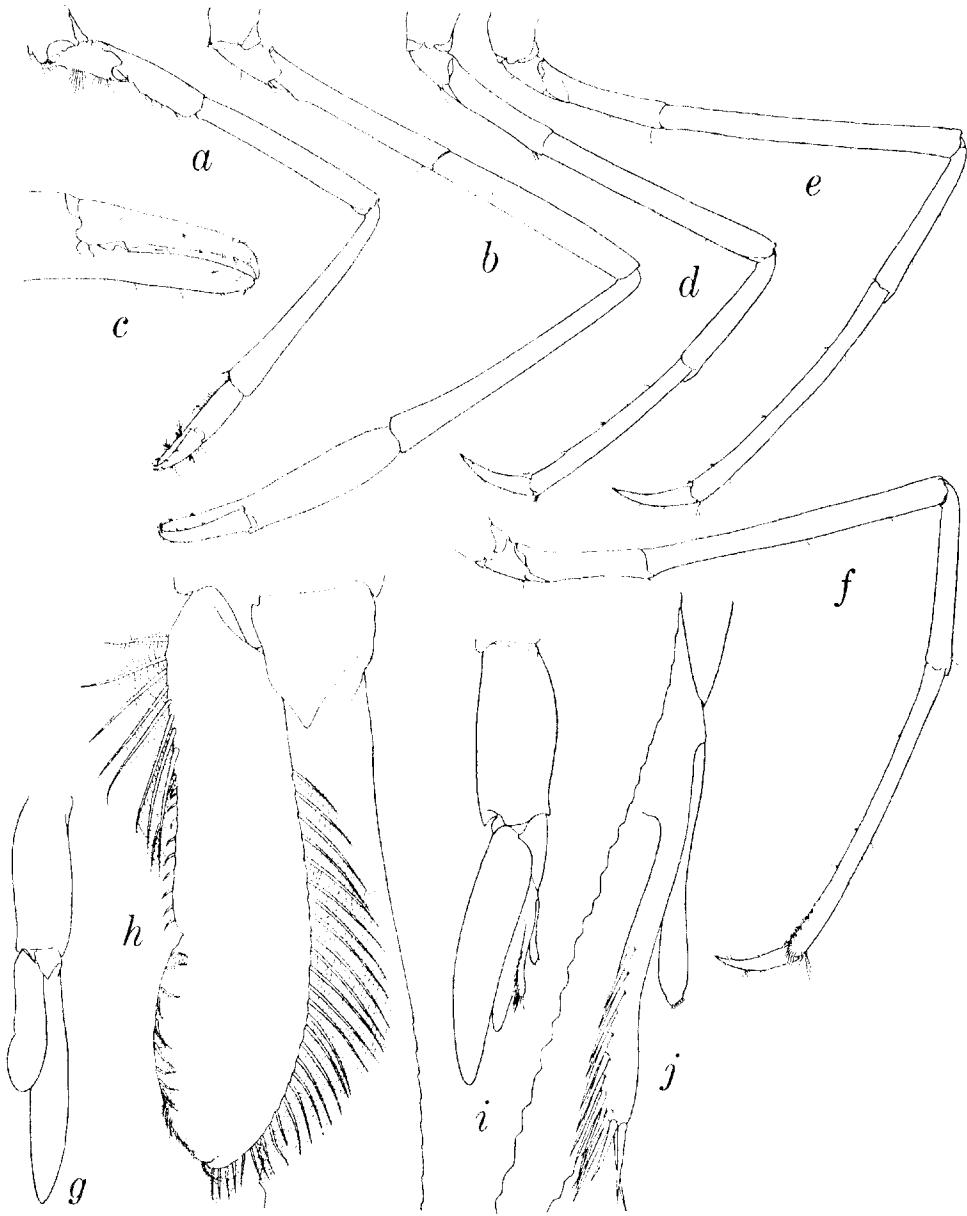


Fig. 4. *Palaemon debilis* Dana, male, carapace length 7.2 mm, from Hilo, Hawaii: *a*, right first pereiopod; *b*, right second pereiopod; *c*, fingers of same; *d*, right third pereiopod; *e*, right fourth pereiopod; *f*, right fifth pereiopod; *g*, right first pleopod; *h*, endopod of same; *i*, right second pleopod; *j*, appendix masculina. Magnifications: *a*, *b*, *d-g*, *i*, $\times 7.8$; *c*, $\times 16$; *b*, *j*, $\times 32$.

distinctly less than one-half as long as merus. Fifth pereopod (fig. 4f) also reaching about as far as end of antennal scale; carpus about three-fifths as long as propodus; merus nearly as long as propodus; ischium about two-fifths as long as merus.

Endopod of first pleopod of male (figs. 4g, h) reaching slightly beyond mid-length of exopod, with notch on mesial margin but without appendix. Appendix masculina on endopod of second pleopod (figs. 4i, j) considerably overreaching appendix interna, armed with about 10 long spines in single row near lateral margin of distal two-thirds of appendix and four in terminal cluster.

Size. -- Males with carapace lengths of 3.3 to 7.2 mm; females, 2.6 to 7.4 mm; ovigerous females, 5.4 to 7.3 mm.

Remarks. -- In Hawaiian specimens of *P. debilis*, the distolateral spine of the basal segment of the antennular peduncle seems invariably to overreach the convex distal margin of the lateral extension of that segment, whereas this spine usually falls short of that margin -- as described by Holthuis (1950: 67, fig. 13c) -- in material examined from Micronesia. Specimens from the Tuamotus seem to be intermediate in this respect, as they also seem to be as far as the presence or absence of a mandibular palp is concerned; in many of them, the distolateral spine of the basal antennular segment extends just about as far as does the distal margin mesial to the spine.

A lot of nine males and seven females (five ovigerous) collected from the main pond at Makalawena, Hawaii, and received from Dr. Timbol, differ noticeably from other Hawaiian specimens in the form of the rostrum and in bearing larger eggs. The rostrum is nearly horizontal, rather than upcurved, and either barely reaches as far as the end of the antennal scale or falls short of that level by varying amounts up to one-half of the total length of the rostrum. It is armed dorsally with two or three (rarely four) teeth on its basal portion, one of them situated posterior to or directly above the posterior margin of the orbit, and one subapical tooth which rarely may be lacking. The ventral margin is armed with from five to seven teeth set close together. To recognize this form as a distinct species or subspecies would be unwarranted without a thorough review and analysis of what seems to be extraordinary variability in *P. debilis*, but the occurrence of this population of individuals with short rostra and large eggs seems noteworthy, especially because the representatives at Hilo, on the opposite side of the Island of Hawaii, have unusually long rostra.

RÉSUMÉ

Dés échantillons de *Palaemon debilis* des Hawaii, localité-type de l'espèce n'ont pas de palpe sur les mandibules; cependant ils paraissent être conspécifiques avec les populations d'autres parties de la région indo-pacifique, chez lesquelles le palpe mandibulaire se trouve ordinairement. Il est recommandé de conserver *Palaemonetes* comme genre valide, au lieu de le placer dans la synonymie de *Palaemon*, au moins jusqu'à ce que la révision complète du complexe entier de *Palaemon* soit effectuée.

LITERATURE CITED

- BORRADAILE, L. A., 1917. On Caridea from the western Indian Ocean. The Percy Sladen Trust Expedition to the Indian Ocean in 1905, under the leadership of Mr. J. Stanley Gardiner, IX. Trans. Linn. Soc. London, Zool., (2) **17** (3): 397-412, pls. 58, 59.
- DANA, J. D., 1852a. Conspectus Crustaceorum quae in orbis terrarum circumnavigatione, Carolo Wilkes e classe Reipublicae Foederatae duce, lexit et descripsit. Proc. Acad. nat. Sci. Philadelphia, **1852**: 10-28.
- , 1852b. Crustacea, 1. United States Exploring Expedition. During the years 1838, 1839, 1840, 1841, 1842. Under the command of Charles Wilkes, U. S. N., **13**: i-viii, 1-685.
- GURNEY, R., 1939. A description of the adult and larval stages of a new species of *Palaemonetes* from the Marianne Islands. Annot. zool. Japon., **13** (2): 145-150, pls. 5, 6.
- , 1940. An error corrected. Annot. zool. Japon., **19** (1): 80.
- HELLER, C., 1869. Zur näheren Kenntniss der in den süßen Gewässern des südlichen Europa vorkommenden Meerescrustaceen. Zeitschr. wiss. Zool., **19**: 156-162.
- HOLTHUIS, L. B., 1950. Subfamily Palaemoninae. The Palaemonidae collected by the Siboga and Snellius Expeditions, with remarks on other species. The Decapoda of the Siboga Expedition, 10. Siboga-Exped. Monogr., **39** (a⁹): 1-268, figs. 1-52.
- KEMP, S., 1925. On various Caridea. Notes on Crustacea Decapoda in the Indian Museum, 17. Rec. Indian Mus., **27** (4): 249-343, figs. 1-24.
- WEBER, F., 1795. Nomenclator entomologicus secundum Entomologiam Systematicam ill. Fabricii adjectis speciebus recens detectis et varietatibus: i-viii, 1-171.

