

***Pseudanthessius spinosus*, a New Species of Copepoda (Poecilostomatoida, Pseudanthessiidae) Associated with the Echinoid *Clypeaster japonicus* from Korea**

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Key Words:

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***Pseudanthessius spinosus* n. sp. is described as an associate of the sea urchin *Clypeaster japonicus* Döderlein from Cheju Island in Korea. The new species may be easily distinguished from its congeners by having four spines and five setae on the third exopodal segment of leg 4. It is the second known species of the genus from Korean waters.**

Copepods of the genus *Pseudanthessius* utilize a wide range of marine invertebrates as hosts. Most species are associated with echinoderms, including Crinoidea, Asteroidea, Ophiuroidea and Echinoidea, with some of other species associated with Turbellaria, Nemertea, Polychaeta, and Pelecypoda (Humes and Boxshall, 1996). Since Humes (1997) counted 38 species in this genus, including his *P. newmanae* Humes, Kim (2000) added a new species, *P. dentatus*, from an unknown origin in the Korean coast of the Yellow Sea.

At least 26 species of echinoids are known to live in Korean seas (Shin and Rho, 1996). However, these Korean echinoids have been very poorly known for their copepod associates, with only one, *Mecomerinx notabilis* (Humes and Cressey), reported from *Anthocidaris crassispina* (A. Agassiz) (Kim, 1998). The sea biscuit *Clypeaster japonicus* Döderlein, from which a new species of *Pseudanthessius* is discovered, is distributed in the southern seas of Korea and Japan (Shin and Rho, 1996). This paper contains the description of the new species discovered from the above sea biscuit in the southern coast of Cheju Island.

Materials and Methods

The host sea urchins were collected by SCUBA-diving and immediately isolated in a plastic bag. After about an hour, the sea urchins were fixed with 80% ethanol. In the laboratory, the fixed sea urchins were agitated and removed from the plastic bag. The remaining sediment was poured into a wide jar, and the copepod specimens were sorted out from the sediment. The copepods were

measured and dissected in lactic acid. The dissection was done using the reversed slide method of Humes and Gooding (1964). In the following description, the body length does not include setae on the caudal rami. Roman numerals represent spines and Arabic numerals indicate setae. All figures were drawn with the aid of a camera lucida.

Description

Order Poecilostomatoida Thorell, 1859

Family Pseudanthessiidae Humes and Stock, 1972

Genus *Pseudanthessius* Claus, 1889

Pseudanthessius spinosus n. sp.

(Figs. 1-3)

Materials examined. Twelve ♀♀, 7 ♂♂ from the sea urchin *Clypeaster japonicus* Döderlein at Supsum near Seogwipo in Cheju Island, in about 10 m, 29 July 2003, collected by S. Shin. Holotype (♀), allotype, and paratypes (9 ♀♀, 4 ♂♂) will be deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. Dissected paratypes (2 ♀♀, 2 ♂♂) are retained in the collection of the junior author.

Female. Body (Fig. 1A, B) moderately slender. Dissected largest specimen 946 µm (785-946 µm, mean 835 µm, n=10). Greatest width 346 µm. Prosoma 638 µm long, as deep as wide, and dorsally convex in lateral view. First pedigerous somite clearly delimited from cephalosome by thick dorsal transverse sclerotization. Urosome (Fig. 1C) 5-segmented. Fifth pedigerous somite 70×110 µm, with each side of posterodorsal margin slightly expanded posteriorly. Genital double-somite 126×98 µm, not expanded laterally. Its lateral margin on both sides forming small rounded process. Genital area

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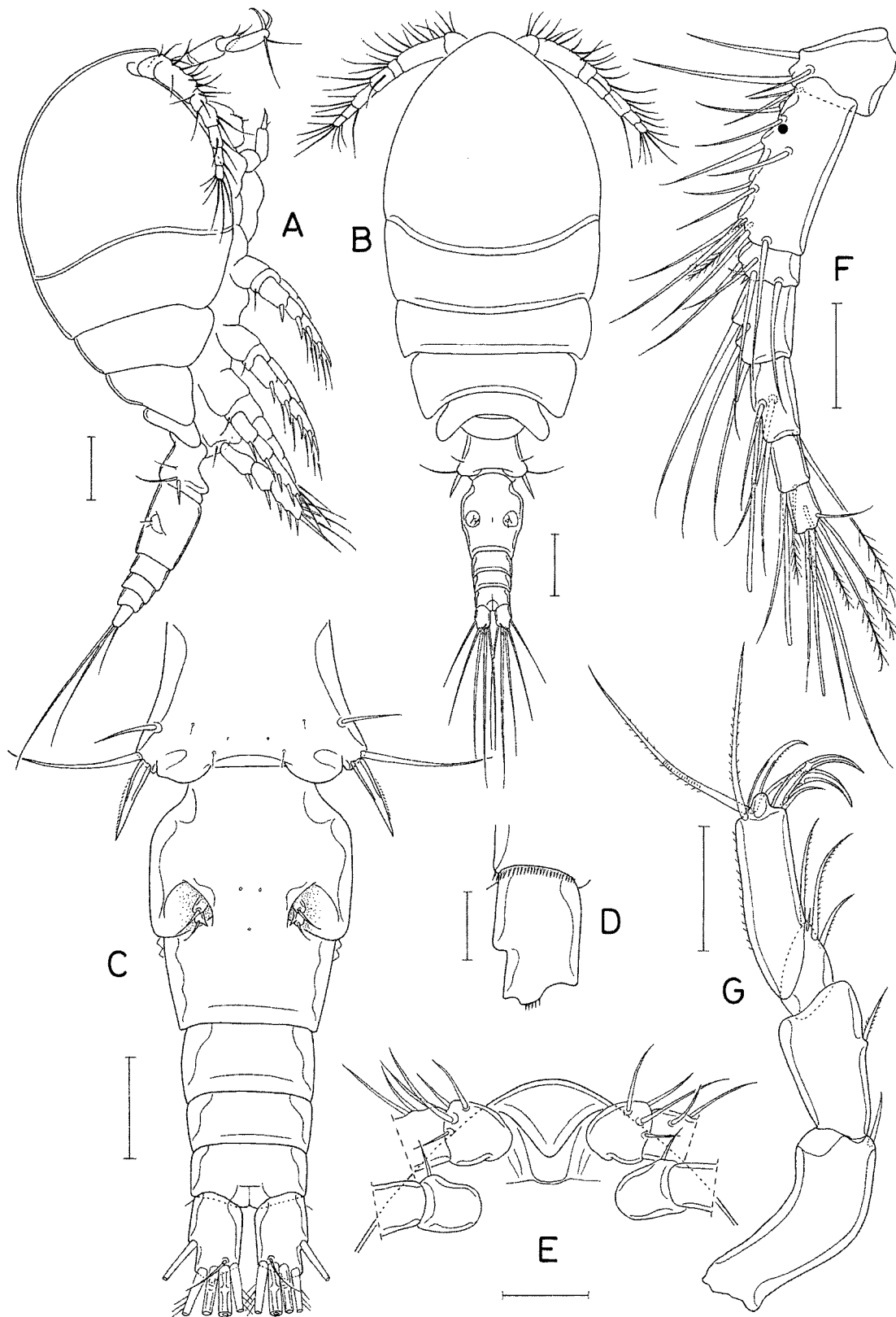


Fig. 1. *Pseudanthessius spinosus* n. sp., female. A, Habitus, lateral. B, Habitus, dorsal. C, Urosome, dorsal. D, Right caudal ramus, ventral. E, Rostral area, ventral. F, Antennule. G, Antenna. Scale bars=0.1 mm (A, B), 0.05 mm (C, E-G), and 0.02 mm (D).

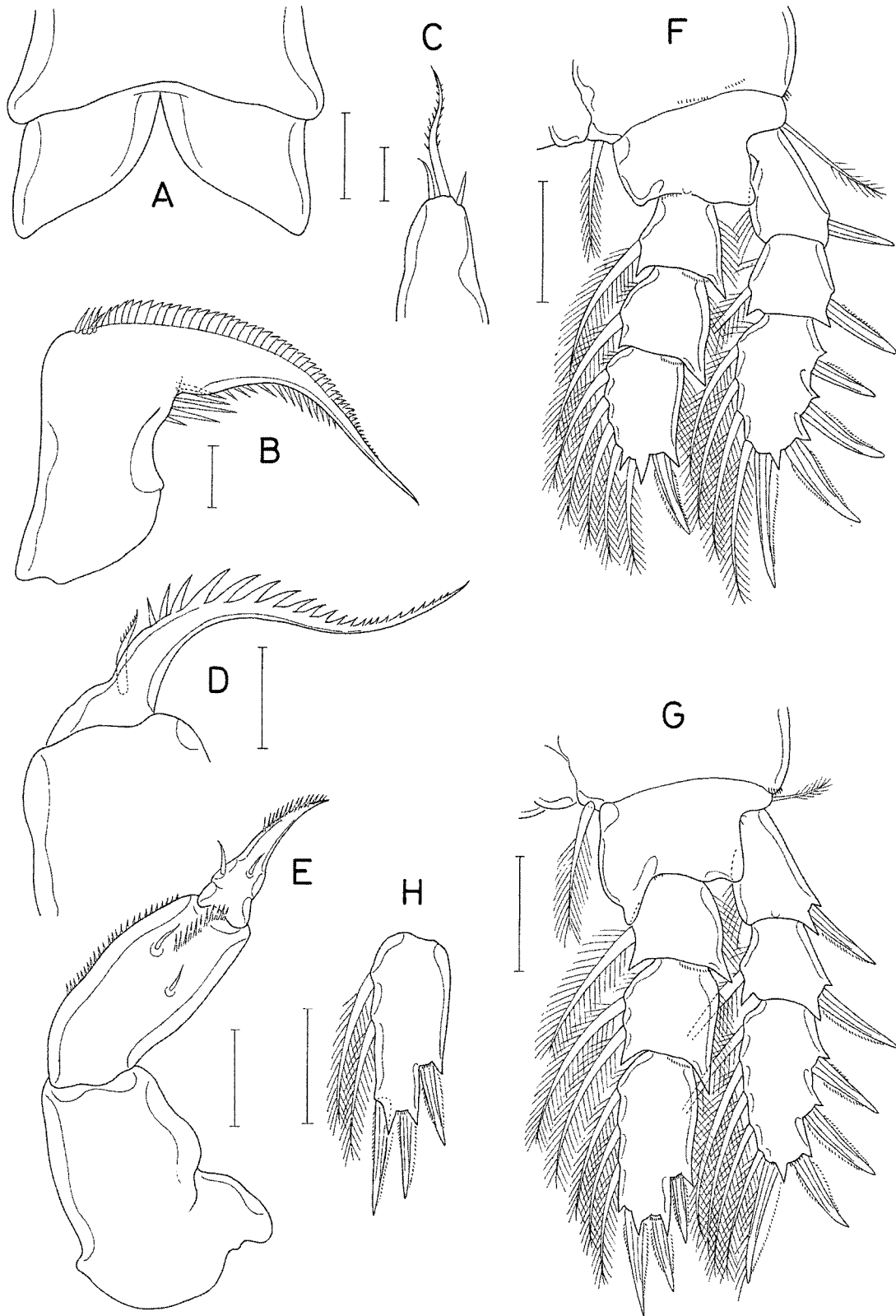


Fig. 2. *Pseudanthessius spinosus* n. sp., female. A, Labrum. B, Mandible. C, Maxillule. D, Maxilla. E, Maxilliped. F, Leg 1. G, Leg 2. H, Third endopodal segment of leg 3. Scale bars=0.02 mm (A, D, E), 0.01 mm (B, C), and 0.05 mm (F-H).

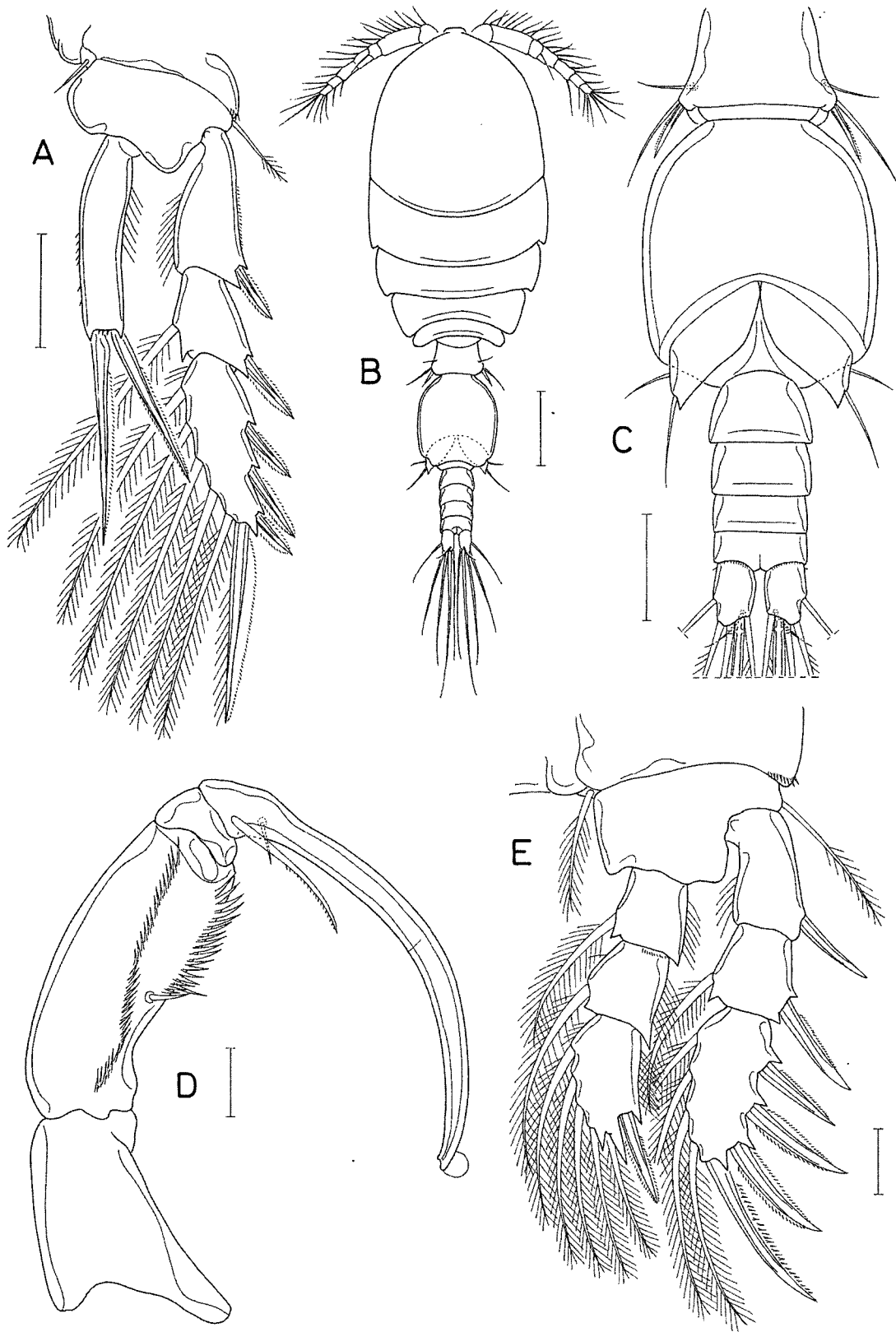


Fig. 3. *Pseudanthessius spinosus* n. sp. Female. A, Leg 4. Male. B, Habitus, dorsal. C, Urosome, ventral. D, Maxilliped. E, Leg 1. Scale bars=0.05 mm (A, C), 0.1 mm (B), and 0.02 mm (D, E).

located dorsally in middle of length of somite. Short hyaline membrane forming 2 small processes on lateral margin just behind genital area. Three abdominal somites 38×64, 25×59, and 31×56 μm. Anal somite with fine spinules along posteroventral border (Fig. 1D). Egg sac not seen.

Caudal ramus (Fig. 1D) 40×25 μm, ratio 1.60 : 1, with 6 caudal setae, 1 proximal setule on outer lateral margin, and few spinules on posteroventral border. Longest inner one of two median terminal setae 283 μm long.

Rostrum small and tapering posteriorly (Fig. 1E). Antennule (Fig. 1F) 7-segmented, with armature formula: 4, 13, 6, 3, 4+1 aesthetasc, 2+1 aesthetasc, and 7+1 aesthetasc. Plumous setae 1 on each second, fifth and sixth, and 3 on terminal segments. Antenna (Fig. 1G) 4-segmented. First and second segments each with 1 inner seta. Third segment small armed with 4 setae, including 1 minute one, near inner distal corner. Fourth segment 71×24 μm (length measured along midline), about 3 times as long as wide, and armed terminally 2 claws of similar lengths (about 46 μm long), 1 claw-like seta, 1 smaller inner seta, and 2 long outer setae.

Labrum (Fig. 2A) with 2 posterolaterally tapering lobes. Mandible (Fig. 2B) with a concave margin oblique row of 5 or 6 strong spinules followed by small spinules; convex margin with 4 small spinules followed by a row of teeth; terminal lash moderately long. Paragnath not identified. Maxillule (Fig. 2C) with 3 terminal setae, the middle one distinctly larger than the other two and barbed. Maxilla (Fig. 2D) with unarmed first segment. Second segment with 1 seta and spinulose lash, without inner and proximal setae. Maxilliped (Fig. 2E) 3-segmented. First segment unarmed. Second segment with 2 identical setae and 2 longitudinal rows of spinules; third segment divided into proximal and distal parts by lateral constriction (this area unsclerotized); distal part with 2 proximal setae and continued to attenuated distal process bearing 1 row of spinules.

Legs 1-4 with 3-segmented rami except for 1-segmented endopod of leg 4. Armature formula of these legs as follows:

Leg 1: coxa 0-1; basis 1-0; exopod I-0; I-1; III, I, 4; endopod 0-1; 0-1; I, 5

Leg 2: coxa 0-1; basis 1-0; exopod I-0; I-1; III, I, 5; endopod 0-1; 0-2; I, II, 3

Leg 3: coxa 0-1; basis 1-0; exopod I-0; I-1; III, I, 5; endopod 0-1; 0-2; I, II, 2

Leg 4: coxa 0-1; basis 1-0; exopod I-0; I-1; III, I, 5; endopod II

Leg 4 (Fig. 3A) exopod characteristically with 3 outer spines; endopod nearly linear, 85×21 μm, ratio 4.05 : 1, with several minute spinules on inner margin and setules on outer margin; 2 terminal spines 94 μm (inner) and 76 μm (outer).

Leg 5 represented by 1 spine (41 μm), 1 adjacent seta (65 μm) and 1 smaller dorsal seta (Fig. 1C). Leg 6

represented by 2 small setae (Fig. 1C).

Male. Body similar to that of female, but rostral area projected anteriorly in dorsal view. Body length of dissected specimen 758 μm (720-777 μm, mean 753 μm, n=7).

Urosome (Fig. 3C) 6-segmented. Fifth pedigerous somite 76 μm wide. Genital somite 120×111 μm (length measured along midline), slightly longer than wide. Genital flap terminated by pointed process. Four abdominal somites 33×49, 26×47, 17×44, and 19×44 μm. Caudal ramus 30×19 μm, ratio 1.58 : 1.

Rostrum and antenna as in female. Antennule added by 1 proximal aesthetasc (slender and distally narrowed) on second segment. Mandible, maxillule, and maxilla as in female. Maxilliped (Fig. 3D) 3-segmented, with terminal claw. First segment unarmed. Second segment with 2 small setae and 2 longitudinal rows of spinules, one of 2 rows extending along whole length of segment, and the other row limited between setae and distal part of segment. Third segment small and unarmed. Terminal claw long, with 2 unequal proximal setae and semicircular hyaline membrane at tip.

Leg 1 (Fig. 3E) with terminal process on third segment of endopod more developed than in female. Legs 2-5 as in female. Leg 6 represented by 2 distal setae on genital flap.

Etymology. The specific name *spinusus* (Latin meaning "full of thorns") alludes to the presence of 4 spines and 5 setae on the third exopodal segment of leg 4 which is an unusual armature (one spine is added on the outer margin) for the genus *Pseudanthessius*.

Remarks. *Pseudanthessius spinusus* n. sp. has an extraordinary character that the armature state on the third exopodal segment of leg 4 on which there are four spines and five setae (formula III, I, 5). As far as we are aware, all known species of the genus *Pseudanthessius* or probably all known species of the family Pseudanthessiidae possess three spines and five setae (formula II, I, 5) on the same segment. Therefore, this feature alone may characterize *P. spinusus*.

Pseudanthessius spinusus may be differentiated by other ways as follows. The species of *Pseudanthessius* Claus, 1889 bear usually long caudal rami. In 14 species of the genus the caudal rami are less than twice as long as wide. In nine of these 14 species the caudal rami are longer than wide but not longer than twice as long as wide, like *P. spinusus* n. sp. These nine species can be separated from the new species by their following characters.

Pseudanthessius angularis Humes and Ho, 1970, *P. madrasensis* Reddiah, 1968, *P. major* Stock, 1967, and *P. minor* Stock, 1967 have the mandible bearing one large tooth on the convex side.

Pseudanthessius dimorphus Stock, 1995 and *P. exilicornis* Stock and Humes, 1995 have the endopod of leg 4 bearing a pointed process on the outer margin.

Pseudanthessius foliatus Claus, 1889 has the fourth segment of antenna distinctly long, more than 8 times as long as wide.

Pseudanthessius pictus Humes, 1977 has the broad prosome, the weak, leveled rostrum, and two terminal claws of the antenna of very different lengths.

Pseudanthessius pusillus Humes, 1969, is closely similar to the new species in body form, especially in the form of urosome, and other important characters. However, this species may be distinguished from *P. spinosus* by the smaller body size (0.51-0.54 mm in the female, according to Humes, 1969), by the absence of spinules on the second segment of the maxilliped, by the distally expanded endopod of leg 4, and by the absence of pointed distal process on the male genital flap.

Acknowledgements

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