

Redescription of *Sternomoera moneronensis* (Crustacea: Amphipoda: Gammaridea) from Moneron Island, the Russian Far East

Ko Tomikawa^{1,3} and Dmitry A. Sidorov²

¹Department of Science Education, Graduate School of Education, Hiroshima University, Higashi-Hiroshima 739-8524, Japan
E-mail: tomikawa@hiroshima-u.ac.jp

²Institute of Biology and Soil Science, Far Eastern Branch of the Russian Academy of Sciences,
100-let Vladivostoku Ave. 159, Vladivostok, 690022, Russia

³Corresponding author

(Received 9 July 2012; Accepted 26 December 2013)

Sternomoera moneronensis Labay, 1997, a poorly known freshwater amphipod, is redescribed based on newly collected specimens from its type locality, Moneron Island in the northern Sea of Japan. Certain inaccuracies of the original description, viz., the shape of the antennal sinus of the head and the number of sternal gills on the ventral margin of pereonite 7, are corrected.

Key Words: *Sternomoera moneronensis*, Amphipoda, taxonomy, redescription, Moneron Island.

Introduction

The genus *Sternomoera* Barnard and Karaman, 1982 is known from fresh waters of Japan and Russia (Tattersall 1922; Uéno 1933; Stephensen 1944; Kuribayashi *et al.* 1994, 1996; Labay 1997; Sidorov 2006; Ishimaru 2011). *Sternomoera* is morphologically characterized by well developed eyes, sternal gills on pereonites 2–7, a one-articulate accessory flagellum on antenna 1, presence of coxal gill 7, and a telson longer than wide and cleft for about 70% of its length (Kuribayashi *et al.* 1996). The following five species have been described: *S. japonica* (Tattersall, 1922) from Honshu, Japan; *S. yezoensis* (Uéno, 1933) from Hokkaido, Japan; *S. hayamensis* (Stephensen, 1944) from Honshu; *S. rhyaca* Kuribayashi *et al.*, 1996 from Hokkaido and Honshu; and *S. moneronensis* Labay, 1997 from Moneron Island, Russia. *Sternomoera hayamensis* was synonymized with *S. japonica* in the taxonomic revision of *Sternomoera* by Kuribayashi *et al.* (1996) and only four valid species are currently recognized.

Recently we had an opportunity to examine specimens of *S. moneronensis* of both sexes collected from its type locality (Fig. 1). Moneron Island is located off southwest approximately 50 km of Sakhalin Island. Five species of Amphipoda and one species of Isopoda are recorded from this island (Sidorov 2006). After detailed observation of the newly collected specimens, we realized that *S. moneronensis* was erroneously described in respect to some important diagnostic characters. In this paper, we redescribe *S. moneronensis* based on the newly obtained specimens and discuss the inaccuracies of the original description.

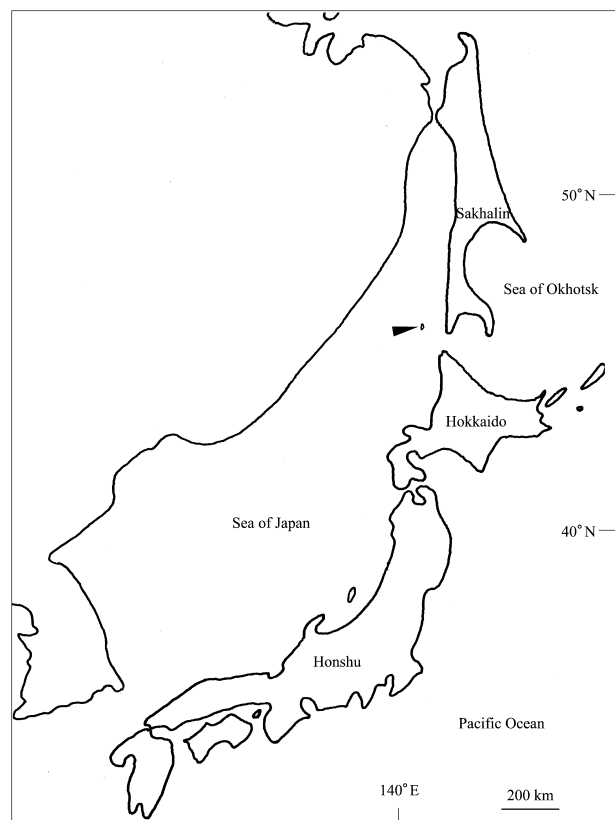


Fig. 1. Study area. Arrow head indicates Moneron Island at which *S. moneronensis* was collected in this study.

Materials and Methods

All appendages of the specimens were dissected under a stereomicroscope (Olympus SZX7) in 70% ethanol and mounted in gum-chloral medium on glass slides. These slides and the remaining bodies of the amphipods were examined using a compound microscope (Olympus BH2) and illustrated with the aid of a camera lucida. The body length from the tip of the rostrum along the dorsal curvature to the base of the telson was measured to the nearest 0.1 mm. Ter-

minology follows Bradbury and Williams (1999). The specimens are deposited in the National Museum of Nature and Science, Tsukuba (NSMT), in the Far East National University, Vladivostok (FENU), and in the research collection of the Institute of Biology and Soil Science, Vladivostok (IBSS).

Sternomoera moneronensis Labay, 1997 (Figs 2–5)

Sternomoera moneronensis Labay, 1997: 754–758, figs 1–3;
Sidorov 2006: 168

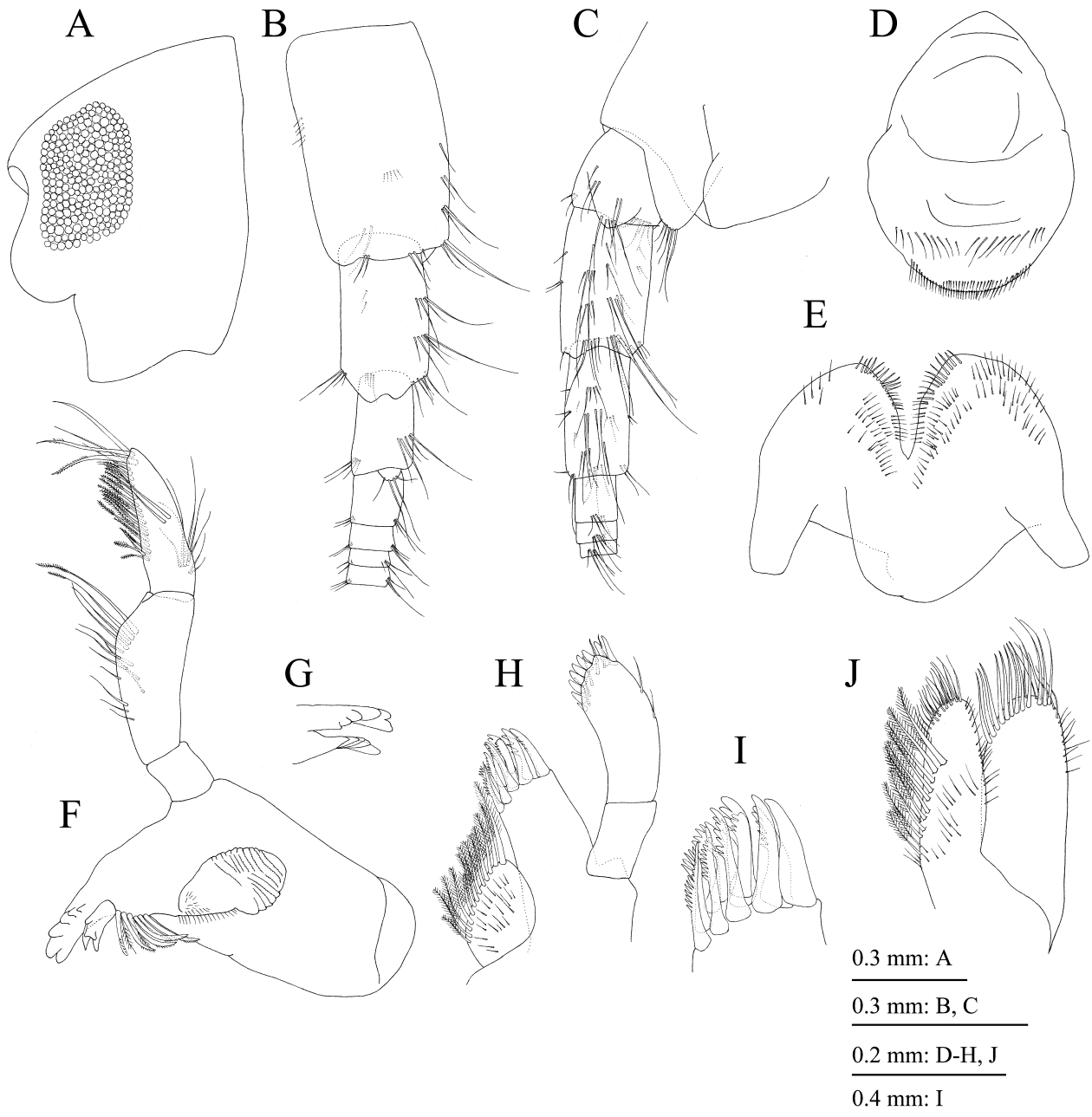


Fig. 2. *Sternomoera moneronensis* Labay, 1997. Immature female (11.0 mm), NSMT-Cr 22189, Moneron Island, Russia. A, head, lateral view; B, peduncular articles 1–3, primary flagellar articles 1–4, and accessory flagellum of antenna 1, medial view; C, peduncular articles 1–5 and flagellar articles 1–3 of antenna 2, medial view; D, upper lip, anterior view; E, lower lip, ventral view; F, right mandible (molar seta broken), medial view; G, incisor and lacinia mobilis of left mandible, medial view; H, maxilla 1, dorsal view; I, apical part of outer plate of maxilla 1, dorsal view; J, maxilla 2, dorsal view.

Material examined. NSMT-Cr 22189, 3 immature females (9.4–11.0 mm), nameless brook, Moneron Island, Russia, 23 August 2001, collector unknown. X37756/Cr-1420-FENU, 1 immature male (11.0 mm), upper part of brook N2, Chuprova Bay, Moneron Island, Russia, 15 July 2004, coll. Bogatov. IBSS-18/1sd, 5 immature males (9.0–11.0 mm) and 13 immature females (5.0–8.5 mm), data same as for above immature male (X37756/Cr-1420-FENU). 10 immature males (9.0–11.5 mm) and 2 immature females (8.5 mm), lower part of brook N2, Chuprova Bay, Moneron Island, Russia, 19 July 2004, coll. Bogatov. Eight males and 1 female (all immature), 2 nameless brooks (46°15.568'N, 141°15.074'E), south part of Moneron Island, Russia, 15 July 2004, coll. Makarchenko. 13 juveniles (3.0–3.5 mm), middle part of nameless brook (46°15.869'N, 141°14.800'E), Chuprova Bay, Moneron Island, Russia, 15 July 2004, coll. Makarchenko. 15 males and 2 females (all immature), nameless brook near "Paletc" rock (46°15.844'N, 141°14.680'E), Chuprova Bay, Moneron Island, Russia, 16 July 2004, coll. Makarchenko. 13 males and 2 females (all immature), "Vodopadny" brook (46°15.497'N, 141°15.254'E), Moneron Island, Russia, 19 July 2004, coll. Makarchenko.

Description. *Immature female (11.0 mm), NSMT-Cr 22189.* Head (Fig. 2A) slightly shorter than pereonites 1 and 2 combined, rostrum short, antennal sinus sharply incised, dorso-ventral length of eyes about 45% of that of head. Dorsal margins of body smooth. Epimeral plates 1–3 (Fig. 4F–H) with 1, 5, and 4 robust setae along their respective ventral margins, and 10, 11, and 6 short setae on their respective posterior margins.

Antenna 1 (Fig. 2B): peduncular articles 1 to 3 in length ratio of 1.0:0.7:0.4; peduncular article 1 with 1 single seta and 2 clusters of setae on posterior margin, peduncular articles 2 and 3 respectively with 2 and 1 clusters of setae on posterior margins; accessory flagellum 1-articulate with 4 apical setae; primary flagellum 35-articulate, calceoli absent. Antenna 2 (Fig. 2C): shorter than antenna 1; gland cone of peduncular article 2 reaching distal part of article 3, with 6 apical setae; peduncular article 4 slightly longer than article 5; flagellum more than 25-articulate, calceoli absent.

Upper lip (Fig. 2D) with fine setae on rounded ventral margin. Lower lip (Fig. 2E) with broad outer lobes, inner lobes absent. Mandibles (Fig. 2F, G): both left and right incisors 6-dentate; left lacinia mobilis 5-dentate, right one indistinctly bifid and bearing 5 teeth; each accessory setal row consisting of weakly pectinate setae; palp 3-articulate, article 3 with A-, B-, D-, and E-setae. Maxilla 1 (Fig. 2H, I): inner plate with many plumose setae on medial margin, inner surface setulose; outer plate subrectangular, with 11 apical robust, serrate setae; palp 2-articulate, exceeding tip of outer plate, article 1 short, without marginal setae, article 2 with 9 robust and 5 slender apical setae and 2 outer marginal setae. Maxilla 2 (Fig. 2J) with row of setae on medial margin of inner plate, oblique setal row of inner plate consisting of plumose setae. Maxilliped (Fig. 3A): inner plate with 2 nodular and 1 slender robust setae apically; outer plate with both apical and medial setae, including some robust and some plumose setae; palp 4-articulate, article 2 with marginal and sub-

marginal rows of setae, article 3 with setae on inner surface.

Gnathopod 1 (Fig. 3B): coxa rectangular; basis with setae on anterior and posterior margins; carpus length 1.6× width; propodus length 1.8× width, palmar margin of propodus (Fig. 3C) almost straight, palmar corner with 3 medial and 4 lateral robust setae; dactylus curved inward, posterior margin serrate. Gnathopod 2 (Fig. 3D): coxa rectangular; basis with setae on anterior and posterior margins; carpus length 1.8× width; propodus length 1.8× width, palmar margin of propodus (Fig. 3E) almost straight, palmar corner with 4 medial and 4 lateral robust setae; dactylus curved inward, posterior margin serrate. Pereopod 3 (Fig. 3F): coxa rectangular; anterior and posterior margins of basis with setae; anterior margin of merus and posterior margins of carpus and propodus with robust setae. Pereopod 4 (Fig. 3G) similar to pereopod 3 except coxa subrectangular with shallow posterior concavity. Pereopod 5 (Fig. 3H): coxa bilobed, ventral margin of posterior lobe with robust seta; anterior margins of basis to propodus and posterior margins of merus to propodus with robust setae. Pereopod 6 (Fig. 4A): coxa bilobed, anterior lobe small, ventral margin of posterior lobe with robust seta; articles longer than those of pereopod 5. Pereopod 7 (Fig. 4B): coxa semicircular; articles longer than those of pereopod 6.

Coxal gills present on gnathopod 2 and pereopods 3–7; accessory lobe absent. Sternal gills on pereonites 2–7, arranged as follows (Fig. 4I): 1–4–4–4–5–3. Oostegites absent.

Pleopods 1–3 (Fig. 4C) each with retinacula (Fig. 4D), inner basal margin of inner ramus with bifid plumose setae (Fig. 4E). Uropod 1 (Fig. 4J): peduncle with 2 lateral and 1 medial robust setae along margins, basofacial seta absent; outer ramus length 0.8× peduncle, lateral margin with 2 robust setae; inner ramus slightly longer than outer, medial margin with 3 robust setae. Uropod 2 (Fig. 4K): peduncle with 2 lateral and 2 medial robust setae along margins; outer ramus length 0.8× peduncle, lateral margin with 2 robust setae; inner ramus length 1.3× outer, lateral and medial margins with 1 and 3 robust setae, respectively. Uropod 3 (Fig. 4L): peduncle with robust setae distally; outer ramus 1-articulate, inner margin with plumose setae; inner ramus 1-articulate, almost as long as outer, outer and inner margins with plumose setae. Telson (Fig. 4M) length 1.2× width, cleft for 70% of length, each lobe with 4 apical setae.

Immature male (11.0 mm), X37756/Cr-1420-FENU. Similar to female but differing as follows. Gnathopod 1 (Fig. 5B): carpus length 1.4× width; propodus length 1.7× width, palmar margin of propodus (Fig. 5C) slightly convex, palmar corner with 5 medial and 5 lateral robust setae. Gnathopod 2 (Fig. 5D): carpus length 1.6× width; palmar margin of propodus (Fig. 5E) straight, palmar corner with 4 medial and 6 lateral robust setae. Sternite of pereonite 7 bearing 2 genital papillae situated lateral to and behind 3 sternal gills.

Remarks. The original description of *S. moneronensis* was based on three male specimens (Labay 1997). The type series of *S. moneronensis* are deposited in the Far East National University in Vladivostok. Unfortunately the type series are in a very bad condition and could not observe (DAS pers. obs.). Compared with the original description,

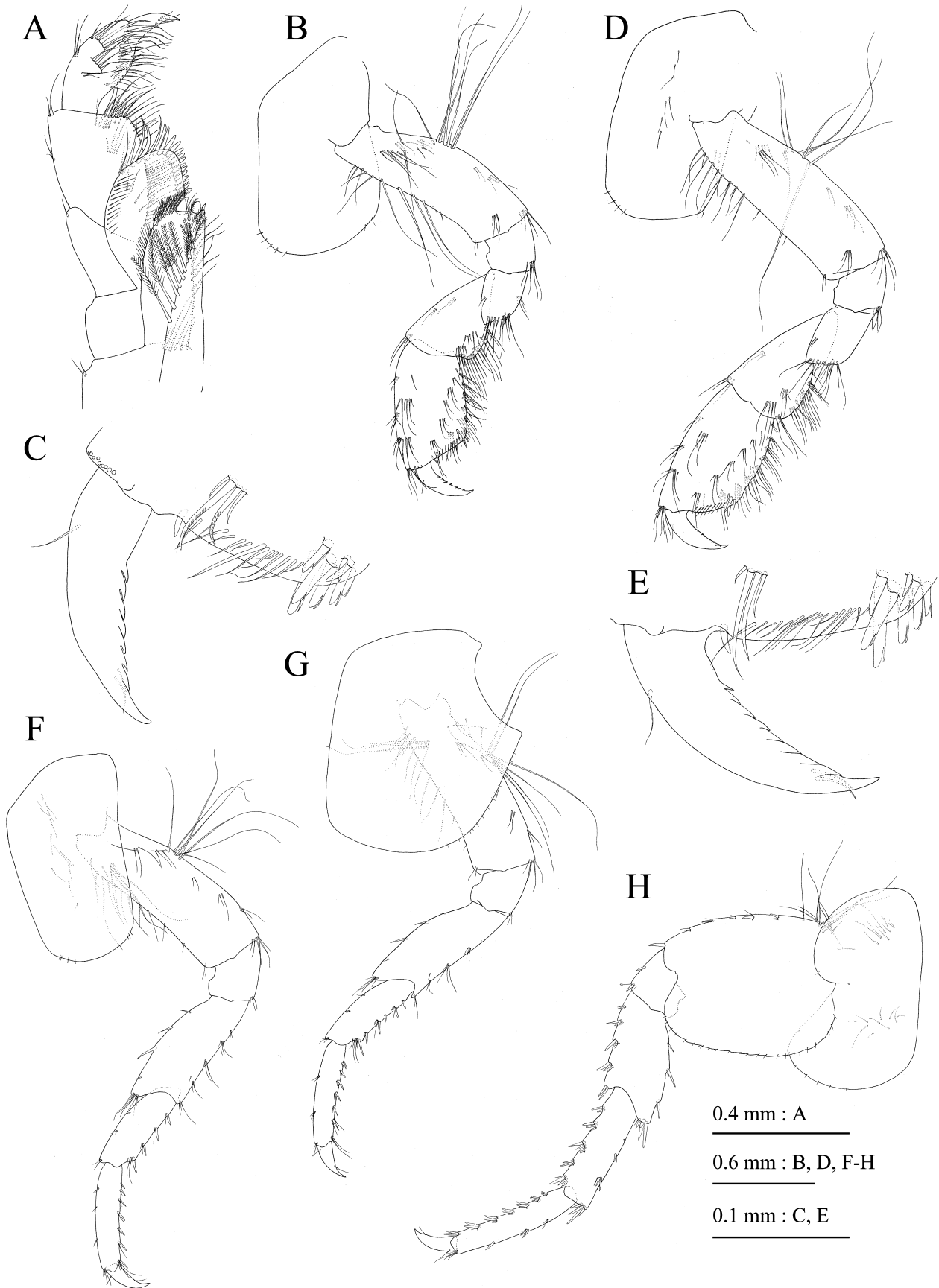


Fig. 3. *Sternomoera moneronensis* Labay, 1997. Immature female (11.0 mm), NSMT-Cr 22189, Moneron Island, Russia. A, maxilliped, dorsal view; B, gnathopod 1, medial view; C, palmar margin of propodus and dactylus of gnathopod 1, medial view; D, gnathopod 2, medial view; E, palmar margin of propodus and dactylus of gnathopod 2, medial view; F-H, pereopods 3-5, respectively, lateral views.

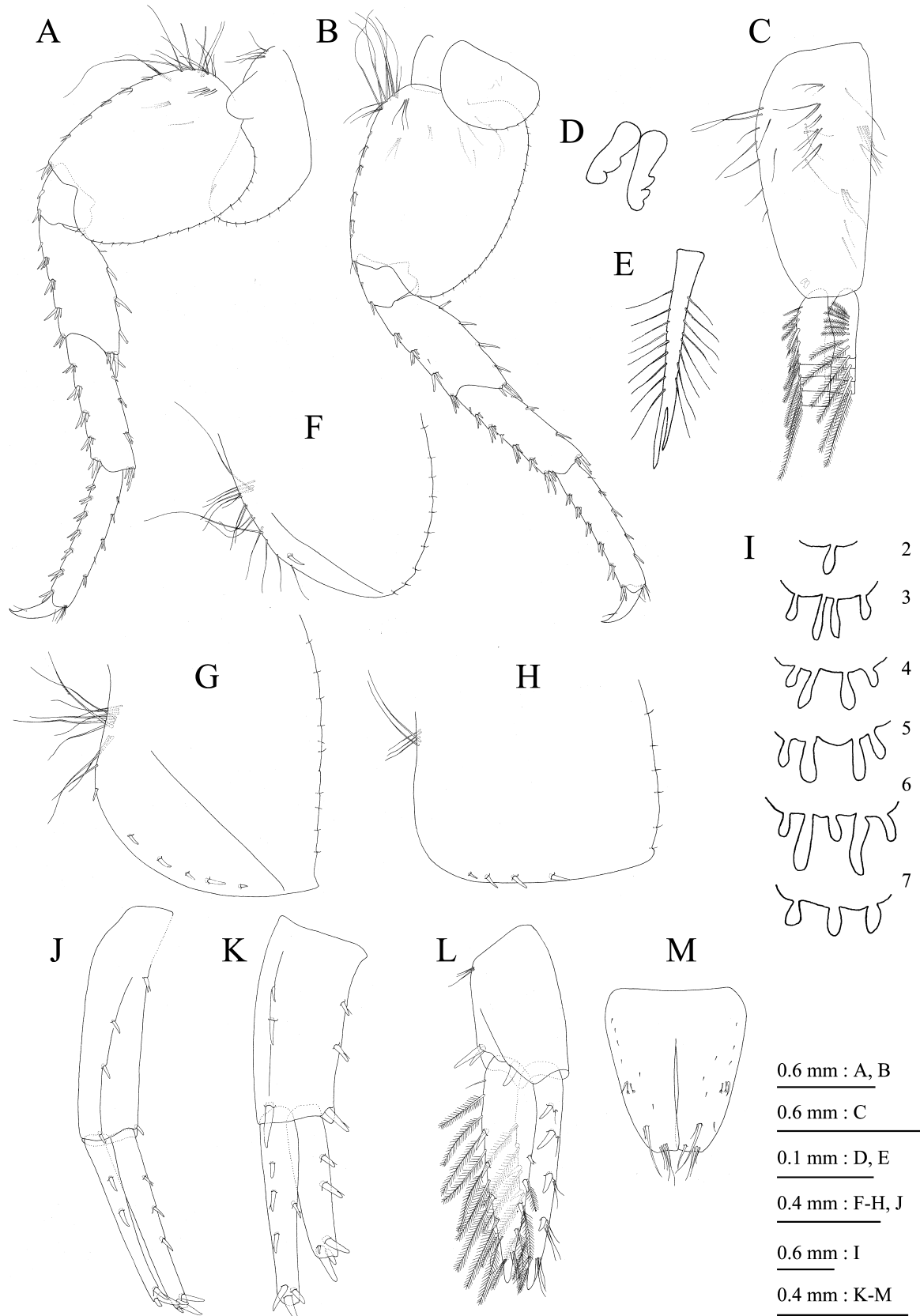


Fig. 4. *Sternomoera moneronensis* Labay, 1997. Immature females (11.0mm, NSMT-Cr 22189, A-H, J-M; 8.5 mm, X37756/Cr-1420-FENU, I), Moneron Island, Russia. A and B, pereopods 6 and 7, respectively, lateral views; C, peduncle and proximal parts of inner and outer rami of pleopod 1, anterior view; D, retinacula on peduncle of pleopod 1, posterior view; E, bifid plumose seta (clothes-pin seta) on inner basal margin of inner ramus of pleopod 1, anterior view; F-H, epimeral plates 1-3, respectively, lateral views; I, sternal gills of pereonites 2-7; J-L, uropods 1-3, respectively, dorsolateral view of uropod 1 and dorsal views of uropods 2 and 3; M, telson, dorsal view.

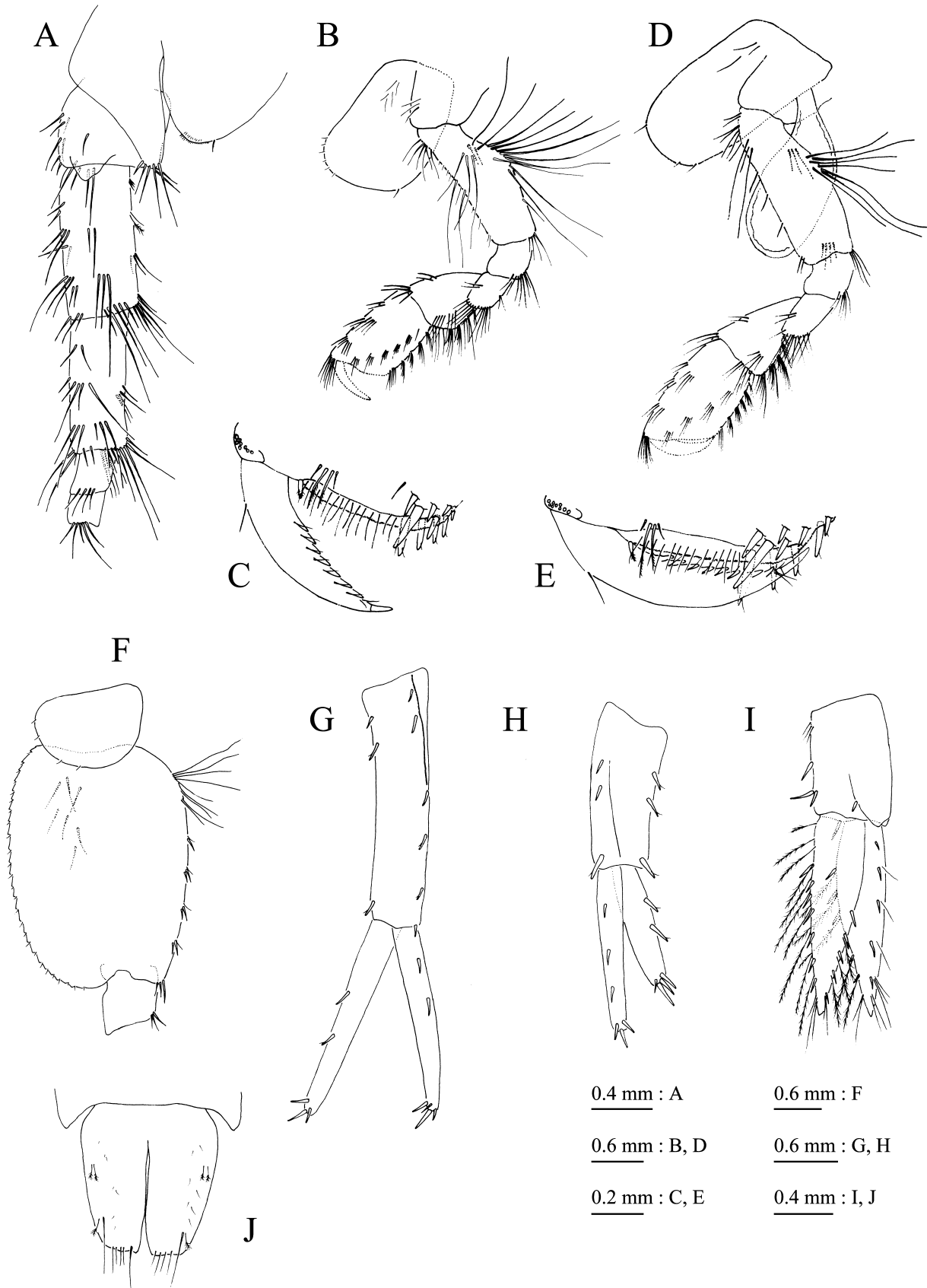


Fig. 5. *Sternomoera moneronensis* Labay, 1997. Immature male (11.0 mm), X37756/Cr-1420-FENU, Moneron Island, Russia. A, peduncular articles 1–5 and flagellar articles 1–2 of antenna 2, medial view; B, gnathopod 1, medial view; C, palmar margin of propodus and dactylus of gnathopod 1, medial view; D, gnathopod 2, medial view; E, palmar margin of propodus and dactylus of gnathopod 2, medial view; F, coxa, basis, and ischium of pereopod 7, lateral view; G–I, uropods 1–3, respectively, dorsal views; J, telson, dorsal view.

the present new material differs in the following features (features of the original description in parentheses): (1) antennal sinus sharply incised (shallowly rounded), (2) pereonite 7 with three sternal gills (two), and (3) ventral margin of peduncular article 1 of antenna 1 with three bundles of setae (two).

We suspect that the first two discrepancies are due to mis-observation or mis-interpretation of characters. Without removing the antenna 2, the edge of the antennal sinus is hard to observe and the anterior margin of peduncular article 1 of antenna 2 may be mistaken for it. In our specimens retaining antenna 2, the antennal sinus indeed appears similar to the figure in the original description. Similar results were found for the related amphipods *Relictomoera relictata* (Uéno, 1971) and *R. tsushimana* (Uéno, 1971). Uéno (1971a, b) described the heads of these two species with unusual sinusoidal anterolateral margins. However, in connection with a redescription of *R. tsushimana* now in preparation, one of us (KT) examined their type specimens and found that Uéno's (1971a, b) original descriptions were erroneously described in a similar manner.

The sternal gills of pereonite 7 are often overlooked because the gills are small (Sidorov 2010). Although we were not able to confirm the situation in type specimens, we found three sternal gills on pereonite 7 of the newly available specimens. We think that Labay (1997) overlooked one sternal gill of pereonite 7 and erroneously described just two sternal gills in the original description.

The number of setal bundles on the ventral margin of peduncular article 1 of antenna 1 is an important diagnostic character for distinguishing *S. japonica* and *S. rhyaca* (Kuribayashi *et al.* 1996). The present material shows three bundles, as in *S. rhyaca*, although the original description shows two, as in *S. japonica*. To clarify the diagnostic validity of this character in *S. moneronensis*, intensive study of its variability is needed.

Since our specimens lacked any development of secondary sex characteristic (calceoli in males and oostegites in females), they were judged to be immature. Gnathopods 1 and 2 of mature males show strong sexual dimorphism in *S. japonica* and *S. rhyaca*, but only slight dimorphism in *S. yezoensis*. Immature females are similar to immature males in many respects in *S. moneronensis*. Nonetheless, the following differences were found in immature individuals that could be sexed through the presence or absence of genital papillae: gnathopods 1 and 2 with more slender carpi, and palmar corners of gnathopods 1 and 2 with fewer robust setae in females. Labay (1997) described his specimens as male but did not mention the presence or absence of genital papillae in the description of *S. moneronensis*. Therefore the sex of the type specimens is unclear. The proportions of gnathopods 1 and 2 of original description are similar to these of our immature male. On the other hand, the distal corners of the palmar margins, with two medial and two lateral setae on gnathopod 1, and three medial and three lateral robust setae on gnathopod 2, are similar to these of our immature female, although these robust setae were only roughly illustrated in the original description. Examination of mature

males and females is needed to clarify the degree of sexual dimorphism of the gnathopods in *S. moneronensis*.

Acknowledgments

We thank Dr Jason D. Toft of University of Washington and Dr Noboru Minakawa of Saga University for providing specimens. Thanks are also due to Dr Toft for providing suggestions on the use of English, and to Dr S. Ishimaru and an anonymous reviewer for their critical reading of the manuscript and valuable comments. This study was partly supported by a grant from the Japan Society for the Promotion of Science (JSPS: 25840140), the Nihon Kyôiku Kômuin Kôsaikai, the River Fund of the Foundation of River and Watershed Environment Management, Japan (24-1215-034) to K.T., and the Presidium of FEBRAS grant # 12-I-P 30-01 (V. V. Bogatov).

References

- Bradbury, J. H. and Williams, W. D. 1999. Key to and checklist of the inland aquatic amphipods of Australia. Technical Reports of the Australian Museum 14: 1–21.
- Ishimaru, S. 2011. Records of freshwater amphipods *Sternomoera japonica* and newly-found *S. rhyaca* in Ishikawa Prefecture, Japan. Bulletin of the Ishikawa Museum of Natural History 1: 37–43. [In Japanese with English summary]
- Kuribayashi, K., Ishimaru, S. and Mawatari, S. F. 1994. Redescription of *Sternomoera yezoensis* (Uéno, 1933) (Amphipoda: Eusiridae) with reference to sexual dimorphism on pleopod 2. Crustacean Research 23: 79–88.
- Kuribayashi, K., Mawatari, S. F. and Ishimaru, S. 1996. Taxonomic study of the genus *Sternomoera* (Crustacea: Amphipoda), with redefinition of *S. japonica* (Tattersall, 1922) and description of a new species from Japan. Journal of Natural History 30: 1215–1237.
- Labay, V. S. 1997. *Sternomoera moneronensis* sp. n. (Amphipoda, Eusiridae) from freshwater of Moneron Island. Zoologicheskii Zhurnal 76: 754–758. [In Russian with English summary]
- Sidorov, D. A. 2006. Fauna of Crustacea (Malacostraca) of Moneron Island. Pp. 167–170. In: Bogatov, V. V., Barkalov, V. Y., Storozhenko, S. Y. (Eds) *Flora and Fauna of Moneron Island (Materials of International Sakhalin Project)*. Dalnauka, Vladivostok. [In Russian with English summary]
- Sidorov, D. A. 2010. A new subgenus of eusirid amphipod (Crustacea: Amphipoda: Eusiridae) from subterranean waters and springs of the Eastern Sikhote-Alin Mountain Ridge, with comments on the morphology of sternal humps, genital papillae and pleopods. Zootaxa 2518: 1–31.
- Stephensen, K. 1944. Some Japanese amphipods. Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening 108: 25–88.
- Tattersall, W. M. 1922. Zoological results of a tour in the Far East. Part 8. Amphipoda with notes on an additional species of Isopoda. Memoirs of the Asiatic Society of Bengal 6: 435–459, pls 18–21.
- Uéno, M. 1933. Three noticeable freshwater Crustacea of Hokkaidô. Annotationes Zoologicae Japonenses 14: 115–122.
- Uéno, M. 1971a. The fauna of the insular lava caves in west Japan VII. Subterranean Amphipoda. Bulletin of the National Science Museum Tokyo 14: 161–170.
- Uéno, M. 1971b. Subterranean Amphipoda from the islands of Tsushima. Bulletin of the National Science Museum Tokyo 14: 195–199.