

A new locality and host for *Pseudione minimocrenulata* Nierstrasz & Brender à Brandis, 1931 (Crustacea: Isopoda: Bopyridae) in the Indian Ocean, with comments on the identity of the type specimens

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Abstract

Three parasitized specimens of *Munida andamanica* Alcock, 1894, including one with a double infestation, from the Indian Ocean off Mozambique were found to contain bopyrid isopods referable to *Pseudione minimocrenulata* Nierstrasz & Brender à Brandis, 1931. This represents a new host species and locality for the parasite which has been reported only twice before from the Kei Islands (Indonesia) and Madagascar. Both sexes of *P. minimocrenulata* are redescribed and illustrated. Examination of type material revealed that the type series contains isopod pairs of two different species. The female from the Kei Islands is selected as lectotype to fix the identity of the species, while the pair from the U.S. Virgin Islands is identified as *P. confusa maxillipedis* Bourdon, 1972.

Key words: Bopyridae, *Pseudione*, Indian Ocean, *Munida*, Virgin Islands

Introduction

Bopyrid parasites of galatheid crabs occur in 16 genera distributed between two subfamilies: the monotypic Entophiliinae (containing only *Entophilus omnitectus* Richardson, 1903) and 15 genera in the Pseudioninae. *Pseudione* Kossmann, 1881, contains the most species of galatheid parasites and is also the largest and most diverse genus in the Bopyridae. There are at least 16 species of *Pseudione* found parasitizing galatheids. (The hosts of several species are unknown but may be galatheids). The monophyly of *Pseudione* is in doubt and the genus is likely to be paraphyletic (Adkison 1988; Boyko 2004a); its type species is a thalassinoid parasite. However, until a revision of the genus as a whole is

undertaken, the galatheid parasites placed in *Pseudione* must remain there. Several *Pseudione* species parasitizing galatheids are clearly closely related and can be considered to form a natural grouping that has been termed the *Pseudione* “crénéles” group (Bourdon 1972b, 1976). This group includes *Pseudione crenulata* G. O. Sars, 1898, *P. confusa confusa* (Norman, 1886), *P. confusa maxillipedis* Bourdon, 1972b, *P. fibriata* Richardson, 1910, *P. itsindrae* Bourdon, 1976, *P. minimocrenulata* Nierstrasz & Brender à Brandis, 1931, and *P. subcrenulata* Nierstrasz & Brender à Brandis, 1923. Except for the two European species, *P. confusa confusa* and *P. crenulata* (see Bourdon 1968), little is known of the distribution and host diversity of species within this group.

Examination by one of us (QBK) during curation of a large collection of galatheids previously studied by Tirmizi & Javed (1993) yielded 11 specimens (out of 535) that were parasitized by bopyrids. Three of these hosts, all identified as *Munida andamanica* Alcock, 1894, and including one with an infestation in both branchial chambers (Fig. 1), were parasitized by pseudionine bopyrids referable to *Pseudione minimocrenulata*, a species previously known only from the host *Agononida incerta* (Henderson, 1888) collected in the Kei Islands and Madagascar (Nierstrasz & Brender à Brandis 1931; Bourdon 1976). Because of the paucity of locality and host records for many bopyrid species, it is advisable to report on these specimens here and give some additional information regarding morphological features of the species and variability within the species for both males and females. Examination showed that the type series of *P. minimocrenulata* consists of pairs of two different species. The identity of *P. minimocrenulata* is fixed by lectotype selection herein.

Carapace length (CL), including rostrum, is provided as an indicator of size for the host crabs. Isopod size is given as total body length (anterior margin of head to posterior margin of pleotelson). The hosts and parasites are currently in the Marine Reference Collection and Resource Center, University of Karachi (MRCC), but will be returned to the Smithsonian Institution, except those cited by Nierstrasz & Brender à Brandis (1931) which are in the Zoological Museum of Copenhagen (ZMUC).

TAXONOMY

Pseudione minimocrenulata Nierstrasz & Brender à Brandis, 1931 (Figures 1–5)

Pseudione minimo-crenulata Nierstrasz & Brender à Brandis, 1931: 160–163 (part: Kei Islands material only), figs. 22–28; Bourdon, 1968: 187, 188 (mention); Bourdon, 1972b: 825 (place in genus).

Pseudione minimocrenulata.— Shiino, 1952: 41 (list); Bourdon, 1976: 366–369, figs. 9, 10; Kensley, 2001: 226 (list).

“bopyrid species”.— Tirmizi & Javed, 1993: 115.

Not *Pseudione minimo-crenulata* Nierstrasz & Brender à Brandis, 1931: 160–163 (St. Croix material only = *P. confusa maxillipedis* Bourdon, 1972).

Not *Pseudione minimocrenulata*.— Markham, 1988: 56 (= *P. confusa maxillipedis* Bourdon, 1972).

Material Examined. 1 mature female (16.3 mm), 1 mature male (4.8 mm), from right branchial chamber of *Agononida incerta* (host lacking, its sex and CL unknown), coll. Danish Expedition to the Kei Islands, st. 51, 05°46'S, 132°51'E, 348 m, 7 Sept. 1922 (ZMUC CRU7270).— 1 mature female (12.0 mm), 1 mature male (4.0 mm), from left branchial cavity of male *Munida andamanica* (21.0 mm CL); 1 mature female (11.5 mm) and cryptoniscid larva, 1 mature male (3.5 mm) from right branchial cavity of male *M. andamanica* (27.0 mm CL); 1 mature female (8.0 mm), 1 mature male (3.5 mm), 1 mature female (9.5 mm), 1 mature male (4.0 m) from right and left, respectively, branchial cavities of male *M. andamanica* (13.0 mm CL exclusive of rostrum, broken after photography), all coll. International Indian Ocean Expedition (IIOE), R.V. *Anton Bruun*, cruise 8, st. 397C, 26°07'S, 34°01'E, (off Mozambique), 600–665 m, 29 Sept. 1964.



FIGURE 1. *Munida andamanica* Alcock (13 mm CL, exclusive of rostrum) host showing double infestation of *Pseudione minimocrenulata*. Scale bar = 9 mm.

Redescription (based primarily on dextral female and male from 27.0 mm CL host and sinistral female and male from 21.0 mm CL host).

Female (Fig. 2A, B) body length 11.5 mm, maximum width 6.0 mm. Pereon with slight dextral curve (Fig. 2A). All body regions and pereomeres distinctly separated.

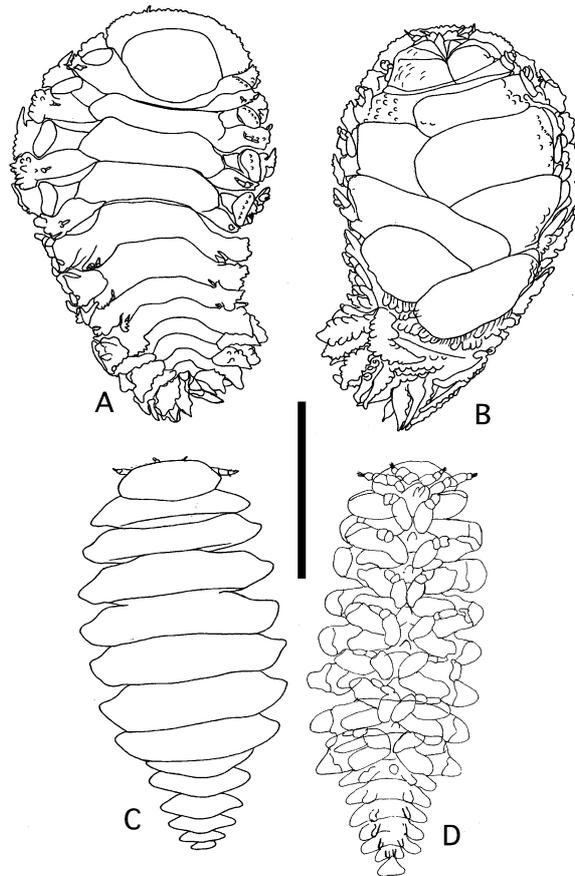


FIGURE 2. *Pseudione minimocrenulata*: A, 12 mm female, dorsal view; B, 12 mm female, ventral view; C, male, dorsal view; D, male, ventral view. Scale bars: A, B = 5 mm; C, D = 1.75 mm.

Head broader than long, strongly produced with large anterior lamina equal to approximately one-fifth length of head, margins of lamina crenulated (Fig. 2A). Eyes absent. Bar-bula as two long lateral lobes, both crenulated at edges and scaled on surfaces, median lobe weakly produced (Fig. 4B–D). Antennule of three articles, antennae of five articles, both distally setose (Fig. 3A–D). Maxilliped (Fig. 4B, C) with thin distally acute spur; palp short, distally tapering and rounded, non-articulating (damaged, not shown). Pereon of seven pereomeres, broadest across pereomere III, gradually tapering anteriorly and posteriorly; pereomere I with slightly convex posterior margin, II with sinuous posterior margin, III–VII with strongly concave posterior margins; approximately three-fourths of pereomere I medially obscured by head. First oostegite covered in minute scales, proximal lobe ovate (dorsal margin folded in specimen illustrated), distal lobe subtriangular, distally tapering and rounded, internal ridge with numerous short, digitate lobes along length (Fig. 4A). Coxal plates as small irregular lobes on pereomeres I–IV, clearly separated from pereomeres, and with crenulate lateral margins. Dorsolateral bosses clearly demarcated on pereomeres I–IV with right side larger than left. Pereomeres II–IV with distinctly demar-

cated tergal area, not projecting. Oostegites entirely enclosing marsupium (Fig. 2B). Pereopods approximately subequal but with slight increase in size posteriorly (Fig. 3E, F). Dorsal margin of propodus and ventral margin of carpus and merus with thin band of scales; propodus stout, dactylus short and blunt. Bases of pereopods with scale-covered bosses on distodorsal margin. First pair of pereopods adjacent to but not surrounding head region; all pereopods evenly spaced.

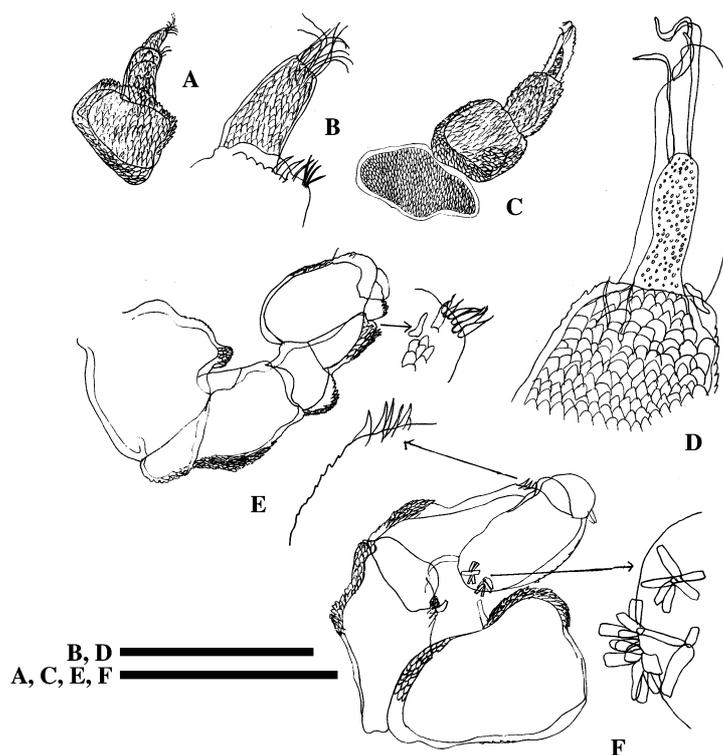


FIGURE 3. *Pseudione minimocrenulata*, 11.5 mm female: A, antennule; B, tip of antennule; C, antenna; D, antennal tip; E, pereopod I; F, pereopod VII (right detail showing unidentified protist tests). Scale bars: B, D = 0.125 mm; A, C, E, F = 0.75 mm.

Pleon with five distinct pleomeres plus pleotelson; posterior margins of all pleomeres strongly concave (Fig. 2A). Pleomeres I–IV with biramous pleopods and uniramous lateral plates (Fig. 2A, B). All pleopods with sub-equal lamellar exopodites and endopodites, broad proximally and distally tapering, pleopods slightly decreasing in size posteriorly, all having surfaces with scattered small papillae; lateral plates tuberculate, strongly produced and crenulate on lateral margins, those on longer side better developed and more crenulate than those on other side, all directed posterolaterally and with few papillae scattered on surface, margins crenulate but not as strongly as on pereomeres. Uropods uniramous, of nearly same shape and size as exopodite of pleopod V, surfaces with scattered papillae.

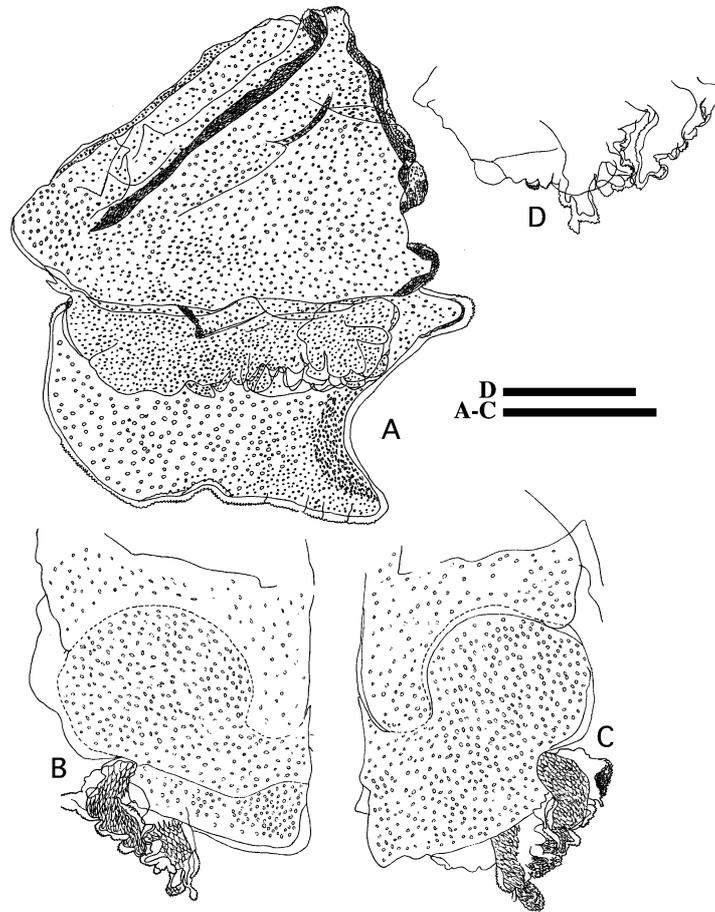


FIGURE 4. *Pseudione minimocrenulata*, 11.5 mm female: A, oostegite I, internal view; B, maxilliped, outer view; C, maxilliped, inner view; D, left side of barbula. Scale bar = 0.5 mm.

Male (Fig. 2C, D) length 4.0 mm, maximal width 2.5 mm.

Head oblong, distinct from first pereomere (Fig. 2A). Eyes absent. Antennule of three articles, distally setose; antenna of five articles, distally setose, extending beyond margin of head (Fig. 5A–D).

Pereomere IV broadest, body tapering anteriorly and posteriorly. Pereomeres directed laterally, distolateral margins of all pereomeres tapering into rounded tips, midventral tubercles present on all segments. No detectable pigmentation. Pereopods (Fig. 5E, F) all subequal, carpus and merus fused, all other articles separated, dactylus long and acute, palm of propodus with row of low blunt stout setae and surrounding region of granular scales, distoventral margin of carpus with granular scales and few distal setae.

Pleon of six separate pleomeres. Pleomeres all directed laterally, distolateral margins of all pleomeres tapering and rounded. Pleomere VI (pleotelson) subtriangular with rounded posterolateral lobes (Fig. 2C, D). Pleopods as low, elongate, rounded lobes on pleomeres I–V (Fig. 2D). No midventral tubercles or uropods.

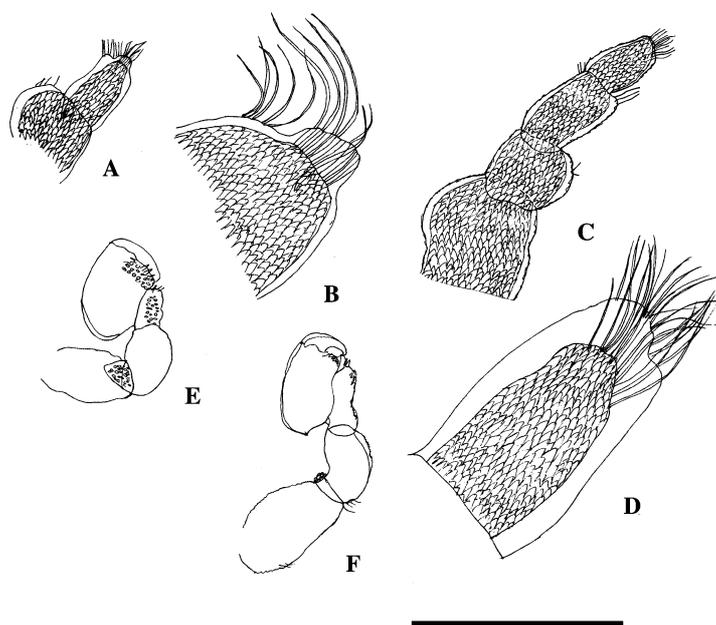


FIGURE 5. *Pseudione minimocrenulata*, male: A, antennule (distal); B, antennular tip; C, antenna (distal); D, antennal tip; E, pereopod I; F, pereopod VII. Scale bars: B, D = 0.2 mm; A, C, E, F = 0.75 mm.

Comparison with Previously Reported Specimens. The IIOE material is essentially identical with the specimens reported by Nierstrasz & Brender à Brandis (1931) from the Kei Islands and Bourdon (1976) from Madagascar. The males are slightly more similar to the Indonesian specimens but appear to fall well within the range of bopyrid intraspecific variability.

Discussion. The type material of *Pseudione minimocrenulata* consists of two pairs of specimens, one pair collected in the Kei Islands and one pair from St. Croix: a dextral mature female (8.3 mm) and mature male (2.6 mm) from the right branchial chamber of a female *Munida stimpsoni* A. Milne-Edwards, 1880 (19.1 mm CL; identified by M. de Saint Laurent, Frederikssted, St. Croix, U.S. Virgin Islands, 7, Feb. 1906, coll. Dr. T. H. Mortensen; ZMUC CRU4856). However, the description and illustrations of Nierstrasz & Brender à Brandis (1931) are almost exclusively of the Kei Islands specimens with the St. Croix pair being only mentioned in passing. Bourdon (1976), in the only substantive treatment of this species since the original description, examined and discussed only the Kei Islands specimens. It is clear from an examination of the two syntypic pairs that these represent two separate *Pseudione* taxa with the St. Croix specimens belonging to the subspecies currently known as *P. confusa maxillipedis* Bourdon, 1972b, which was originally described from Cuban material. In both the St. Croix female and the female syntypes of *P. confusa maxillipedis* the maxilliped has a large, unarticulated palp with long distal setae (the palp being short and tipped with short setae in *P. minimocrenulata*) and the host is the

same species for both the Cuban and St. Croix specimens. In order to fix the identity of *P. minimocrenulata* and to continue accepted usage of its name, we select the female specimen from the Kei Islands as the lectotype. The Kei Islands male and both of the St. Croix specimens therefore become paralectotypes of *P. minimocrenulata*, while the two St. Croix specimens are also synonymous with *P. confusa maxillipedis*.

The genus *Pseudione* has been regarded as the most primitive of the Bopyridae (Shiino 1965), although this statement cannot apply to all currently included species as the genus is likely paraphyletic (Adkison 1988; Boyko 2004a). The association of bopyrids and galatheids is very old, with evidence of host branchial chamber swellings found as far back as the Jurassic (Markham 1986) and galatheids may have been the original hosts for bopyrids among the Decapoda. It is worth noting that swellings on decapod carapaces can result from influences other than bopyrids (Boyko, personal observation), so it is unclear whether all fossilized swellings are caused by bopyrids because no actual fossilized bopyrids have been found, and the generic identities of fossil bopyrids remain unknown.

The IIOE material contained eleven species of *Munida*, but only three of these were found bearing bopyrids: *M. andamanica*, *M. arabica* Tirmizi & Javed, 1992, and *M. heteracantha* Ortmann, 1892. *Munida andamanica* is also infested by *Aporobopyrina javaensis* Bourdon, 1972a, from Java, *Pseudione andamanicae* Bourdon, 1976, from Madagascar, and *Aporobopyrus retrorsa* (Richardson, 1910) from the Philippines (Boyko, 2004b). Interestingly, the other eight species of *Munida* collected by IIOE have almost the same longitudinal range as the three infested species (Tirmizi & Javed 1993) but were not found to harbour any bopyrid parasites, although *A. incerta* is known to be parasitized by *P. minimocrenulata* in Madagascar (Bourdon 1976). Whether this represents a degree of host specificity by the bopyrids is unknown because data are still very limited. The ranges of the two known hosts for *Pseudione minimocrenulata* greatly overlap as both *Munida andamanica* and *A. incerta* are found from the east coast of Africa into the Arabian Sea and across to the Maldives, Java Sea, Moluccas, Philippines and Japan (Tirmizi & Javed 1993). The apparently restricted distributions of bopyrid parasites relative to those of their hosts reflect the principle of Pielou (1974) that parasites do not range as far as their hosts, but it would be presumptive to make any conclusions based on the limited data available for galatheid-infesting bopyrids.

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