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On some species of the genera *Campylaspenis* and *Campylaspis* (Crustacea, Cumacea, Nannastacidae) from the Sea of Japan (Northwest Pacific), with description of a new species of *Campylaspenis*

TADASHI AKIYAMA
Ushimado Marine Laboratory, Okayama University, Ushimado, Okayama 701-4303, Japan
akiyama@uml.okayama-u.ac.jp; https://orcid.org/0009-0007-4190-9578

Abstract

The cumacean genus *Campylaspenis* (Cumacea: Nannastacidae) currently consists of two species, characterized by an unusual character, the presence of a pair of large penial lobes in adult males, the only character which distinguishes the genus from the genus *Campylaspis*. This study, based on specimens from the Sea of Japan, describes a new species, *C. sigeogamoi* **sp. nov**, and *Campylaspis pisum* Vassilenko & Tzareva, 2004 is re-described and transferred to the genus *Campylaspenis*. Additionally, two species of *Campylaspis*, *C. crispa* (re-described) and *C. brevirostris* (briefly re-described) are reported. These four species with a carapace with three oblique ridges closely resemble each other except that the two *Campylaspenis* males have a pair of large penial lobes, suggesting that these four species may share a common ancestor. Among them, *Campylaspenis sigeogamoi* and *Campylaspis crispa* are similar to each other in the normal pseudorostrum and no distinct transverse ridge on the frontal lobe of the carapace, and *Campylaspenis pisum* is similar to *Campylaspis brevirostris* including the short, upturned pseudorostrum and transverse ridge on the frontal lobe. The similarity of the two pairs of species suggests that presence of penial lobes may not be a generic level character in this group.

Key words: Cumacea, Nannastacidae, *Campylaspis*, *Campylaspenis*, new species, Northwest Pacific

Introduction

The nannastacid genus *Campylaspenis* was established based on the presence of a pair of long penial lobes in adult males (Bacescu & Muradian, 1974), which is unusual in cumaceans. Except for this character, the genus is very similar to the genus *Campylaspis*. The type species, *Campylaspenis rowei* Bacescu & Muradian, 1974, was collected from 3045 m in the western Atlantic. A second species of the genus, *C. tangaroae* Gerken, 2012, was collected from 264–1239 m depth in New Zealand, southwest Pacific (Gerken, 2012).

The genus *Campylaspis* (Nannastacidae) consists of more than 200 species, distributed all over the world from shallow waters to abyssal depth (Bacescu, 1992; Watling & Gerken, 2024). In the northwest Pacific, eight species of the genus *Campylaspis* are reported from the Russian coast of the Sea of Japan from various depths (Golovan *et al.*, 2012; Tzareva *et al.*, 2013), including *Campylaspis crispa* Lomakina, 1955 and *C. pisum* Vassilenko & Tzareva, 2004, which are both characterized by three oblique ridges on each side of carapace. The deep-sea fauna of the Japanese coast of the Sea of Japan was investigated by R/V *Tansei-maru* of the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) in 2011 (Saito *et al.*, 2014). Based on the specimens collected during the cruise, Akiyama (2014) described *Campylaspis brevirostris*, another *Campylaspis* species with 3 oblique ridges on each side of carapace. The present study describes a new species of the genus *Campylaspenis*, redescribes and transfers a species into *Campylaspenis* from *Campylaspis,* and adds additional description to two species of *Campylaspis* from the region. Morphological characters of these species are compared.

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Material and methods

The cumacean specimens examined in this study were collected during surveys on benthic fauna of the Sea of Japan, Northwest Pacific by R/V *Tansei-maru*, Japan Agency for Marine-Earth Science and Technology (JAMSTEC, cruise KT-11-9) in 2011. The gear used for the collection was a beam trawl of 3 m span, equipped with two small ring nets for collection of small benthic organisms. Sampling sites during the cruise and detailed procedure for the collection are described elsewhere (Saito *et al.*, 2014; Akiyama, 2014; Akiyama & Gamô, 2012; Akiyama & Gerken, 2012). The cumacean specimens were preserved in 70–80 % ethanol.

The specimens were examined under a stereo microscope (Leica MZ125, M165) and a light microscope (Nikon E600), equipped with drawing tubes. Total body length was determined from tip of pseudorostrum of the carapace to the posterior end of the 6th pleonite. The type specimens are deposited in National Museum of Nature and Science, Tokyo (NSMT).

Taxonomy

Family Nannastacidae Bate, 1866

Genus *Campylaspenis* Bacescu & Muradian, 1974

Campylaspenis sigeogamoi sp. nov.

(Figs. 1–3)

Campylaspis sp. 2 Akiyama, 2014: 168.

Diagnosis. Females: Carapace with three weak oblique ridges on each side, vertical ridge connecting1st and 2nd oblique ridge obsolete; 1st oblique ridge branch and re-unite on dorsal surface, making encircled region; pseudorostrum 0.11–0.13 times carapace length, not upturned; eye lobe semicircular; frontal lobe with no transverse ridge. Maxilliped 3 basis inner distal corner projected; inner and outer margins of merus and carpus serrated; inner margin of propodus serrated. Pereopod 1 basis inner distal corner projected. Uropod peduncle 2.1–2.5 times pleonite 6, 2.1–2.3 times exopod and 1.9–2.2 times endopod; exopod 0.9 times endopod. Males. Pereonite 5 with pair of large penial lobes; pleon with lateral groove; antenna 2 exceeding posterior end of pleon; uropod peduncle 2.4–2.7 times pleonite 6, 2.3–2.4 times exopod and 1.9–2.0 times endopod.

Material examined. Holotype ovigerous female, 3.3 mm (NSMT Cr-32968), off Esashi, northern coast of Hokkaido, the Sea of Japan, 41°47.46′N, 139°34.49′E–41° 48.96′N, 139° 34.88′E, 563–605 m (KT-11-9, St. E3), 29 May 2011. Paratypes. 52 females, 22 males, 11 juveniles (including dissected 5 ovigerous females, 3.0–3.4 mm, 3 adult males, 3.8–3.9 mm (NSMT Cr-22792), same locality and date as holotype female (KT-11-9, St. E3).

Description. Holotype ovigerous female, 3.3 mm (Figs. 1A, B). Carapace 0.44 times total body length, 1.37 times width and 1.75 times depth, with short setae; integument with scale-like sculpture, making numerous minute spines directing outward on carapace; each side with 3 weak oblique ridges running parallel, 1st oblique ridge branch and re-unite on dorsal surface, making encircled region; short vertical ridge connecting 1st and 2nd oblique ridges absent; third oblique ridge and posterior end of carapace a little apart; pseudorostrum 0.13 times carapace width, not upturned; width of semicircular eye lobe 0.12 times carapace width, 1.19 times eye lobe length; frontal lobe without transverse ridge (Fig. 1B); antennal notch obsolete; lower margin with very small teeth. Pereon (Fig. 1A) 0.40 times carapace length. Pleon (Fig. 1A) 0.38 times total body length, with weak lateral ridge on each side.

Paratype ovigerous females, 3.0–3.4 mm. Carapace 0.43–0.45 times total body length, 1.34–1.41 times width and 1.41–1.83 times depth; integument covered with scale-like sculpture, forming minute spine anteriorly (Fig. 1C); very weak vertical ridge connecting 1st and 2nd oblique ridges present or absent; frontal lobe without transverse ridge; width of semicircular eye lobe 0.09–0.12 times carapace width, 1.0–1.2 times eye lobe length; pseudorostrum 0.11–0.13 times carapace width, not upturned; antennal notch obsolete; lower margin with minute teeth or spines (anterior end of scale-like sculpture). Pereon 0.37–0.44 times carapace length. Pleon 0.37–0.38 times total body length. pleonite 6 (Fig. 2G) length 0.66–0.79 times as long as wide.

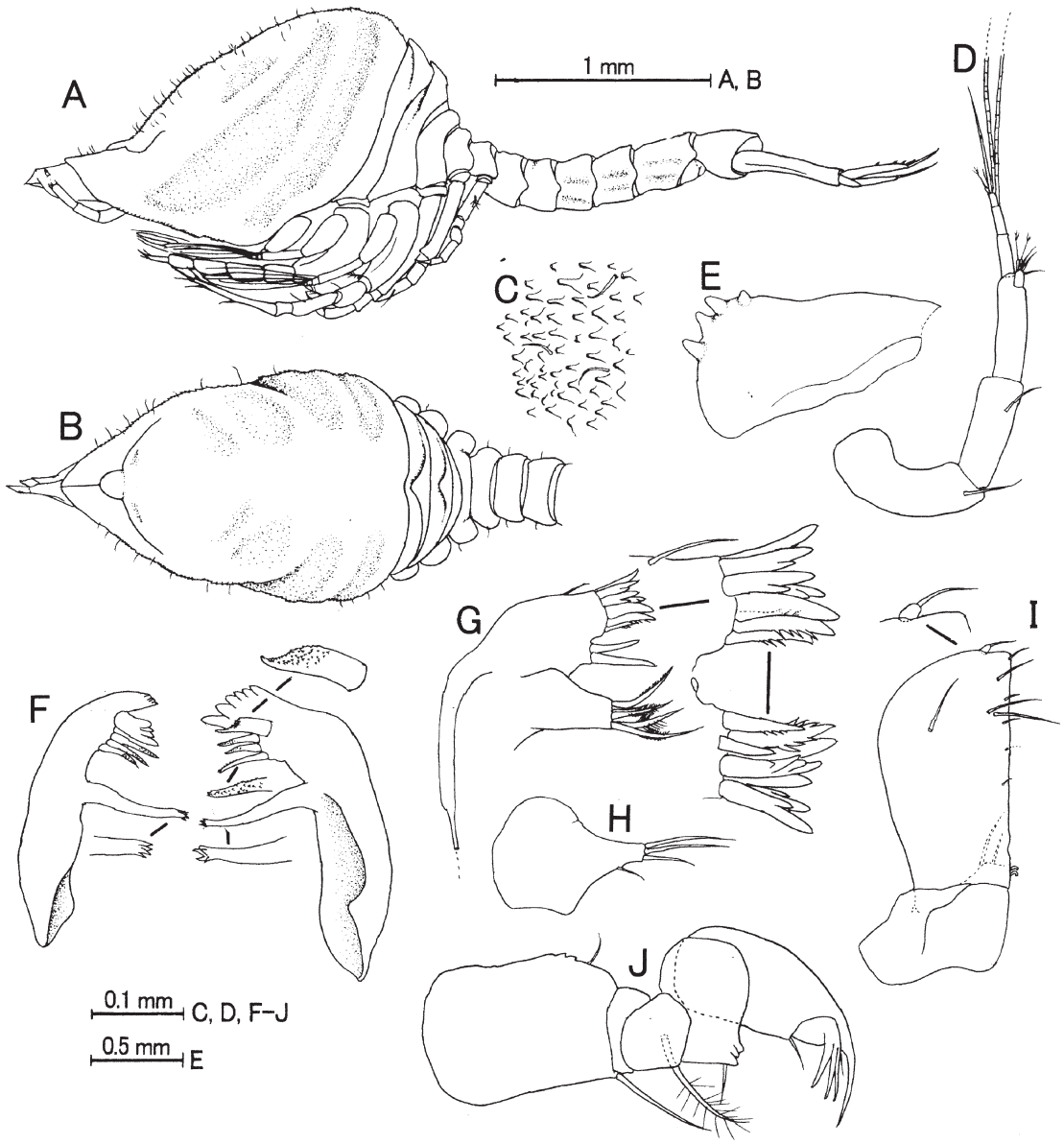

FIGURE 1. *Campylaspenis sigeogamoi* sp. nov.,A, B, holotype ovigerous female; C–J, paratype ovigerous female. A, lateral view; B, anterior portion of body, from above; C, integument of carapace; D, antenna 1; E, antenna 2; F, mandibles; G, maxilla 1; H, maxilla 2; I, J, maxillipeds 1 and 2.

Antenna 1 (Fig. 1D), peduncle basal article curved, 1.0–1.4 times articles 2 and 1.1–1.4 times article 3, with simple seta on distal corner; article 2 with 1 short simple seta on distal region; article 3 0.9–1.0 times article 2. Main flagellum 3-articulate, 0.8–0.9 times peduncle article 3; basal article 0.9–1.1 times combined length of articles 2 and 3; accessory flagellum uni-articulate, 0.4–0.5 times article 1 of main flagellum. Antenna 2 (Fig. 1E) uni-articulate without setae, with 4–7 tubercles on distal region. Left and right mandibles (Fig. 1F) with 3 and 4 robust setae with many minute tubercles, respectively; molar process styliform, 4- or 5- dentate; lacinia mobilis 4- dentate; incisor process 5- or 6- dentate. Maxilla 1 (Fig. 1G) outer endite with 9–10 robust setae, some of which dentate; lower 2 setae a little apart from the remaining setae; narrow endite with 5 ciliated setae; palp with 1 terminal seta. Distal end of maxilla 2 (Fig. 1H) narrow, with 3 terminal and 1 subterminal setae. Maxilliped 1 (Fig. 1I) with 11–12 branchial lobules; merocarpus with 3–4 simple setae on distal region and 3–5 short simple setae on inner margin; dactylus minute, 0.043–0.052 times merocarpus length. Maxilliped 2 (Fig. 1J) basis 0.6–0.7 times combined length of distal articles together, with simple seta on inner distal corner; ischium naked; merus with 0–1 plumose setae on inner margin; carpus with 2–3 denticules, 1–2 simple and 0–1 plumose setae on inner margin; propodus rather elongate,

with 1 long terminal spine; joint between carpus and propodus strongly bend; dactylus with 3 long terminal spine; coxa with 8–10 setae. Maxilliped 3 (Fig. 2A) basis 0.7 times distal articles together; inner distal corner projected, with 2–4 spines, 2 plumose and 0–1 simple setae; outer distal corner with 2 plumose setae; ischium short; merus 1.0–1.1 times combined length of carpus and propodus, with 8–9 teeth and 6–7 short simple setae on inner margin and 3–5 teeth and 1 plumose seta on outer margin; carpus with 3–5 teeth and 3–5 simple setae on inner margin, 3 teeth and plumose seta on outer margin; propodus with 4–5 teeth and 3 plumose setae on inner margin, plumose seta on outer distal corner; dactylus with 3–4 terminal setae; exopod flagellum of 3 articles.

Pereopod 1 (Fig. 2B) basis 0.8 times distal articles together, with 3 plumose setae on inner margin and 1 plumose seta on outer distal corner; merus 0.7–0.8 times combined length of carpus and propodus, with 1–3 plumose and 4–5 simple setae on inner margin, 4–6 teeth and 2 plumose setae on outer margin; carpus with 4–5 teeth and 3–4 simple setae on inner margin, 2–5 teeth and 2 plumose setae on outer margin; propodus with 2–3 teeth and 2 simple seta on inner margin, 3 plumose setae on outer margin; dactylus with 5–6 simple setae; exopod flagellum of 4 articles. Pereopod 2 (Fig. 2C) basis 0.5 times distal articles together, with 2 plumose seta on inner margin and 1 plumose seta on outer distal corner; carpus with 0–2 plumose and 0–2 simple setae on lateral margin; dactylus 1.6–1.9 times carpus, with 9–12 setae; exopod flagellum of 4 articles. Pereopod 3 (Fig. 2D) basis 1.1–1.4 times distal articles together, with two rows of plumose and simple setae on lateral margin. Pereopod 4 (Fig. 2E) basis 0.9–1.0 times distal articles together, with plumose seta on distal corner and plumose seta on side. Pereopod 5 (Fig. 2F) basis 0.5–0.6 times distal articles together. Terminal setae on dactylus of pereopods 3–5 fused to the articles.

Uropod (Fig. 2G) peduncle 2.1–2.5 times pleonite 6 length, 2.1–2.3 times exopod, 1.9–2.2 times endopod, serrated on inner and outer margin, exopod 0.9 times endopod, with 2 terminal seta; endopod uni-articulate, with 4–5 spiniform setae on inner margin and terminal seta.

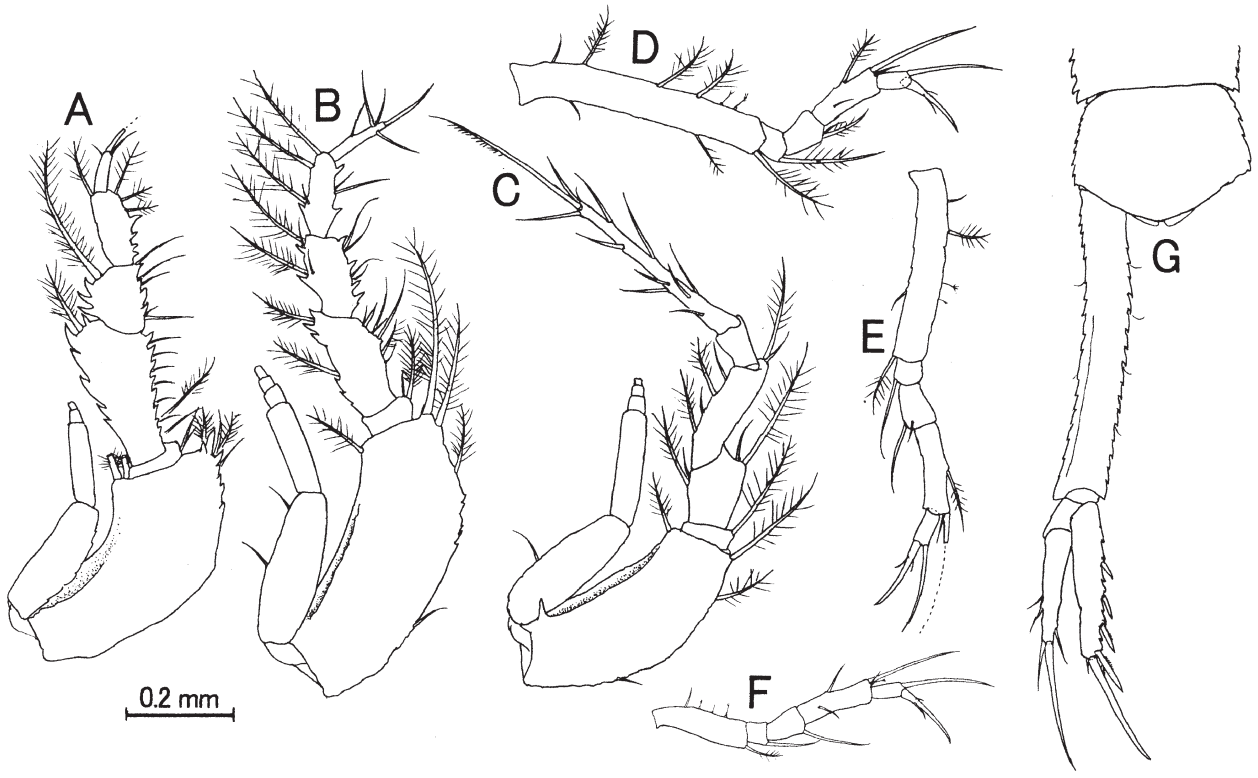

FIGURE 2. *Campylaspenis sigeogamoi* sp. nov., paratype ovigerous female. A, maxilliped 3; B–F, pereopods 1–5; G, uropod with pleonite 6.

Paratype 3 adult males, 3.8–3.9 mm (Fig. 3). Carapace (Fig. 3A, B) 0.39–0.41 times total body length, 1.39–1.44 times width, 1.93–2.17 times depth, covered with short setae; each side with 3 oblique ridges running parallel; pseudorostrum (Fig. 3A, B) 0.092–0.099 times carapace length, not upturned; width of eye lobe 0.10–0.12 times carapace width, 1.1–1.4 times eye lobe length; corneal lenses absent; frontal lobe without transverse ridge; antennal notch shallow. Pereon (Fig. 3A) 0.52–0.60 times carapace length; posterior margin of lateral projection on pereonite

3–5 round; pereonite 5 with a pair of penial lobe (Fig. 3C, D); penial lobe longer than basis of pereopod 5. Pleon (Fig. 3A) 0.37–0.39 times total body length, with lateral grooves; pleonite 6 0.9 times as long as wide.

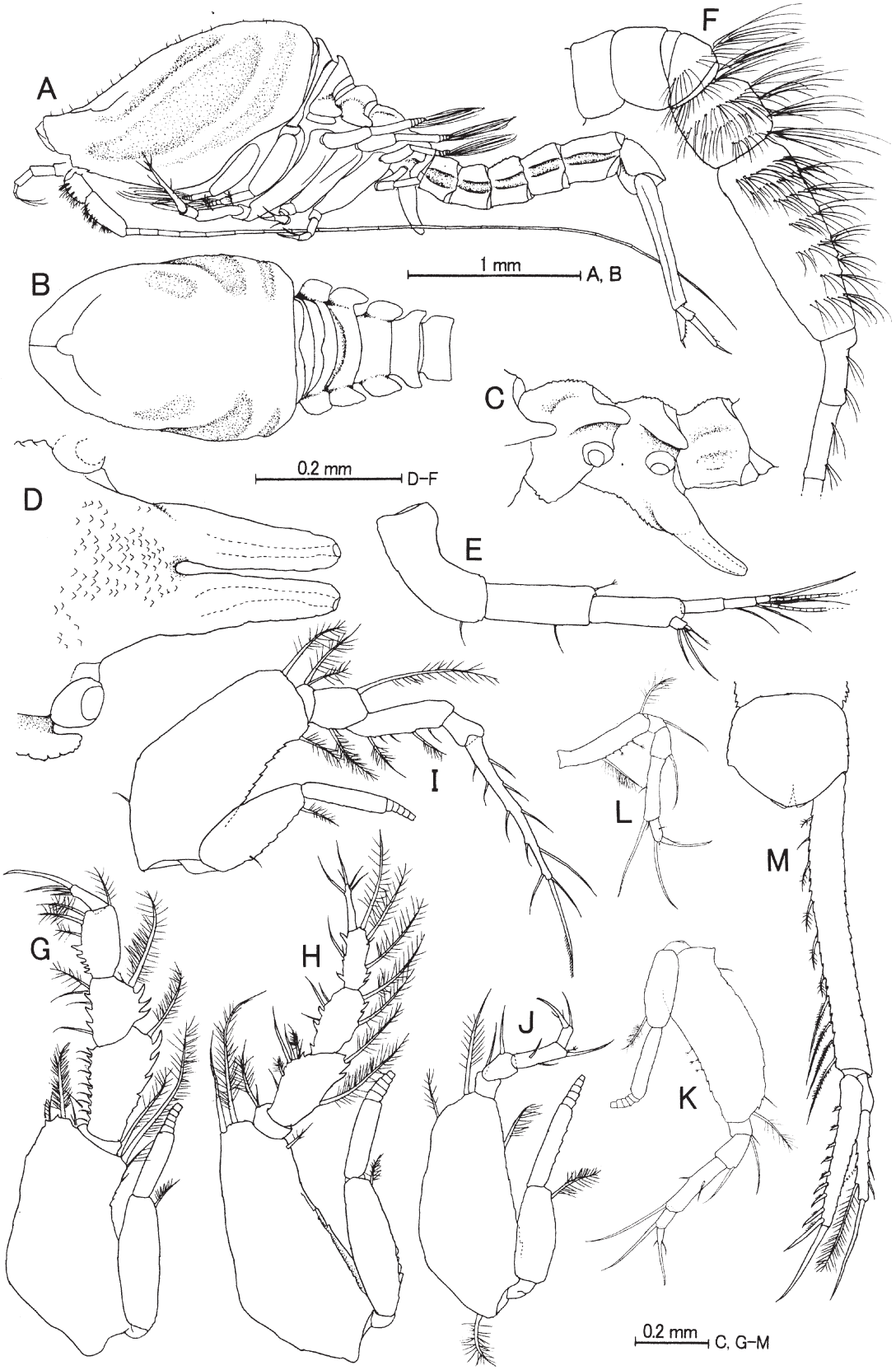

FIGURE 3. *Campylaspenis sigeogamoi* sp. nov., paratype adult male. A, lateral view; B, anterior portion of body, from above; C, pereonites 4, 5 and pleonite 1, lateral view; D, penial lobes on pereonite 5, frontal view ; E, Antenna 1; F, Antenna 2; G, maxilliped 3; H–L, pereopods 1–5; M, uropod with pleonite 6.

Antenna 1 (Fig. 3E), peduncle basal article 1.2–1.3 times article 2 and 1.5–1.6 times article 3; article 3 0.8 times article 2; Main flagellum tri-articulate, 1.0 times peduncle article 3; articles 2 and 3 with 1 aesthetasc, respectively; accessory flagellum uni-articulate, 0.4–0.5 times main flagellum article 1. Antenna 2 (Fig. 3F) peduncle article 5 2.3– 2.6 times article 4; flagellum of 20 articles, exceeding posterior end of pleon. Maxilliped 3 (Fig. 3G) basis 0.7–0.8 times distal articles together, with 2 plumose setae on inner distal corner and 1–3 plumose setae on outer distal corner; merus 0.8–0.9 times combined length of carpus and dactylus, with 7–8 teeth and 7–9 short simple setae on inner margin, 4–7 teeth and plumose seta on outer margin; carpus with 3 teeth and 1 plumose, 3–4 simple setae on inner margin, 3 teeth and plumose seta on outer margin; propodus with 4–5 teeth and 3 plumose setae on inner margin and plumose seta on outer distal corner; dactylus with 4–5 terminal setae; exopod flagellum of 6 articles.

Pereopod 1 (Fig. 3H), basis 0.8–0.9 times distal articles together, inner distal corner projected, with 1–2 plumose setae; outer distal corner with 1–2 plumose setae; merus 0.7 times combined length of carpus and propodus, with 1–2 plumose and 3–4 simple setae on inner margin and 2–4 teeth and 2 plumose setae on outer margin; carpus with 3–4 teeth and 3 simple setae on inner margin, 2 teeth and 2 plumose setae on outer margin; propodus with 2–3 teeth and 1–2 simple setae on inner margin, 3 plumose setae on outer margin; exopod flagellum of 6-articles. Pereopod 2 (Fig. 3I) basis 0.6–0.7 times distal articles together, with plumose seta on inner and outer distal corner; merus with 1 plumose and 0–1 simple setae on outer margin and 1 plumose and 0–1 simple setae on inner distal corner; carpus with 2 plumose and 1–3simple setae on outer margin; dactylus 1.6–1.9 times carpus, with 11–13 setae; exopod flagellum of 6 articles. Pereopod 3 (Fig. 3J) basis 1.6 times distal articles together, with 2–3 plumose setae on inner margin and plumose seta on outer margin; exopod flagellum of 6 articles. Pereopod 4 (Fig. 3K) basis 1.1–1.2 times distal articles together, with plumose seta on inner distal corner, exopod flagellum 6-articulate. Pereopod 5 (Fig. 3L) basis 0.6–0.7 times distal articles together, with plumose seta on distal corner and lateral margin, respectively.

Uropod (Fig. 3M) peduncle 2.4–2.7 times pleonite 6, 2.3–2.4 times exopod and 1.9–2.0 times endopod, with 7–9 plumose and 0–1 simple setae on inner margin; exopod 0.8 times endopod, with long simple terminal seta and plumose subterminal seta, outer margin with 1–2 simple setae; endopod uni-articulate, with 9–12 spiniform setae on inner margin and robust terminal seta.

Etymology. The species name is dedicated to Dr. Sigeo Gamô, who made great contributions to cumacean taxonomy.

Remarks. Male specimens of the present new species are similar to *C. rowei* Bacescu and Muradian, 1974 from south of Cape Hatteras, North Carolina, western Atlantic, 3045 m. The new species is distinguished from *C. rowei* by (1) posterior margin of lateral projection on pereonite 3–5 round (pointed in *C. rowei*), (2) separated region of left and right penial lobes subequal in length to the proximal, unseparated region of the lobes (shorter in *C. rowei*), spermatozoa not observable on tip (observable in *C. rowei*) (3) eye lobe width 0.10–0.12 times carapace width (0.09 in *C. rowei*), (4) uropod peduncle slightly shorter than combined length of last 3 pleonites (longer than combined length of last 3 pleonites in *C. rowei*).

Distribution. Japanese coast of the Sea of Japan, 563–605 m.

Campylaspenis pisum (Vassilenko & Tzareva, 2004)

(Figs. 4–6)

Campylaspis pisum, Vassilenko & Tzareva, 2004: 13–16, Figs. 7–8. Akiyama, 2014: 161.

Diagnosis. Females: Carapace compressed antero-posteriorly; each side with three distinct oblique ridges running parallel; 1st oblique ridge branch and re-unite on dorsal surface, making encircled region; pseudorostrum short, 0.04–0.07 times carapace length, upturned; eye lobe semicircular; frontal lobe with distinct transverse ridge. Maxilliped 3 basis inner distal corner projected; inner and outer margins of merus and carpus serrated, inner margin of propodus serrated. Pereopod 1 basis inner distal corner projected. Uropod peduncle 0.8 times pleonite 6, 1.8–2.3 times exopod, 1.9–2.3 times endopod; exopod 0.9–1.0 times endopod. Male. Pereonite 5 with a pair of large penial lobes; pleon with lateral groove; antenna 2 exceeding posterior end of pleon; uropod peduncle 0.8 times pleonite 6, 2.4 times exopod and 1.9 times endopod.

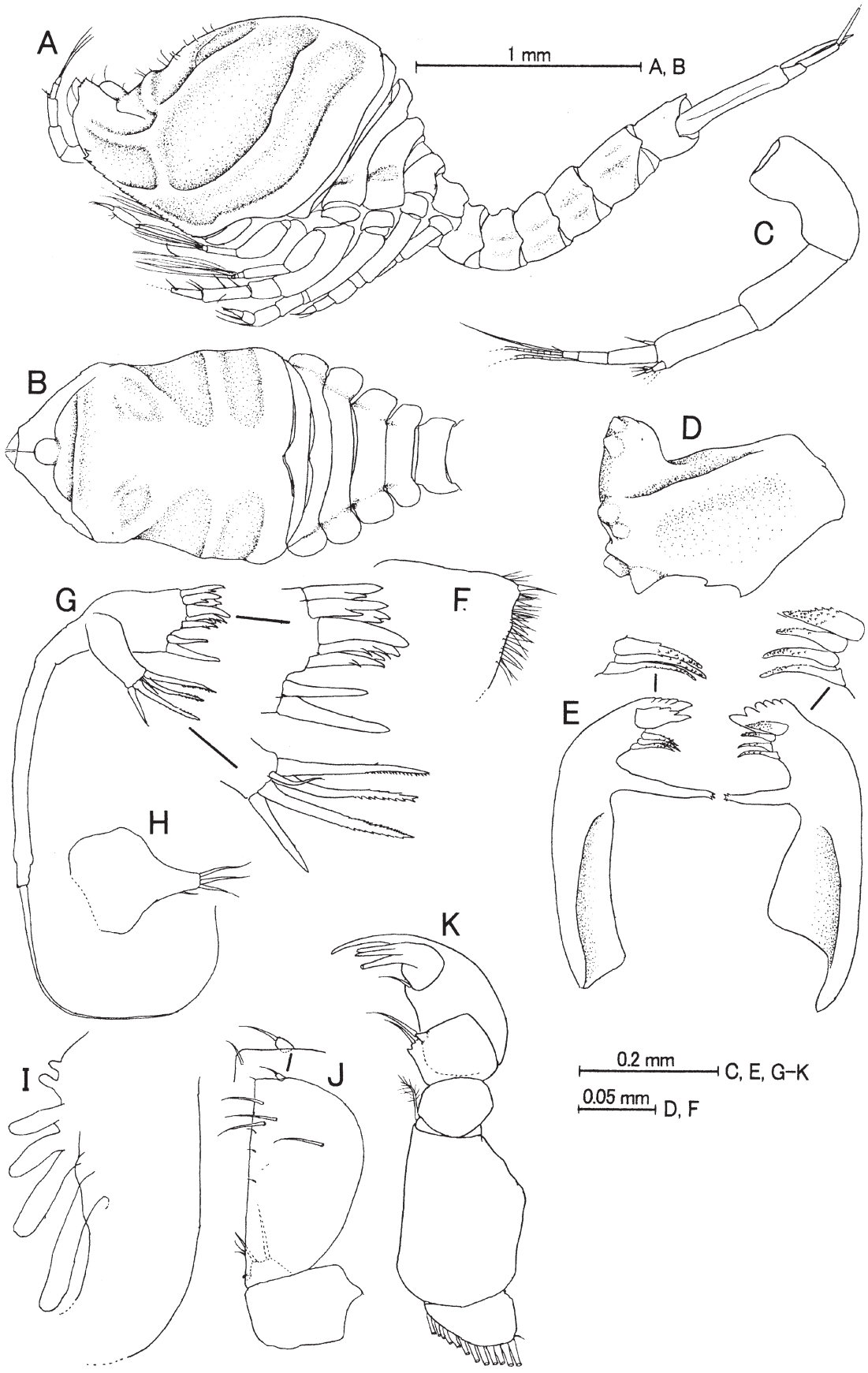

FIGURE 4. *Campylaspenis pisum* (Vassilenko and Tzareva, 2004)., ovigerous female. A, lateral view; B, anterior portion of body, from above; C, antenna 1; D, antenna 2; E, mandibles; F, labium; G, H maxilla 1 and 2; I, J, maxilliped 1; K, maxilliped 2.

Material examined. 14 ovigerous and preparatory females, 1 adult and 4 subadult males, 11 juveniles (including dissected 4 ovigerous females, 2.9–3.4 mm, 1 preparatory female, 3.2 mm, 1 adult male 3.6 mm) (NSMT Cr-22780), off Kasumi, northern coast of Hyogo prefecture, Honshu, the Sea of Japan, 35°46.11′N, 134°30.94′E–35° 46.57′N, 134° 32.09′E, 203–205 m (KT-11-9, St. K2), 3 June 2011; 4 females, 2 subadult males, 9 juveniles (including dissected 1 ovigerous female, 3.2 mm) (NSMT-22779), off Toyama, northern coast of Honshu, 37°28.77′N, 137°29.07′E–37°29.53′N, 137°28.63′E, 207–258 m (KT-11-9, St. T2), 31 May 2011; 1 subadult male, off Noto Peninsula, 37°57.06′N, 136°56.60′E–37°57.04′N, 136°58.23′E, 201–203 m (KT-11-9, St. N2), 1 June 2011.

Description. 4 ovigerous females, 2.9–3.4 mm; 2 preparatory females, 3.2, 3.4 mm. Carapace (Fig. 4A, B) 0.35–0.40 times total body length, 1.18–1.29 times as width and 1.33–1.46 times depth, covered with short setae; each side with 3 distinct oblique ridges running parallel, 1st oblique ridge branch and re-unite on dorsal surface, making encircled region; 1st and 2nd oblique ridges connected by a short vertical ridge near lower margin of carapace; pseudorostrum 0.03–0.07 times carapace length, upturned; width of round eye lobe 0.11–0.13 times carapace width , 0.9–1.2 times eye lobe length; frontal lobe with distinct transverse ridge (Fig. 7A, B); antennal notch obsolete; lower margin serrated. Pereon (Fig. 4A) 0.48–0.70 times carapace length. Pleon (Fig. 4A) 0.38–0.42 times total body length; pleon with weak lateral process on each side; pleonite 6 (Fig. 5G) 0.8 times as long as wide.

Antenna 1 (Fig. 4C), peduncle almost naked; basal article curved, 1.0–1.3 times articles 2 and 1.0–1.3 times article 3; article 3 0.9–1.1 times article 2; main flagellum tri-articulate, 0.8–0.9 times peduncle article 3; basal article 1.0 times combined length of articles 2 and 3; accessory flagellum uni-articulate, 0.3–0.4 times main flagellum article 1. Antenna 2 (Fig. 4D) uni-articulate, with 6 tubercles on distal margin. Left and right mandibles (Fig. 4E) broad at base; with robust 3 and 4 setae with many minute tubercles, respectively; molar process styliform, 3- or 4-dentate; lacinia mobilis 4-dentate; incisor process 5- or 6- dentate. Labium (Fig. 4F) with short simple setae on tip. Maxilla 1 (Fig. 4G) outer endite with 9 simple or dentate robust setae, lower 2 simple setae a little apart from the remaining setae; narrow endite with 5 ciliated, non-dentate setae; palp with terminal seta. Maxilla 2 (Fig. 4H) narrow distally, with 3 terminal and 1 subterminal setae. Maxilliped 1 (Fig. 4I, J) with 4–6 branchial lobules (Fig. 4I); merocarpus with 3–4 simple setae on distal region and 3–4 short simple seta on inner margin; dactylus minute, 0.04–0.07 times merocarpus length (Fig. 4J). Maxilliped 2 (Fig. 4K) basis 0.7–0.8 times distal articles together; ischium with plumose seta on inner distal corner; carpus with 2 tubercles and 2 simple setae on inner margin; propodus long, with 1 long terminal spines; dactylus with 3 long terminal spines. Maxilliped 3 (Fig. 5A) basis 0.6–0.7 times distal articles together, inner distal corner projected, with 1–2 plumose and 0–3 simple setae; outer distal corner with 0–2 long plumose setae; ischium with 2–3 simple setae on inner margin; merus 1.1–1.3 times combined length of carpus and propodus, with 7–9 teeth and 7–9 simple setae on inner margin, and 2–4 teeth and plumose seta on outer margin; carpus with 3–5 teeth and 2–3 simple setae on inner margin, 2–3 teeth and a plumose seta on outer margin; propodus with 4–6 teeth and 2–3 plumose setae on inner margin and plumose seta on outer distal corner; dactylus with 3 terminal setae.

Pereopod 1 (Fig. 5B) basis 0.7–0.8 times distal articles together, inner distal corner projected, with 2 plumose setae, outer distal corner with 0–1 plumose setae; ischium with 1–2 plumose setae on inner margin; merus 0.7–0.8 times combined length of carpus and propodus, with 1–2 plumose and 2–4 simple setae on inner margin, with 2–3 plumose seta on outer margin; carpus with 4–5 teeth and 2 simple setae on inner margin, 3 teeth and 2 plumose setae on outer margin; propodus with 2–3 teeth and 2 simple setae on inner margin, 3 plumose setae on outer margin; exopod flagellum of 4 articles. Pereopod 2 (Fig. 5C) basis 0.5 times distal articles together, with plumose seta on inner distal corner; dactylus 1.4–2.0 times carpus, with 9–10 setae. Pereopod 3 (Fig. 5D) basis 1.2–1.4 times distal articles together, with 2–3 plumose on lateral margin. Pereopod 4 (Fig. 5E) basis 0.9–1.0 times distal articles together. Pereopod 5 (Fig. 8F) basis 0.5–0.6 times distal articles together. Terminal setae on dactylus of pereopods 3–5 fused to the articles.

Uropod (Fig. 5G) peduncle 1.7–2.0 times pleonite 6 length, 1.8–2.4 times exopod, 1.9–2.3 times endopod, serrated on inner margin; exopod 0.9–1.0 times endopod, with long simple terminal seta; endopod uni-articulate, with 3 spiniform setae on inner margin and long terminal seta.

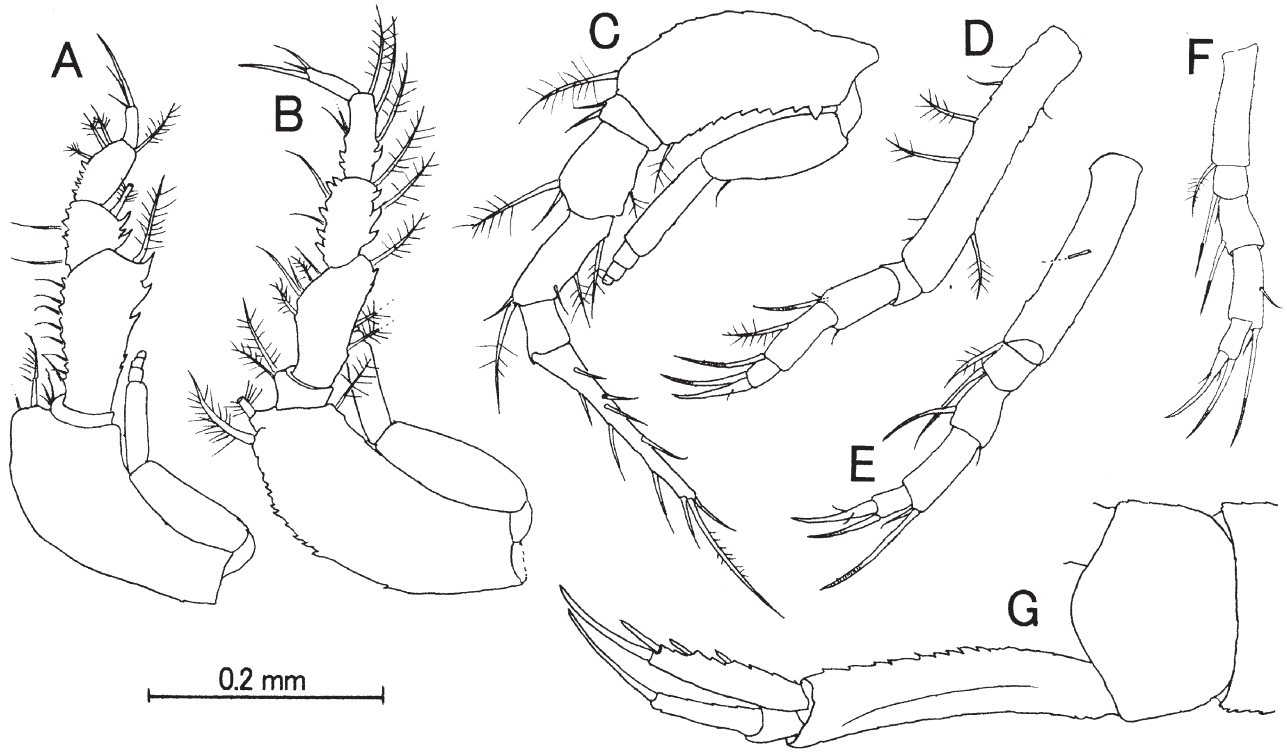

FIGURE 5. *Campylaspenis pisum* (Vassilenko and Tzareva, 2004), ovigerous female. A, maxilliped 3; B–F, pereopods 1–5; G, uropod with pleonite 6..

Adult male, 3.6 mm (Fig. 6). Carapace (Fig. 6A, B) 0.37 times total body length, 1.46 times width, 1.79 times depth, with few short setae; ridges on carapace similar to females; pseudorostrum (Fig. 6A, B) 0.06 times carapace length; width of eye lobe 0.13 times carapace width, 1.2 times eye lobe length; corneal lenses absent; antennal notch shallow (Fig. 6C); lower margin of carapace serrated. Pereon (Fig. 9A, B) 0.66 times carapace length; pereonite 5 with large penial lobes (left lobe shown in Fig. 6A, D), longer than basis of pereopod 5. Pleon (Fig. 6A) 0.39 times total body length, with lateral grooves; pleonite 6 (Fig. 6M) 0.8 times as long as wide.

Antenna 1 (Fig. 6E), peduncle basal article 1.2 times article 2 and 1.3 times article 3; article 3 0.9 times article 2. Main flagellum tri-articulate, 1.0 times peduncle article 3, with 1 aesthetasc on articles 2 and 3; accessory flagellum uni-articulate 0.4 times main flagellum article 1. Antenna 2 (Fig. 6F) peduncle articles 5 2.0 times article 4; flagellum of 20 articles, exceeding posterior end of pleon. Maxilliped 3 (Fig. 6G) basis 0.8 times distal articles together, inner distal corner with 2 plumose and 1 simple setae, outer distal corner with 2 plumose setae; merus 0.9 times combined length of carpus and dactylus, with 8 teeth and 8 short simple setae on inner margin and 5 teeth and plumose seta on outer margin; carpus with 3 teeth and 3 simple setae on inner margin, with 3 teeth and plumose seta on outer margin; propodus with 4 teeth and 3 plumose setae on inner margin and plumose seta on outer distal corner; dactylus with 3 terminal setae; exopod flagellum 5-articulate.

Pereopod 1 (Fig. 6H) basis 0.8 times distal articles together, inner distal corner with 2 long plumose setae, outer distal corner with plumose seta; merus 0.7 times combined length of carpus and propodus, with 2 plumose and 3 simple setae on inner margin, 4 teeth and 2 plumose setae on outer margin; carpus with 2 teeth and 3 simple setae on inner margin, with 1 tooth and 2 plumose setae on outer margin; propodus with 3 teeth and 2 simple setae on inner margin, with 1 tooth and 2 plumose setae on outer margin; exopod flagellum 5-articulate. Pereopod 2 (Fig. 6I) basis 0.6 times distal articles together, with plumose seta on inner and outer distal corner, respectively; dactylus 1.9 times carpus, with11 setae; exopod flagellum 6-articulate. Pereopod 3 (Fig. 6J) basis 1.4 times distal articles together; exopod flagellum 6-articulate. Pereopod 4 (Fig. 6K) basis 1.1 times distal articles together; exopod flagellum 6-articulate. Pereopod 5 (Fig. 6L) basis 0.7 times distal articles together.

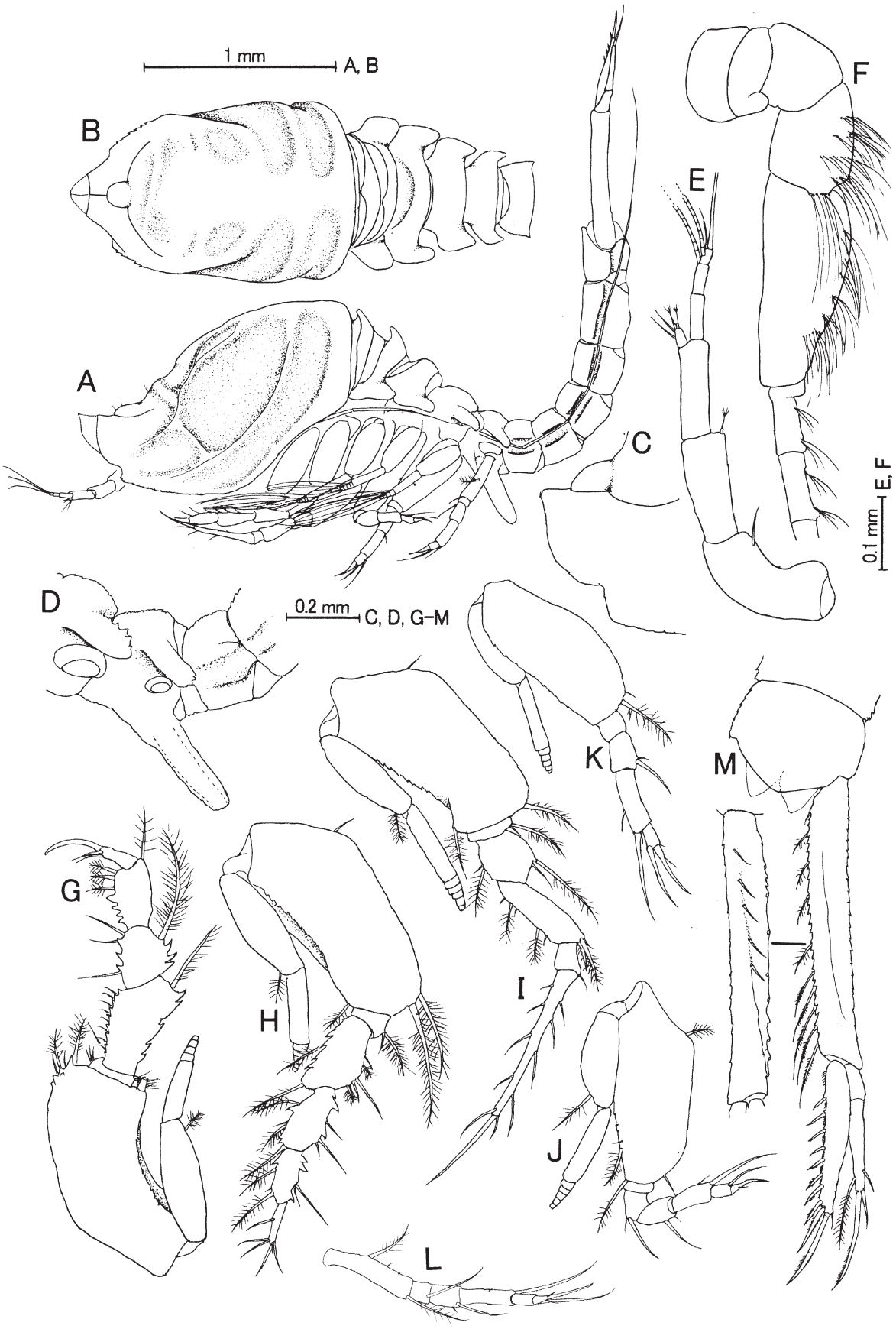

FIGURE 6. *Campylaspenis pisum* (Vassilenko and Tzareva, 2004), adult male. A, lateral view; B, anterior portion of body, from above; C, anterior portion of carapace, lateral view; D, pereonite 5 with left penial lobe, and pleonite 1, lateral view; E, Antenna 1; F, Antenna 2; G, maxilliped 3; H–L, pereopods 1–5; M, uropod with pleonite 6.

Uropod (Fig. 6M) peduncle 2.7 times pleonite 6, 2.4 times exopod and 1.9 times endopod, with 9 plumose or ciliated setae on inner margin and 5 simple setae on ventral surface; exopod 0.8 times endopod, with 2 terminal and 2 sub-terminal setae; endopod uni-articulate, with 9 spiniform setae on inner margin and terminal seta.

Remarks. This species, originally described as *Campylaspis pisum* based on female specimens collected from northern coast of the Sea of Japan, 42°40′9″N, 135°16′8″E, 865–950 m, (Vassilenko and Tzareva, 2004), is transferred to the genus *Campylaspenis* due to the presence of the large penial lobes in the adult male specimen. Other morphological characters of the Japanese specimens agree with the original description by Vassilenko and Tzareva.

Campylaspenis pisum is similar to *C. sigeogamoi*, another *Campylaspenis* species from the Sea of Japan. *Campylaspenis pisum* is distinguished from *C. sigeogamoi* by (1) a transverse ridge present on frontal lobe of carapace (not present in *C. sigeogamoi*), (2) pseudorostrum very short, 0.035–0.072 times carapace length, upturned (pseudorostrum not so short, 0.11–0.13 times carapace length, not upturned in *C. sigeogamoi*).

Campylaspenis pisum is very similar to *Campylaspis brevirostris* Akiyama, 2014 except for the presence of penial lobes in males. Upturned pseudorostrum of both species is very short, 0.035–0.072 times carapace length in *C. pisum* and 0.034–0.039 times in *C. brevirostris* (based on the drawings of the 5 type specimens described in Akiyama, 2014). However, in addition to the morphological characters in Akiyama (2014), *Campylaspenis pisum* is distinguished from *Campylaspis brevirostris* by (1) relative length of basis to combined length of distal articles in maxilliped 3 and pereopod 1 are 0.6–0.8 for maxilliped 3 and 0.7–0.8 for pereopod 1 in females (0.9–1.0 for maxilliped 3 and 1.0–1.1 for pereopod 1 in *C. brevirostris*), (2) finger-like process absent on propodus of maxilliped 3 in adult male (present in *C. brevirostris*, Fig. 6B, C).

Distribution. Russian and Japanese coast of the Sea of Japan, 865–950 m in Russia and 201–258 m in Japan.

Genus *Campylaspis* Sars, 1865

Campylaspis crispa Lomakina, 1955

(Figs. 7–9)

Campylaspis crispa Lomakina, 1955: 132–133, figs. 32, 33.
Campylaspis sp. 1 Akiyama, 2014: 167–168.

Diagnosis. Females: Carapace with three distinct oblique ridges on each side, connected on dorsal surface; short vertical ridge connecting 1st and 2nd oblique ridges; 1st oblique ridge branch and re-unite on dorsal surface, making encircled region; pseudorostrum 0.08–0.14 times carapace length, not upturned; eye lobe semicircular; frontal lobe with no transverse ridge. Pereopod 1 inner distal corner projected. Uropod peduncle 1.8–2.1 times pleonite 6, 2.4–3.0 times exopod and 2.1–2.7 times endopod. Males. Genital pore present under ventral surface of pereonite 5; uropod peduncle 2.4–3.0 times pleonite 6, 2.6–2.7 times exopod and 2.0–2.2 times endopod; exopod 0.8 times endopod .

Material examined. 17 females, 4 males, 9 juveniles (includind dissected 3 ovigerous females, 3.8–4.3 mm, 2 preparatory females, 3.9, 4.1 mm, 3 adult males, 4.7–5.2 mm) (NSMT Cr-32969), off Esashi, Hokkaido, the Sea of Japan, 41°47.46′N, 139°34.49′E–41° 48.96′N, 139° 34.88′E, 563–605 m (KT-11-9, St. E3), 29 May 2011; 14 females, 4 males, 10 juveniles (NSMT Cr-22790), off Esashi, Hokkaido, the Sea of Japan, 41°50.26′N, 139°34.03′E–41°48.70′N, 139° 34.18′ E, 388–538 m (KT-11-9, St. E2), 29 May 2011; 53 females, 6 adult and 16 subadult males, 11 juveniles (NSMT Cr-22789), Musashi Bank, 44°40.48′N, 140°02.38′E–44°39.53′N, 140°002.83′E, 198–206 m (KT-11-9, St. M2), 28 May 2011; 3 females, 6 juveniles, 3 manca, Toyama Bay, 37°28.77′N, 137°29.07′E–37°29.53′N, 137°28.63′E, 207–258 m (KT-11-9, St. T2), 31 May 2011; 13 females, 7 males, 29 juveniles, 12 manca (NSNT Cr-22791), 37°19.80′N, 137°33.38′E–37°20.02′N, 137°34.20′E, 561–583 m (KT-11-9, St. T4), 1 June 2011; 8 females, 4 males, 13 juveniles, Toyama Bay, 37°18.45′N, 137°31.77′E–37°18.66′N, 137°32.85′E, 794–808 m (KT-11-9, St. T5), 1 June 2011.

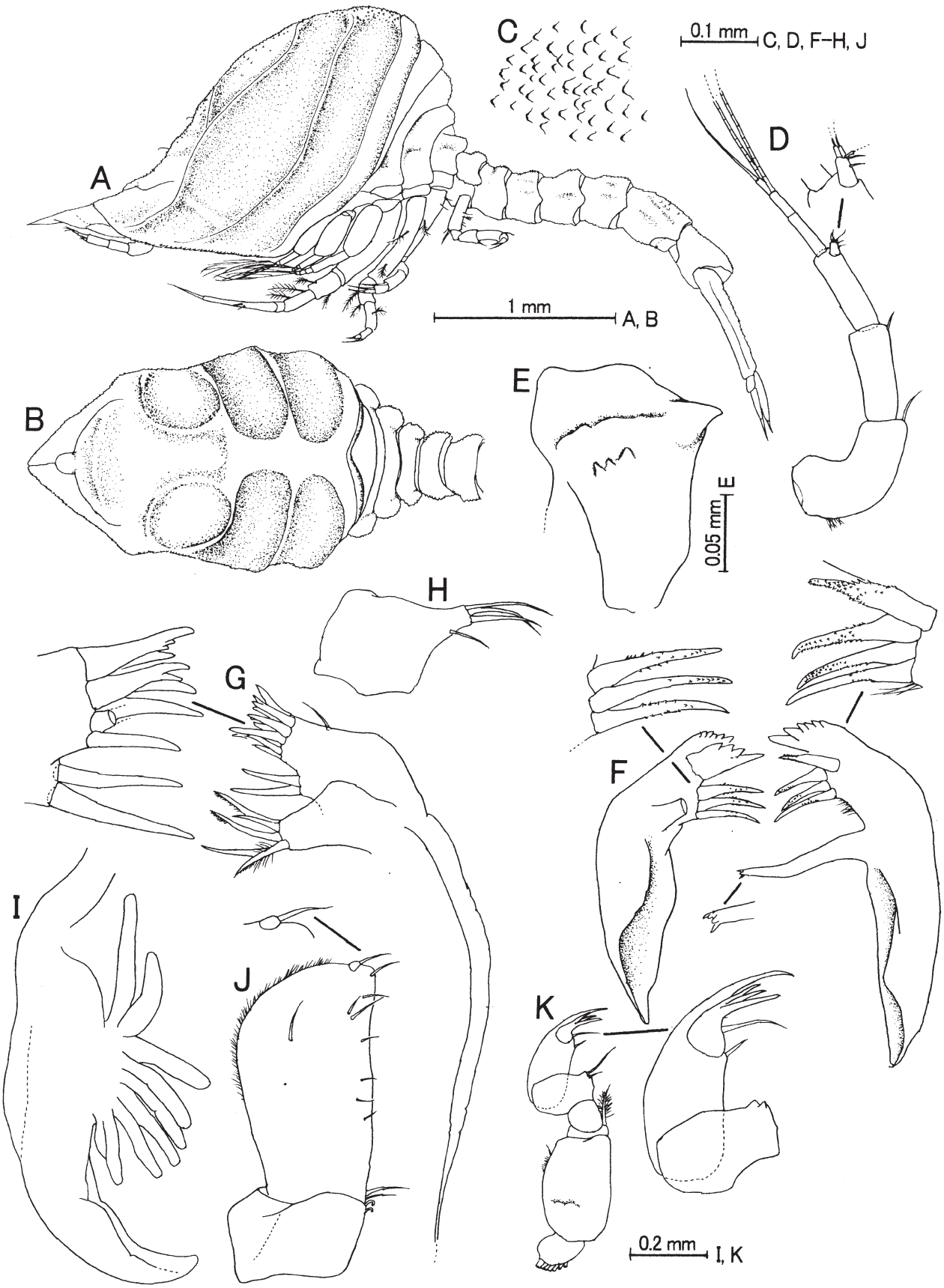

FIGURE 7. *Campylaspis crispa* Lomakina, 1955 ovigerous female. A, lateral view; B, anterior portion of body, from above; C, integument of carapace; D, antenna 1; E, antenna 2; F, mandibles; G, maxilla 1; H, maxilla 2; I, J, maxilliped 1;K, maxilliped 2.

Description. 5 ovigerous females, 3.6–4.3 mm (Figs. 7, 8). Carapace (Fig. 7A, B) 0.43–0.45 times total body length, 1.36–1.43 times width and 1.69–1.83 times depth, with sparse short setae; integument covered with scale-like sculpture (Fig. 7C); each side with 3 distinct oblique ridges running parallel, connected at dorsal surface, 1st oblique ridge branch and re-unite on dorsal surface, making encircled round region; 1st and 2nd oblique ridges connected by a short vertical ridge near lower margin of carapace; third oblique ridge running near posterior end of carapace; pseudorostrum 0.08–0.14 times carapace width, not upturned; width of semicircular eye lobe 0.07–0.10 times carapace width, 0.9–1.1 times eye lobe length; frontal lobe with faint or no transverse ridge; antennal notch obsolete; lower margin with minute teeth. Pereon (Fig. 7A) 0.30–0.50 times carapace length. Pleon (Fig. 7A) 0.36–0.39 times total body length; pleonite 2–5 with weak lateral ridge on each side; pleonite 6 (Fig. 8G) length 0.8–0.9 times as long as wide.

Antenna 1 (Fig. 7D), peduncle basal article curved, 1.2–1.4 times articles 2 and 1.3–1.5 times article 3, with an simple seta on distal corner; article 2 with 1 short simple seta on distal corner; article 3 0.9–1.0 times article 2; main flagellum tri-articulate, 0.9–1.1 times peduncle article 3; basal article 1.0–1.3 times combined length of articles 2 and 3; accessory flagellum uni-articulate, 0.3 times article 1 of main flagellum. Antenna 2 (Fig. 7E) uni-articulate, without setae. Left and right mandibles (Fig. 7F) broad at base; with 3 and 4 robust setae with many minute tubercles respectively; molar process styliform, 4-dentate; lacinia mobilis 4-dentate; incisor process 6 dentate. Maxilla 1 (Fig. 7G) outer endite with 9 dentate or simple robust setae, lower 2 setae a little apart from the other setae; narrow endite with 5 ciliated or simple setae; palp with terminal seta. Maxilla 2 (Fig. 7H) narrow distally, with 3 terminal and 1 subterminal setae. Maxilliped 1(Fig. 7I, J) with 9 branchial lobules; merocarpus with 3–5 simple setae on distal region and 3–5 short simple setae on inner margin; dactylus minute, 0.040– 0.056 times merocarpus length. Maxilliped 2 (Fig. 7K) basis 0.7–0.9 times distal articles together; ischium with plumose seta on inner distal corner; carpus with 2 tubercles and 2 simple setae on inner margin; joint between carpus and propodus strongly bend; propodus long, with 1 long terminal spine; dactylus with 3 long terminal spines; coxa with 7–8 setae. Maxilliped 3 (Fig. 8A) basis 0.7–0.8 times distal articles together; inner distal corner projected, with 2 plumose setae and 2–5 spines; outer distal corner with 1–2 plumose setae; ischium short; merus 1.1–1.2 times combined length of carpus and propodus, with 8–10 teeth and 6–7 short simple setae on inner margin and 4–10 teeth and 1 plumose seta on outer margin; carpus with 2–4 teeth and 3 plumose and 0–1 simple setae on inner margin and 3 teeth and plumose seta on outer margin; propodus 1.7–2.1 times dactylus, with 5 teeth and 2 plumose setae on inner margin and 1 plumose seta on outer distal corner; dactylus with 3 terminal setae; exopod flagellum of 3 articles.

Pereopod 1 (Fig. 8B) basis 0.8–0.9 times distal articles together; inner distal corner projected, with 2 plumose setae; outer distal corner with 0–1 simple seta; ischium with plumose seta and 0–1 short simple seta on inner margin; merus 0.7–0.8 times combined length of carpus and propodus, with 0–1 tooth, 2 plumose and 3 simple setae on inner margin, 3–6 teeth and 2 plumose setae on outer margin; carpus with 3–5 teeth and 2–3 simple setae on inner margin, 2 plumose setae on outer margin; propodus with 2–3 teeth and 3 simple seta on inner margin, 2–3 plumose and 0–1 simple setae on outer margin; dactylus with 1–2 terminal setae; exopod flagellum of 4 articles. Pereopod 2 (Fig. 8C) basis 0.5–0.6 times distal articles together, with plumose seta on distal corner; dactylus 1.3–1.6 times carpus, with 8–11 simple setae; exopod flagellum of 4 articles. Pereopod 3 (Fig. 8D) basis 1.3–1.5 times distal articles together, with 3 plumose and 2 simple setae on lateral margin. Pereopod 4 (Fig. 8E) basis 0.8–1.0 times distal articles together, with 1–2 plumose and 1 simple setae on lateral margin. Pereopod 5 (Fig. 8F) basis 0.5 times distal articles together.

Uropod (Fig. 8G) peduncle 1.8–2.1 times pleonite 6 length, 2.4–3.0 times exopod, 2.1–2.7 times endopod, inner and outer margin serrated; exopod 0.9 times endopod, with long and short simple terminal seta; endopod uni-articulate, with 4 spiniform setae on inner margin and terminal seta.

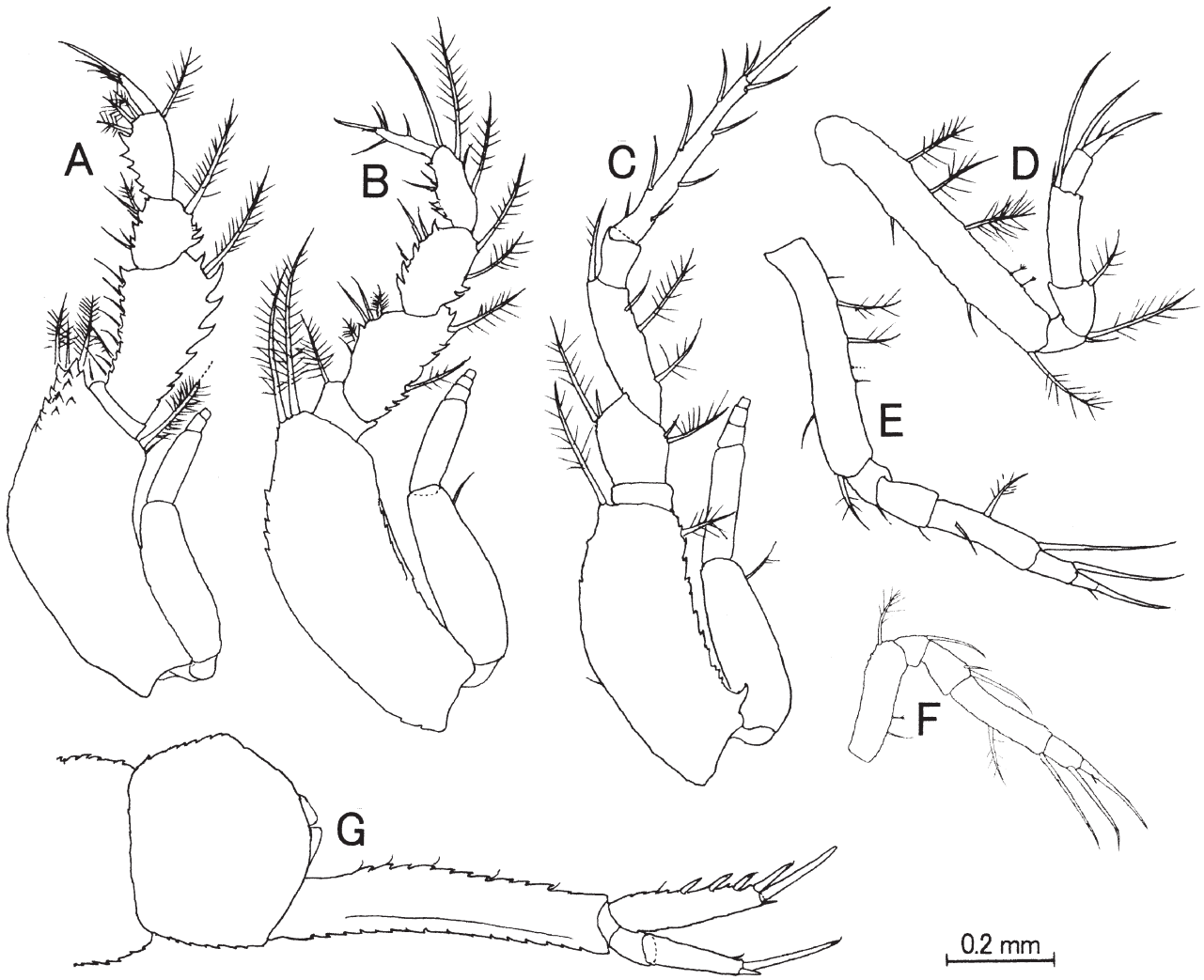

FIGURE 8. *Camplaspis crispa* Lomakina, 1955, ovigerous female. A, maxilliped 3; B–F, pereopods 1–5; G, uropod with pleonite 6.

3 adult males, 4.7–5.2 mm (Fig. 9). Carapace (Fig. 9A, B) 0.37–0.40 times total body length, 1.41–1.47 times width, 2.01–2.14 times depth, with few short setae; each side with distinct 3 oblique ridges connected at dorsal surface; 1 short vertical ridge connects 1st and 2nd oblique ridges; pseudorostrum (Fig. 9A–C) 0.076–0.079 times carapace length, not upturned; width of eye lobe 0.10–0.12 times carapace width, 1.0–1.2 times eye lobe length; corneal lenses absent; frontal lobe without transverse ridge; antennal notch shallow (Fig. 9C); lower margin of carapace not serrated. Pereon (Fig. 9A, B) 0.54–0.67 times carapace length; pereonite 5 with a couple of genial pores (arrowheads) near basal region of pereopod 5 (Fig. 9D, E); Pleon (Fig. 9A) 0.38–0.39 times total body length, with lateral grooves; pleonite 6 0.8–1.0 times as long as wide.

Antenna 1 (Fig. 9F), peduncle basal article curved, 1.4–1.6 times article 2 and 1.4–1.6 times article 3; article 3 0.9–1.0 times article 2; Main flagellum tri-articulate, 1.2 times peduncle article 3; articles 2 and 3 with 1 aesthetasc, respectively; accessory flagellum uni-articulate, 0.3–0.4 times main flagellum article 1. Antenna 2 (Fig. 9G) peduncle articles 4 and 5 with numerous setae; peduncle article 5 2.0–2.2 times article 4; flagellum of 20 articles, exceeding posterior end of pleon. Maxilliped 3 (Fig. 9H) basis 1.0 times distal articles together, with 0–1 plumose setae on inner margin, 2 plumose setae on outer distal corner; merus 1.0–1.1 times combined length of carpus and propodus, with 7–10 teeth and 6–7 simple setae on inner margin, 7–8 teeth and plumose seta on outer margin; carpus with 3–4 teeth and 3 simple setae on inner margin, 2–3 teeth and plumose seta on outer margin; propodus with 4–5 teeth and 3 plumose setae on inner margin, plumose seta on outer distal corner; dactylus with 3–4 terminal setae; exopod flagellum 6-articulate.

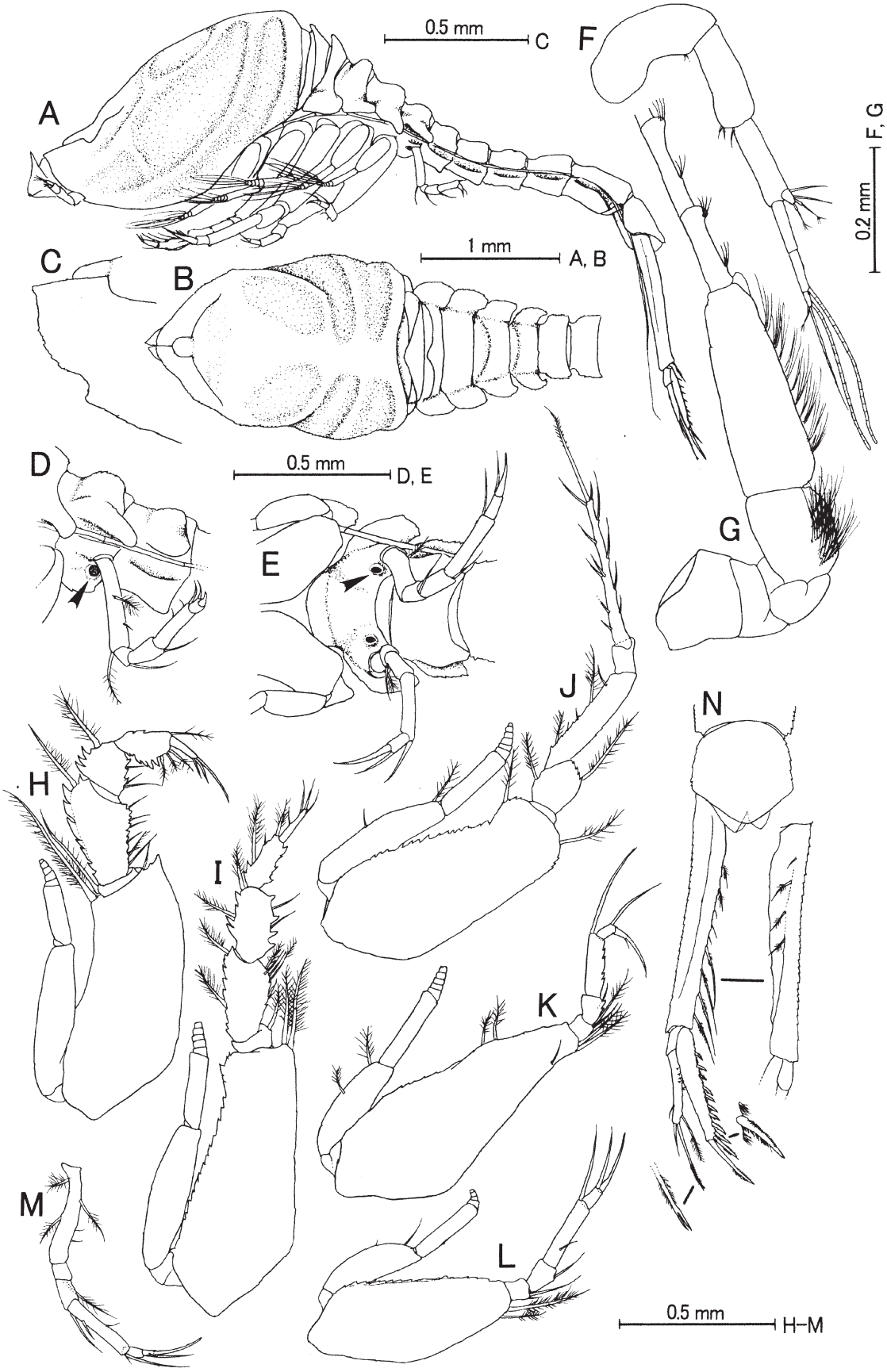

FIGURE 9. *Campylaspis crispa* Lomakina, 1955, adult male. A, lateral view; B, anterior portion of body, from above; C, anterior portion of carapace, lateral view; D, pereonite 5 with pereopod 5, lateral view; E, pereonite 5 with pereopod 5, view from below; F, G, antenna 1 and 2; H, maxilliped 3; I–M, pereopods 1–5; N, uropod with pleonite 6.

Pereopod 1 (Fig. 9I), basis 0.9–1.0 times distal articles together; inner distal corner of basis projected, with 2 plumose setae; merus 0.7 times combined length of carpus and propodus, with 2–3 plumose and 3 simple setae on inner margin, 7–8 teeth and 2 pluumose setae on outer margin; carpus with 4 teeth and 2–3 simple setae on inner margin, 3–5 teeth and 2 plumose setae on outer margin; propodus with 3 teeth on inner margin, 2 teeth and 2–3 plumose setae on outer margin; exopod flagellum 6-articulate. Pereopod 2 (Fig. 9J) basis 0.7 times distal articles together, with plumose seta on inner and outer distal corner, respectively; dactylus 1.2–1.4 times carpus, with 11–12 setae; exopod flagellum 7-articulate. Pereopod 3 (Fig. 9K) basis 1.7–2.0 times distal articles together, with 2 plumose setae on outer margin; exopod flagellum 6-articulate. Pereopod 4 (Fig. 9L) basis 1.1–1.2 times distal articles together, with 2 plumose setae on inner distal corner, exopod flagellum of 5 articles. Pereopod 5 (Fig. 9M) basis 0.6–0.7 times distal articles together, with 2–3 plumose setae on lateral margin.

Uropod (Fig. 9N) peduncle 2.4–3.0 times pleonite 6, 2.6–2.7 times exopod and 2.0–2.2 times endopod, with 8–9 setae on inner margin; exopod 0.8 times endopod, with ciliated seta on inner margin and 2 terminal setae; endopod uni-articulate, with 10 spiniform setae on inner margin and terminal seta.

Remarks. The original description of *Campylaspis crispa* was based on female specimens from Petra Verikogo, Russian coast of the Sea of Japan (Lomakina, 1955). Akiyama (2014) did not assign Japanese specimens (*Campylaspis* sp. 1) to *C. crispa*, due to the different lengths of the uropod peduncle to the endopod (twice in Japanese specimens, three times in Russian specimens). However, on closer inspection, considerable variation in the ratio (2.1–2.7 to endopod) in the Japanese specimens shows that they should be identified as *C. crispa*.

Female specimens of *Campylaspis crispa* closely resemble females of *Campylaspenis sigeogamoi*, but are distinguished by (1) 3 oblique ridges on carapace distinct (weak in *C. sigeogamoi*), (2) anterior end of scale-like sculpture on carapace not forming minute spine (forming minute spine directed outward in *C. sigeogamoi*), and (3) uropod peduncle not slender (slender in C. *sigeogamoi)*. Comparing the specimens from the same sediment sample (KT-11-9, St. E3), the total body length of *C. crispa* (3.8–4.3 mm in ovigerous females, 3.9, 4.1 mm in preparatory female, 4.7–5.2 mm in adult males) was larger than *C. sigeogamoi* (3.0–3.4 mm in ovigerous females, 3.8–3.9 mm in adult males).

In adult male specimens, a pair of large genital pores are present on the ventral surface of pereonite 5, as is also found in *Campylaspis brevirostris*.

Distribution. Russian and Japanese coast of the Sea of Japan, 10–994 m in Russia and 198–808 m in Japan.

Campylaspis brevirostris Akiyama, 2014

(Fig. 10)

Campylaspis brevirostris Akiyama, 2014: 161–167, figs. 1–3.

Diagnosis. Females; carapace antero-posteriorly compressed, each side with 3 weak oblique ridges; broad transverse ridge running on frontal lobe; upturned pseudorostrum very short, 0.034–0.039 times carapace length; eye lobe semicircular. Maxilliped 3 basis inner distal corner projected; merus, carpus and dactylus serrate on inner margin. Pereopod 1 basis inner distal corner projected. Uropod peduncle 1.50–1.63 pleonite 6, 1.9–2.1 times endopod; exopod longer than endopod. Male. Pereonite 5 with genital pores on ventral surface. Maxilliped 3 propodus with finger-like process. Uropod peduncle 2.3 times pleonite 6 and 1.9 times endopod.

Material examined. 1 adult male, 3.3 mm (NSMT Cr-32970), off Esashi, northern coast of Hokkaido, the Sea of Japan, 41°47.46′N, 139°34.49′E–41° 48.96′N, 139° 34.88′E, 563–605 m, (KT-11-9, St. E3), 29 May 2011.

Other material. 1 preparatory female, 2 juveniles, 3 manca, Toyama Bay, 37°28.45′N, 137°28.15′E–37°29.18′N, 137°28.86 ′, 160–173 m, 31 May 2011 (KT-11-9, St. T1); 3 ovigerous females, 7 preparatory females, 2 subadult males, 11 juveniles, 4 manca, Toyama Bay, 37°29.18′N, 137°33.25′E–37°29.35′N, 137°31.96′E, 383–460 m, 31 May, 2011 (KT-11-9, St. T3); 4 ovigerous females, 3 preparatory females, 2 subadult males, 6 juveniles, 1 manca, Toyama Bay, 37°19.80 N, 137°33.38′E–37°20.02′N, 137°34.20′E, 561–583 m, 1 June, 2011 (KT-11-9, St. T4); 9 ovigerous females, 2 preparatory females, 1 subadult male, 8 juveniles, Toyama Bay, 37°18.45′N, 137°31.77′E–37°18.66′N, 137°32.85′E, 794–808 m, 1 June, 2011 (KT-11-9, St. T5); 1 subadult male, 3 juveniles, 1 manca, north of Noto Peninsula, 37°57.06′N, 136°56.60′E–37°57.04′N, 136°58.23′E, 201–203 m, 1 June, 2011 (KT-11-9, St. N2) ; 5 ovigerous females, 1 preparatory female, 4 juveniles, north of Noto Peninsula, 38°03.25′N, 136°53.39′E–

38°03.82′N, 136°55.13′E, 402–411 m, 1 June, 2011 (KT-11-9, St. N3); 1 preparatory female, 2 subadult males, 6 juveniles, 1 manca, north of Noto Peninsula, 38°08.04′N, 136°49.64′E–38°09.00′N, 136°51.20′E, 603–622 m, 1 June, 2011 (KT-11-9, St. N4).

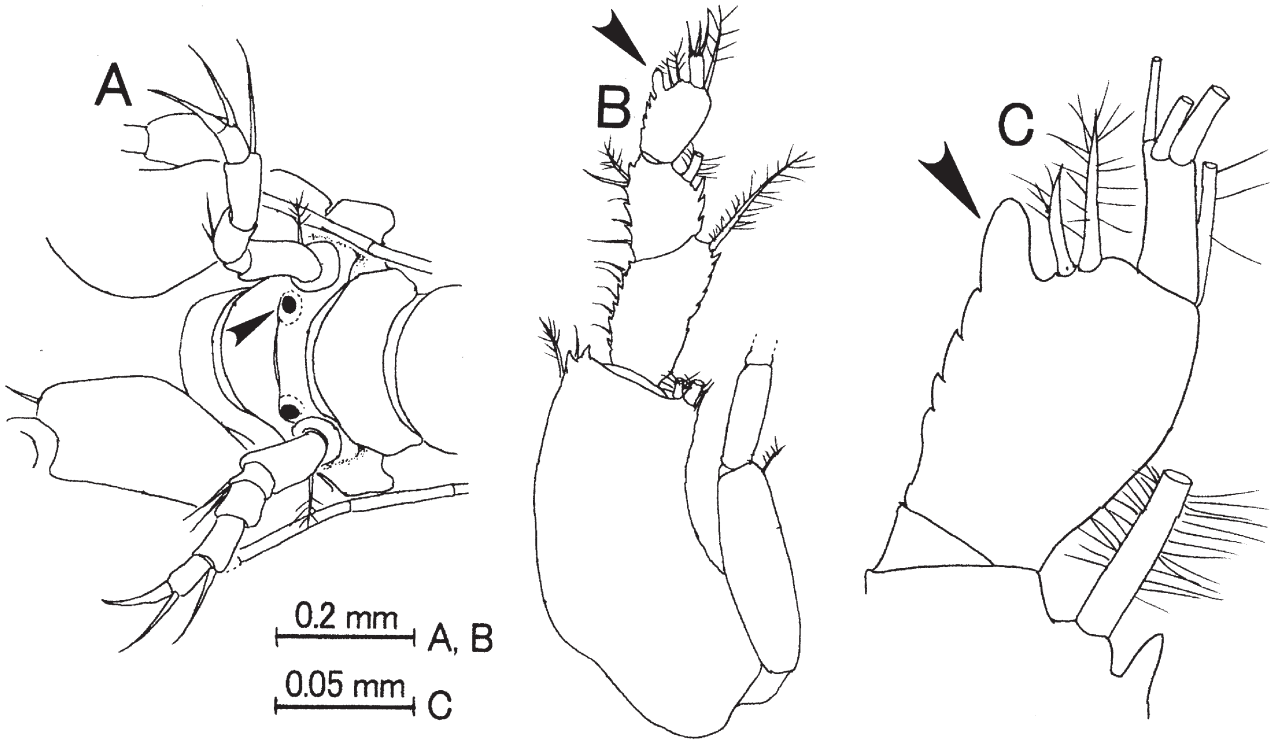

FIGURE 10. *Campylaspis brevirostris* Akiyama, 2014, adult male. A, pereonite 5 with pereopod 5, view from below; B, maxilliped 3; C, propodus and dactylus of maxilliped 3.

Remarks. An additional adult male specimen found in the present study agrees well with a male specimen in the original description (Akiyama, 2014). A noteworthy character is a pair of large genital pores on the ventral surface of pereonite 5 (arrowhead in Fig. 10A), also found in *C. crispa*.

Campylaspis brevirostris closely resembles *C. bacescui* from the southern coast of Argentine, Falkland Isles, Straight of Magellan, 82–361 m, western Atlantic, but is distinguished by (1) lower margin of carapace serrated in both sexes (anterior half of lower margin serrated in female, not serrated in male of *C. bacescui*), (2) carapace of adult male is not dorso-ventrally compressed, but is spherical (dorso-ventrally compressed in *C. bacescui*), (3) propodus of maxilliped 3 with finger-like process in adult male (without finger-like process in *C. bacescui*).

Distribution. Japanese coast of the Sea of Japan, 160–808 m

Discussion

The type species of the genus *Campylaspenis*, *C. rowei*, was described only on the holotype adult male specimen. Gerken (2012) described *C. tangaroae*, second species of the genus based on both males and females, noting that "It is not possible to distinguish females of this genus from *Campylaspis*....". Also in this study, *Campylaspenis* could only be distinguished from *Campylaspis* by the presence of long penes in adult males.

The genus *Campylaspis* consists of more than 200 species (Watling and Gerken, 2019), and shows considerable variation in morphology of carapace and appendages (see illustrations by, Sars, 1900; Jones, 1974; Lomakina, 1958; Muradian-Ciamician, 1980; Ledyer, 1993; Petrescu, 2006, 2018; Gerken , 2012). The four species described in this study, *Campylaspenis sigeogamoi* sp. nov., *Campylaspenis pisum* (Vassilenko and Tzareva, 2004), *Campylaspis crispa* Lomakina, 1955, and *Campylaspis brevirostris* Akiyama, 2014 are similar to each other, suggesting these four species may share a common ancestor. The noteworthy morphological characters are:

Carapace. The four species are characterized by 3 oblique ridges running parallel; the first one branches and re-unite dorsally, making two encircled areas. The first and second oblique ridges are connected by a short vertical ridge; however, this ridge is almost lost in *Campylaspenis sigeogamoi* and *Campylaspis brevirostris*.

Male pereonite 5. Length of the penial lobes in *Campylaspenis sigeogamoi* and *C. pisum*, similar to the previously known two species of the genus, is longer than basis of pereopod 5. In *Campylaspis crispa* and *C. brevirostris*, the ventral surface of pereonite 5 has a pair of genital pores.

Antenna 1. Main flagellum of antenna 1 is subequal in length or shorter than peduncle article 3.

Female antenna 2. Uni-articulate, without setae.

Mandibles. Number of setae on the inner margin of mandibles in the genus *Campylaspis* is 3–6, each of which is ciliated or with tubercles (Sars, 1900; Gerken, 2012). The four species have 3 or 4 setae, with many minute tubercles.

Maxilla 1. Lower 2 setae on outer endite are apart a little from the other setae; inner endite without dentate setae. Maxilla 1 palp with 1 or 2 terminal setae in *Campylaspis* (Gerken, 2012). The four species have 1 terminal seta.

Maxilla 2. Based on the shape of this appendage, Muradian (1979) proposed a subgenus of *Campylaspis*, *Sarsicuma* ("distal edge broad and truncate") and *Bacescuma* ("distal edge pointed"). Although these subgenera seem to have not been accepted, *Campylaspis* maxilla 1 is possibly classified into the following two types, (1) distal margin broad, with 6 setae, and (2) distal margin narrow, with 3 terminal (and 1 subterminal) setae (e. g., Sars, 1900; Muradian-Ciamician, 1980; Gerken, 2012). The four species in the present study are characterized by the type 2 (narrow) morphology.

Maxilliped 1. The dactylus in all four species is minute, around 0.05 times merocarpus length (the ratio in *C. brevirostris* is based on the drawings of 4 type specimens described in Akiyama, 2014); merocarpus with 3–5 simple setae on distal half, 3–5 short simple setae on inner margin.

Maxilliped 2. In previous studies, the spines on the dactylus of maxilliped 2 have been a focus in description of *Campylaspis* species. Other noteworthy characters of the appendage are (1) relative length of basis to combined length of distal articles and (2) shape of propodus. This appendage of the four species is characterized by (1) basis subequal in length, or shorter than distal articles together, and (2) propodus elongate, joint between propodus and carpus strongly bent.

Maxilliped 3. In the genus *Campylaspis*, this appendage shows considerable variation. Morphological characters shared by the four species are (1) inner distal corner of basis projected, (2) many teeth present on inner margin of merus, carpus and propodus (3) elongate merus narrow at basal region.

Pereopd 1. This appendage of the four species is similar to maxilliped 3, except for a lesser number of teeth on the merus and propodus, compared to maxilliped 3.

The morphological characters of *Campylaspenis rowei* of the carapace, maxillipeds 1–3, pereopods 1– 2, and uropods (Bacescu and Muradian, 1974) agree with the characters mentioned above for the Japanese species. Characters of male *C. tangaroae* specimens (Gerken, 2012) also agree with most of characters of the four Japanese species. It is notable that among the four species reported in this study, *Campylaspenis pisum* and *Campylaspis brevirostris* have similar carapace morphology including (1) distinct transverse ridge on frontal lobe of carapace, and (2) very short, upturned pseudorostrum. *Campylaspenis sigeogamoi* and *Campylaspis crispa* also share carapace morphology including (1) no transverse ridge on frontal lobe, and (2) normal, not-upturned pseudorostrum.

In other cumacean families and genera, morphological characters of adult males, including unusual clasping forms of male antenna 2, have been regarded as reliable generic level characters in cumacean taxonomy (for example, Gerken, 2018), without significant taxonomic problems. However, the similarity of the carapace morphology in the two pairs of Japanese *Campylaspenis* and *Campylaspis* species suggests that presence of penial lobes may not be a generic level character. It is possible that the presence or absence of a penial lobe could strongly affect reproductive isolation of species living near to each other. If the penial lobe is considered as a simple tube extending from the genital pore, it is possible that it could evolve relatively rapidly as a means of reproductive isolation. Among the four species in this study, specimens of three of the species were found at the same sampling site. Recently, molecular analyses have begun to focus on cumacean phylogeny, including the genus *Campylaspis* (Uhlir *et al.*, 2021; Gerken *et al.*, 2023). The relationship between *Campylaspis* and *Campylaspenis* may be revealed only by molecular study.

Key to species of *Campylaspis* and *Campylaspenis* from the Sea of Japan

1. Carapace without ridges, tubercles or depressions . . . 2
- Carapace with ridges, tubercles or depressions . . . 4
2. Maxilliped 3 merus wide . . . 3
- Maxilliped 3 merus narrow . . . *Campylaspis orientalis* Calman, 1911
3. Female. Pereopod 1 merus longer than carpus, uropod endopod less than twice as peduncle length . . . *Campylaspis rubicunda* (Lilljeborg, 1855)
- Female. Pereopod 1 merus subequal in length to carpus; uropod endopod twice as peduncle length . . . *Campylaspis glabra* Sars, 1879
4. Carapace with tubercles on dorsal surface; pleonite 5 narrow at middle region . . . 5
- Carapace with 3 oblique ridges, without tubercles on dorsal surface; pleonite 5 not narrow at middle region . . . 6
5. Carapace with wide depression on side . . . *Campylaspis clavata* Lomkina, 1958
- Carapace with narrow sulcus on side . . . *Campylaspis papillata* Lomakina, 1952
6. Maxilliped 3 merus not elongate, basis inner distal corner not projected . . . 7
- Maxilliped 3 merus elongate, basis inner distal corner projected . . . 8
7. 2nd oblique ridge of carapce branch . . . *Campylaspis costata speciosa* Lomakina, 1955
- 2nd oblique ridge of carapace not branch . . . *Campylaspis vassilenkoae* Lavrentiva and Tzareva, 2013
8. Carapace with a transverse ridge on frontal lobe, pseudorostrum upturned, very short . . . 9
- Carapace without transverse ridges on frontal lobe, pseudorostrum normal . . . 10
9. Female. Oblique ridges on carapace prominent, basis of maxilliped 3 shorter than remaining articles together: Male. Large penial lobes present on pereonite 5 . . . *Campylaspenis pism* (Vassilenko and Tzareva, 2004)
- Oblique ridges on carapace weak, basis of maxilliped 3 subequal in length to remaining articles together: Male. Penial lobes absent . . . *Campylaspis brevirosttris* Akiyama, 2014
10 Female. carapace with minute spines, oblique ridges weak: Male. Large penial lobes present on pereonite 5 . . . *Campylaspenis sigeogamoi* **sp. nov.**
- Female. carapace without minute spines, oblique ridges prominent; Male. Penial lobes absent . . . *Campylaspis crispa* Lomakina, 1958

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