

**First description of the male of *Eragia profunda* Markham, 1994
(Crustacea: Isopoda: Bopyridae), with comments on relationships in the
subfamily Argeiinae**

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Abstract.—The male of *Eragia profunda* Markham is described for the first time. The only known host of this species is *Prionocrangon paucispina* Kim & Chan and parasitized hosts have been collected from New Caledonia and Taiwan in 2100–2543 m depth. Morphology of the male and female parasites indicates that the species belongs to a group of argeiine bopyrids consisting of *Argeia*, *Parargeia*, *Eragia*, and *Stegoalpheon*.

Markham (1994) described *Eragia profunda* as a new genus and species of argeiine bopyrid (Bopyridae: Argeiinae) from an undescribed species of shrimp within the genus *Prionocrangon* Wood-Mason & Alcock, 1891 (Crustacea: Caridea: Crangonidae) collected off New Caledonia in 2100–2110 m depth. The host specimen was subsequently described as a paratype of *Prionocrangon paucispina* Kim & Chan, 2005, and those authors also cited another paratype of *P. paucispina* from Taiwan (2334–2543 m depth) bearing a “bopyrid parasite probably *Eragia profunda* attached on abdomen.” As all known species of argeiine bopyrids are branchial parasites, the infested Taiwanese shrimp host was borrowed from the National Taiwan Ocean University, Keelung (NTOU) for examination. The host was found to bear the parasite in the right branchial chamber, not on the abdomen as per Kim & Chan (2005), and a male was present along with the female bopyrid. Males of *E. profunda* were previously unknown and are described herein. Male

morphology allows us to make comments on the relationships between the monotypic genus *Eragia* Markham, 1974 and other genera in the Argeiinae.

Materials and Methods

The host shrimp and parasites are deposited in the collection of the National Taiwan Ocean University, Keelung (NTOU). Total length (TL) of isopods is given as anterior margin of cephalon to posterior of telson (excluding pleopods), while that of the host is given as carapace length (CL, inclusive of rostrum).

Systematics

Family Bopyridae Rafinesque-Schmaltz, 1815

Subfamily Argeiinae Markham, 1977

Genus *Eragia* Markham, 1994

Eragia profunda Markham, 1994

Eragia profunda Markham, 1994:234–235, fig. 5.—Bruce, 2007:278.—“probably *Eragia profunda*” Kim & Chan, 2005:1620.

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Material examined.—One slightly sinistral female (4.9 mm TL) and 1 male (2.6 mm TL) (NTOU I00001) from right branchial chamber of 8.1 mm CL female *Prionocrangon paucispina* Kim & Chan, 2005 (NTOU M00593), TAIWAN 2002, "Ocean Researcher 1", stn CP 185, 22°0.54'N, 119°27.94'E, 2334–2543 m, 26 Aug 2002.

Description of female.—(Fig. 1A, B). Length 4.9 mm TL. The female specimen differs only in minor details from the holotype described by Markham (1994). The present specimen is sinistral instead of dextral, the pleon is somewhat more pronounced and less symmetrical than in the holotype. The first oostegite is similar to that described in the holotype, with the proximal lobe broadly rounded and distal lobe slender, falcate (Fig. 1B). As in the male (see below), the female possesses pereopods that are smaller anteriorly and markedly longer posteriorly, largely due to longer bases and ischia.

Description of male.—(Fig. 1C–G). Length 2.6 mm, maximal width 0.65 mm, head length 0.3 mm, head width 0.43 mm, pleon length 0.73 mm.

Head broader than long, widest posteriorly, distinct from first segment of pereon (Fig. 1C). Eyes lacking. Antenna of seven articles, distally setose, extending beyond posterior margin of cephalon, nearly reaching posterior margin of first pereomere; antennule of three articles, distally setose (Fig. 1E).

Pereomeres II and IV broadest, others gradually tapering anteriorly and posteriorly. All pereomeres directed laterally, distolateral margins of all pereomeres subquadrate. No detectable pigmentation. Pereopods (Fig. 1F, G) subchelate, gradually increasing in size from anterior to posterior, posterior pair of pereopods with much longer bases and ischia than first pair, all articles distinctly separated.

Pleon of one large, triangular, segment, gently tapering distally with rounded margins, no midventral tubercles. Pleo-

pods and uropods absent, small anal cone present on distomedial ventral margin (Fig. 1D).

Distribution.—Taiwan and New Caledonia, 2100–2543 m depth.

Host.—Known only from *Prionocrangon paucispina* Kim & Chan, 2005.

Remarks.—To date, seven genera have been placed in the Argeiinae: *Argeia* Dana, 1852 (4 or 5 species), *Parargeia* Hansen, 1897 (1 species), *Bopyrosa* Nierstrasz & Brender à Brandis, 1923 (1 species), *Stegoalpheon* Chopra, 1923 (1 species), *Argeiopsis* Kensley, 1974 (2 species), *Gareia* Bourdon & Bruce, 1983 (1 species), and *Eragia* Markham, 1994 (1 species) (see Markham 1977, Bourdon & Bruce 1983, Markham 1994, Boyko & Kazmi 2005). Note that *Stegoalpheon choprai* Pillai, 1954, listed as a distinct species by Markham (1977), was synonymized with *S. kempi* by Pillai (1966). The type species of *Bopyrosa* was poorly described from a single immature female that was subsequently lost and therefore is in need of redescription (Markham 1977).

Markham (1994) did not mention any similarities between *E. profunda* and other argeiine genera and only gave a statement about those characters it possessed that differed from all other argeiines. It is clear, however, that females of *E. profunda* most closely resemble those of *Argeia*, as well as *Stegoalpheon kempi* Chopra, 1923. Discovery of the male of *E. profunda* allows for comparisons with males in these two genera as well. In overall shape, the male of *E. profunda* is closest to the males of *Argeia* (elongate body shape), as compared to those of *Stegoalpheon* that are much broader proportionally. Males of both *Argeia* and *Eragia* have relatively small first pereopod dactyli and propodi, appearing similar to those of the posterior pairs. In contrast, the males of *Stegoalpheon* have greatly enlarged first pereopod dactyli and carpi, easily visible extending laterally from the body when seen in dorsal view.

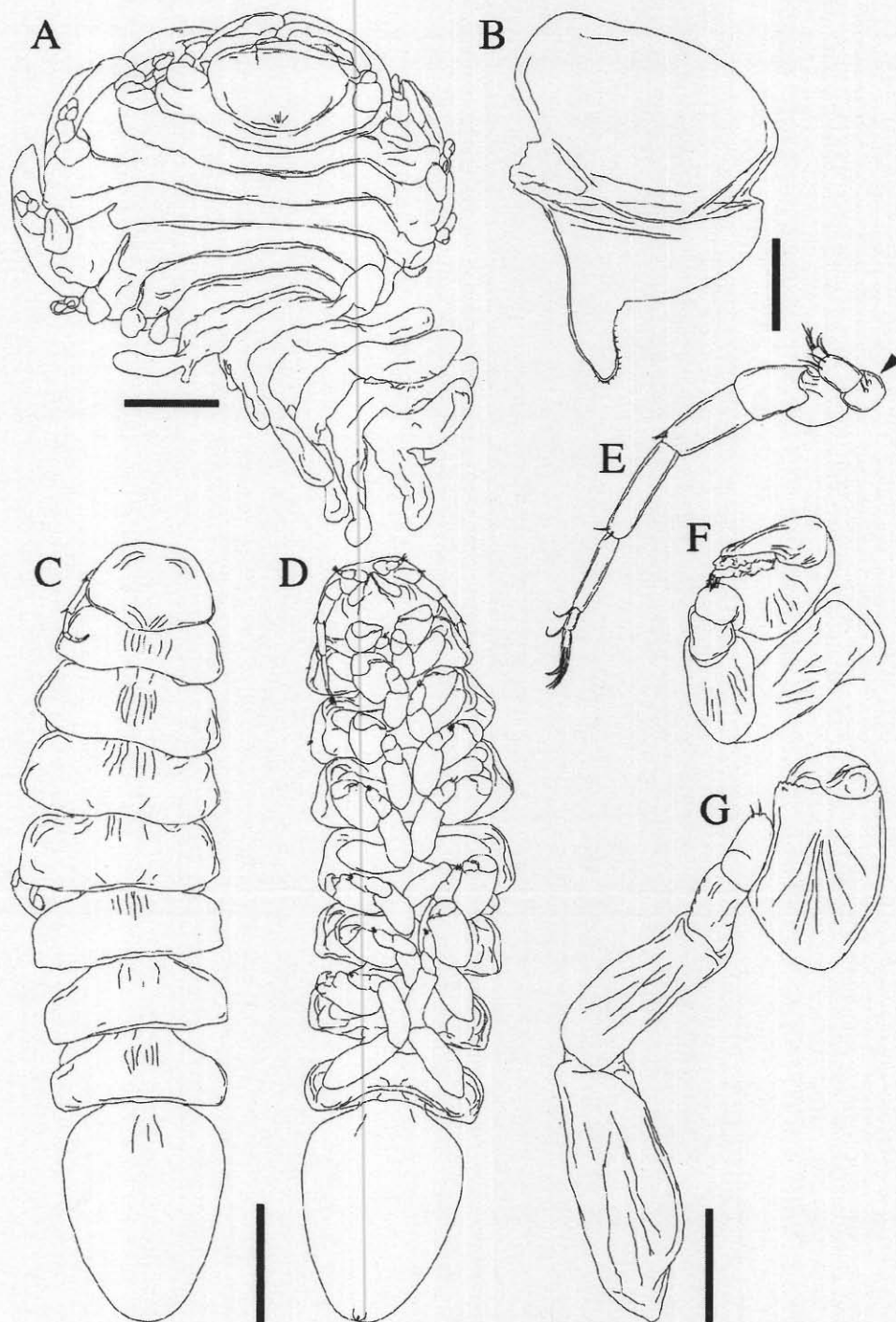


Fig. 1. *Eragia profunda* Markham, 1994 (NTOU I00001). Female (A, B); male (C–G). A, female, dorsal view; B, left oostegite 1, internal view; C, male, dorsal view; D, male, ventral view; E, male, right antennule (article 1 shown by arrowhead) and antenna; F, male, left pereopod 1; G, male, left pereopod 7. Scale bars = 1 mm (A), 500 μm (B–D), 150 μm (E–G).

However, the elongate antennae of *E. profunda* males are much more similar to those of *S. kempfi*, and quite dissimilar to those in all other argeiine genera, including *Argeia*, where they are short and scarcely visible extending from the head.

Based on the characters of the males of the species, which are less modified and can be more informative at the genus level, the Argeiinae appears to be composed of two groups of genera: Group 1: *Argeia*, *Parargeia*, *Eragia*, and *Stegoalpheon*, and Group 2: *Argeiopsis* and *Gareia*. The affinities of *Bopyrosa phryxiformis* Nierstrasz & Brender à Brandis, 1923 appear to be with Group 2; but, as stated above, the female type specimen appears to be immature. A revision of this subfamily, ideally based in reexamination of extant type material and molecular data obtained from newly collected specimens, is needed to clarify the relationships between the genera.

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