

Three New Species of *Spectrarcturus* (Isopoda: Valvifera: Arcturidae) from Kumano Basin, Southwestern Japan

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Three new species of the genus *Spectrarcturus* Schultz, 1981 (Arcturidae) are described from Kumano-Basin, Japan: *S. regularis* sp. nov., *S. bispinosus* sp. nov., and *S. crassibrevis* sp. nov. *Spectrarcturus regularis* sp. nov. resembles *S. murchiei* (Benedict, 1898) from North Pacific and Arctic waters around Greenland, *S. hystrix* (Sars, 1877) from northernmost North Atlantic Ocean, and *S. intermedius* (Richardson, 1899) from northernmost North Pacific, in the following features: head with 2 supraocular spines; pereonites 1–3 and 5–7 each with 2 submedial spines; pleon with 6 lateral spines. However, *S. regularis* sp. nov. is distinguished from these three species by the following combination of characters: body covered with long spines; head with 2 supraocular spines and 2 posterior supraocular spines; pereonite 1 with 2 submedial and 4 lateral spines; pereonites 2 to 7 with 2 submedial spines. *Spectrarcturus bispinosus* sp. nov. is separated from its congeners by the following combination of characters: body with numerous small tubercles; pereonite 3 with 2 blunt submedial spines. *Spectrarcturus crassibrevis* sp. nov. differs from its congeners by the following combination of characters: pereonites 1–7 each with 2–4 short blunt submedial spines; pleotelson with 4 short blunt submedial and 2 lateral spines. This study provides the first species of the genus to be described and found in Japan, and southernmost distributional record of the genus. An amended diagnosis of the genus and key to the species are provided.

Key Words: marine isopod, *Spectrarcturus*, new species, new record, Japan.

Introduction

Arcturidae is a family in the suborder Valvifera, with 164 species and 14 genera reported worldwide, and 16 species of six genera have been reported from Japan (Nunomura and Shimomura 2011a, b; Ota et al. 2025; Boyko et al. 2026). This family is found from shallow waters to the deep sea, and all species are benthic-filter feeders (Poore 2001; Castelló et al. 2018).

The genus *Spectrarcturus* Schultz, 1981 comprises eight species, most of which are found in the Bering Sea and the Sea of Okhotsk in the Northern Hemisphere: six species [*S. chlebovitschi* (Kussakin, 1972), *S. fabulosus* (Gurjanova, 1955), *S. furcatus* (Kussakin, 1982), *S. intermedius* (Richardson, 1899), *S. iturupicus* (Kussakin and Mezhev, 1979) and *S. toporoki* (Kussakin, 1972)] are distributed in the northwest North Pacific (Bering Sea, Kurile Islands, Aleutian Islands and Sea of Okhotsk) from 5 to 414 meters (Kussakin 1972, 1982; Kussakin and Mezhev 1979; Kussakin and Vasina 1990; Stransky et al. 2020), *S. hystrix* (Sars, 1877) is recorded from the northernmost North Atlantic Ocean from 600 to 1150 meters (Hansen 1916; Stransky et al. 2020), and *S. murchiei* (Benedict, 1898) is reported from the North Pacific and Arctic waters around Greenland from 40 to 200

meters (Stransky et al. 2020).

During a survey of the benthic fauna of the Kumano Basin, Mie Prefecture, central Japan, depth 97–739 m, by the T/V *Seisui-Maru* of the Field Course of Marine Ecology of Mie University in 2021–2025, three unidentified species of the genus *Spectrarcturus* were found. This is the first record of the genus from northwestern Pacific, Japan, and southernmost distributional record of the genus. Based on this material, we describe them herein as three new species of the genus.

Materials and Methods

Isopod specimens were collected during a survey of deep-sea benthic fauna of the Kumano Basin, Japan by the T/V *Seisui-Maru* of the Field Course of Marine Ecology of Mie University in 2021–2025 (Fig. 1). A biological dredge [mouth area 30 cm (height) × 100 cm (width); 4 mm mesh] was used for the collection. Sample was elutriated on board through a 1 mm mesh sieve. The specimens were preserved in 99% ethanol immediately after capture and photographed using an SMZ18 stereomicroscope (Nikon, Tokyo, Japan) equipped with NIS-Elements Documentation software (version 5.30.00; Nikon). The specimens were dissected and

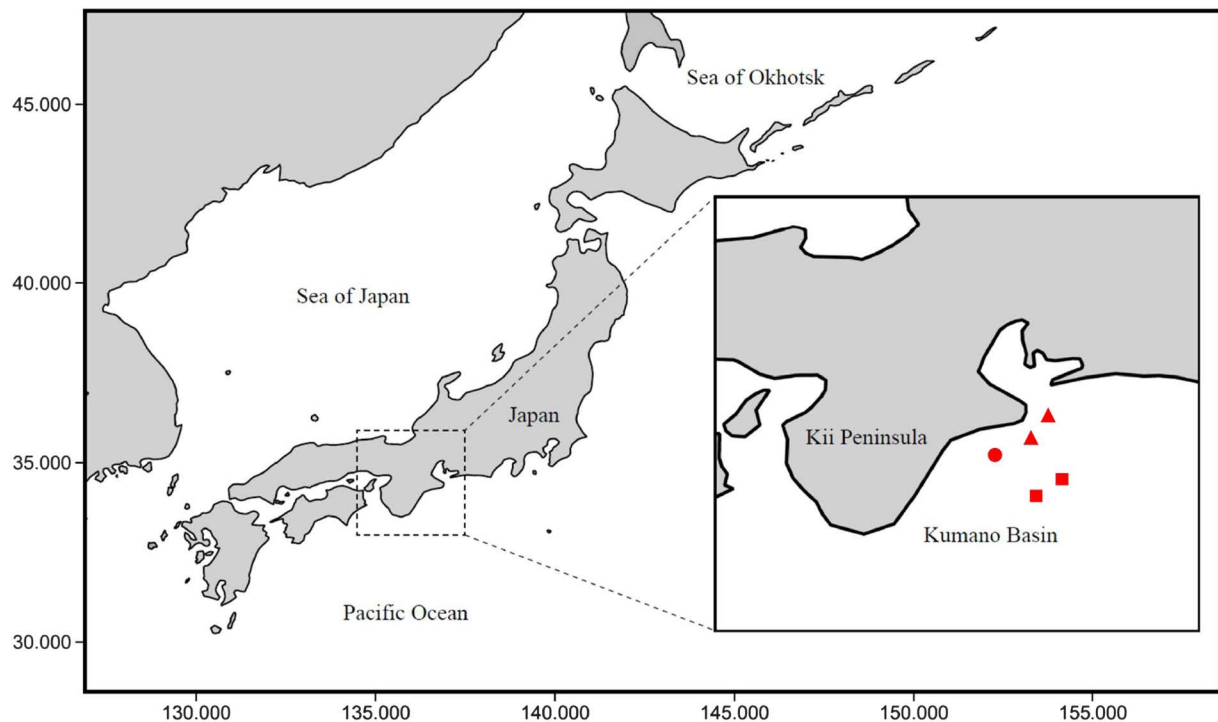


Fig. 1. Sampling sites for biological dredge operations by the T/V *Seisui-Maru*. Circles, *Spectrarcturus regularis* sp. nov.; triangles, *S. bispinosus* sp. nov.; squares, *S. crassibrevis* sp. nov.

prepared for morphological examination using a SMZ 1500 stereomicroscope (Nikon) and ECLIPSE E600 microscope (Nikon) with drawing tubes.

Terminology and measurements used herein follow those of Pereira et al. (2019, 2020), and Hessler (1970). Materials examined in this study are deposited in the Seto Marine Biological Laboratory (SMBL), Kyoto University, Japan.

Taxonomy

Suborder **Valvifera** Sars, 1883
 Family **Arcturidae** Dana, 1849
 Genus ***Spectrarcturus*** Schultz, 1981

Spectrarcturus Schultz, 1981: 67; Stransky et al. 2020: 14.

Spectrarcturus: Poore 2001: 222 (incorrect subsequent spelling).

Type species. *Spectrarcturus multispinatus* Schultz, 1981, a junior synonym of *Arcturus murdochi* Benedict, 1898.

Included species. Eleven species: *S. murdochi* (Benedict, 1898); *S. chlebovitschi* (Kussakin, 1972); *S. fabulosus* (Gurjanova, 1955); *S. furcatus* (Kussakin, 1982); *S. hystrix* (Sars, 1877); *S. intermedius* (Richardson, 1899); *S. iturupicus* (Kussakin and Mezhev, 1979); *S. toporoki* (Kussakin, 1972); *S. regularis* sp. nov.; *S. bispinosus* sp. nov.; *S. crassibrevis* sp. nov.

Diagnosis [modified from Stransky et al. (2020)]. Body cylindrical. Pereonite 1 fused to head, with shallow transverse groove on former suture line. Lateral margins of head and pereonite 1 margin deep, convex, embracing mouth-

parts and pereopod 1 laterally. Pereonite 4 longest, 2–4 times as long as pereonite 3. All pleonites fused with pleotelson, with at least 2 pairs of lateral wings. Antenna with spines on peduncle articles 2; flagellum short, with 3 articles and 1 distal claw-like article in females; in males distal article spine-like. Pereopod 1 dactylus short, without unguis. Pereopods 2–4 not flexed between carpus and propodus, with paired long setae along lower margin; with small claw-like dactyli, with short unguis. Pereopods 5–7 dactyli with 2 unguis. Male pleopod 1 simple, exopod without diagonal groove.

Remarks. All species of the genus *Spectrarcturus* occur in the Northern Hemisphere. This is the first record of the species in the genus in Japan.

The genus was revised by Stransky et al. (2020), and is characterized by spines on articles 2 and 3 of the antennal peduncle. *Spectrarcturus bispinosus* sp. nov. and *S. crassibrevis* sp. nov. have small spines on article 2 and lack spines on article 3, but all other morphological characters match the diagnosis of the genus *Spectrarcturus*.

Spectrarcturus regularis sp. nov.

[New Japanese name: Togetoge-togeoninanafushi]
 (Figs 2–8)

Material examined. Holotype: adult female (ovigerous, 6.7 mm) (SMBL-V0903) (Fig. 2), Kumano Basin, Mie Prefecture, Honshu Island, Japan, 34°05.56'N, 136°37.43'E–34°05.45'N, 136°37.27'E, St-4, 457–463 m depth, sand, with amphipods, annelids, echinoderms, decapods and molluscs, 25 November 2021, coll. M. Shimomura (MS), T/V *Seisui-maru*.



Fig. 2. *Spectrarcturus regularis* sp. nov., holotype, ovigerous female (SMBL-V0903), habitus, lateral, 99% ethanol preserved.

Diagnosis. Adult female. Body covered with long thin spines, widest at pereonite 4 (excluding spines). Head with 2 supraocular spines and 2 posterior supraocular spines. Pereonite 1 with 2 submedial and 4 lateral spines. Pereonites 2 to 7 with 2 submedial spines. Posterior end of pleotelson rounded.

Description of the holotype adult female. Body (Figs 2, 3A, B) weakly geniculate, widest at pereonite 4 (excluding spines). Head and pereonite 1 fused; eyes small, e/d ratio 0.3. Pereonite 1 with 2 submedial and 4 lateral spines; pereonites 2 to 7 with 2 submedial spines. Pleonites 1–3 fused. Pleotelson with 4 sublateral and lateral spines.

Antennula (Fig. 3C): peduncle composed of 3 articles; article 1 widest, with 2 plumose and 1 simple setae and 1 blunt spine on distal margin; article 2 with 2 plumose and 1 simple setae dorsodistally; article 3 shortest, 0.7 times as long as article 2, with 3 simple setae dorsodistally; flagellum of single article, with 4 simple and 1 circumplumose setae on dorsal margin, and 3 aesthetascs ventrodistally (one aesthetasc broken).

Antenna (Fig. 3D) about as long as body; peduncle composed of 5 articles; article 1 not dissected; article 2 with 3 lateral blunt spines; article 3 with 2 lateral blunt spines, 2.8 times as long as article 2; article 4 without setae, 2.1 times as long as article 3; article 5 as long as article 4, with few simple short setae on dorsal and ventral margin; flagellum composed of 4 articles; article 1 longest; article 2 0.3 times as long as article 1; article 3 0.7 times as long as article 2; article 4 1.1 times as long as article 3; all flagellum articles without setae.

Right mandible (Fig. 4A, B) asymmetrical, without palp:

incisor process with 4 sclerotized teeth; molar process smooth, slightly dentate anterior edge; lacinia mobilis with 3 serrate teeth.

Paragnaths (= hypopharynx: Fig. 4C) bilobate; medial margins covered with short setae.

Maxillula (Fig. 4D): lateral lobe with 11 stout setae distally, and few simple setae with inner and outer margins; medial lobe with 4 setulate setae distally, and few simple setae with inner margin.

Maxilla (Fig. 4E): outer lobe with 3 long setulate setae distally, with several simple setae on outer and dorsal surface; medial lobe with 4 serrate setae distally; inner lobe with 7 setulate and 10 simple setae distally, with 2 simple setae on inner margin and 5 simple setae on ventral surface.

Maxilliped (Fig. 4F): endite with 4 plumose setae and 2 simple and many short setae on distal margin, without coupling hooks; basis with some simple setae on inner and outer margins, 1 simple seta on ventral surface; palp with 5 articles; article 1 shortest, 0.2 times as long as article 3, with 3 simple setae on ventral surface; article 2 0.4 times as long as article 3, with 2 simple setae on ventral surface; article 3 longest, with 11 simple setae and 8 plumose setae on inner and outer margins and ventral surface; article 4 0.6 times as long as article 3, with 6 simple setae and 5 plumose setae on inner and outer margins, and ventral surface; article 5 0.2 times as long as article 3, with 9 simple setae on distal and outer margins; epipod ovate, with many simple setae on ventral surface, and inner and outer margins, ventral surface with cuticular combs.

Pereopod 1 (Fig. 5A) shorter and stouter than pereopods 2–4: basis 2.1 times as long as wide, distoventrally with sev-

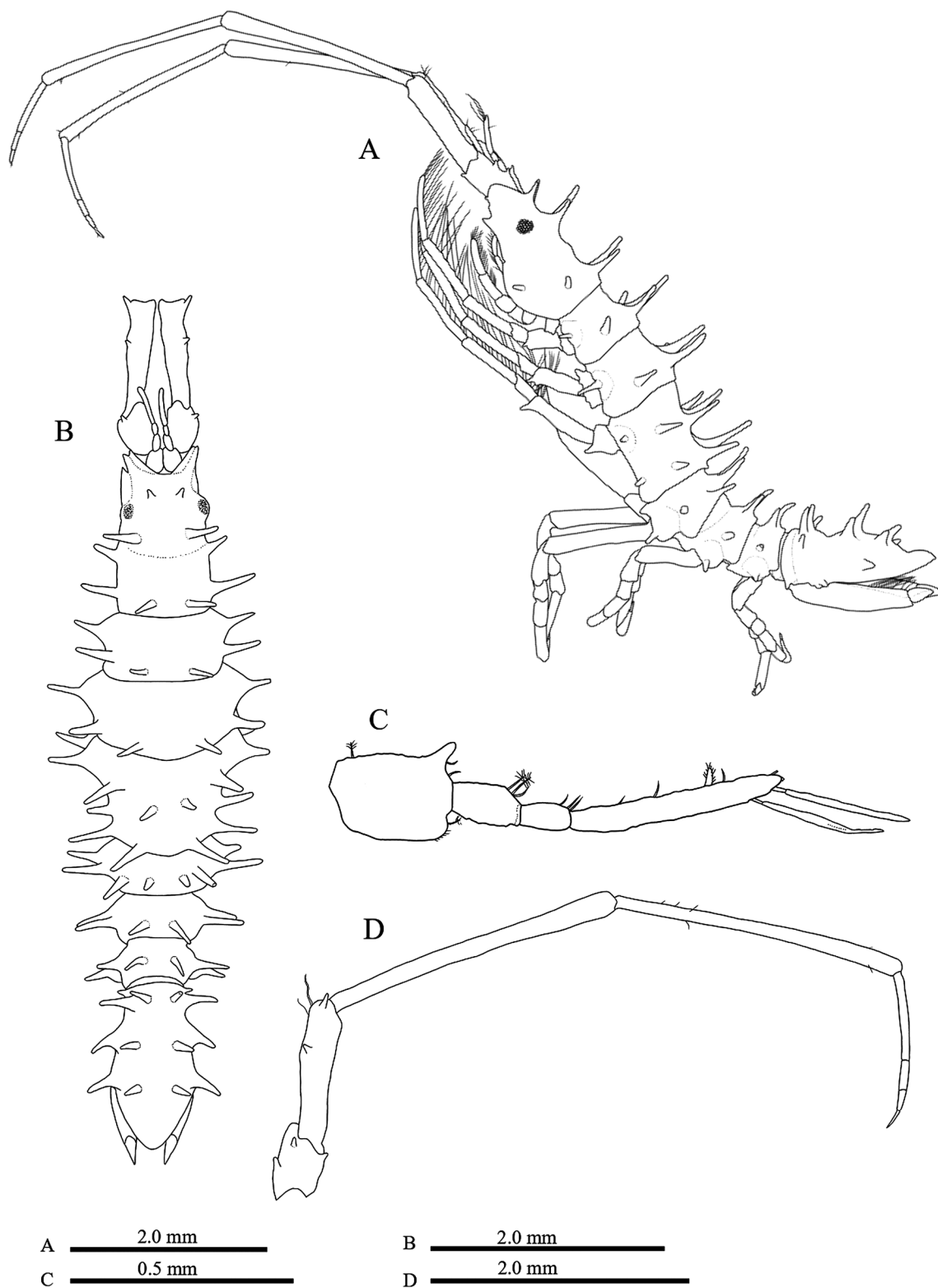


Fig. 3. *Spectrarcturus regularis* sp. nov., holotype, ovigerous female (SMBL-V0903). A, Habitus, lateral; B, habitus, dorsal; C, right antennula, lateral; D, right antenna, lateral.

eral long simple setae; ischium 0.6 times as long as basis, 1.4 times longer than wide, with some plumose setae on ventral margin; merus as long as ischium, 0.9 times longer than wide, ventral and inferior margins with many simple setae and several plumose setae; carpus 1.7 times as long as merus, 2.2 times longer than wide, ventral margin with

many plumose setae; propodus longest article, 1.1 times as long as carpus, 3.0 times longer than wide, ventral and dorsal margin with many plumose setae, and superior margin with 1 simple and 1 setulate setae and 2 clavate denticulate setae; dactylus shortest, 0.2 times as long as propodus, 2.0 times longer than wide, without claws, superior margin with



Fig. 4. *Spectrarcturus regularis* sp. nov., holotype, ovigerous female (SMBL-V0903). A, Right mandible, ventral; B, right mandible, dorsal; C, paragnaths, ventral; D, right maxillula, dorsal; E, right maxilla, dorsal; F, left maxilliped, ventral.

2 plumose and 2 setulate setae.

Pereopod 2 (Fig. 5B): distoventral angle of basis and ventral margin of ischium to propodus with many bifid filtering setae; basis with 1 blunt spine on distodorsal angle and 1 short simple seta on dorsal margin; ischium 0.6 time as

long as basis, dorsal margin without setae; merus 2.8 times as long as ischium, dorsal margin without setae; carpus 1.3 times as long as merus, dorsal margin with 2 short simple setae; propodus 0.9 times as long as carpus, with few short simple setae on dorsal margin; dactylus shortest, 0.08 times

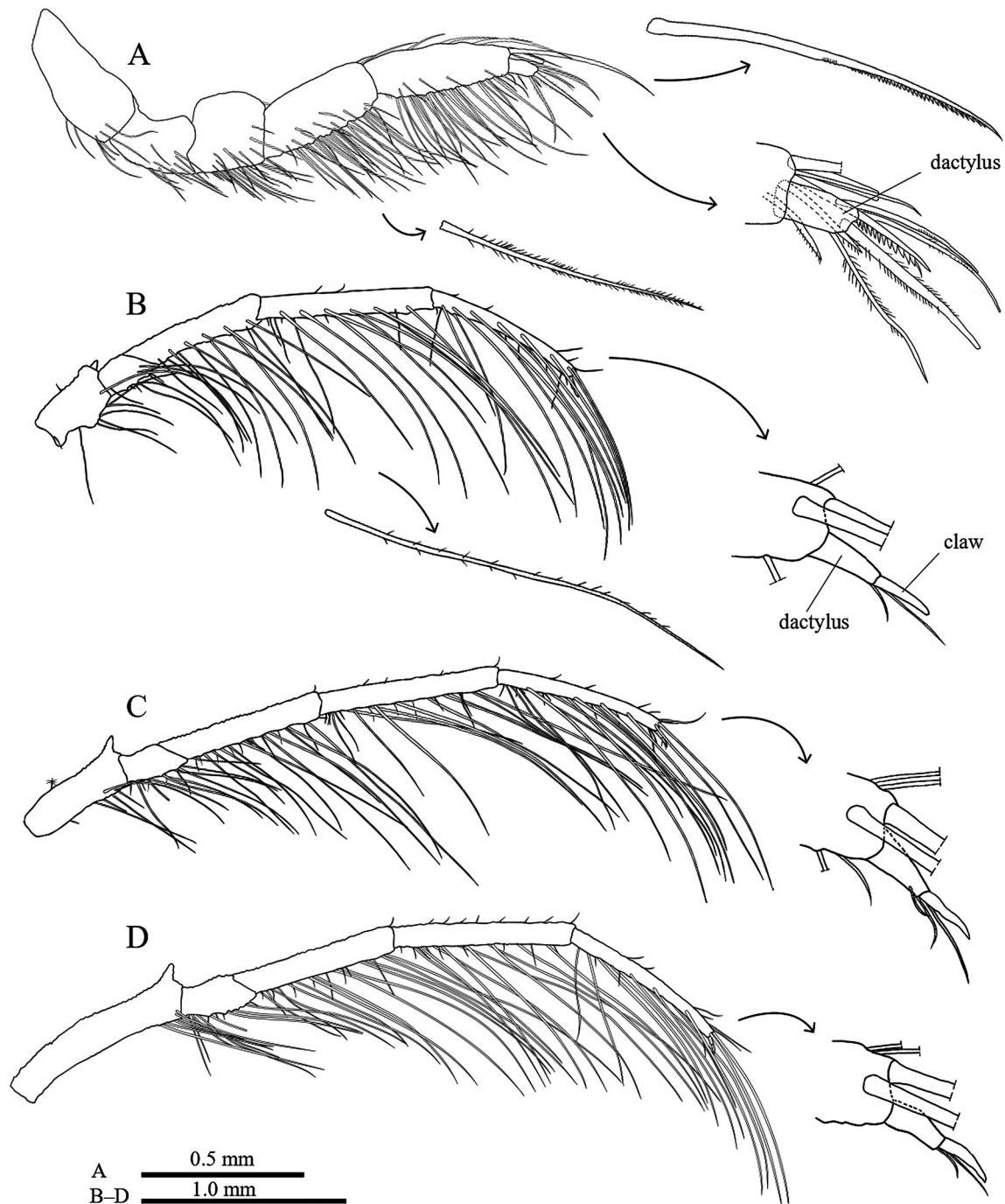


Fig. 5. *Spectrarcturus regularis* sp. nov., holotype, ovigerous female (SMBL-V0903). A, Right pereopod 1, lateral; B, right pereopod 2, lateral; C, right pereopod 3, lateral; D, right pereopod 4, lateral.

as long as propodus, with 1 claw and 1 simple seta; claw length as long as dactylus.

Pereopod 3 (Fig. 5C) similar to pereopod 2 except in the number of plumose and short simple setae on basis, merus, carpus and dactylus: basis with 1 plumose seta on dorsal margin; merus with 1 short simple seta on distodorsal margin; carpus with few short simple setae on dorsal margin; dactylus with 3 simple setae.

Pereopod 4 (Fig. 5D) similar to pereopod 2 except in the number of plumose and short simple setae on basis, merus, carpus and dactylus: dorsal margin of basis without setae; merus with 1 short simple seta on distodorsal margin; car-

pus with few short simple setae on dorsal margin; dactylus with 2 simple setae.

Pereopod 5 (Fig. 6A): basis with several simple short setae on dorsal and ventral margins; ischium 0.4 times as long as basis, few simple short setae on dorsal and ventral margins; merus 0.4 times as long as ischium, with few short simple setae on dorsal and ventral margins; carpus as long as merus, with few short simple setae on dorsal and ventral margins, and 1 plumose seta on dorsal margin; propodus 2.7 times as long as merus, with few simple setae on dorsal and ventral margins, and 2 plumose setae on dorsal margin; dactylus 0.4 times as long as propodus, with 2 claws distal-

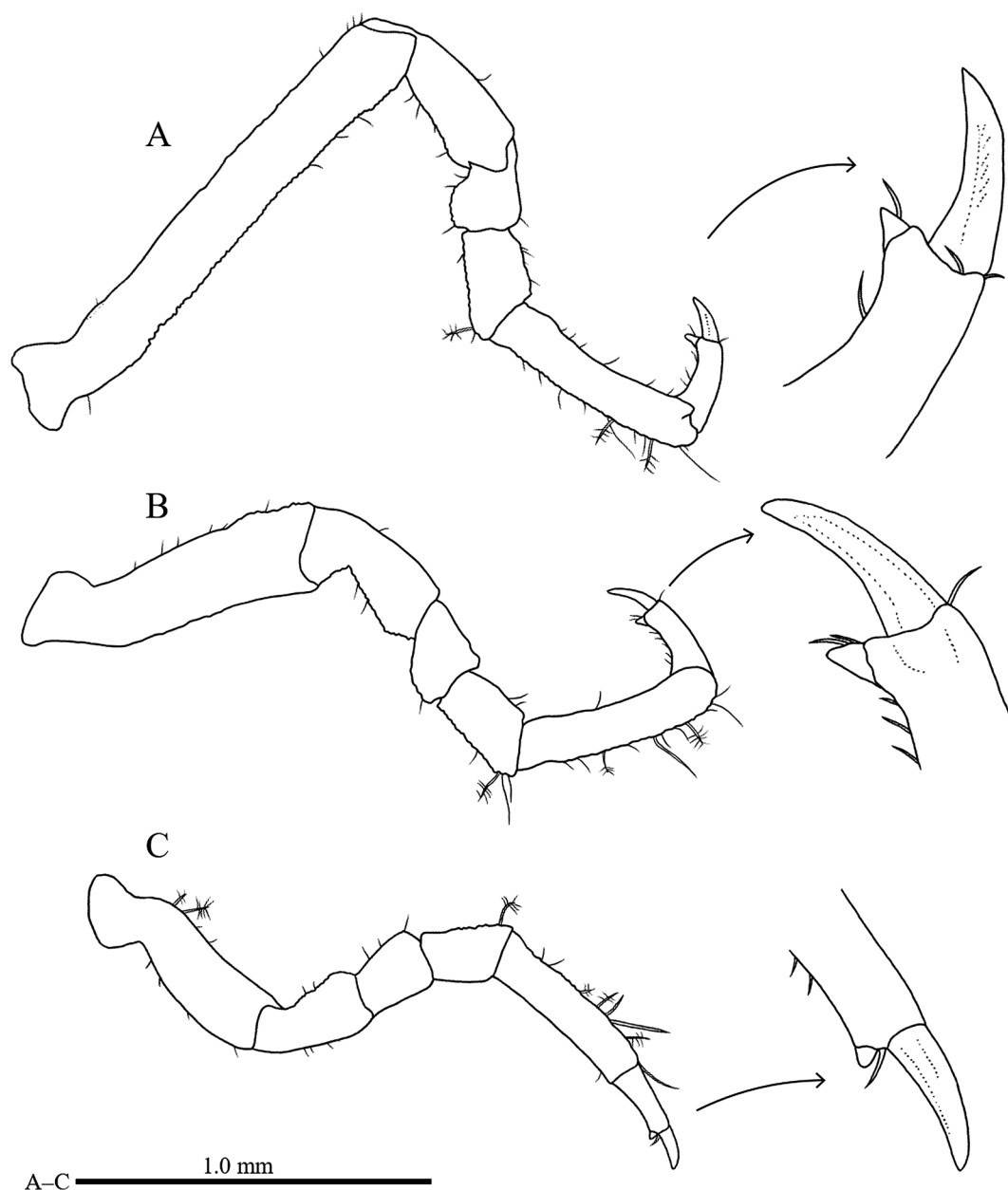


Fig. 6. *Spectrarturus regularis* sp. nov., holotype, ovigerous female (SMBL-V0903). A, Right pereopod 5, lateral; B, right pereopod 6, lateral; C, right pereopod 7, medial.

ly, and few short simple setae on dorsal and distal margins; dorsal claw shorter than dactylus.

Pereopod 6 (Fig. 6B) similar to pereopod 5.

Pereopod 7 (Fig. 6C) similar to pereopod 5 except in the number of plumose setae on basis: basis with 2 plumose setae on ventral margin.

Pleopod 1 (Fig. 7A): protopod 4.5 times as long as wide, with few fine setae on inner margin; exopod as long as endopod, 8.6 times longer than wide, with 6 plumose setae on distal margin, and few fine setae on inner and outer margins; endopod with 8 plumose setae on distal margin; all plumose setae as long as rami.

Pleopod 2 (Fig. 7B): protopod 1.7 times as long as wide, with 5 coupling hooks on inner margin, and several fine setae on outer margin; exopod as long as endopod, 3.4 times

longer than wide, with 16 plumose setae on distal margin, several fine setae on outer and inner margins; endopod with 12 plumose setae on distal margin, few fine setae on distal and outer margins; all plumose setae longer than rami.

Pleopod 3 (Fig. 8A): protopod without setae; endopod rounded distally, 0.7 times as long as exopod, with several fine setae and 2 plumose setae on inner margin; exopod without setae.

Pleopod 4 (Fig. 8B) similar to pleopod 3 except in the number of simple and plumose setae on protopod and endopod: protopod with 1 simple seta; endopod with 3 simple and 1 plumose seta on inner margin.

Pleopod 5 (Fig. 8C) similar to pleopod 3 except in the number of simple and plumose setae on endopod: endopod with 5 simple and 1 plumose seta on inner margin.

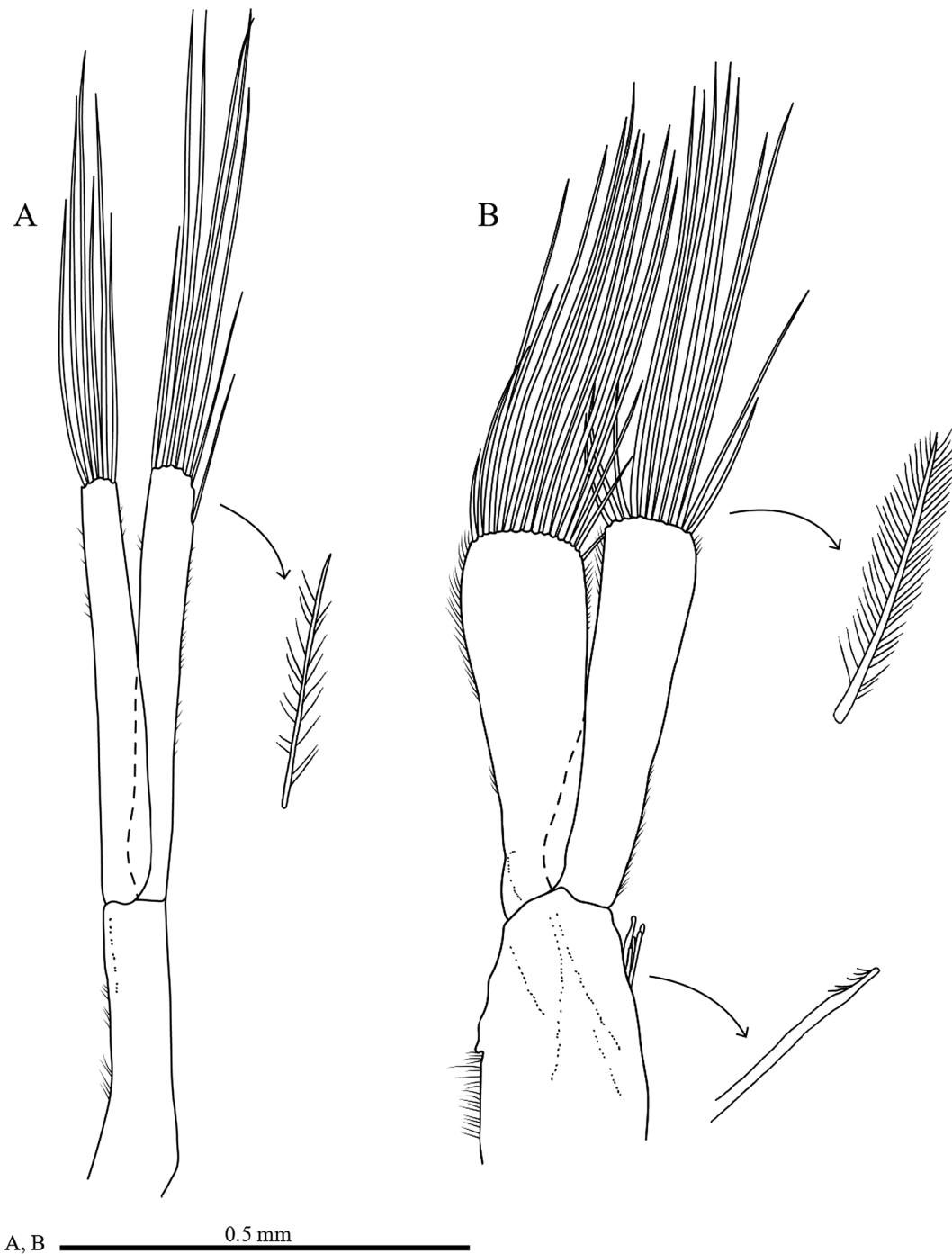


Fig. 7. *Spectrarcturus regularis* sp. nov., holotype, ovigerous female (SMBL-V0903). A, Left pleopod 1, dorsal; B, right pleopod 2, dorsal.

Uropod (Fig. 8D) biramous: protopod inner margin with 6 plumose setae, outer margin with several simple setae; exopod 0.4 times as long as endopod, with 2 plumose and several simple setae on outer margin; endopod with several fine setae on inner margin, and 2 short simple setae on outer margin.

Color. Ethanol-preserved specimens whitish; eye light brown.

Etymology. The Latin adjective *regularis*, meaning regular. This name refers to having each pereonite having similarly arranged long spines.

The Japanese name for *Spectrarcturus* consists of “Toge”

(= spines) and “Oninanafushi” (Japanese name for Arcturidae). The Japanese acronym for the species name “Togetoge” means “many spines”, alluding to the presence of long spines on their dorsal surfaces.

Remarks. *Spectrarcturus regularis* sp. nov. resembles *S. murchisoni* from North Pacific and Arctic waters around Greenland, *S. hystrix* from northernmost North Atlantic Ocean, and *S. intermedius* from northernmost North Pacific, in the following features: head with two supraocular spines; pereonites 1–3 and 5–7 each with two submedial spines; pleon with six lateral spines. However, *S. regularis* sp. nov. differs from *S. murchisoni* in the following features (those

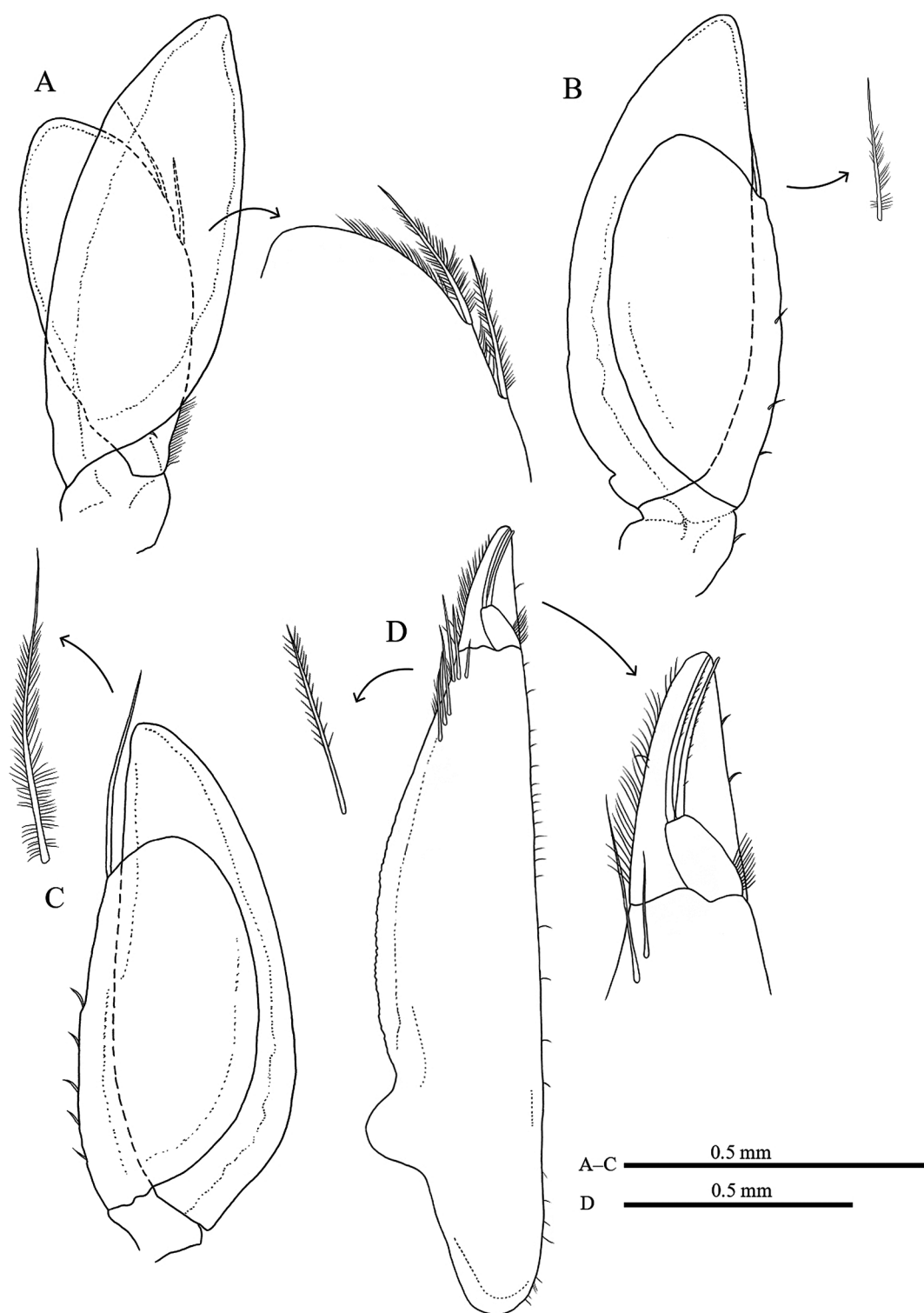


Fig. 8. *Spectrarcturus regularis* sp. nov., holotype, ovigerous female (SMBL-V0903). A, Right pleopod 3, dorsal; B, left pleopod 4, ventral; C, right pleopod 5, ventral; D, right uropod, internal.

of *S. murchiei* in parentheses): head without mid-dorsal spine (with one mid-dorsal spine); posterior end of pleotelson rounded (bifid), posterior part without smaller spines (with several smaller spines); bases of pereopods 5–7 without spines (with one spine). *Spectrarcturus regularis* sp. nov. is distinguished from *S. hystrix* by the following characters (those of *S. hystrix* in parentheses): posterior end of pleotelson rounded (bifid); spines of antenna articles 2 and 3 short

and small (with three long, large spines on article 2 and one long, large spine on article 3); bases of pereopods 5–7 without spines (with 1–2 spines). *Spectrarcturus regularis* sp. nov. differs from *S. intermedius* in the following features (those of *S. intermedius* in parentheses): head without mid-dorsal spine (with 1 spine); pereonites 1–3 without sublateral spines (with 2 sublateral spines); posterior end of pleotelson rounded (bifid).

Spectrarcturus bispinosus sp. nov.

[New Japanese name: Futakobu-togeoninanafushi]

(Figs 9–15)

Material examined. Holotype: adult female (non-ovigerous, 7.9 mm) (SMBL-V0904) (Fig. 9), Kumano Basin, Mie Prefecture, Honshu Island, Japan, St-1, 97–98 m depth, sand, with amphipods, decapods, and molluscs, 34°13.32'N, 136°53.78'E–34°13.32'N, 136°53.67'E, 13 December 2022, coll. MS, T/V *Seisui-maru*. Paratype: adult female (non-ovigerous, 8.7 mm) (SMBL-V0905), Kumano Basin, Mie Prefecture, Honshu Island, Japan, St-7, 115–117 m depth, sand, with amphipods, annelids, decapods, and molluscs, 34°19.72'N, 137°06.12'E–34°19.86'N, 137°06.14'E, 6 November 2025, coll. MS, T/V *Seisui-maru*.

Diagnosis. Adult female. Body with numerous small tubercles, widest at pereonite 4. Head with 2 posterior supraocular spines. Antenna peduncle article 3 without spines. Pereonite 1 with 2 lateral spines. Pereonite 3 with 2 blunt submedial spines. Basis of pereopods 5–7 each with 1–2 blunt spines. Pleotelson without submedial spines, posterior margin rounded.

Description of the holotype adult female. Body (Figs 9, 10A, B) widest at pereonite 4, with numerous small tubercles. Head and pereonite 1 fused; head with 2 posterior supraocular spines; eyes medium-sized, e/d ratio 0.7. Pereonite 1 with 2 lateral spines; pereonite 3 with 2 submedial spines. Pleonites 1–3 fused. Pleotelson with 2 lateral spines.

Antennula (Fig. 10C) peduncle composed of 3 articles; article 1 widest, with 1 plumose seta dorsodistally and 2 blunt spines on lateral margin; article 2 without spines and

setae; article 3 shortest, 0.7 times as long as article 2; flagellum of single article, with 7 aesthetascs distally.

Antenna (Fig. 10D) about as long as body; peduncle composed of 5 articles; article 1 not dissected; article 2 with 5 blunt spines on lateral margin; article 3 with few simple setae on dorsal and ventral margins, 3.0 times as long as article 2; article 4 with few simple setae on ventral margin, 2.2 times as long as article 3; article 5 0.9 times as long as article 4, with few short simple setae on dorsal and ventral margins; flagellum composed of 4 articles; article 1 longest; article 2 0.3 times as long as article 1; article 3 0.4 times as long as article 2; article 4 0.6 times as long as article 3, with 1 simple seta distally.

Left mandible (Fig. 11A) asymmetrical, without palp: incisor process with 3 sclerotized teeth; molar process with smooth surface with indented margins; lacinia mobilis with 3 stout and 6 serrate teeth.

Right mandible (Fig. 11B) asymmetrical, without palp: incisor process with 3 sclerotized teeth; molar process with grinding surface with indented margins; lacinia mobilis with 3 stout and 4 serrate teeth.

Paragnaths (= hypopharynx: Fig. 11C) bilobate; medial margins covered with short setae.

Maxillula (Fig. 11D) lateral lobe with 10 stout setae distally, and few simple setae on inner and outer margins; medial lobe with 3 setulate setae distally, and few simple setae on inner margin.

Maxilla (Fig. 11E) outer lobe with 4 long setulate setae distally, with several simple setae on outer margin; medial lobe with 4 serrate setae distally; inner lobe with 8 setulate and 9 simple setae distally, with several simple setae on

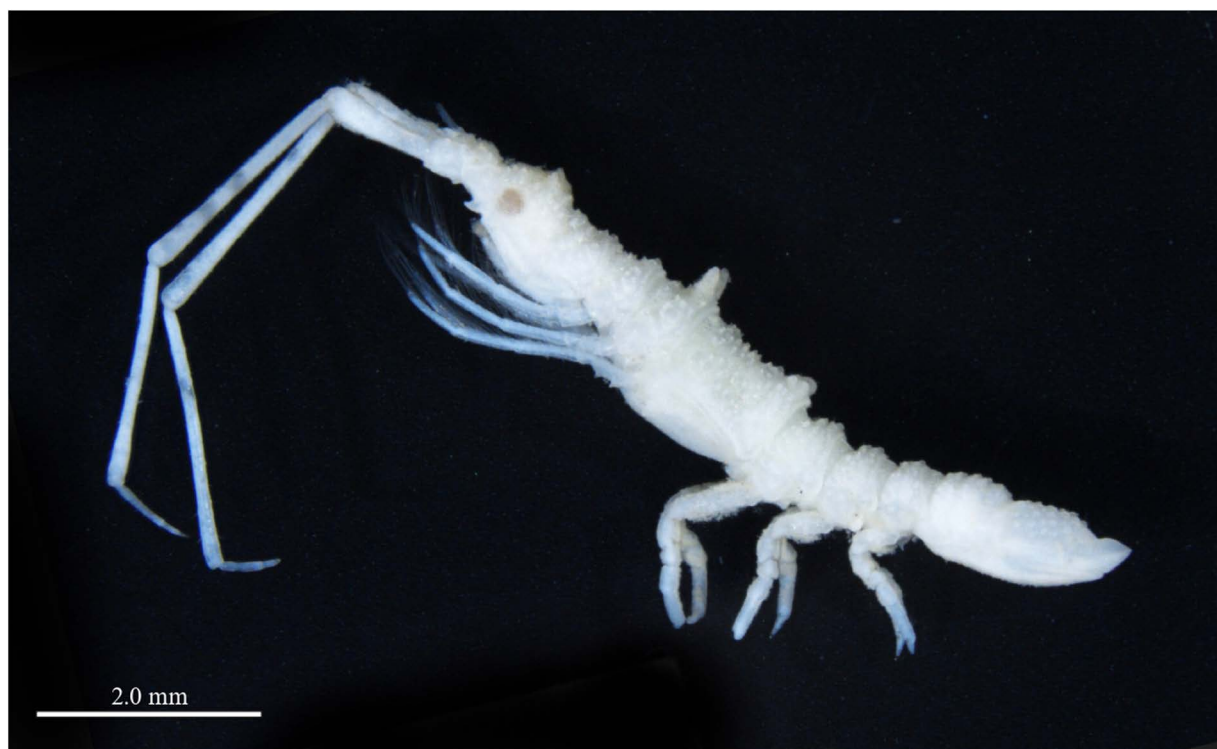


Fig. 9. *Spectrarcturus bispinosus* sp. nov., holotype, non-ovigerous female (SMBL-V0904), habitus, lateral, 99% ethanol preserved.

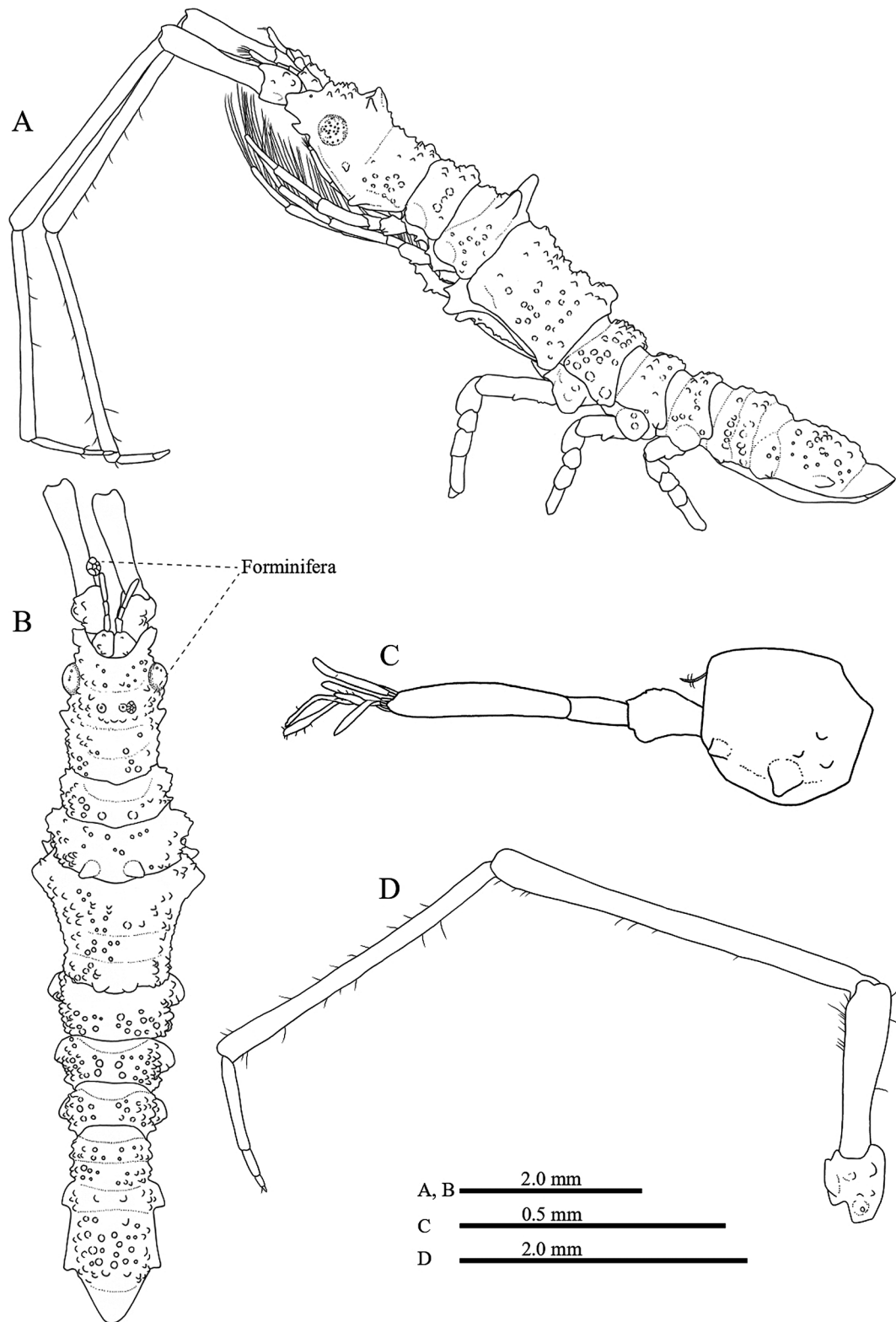


Fig. 10. *Spectrarcturus bispinosus* sp. nov., holotype, non-ovigerous female (SMBL-V0904). A, Habitus, lateral; B, habitus, dorsal; C, left antennula, lateral; D, left antenna, lateral.

inner margin.

Maxilliped (Fig. 11F) endite with 5 plumose setae and several simple setae on distal margin, with 3 coupling hooks; basis with 4 plumose and 2 simple setae and cuticular combs on ventral surface; palp with 5 articles; article 1 shortest, 0.2 times as long as article 3, with 2 plumose

setae on ventral surface; article 2 0.3 times as long as article 3, with 5 plumose and 2 simple setae on inner margin and ventral surface; article 3 longest, with 2 plumose setae on outer margin, 3 plumose and 3 simple setae on ventral surface, several plumose and simple setae on inner margin; article 4 half as long as article 3, with several plumose and



Fig. 11. *Spectrarcturus bispinosus* sp. nov., holotype, non-ovigerous female (SMBL-V0904). A, Left mandible ventral; B, right mandible, dorsal; C, paragnaths, ventral; D, left maxillula, ventral; E, right maxilla, ventral; F, left maxilliped, ventral.

simple setae on inner and outer margins and ventral surface; article 5 0.2 times as long as article 3, with 4 plumose and 5 simple setae on distal margin; epipod ovate, with many sim-

ple setae on inner and outer margins, and few simple setae on ventral surface.

Pereopod 1 (Fig. 12A) shorter and stouter than pereopods

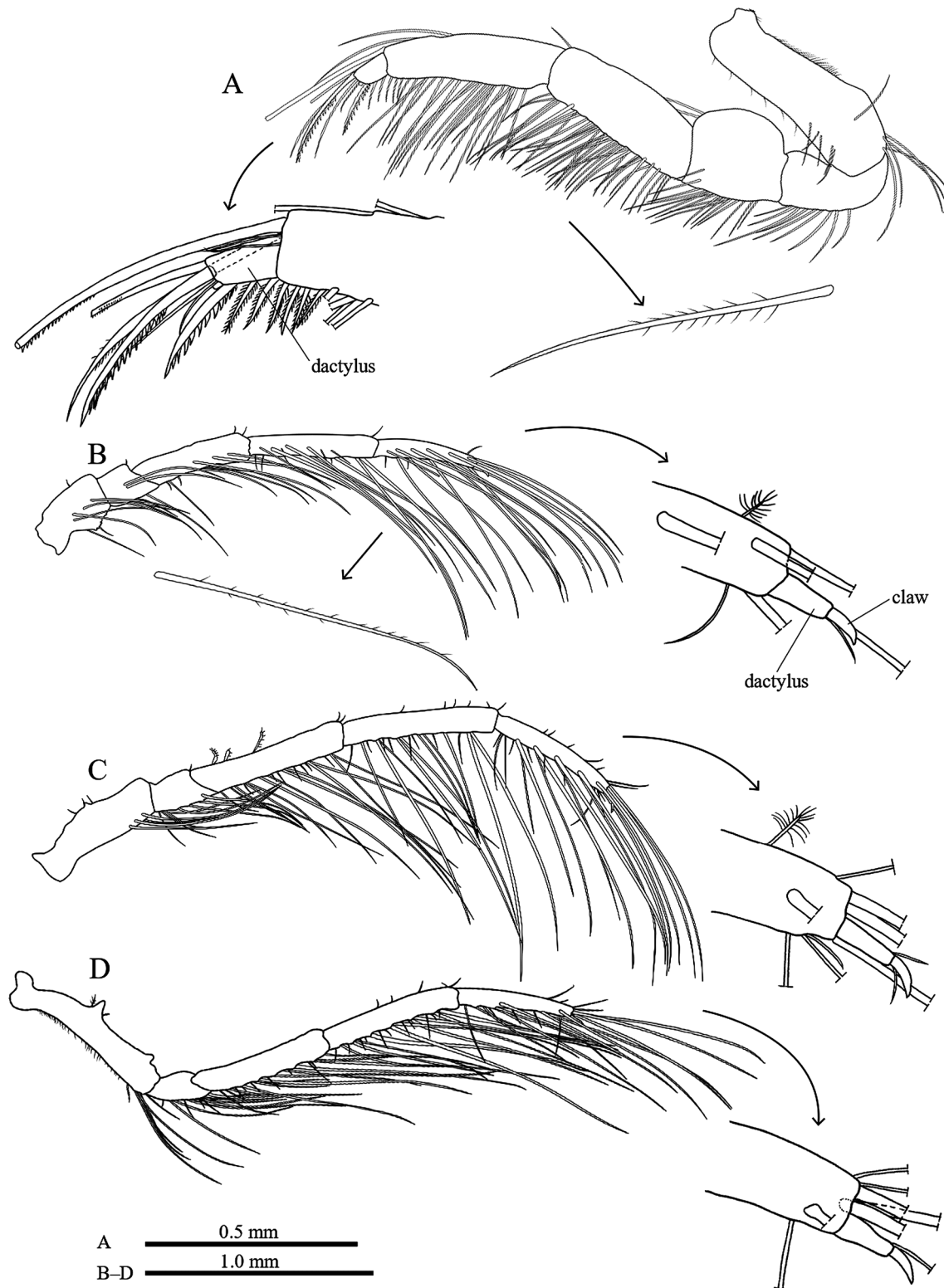


Fig. 12. *Spectrarcturus bispinosus* sp. nov., holotype, non-ovigerous female (SMBL-V0904). A, Left pereopod 1, lateral; B, right pereopod 2, lateral; C, right pereopod 3, lateral; D, right pereopod 4, lateral.

2–4: basis longest article, 3.0 times as long as wide, with some simple setae on distoventral and distodorsal angles, some short setae on ventral and dorsal margins; ischium 0.3 times as long as basis, 1.3 times longer than wide, ventral margin with many simple setae; merus 1.3 times as long as ischium, as long as wide, ventral and inferior margin with

many simple setae, and 2 simple setae distodorsally; carpus 1.7 times as long as merus, 2.7 times longer than wide, ventral margin with many plumose setae, 1 simple seta distodorsally; propodus as long as carpus, 3.4 times longer than wide, ventral margin with many plumose setae and dorsal margin with 2 setulate setae, and superior margin with 2

simple and 1 plumose and 1 setulate setae; dactylus shortest, 0.2 times as long as propodus, 1.6 times longer than wide, without claws, superior margin with 2 simple, 2 setulate, 1 plumose and 1 clavate denticulate setae.

Pereopod 2 (Fig. 12B) distoventral angle of basis and ventral margin of ischium to propodus with many bifid filtering setae; basis with 1 short simple seta on dorsal margin; ischium half as long as basis, with 1 short simple seta on dorsal margin; merus 2.6 times as long as ischium, with 2 short simple setae on dorsal margin; carpus 1.2 times as long as merus, with 1 short simple seta on dorsal margin; propodus 0.8 times as long as carpus, with 1 plumose seta on dorsal margin; dactylus shortest, 0.09 times as long as propodus, with 1 claw and 1 simple seta; claw shorter than dactylus.

Pereopod 3 (Fig. 12C) similar to pereopod 2 except in the number of short simple and plumose setae on basis, ischi-

um, carpus, propodus and dactylus: basis with 3 short simple setae on dorsal margin; dorsal margin of ischium without setae; carpus with few short simple setae on dorsal margin; propodus with 1 plumose and few short simple setae on dorsal margin; dactylus with 2 simple setae.

Pereopod 4 (Fig. 12D) similar to pereopod 2 except in the number of spines, short simple and plumose setae on basis, ischium, merus, carpus and propodus: basis with 1 plumose and 1 short simple setae, and with 2 blunt spines on dorsal margin; dorsal margin of ischium and merus without setae; carpus with few short simple setae on dorsal margin; propodus with few short simple setae on dorsal margin.

Pereopod 5 (Fig. 13A) basis with 2 blunt spines on lateral margin, with 2 plumose setae on ventral margin, with few simple setae on ventral and dorsal margins; ischium 0.3 times as long as basis, few simple setae on dorsal and ventral

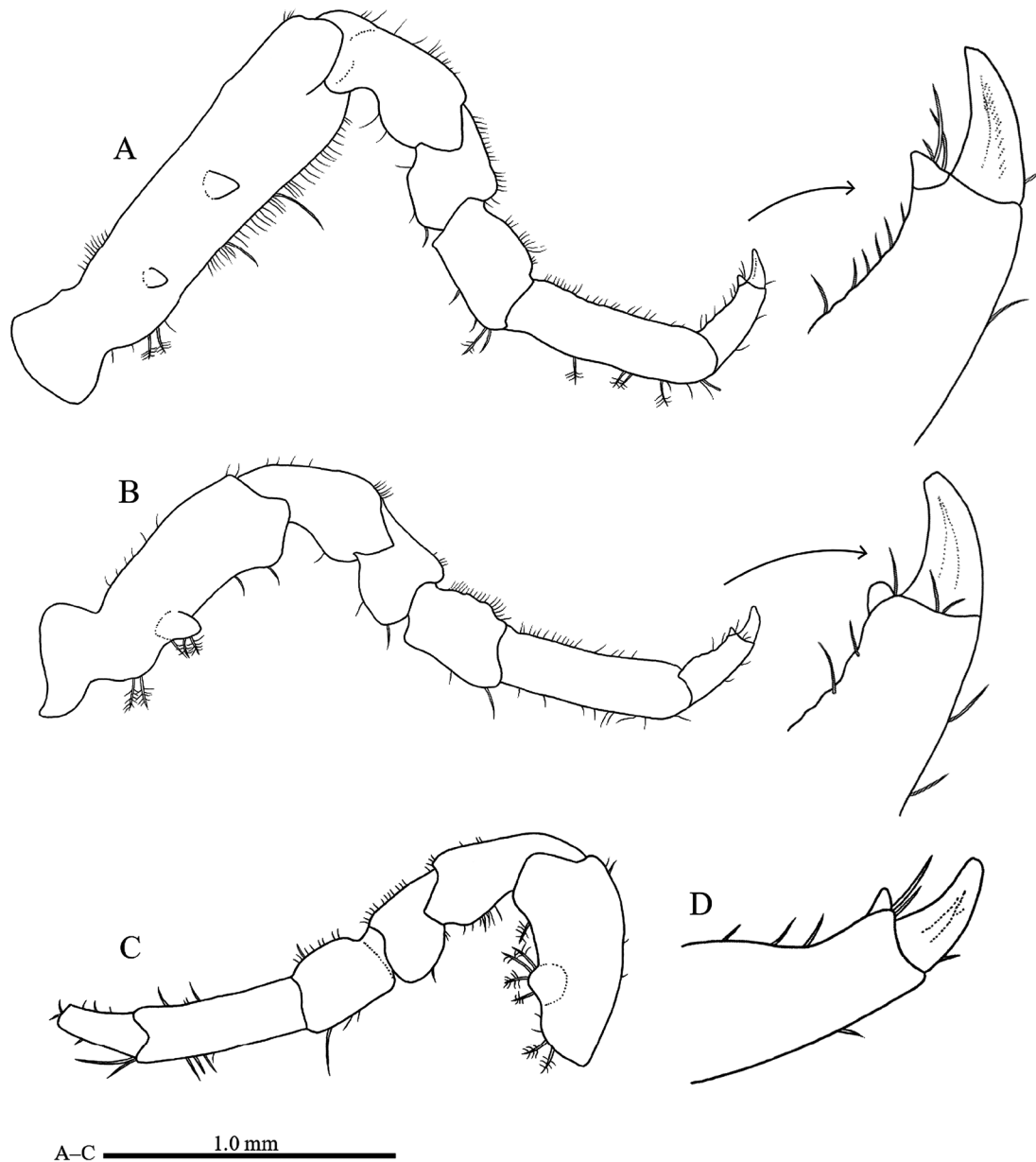


Fig. 13. *Spectrarcturus bispinosus* sp. nov., holotype, non-ovigerous female (SMBL-V0904). A, Right pereopod 5, lateral; B, right pereopod 6, lateral; C, left pereopod 7, lateral.

margins; merus 0.4 times as long as ischium, with few short simple setae on dorsal and ventral margins; carpus 1.6 times as long as merus, with few short simple setae on dorsal and ventral margins and 1 plumose seta on ventral margin; propodus twice as long as carpus, with few simple setae on dorsal and ventral margins and 4 plumose setae on ventral margin; dactylus 0.3 times as long as propodus, with 2 claws distally, and few simple setae on dorsal, distal and ventral margins; dorsal claw shorter than dactylus.

Pereopod 6 (Fig. 13B) similar to pereopod 5 except in the number of blunt spines, simple and plumose setae on bases, carpus and propodus: basis with 1 blunt spine, with 4 plumose setae on ventral margin and few simple setae on ven-

tral and dorsal margins; carpus with few short simple setae on dorsal and ventral margins; propodus with few simple setae on dorsal and ventral margins.

Pereopod 7 (Fig. 13C) similar to pereopod 5 except in the number of blunt spines, simple and plumose setae on bases, carpus and propodus: basis with 1 blunt spine, with 7 plumose setae on ventral margin and few simple setae, and with few simple setae on dorsal and ventral margins; carpus with few short simple setae on dorsal and ventral margins; propodus with few simple setae on dorsal and ventral margins.

Pleopod 1 (Fig. 14A) protopod 3.0 times as long as wide, with 4 coupling hooks on inner margin; exopod as long as endopod, 5.0 times longer than wide, with 14 plumose setae

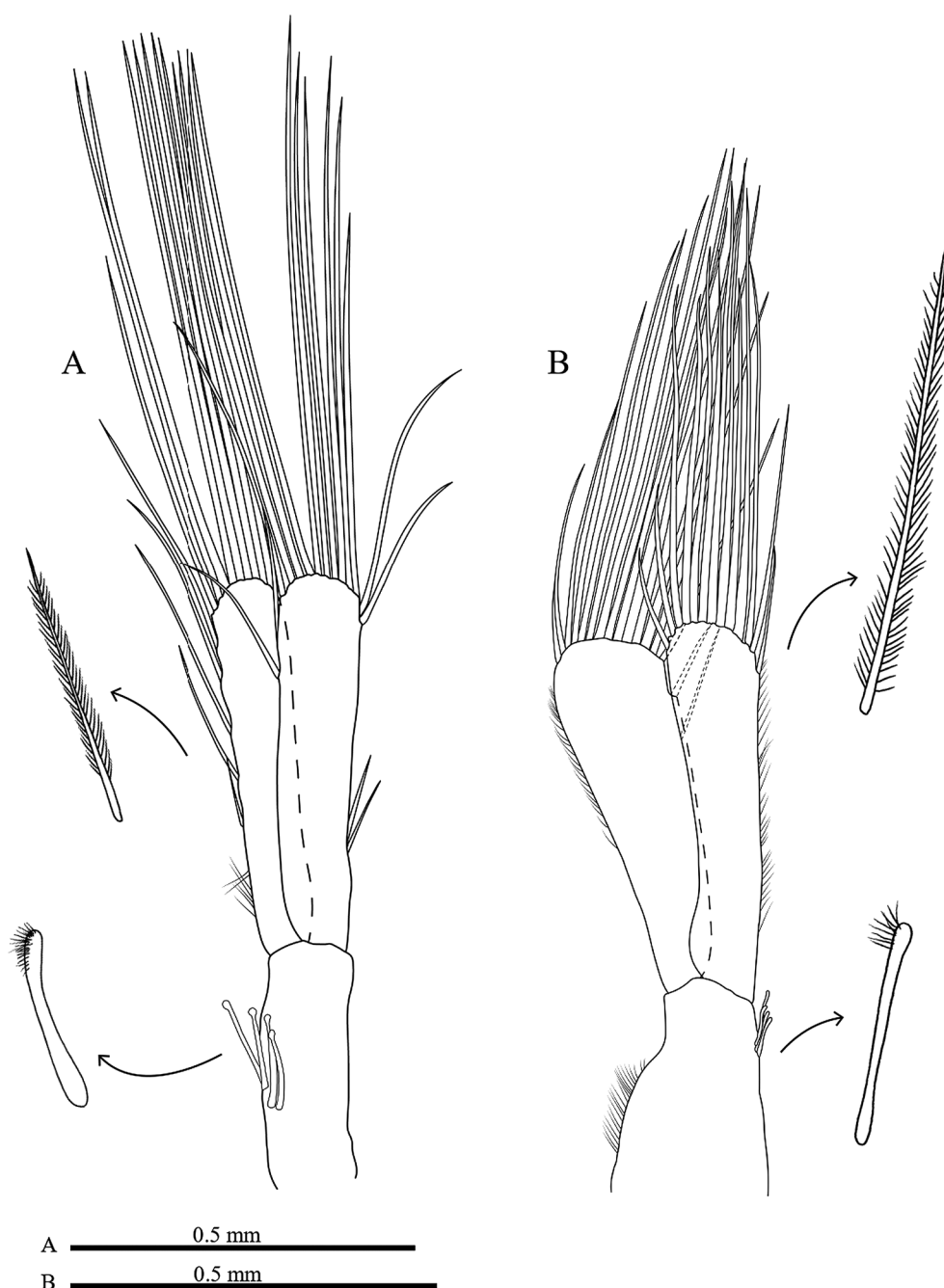


Fig. 14. *Spectrarcturus bispinosus* sp. nov., holotype, non-ovigerous female (SMBL-V0904). A, Right pleopod 1, ventral; B, right pleopod 2, dorsal.

on inner and distal margins, and few fine setae on inner margin; endopod with 15 plumose setae on distal margin and 2 plumose setae on outer margin; several plumose setae longer than rami.

Pleopod 2 (Fig. 14B) protopod 1.7 times as long as wide, with 4 coupling hooks on inner margin, and several fine setae on outer margin; exopod as long as endopod, 3.8 times

longer than wide, with 16 plumose setae on distal margin, several fine setae on outer margin; endopod with 13 plumose setae on distal margin and several fine setae on inner margin; several plumose setae longer than rami.

Pleopod 3 (Fig. 15A) protopod without setae; endopod rounded distally, 0.9 times as long as exopod, with 2 plumose and many fine setae on inner margin; exopod without

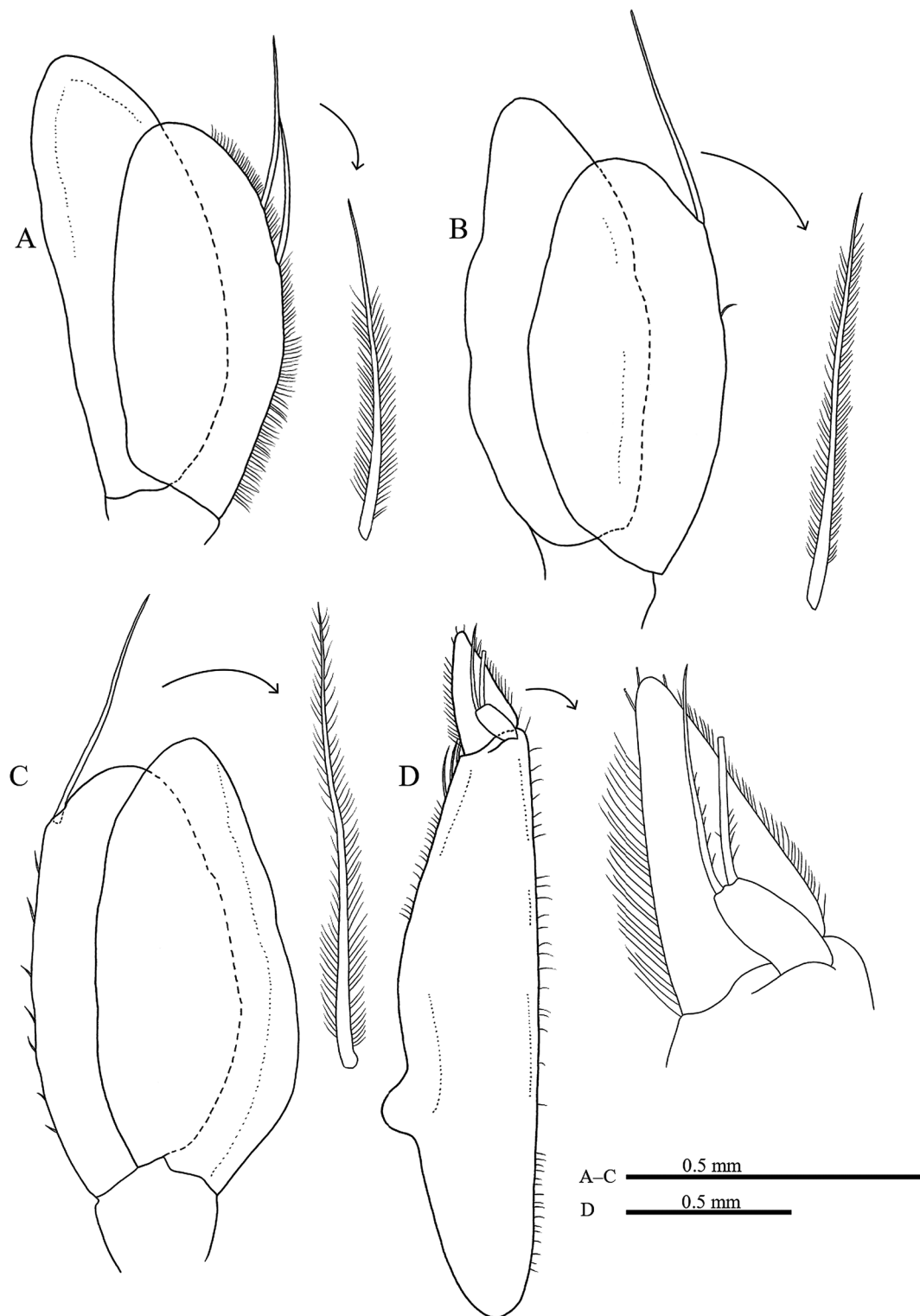


Fig. 15. *Spectrarcturus bispinosus* sp. nov., holotype, non-ovigerous female (SMBL-V0904). A, Right pleopod 3, dorsal; B, right pleopod 4, dorsal; C, right pleopod 5, ventral; D, right uropod, internal.

setae.

Pleopod 4 (Fig. 15B) similar to pleopod 3 except in the number of simple and plumose setae on endopod: endopod with 1 plumose and 1 simple setae on inner margin.

Pleopod 5 (Fig. 15C) similar to pleopod 3 except in the number of simple and plumose setae on endopod: endopod with 1 plumose and 7 simple setae on inner margin.

Uropod (Fig. 15D) biramous: protopod with several simple setae inner and outer margins; exopod 0.4 times as long as endopod, with 2 plumose setae distally; endopod with several simple setae on inner and outer margins and 3 short simple setae distally.

Color. Ethanol-preserved specimens whitish; eye light brown.

Etymology. From the Latin compound adjective bi- and spinosus, meaning with two large blunt spines. This name refers to having two large blunt spines on pereonite 3.

The Japanese acronym for the species name “Futakobu” comes from “two large blunt spines” on the pereonite 3.

Remarks. *Spectrarcturus bispinosus* sp. nov. resembles *S. iturupicus* from northernmost North Pacific in the following features: body with numerous small tubercles; pleotelson short, with 2 lateral spines; basis of pereopods 5–7 with spines. *Spectrarcturus bispinosus* sp. nov. differs from *S. iturupicus* in the following features (those of *S. iturupicus* in parentheses): head with 2 posterior supraocular spines (without spines); antenna article 3 without spines (with 2–3 spines); pereonite 3 with 2 blunt submedial spines (without spines).

***Spectrarcturus crassibrevis* sp. nov.**

[New Japanese name: Futotoge-togeoninanafushi]

(Figs 16–22)

Material examined. Holotype: immature female (non-ovigerous, 6.2 mm) (SMBL-V0906) (Fig. 16), Shima Spur, south of Shima Peninsula, Kumano Basin, Mie Prefecture, Honshu Island, Japan, St-6, 716–739 m depth, rocks, with amphipods, annelids, echinoderms, decapods and molluscs, 34°03.28'N, 136°53.36'E–34°03.75'N, 136°53.56'E, 15 December 2022, coll. MS, T/V *Seisui-maru*. Paratype: adult female (non-ovigerous, 5.9 mm) (SMBL-V0907), Shima Spur, south of Shima Peninsula, Kumano Basin, Mie Prefecture, Honshu Island, Japan, St-6, 765–768 m depth, rock, with amphipods, copepods, echinoderms, isopods and molluscs, 33°59.33'N, 136°55.68'E–33°59.30'N, 136°55.57'E, 26 October 2023, coll. MS, T/V *Seisui-maru*.

Diagnosis. Female. Body covered with short blunt spines. Head with 2 posterior supraocular spines. Antenna peduncle article 3 without spines. Pereonites 1–7 each with 2–4 submedial spines. Pleotelson with 4 submedial and 2 lateral spines, posterior margin rounded.

Description of the holotype female. Body (Figs 16, 17A, B) pereonite 7 narrowest. Head and pereonite 1 fused; head with 2 blunt posterior supraocular spines; eyes medium-sized, e/d ratio 0.6. Pereonites 1–7 each with 2–4 submedial spines. Pleonites 1–3 fused. Pleotelson with 4 submedial and 2 lateral spines.

Antennula (Fig. 17C) peduncle composed of 3 articles; article 1 widest, with few short simple setae on dorsal margin and 1 plumose seta on ventral margin and 1 short simple seta dorsodistally; article 2 with 2 plumose setae and 1 short simple seta on ventral margin; article 3 shortest, 0.7



Fig. 16. *Spectrarcturus crassibrevis* sp. nov., holotype, non-ovigerous female (SMBL-V0906), habitus, lateral, 99% ethanol preserved.

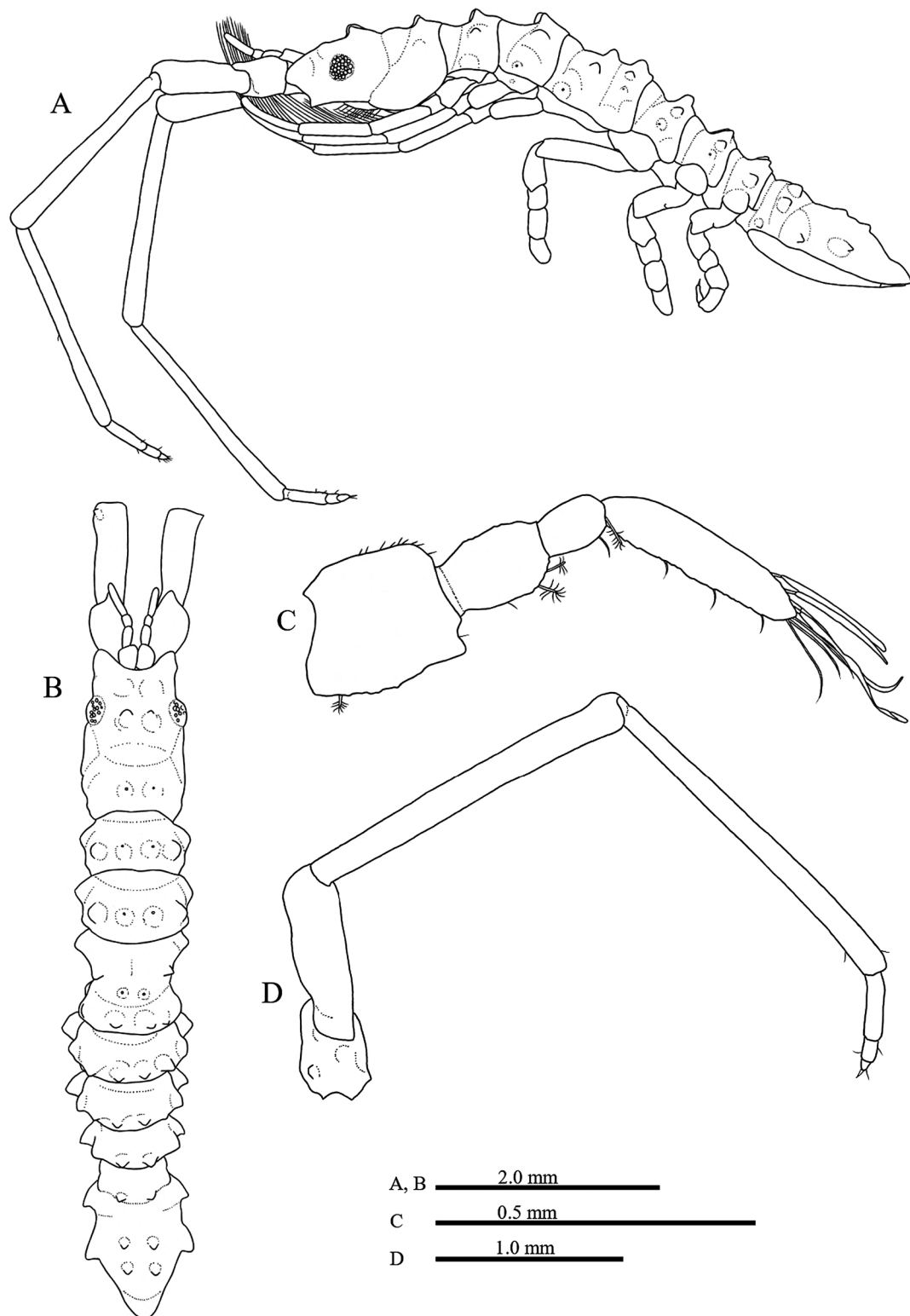


Fig. 17. *Spectrarcturus crassibrevis* sp. nov., holotype, non-ovigerous female (SMBL-V0906). A, Habitus, lateral; B, habitus, dorsal; C, right antennula, lateral; D, right antenna, lateral.

times as long as article 2; flagellum of a single article, with 4 aesthetascs and 3 long simple setae distally.

Antenna (Fig. 17D) about as long as body: peduncle composed of 5 articles; article 1 not dissected; article 2 with 1 lateral blunt spine on lateral margin; article 3 without setae, 1.8 times as long as article 2; article 4 without setae, twice

as long as article 3; article 5 as long as article 4, with few simple short setae on dorsal and ventral margins; flagellum composed of 4 articles; article 1 longest; article 2 0.3 times as long as article 1, with 1 short simple seta distally; article 3 0.5 times as long as article 2, with 1 short simple seta distally; article 4 claw-like, 0.9 times as long as article 3.

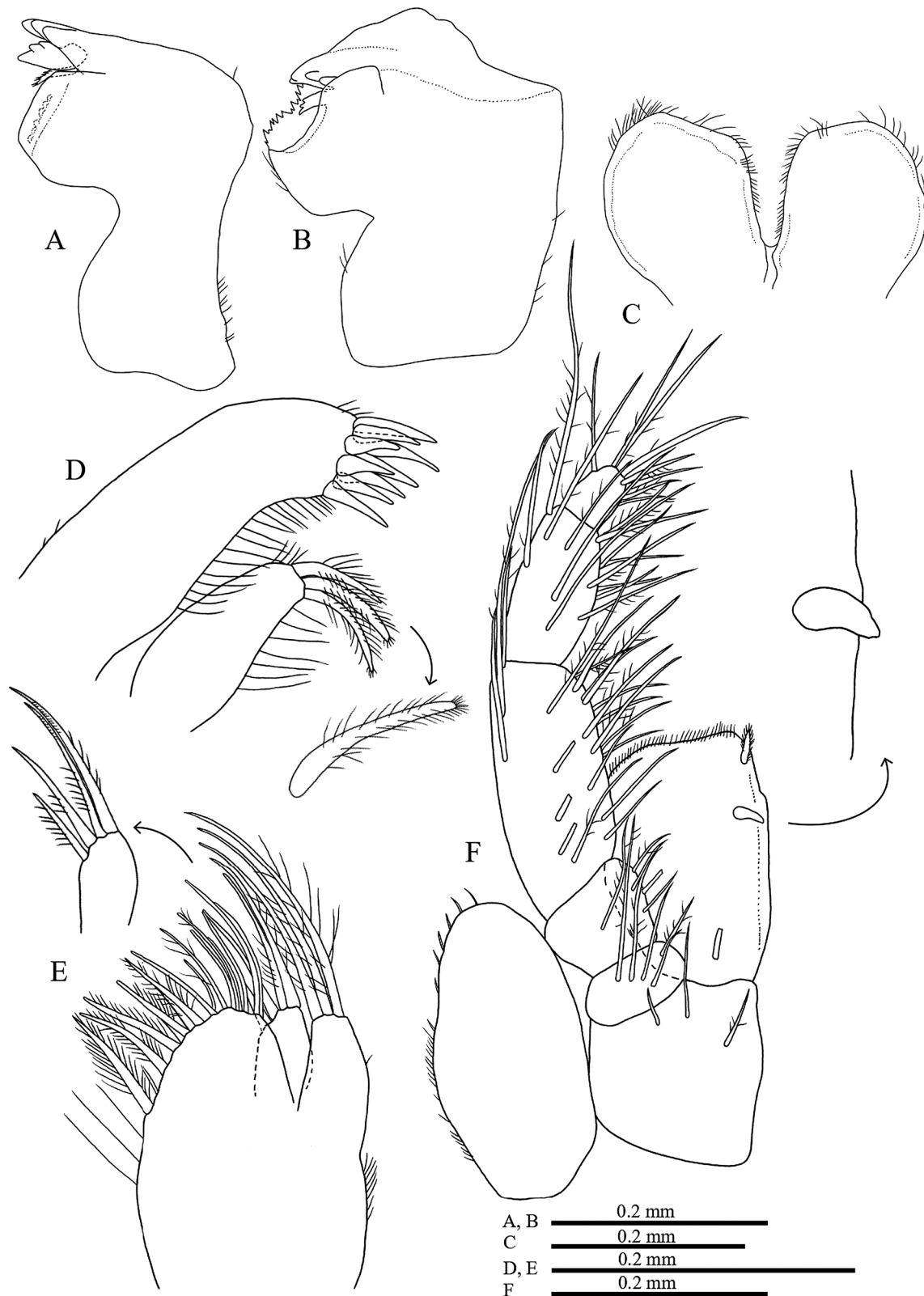


Fig. 18. *Spectrarturus crassibrevis* sp. nov., holotype, non-ovigerous female (SMBL-V0906). A, Left mandible ventral; B, right mandible, dorsal; C, paragnaths, ventral; D, right maxillula, ventral; E, right maxilla, dorsal; F, right maxilliped, ventral.

Left mandible (Fig. 18A) asymmetrical, without palp: incisor process with 3 sclerotized teeth; molar process with smooth margins; lacinia mobilis with 3 stout and 6 serrate teeth.

Right mandible (Fig. 18B) asymmetrical, without palp: in-

cisor process with 4 sclerotized teeth; molar process with serrate with indented margin; lacinia mobilis with 3 stout teeth.

Paragnaths (= hypopharynx: Fig. 18C) bilobate; medial margins covered with short setae.

Maxillula (Fig. 18D) lateral lobe with 9 stout setae distal-

ly, and few simple setae on inner and outer margins; medial lobe with 3 setulate setae distally, and few simple setae on inner and outer margins.

Maxilla (Fig. 18E) outer lobe with 3 long setulate setae distally, with several simple setae on outer margin; medial lobe with 4 serrate setae distally; inner lobe with 9 setulate and 7 simple setae distally, with 3 long simple setae on inner margin.

Maxilliped (Fig. 18F) endite with 1 plumose and several short simple setae on distal margin, and with 1 coupling hook; basis with 1 plumose and 2 simple setae on ventral surface; palp with 5 articles; article 1 shortest, 0.2 times as long as article 3, with 3 plumose and 2 long simple setae on

ventral surface; article 2 0.3 times as long as article 3, with at least 2 plumose and 2 long simple setae on inner margin and ventral surface, 1 seta broken; article 3 longest, with 3 plumose setae on outer margin, at least 2 plumose and 1 long simple setae on ventral surface (3 setae broken), several plumose and long simple setae on inner margin; article 4 0.6 times as long as article 3, with several plumose and long simple setae on inner and outer margins and ventral surface; article 5 0.3 times as long as article 3, with 7 plumose and 1 long simple setae on distal margin; epipod ovate, with few simple setae on outer margin.

Pereopod 1 (Fig. 19A) shorter and stouter than pereopods

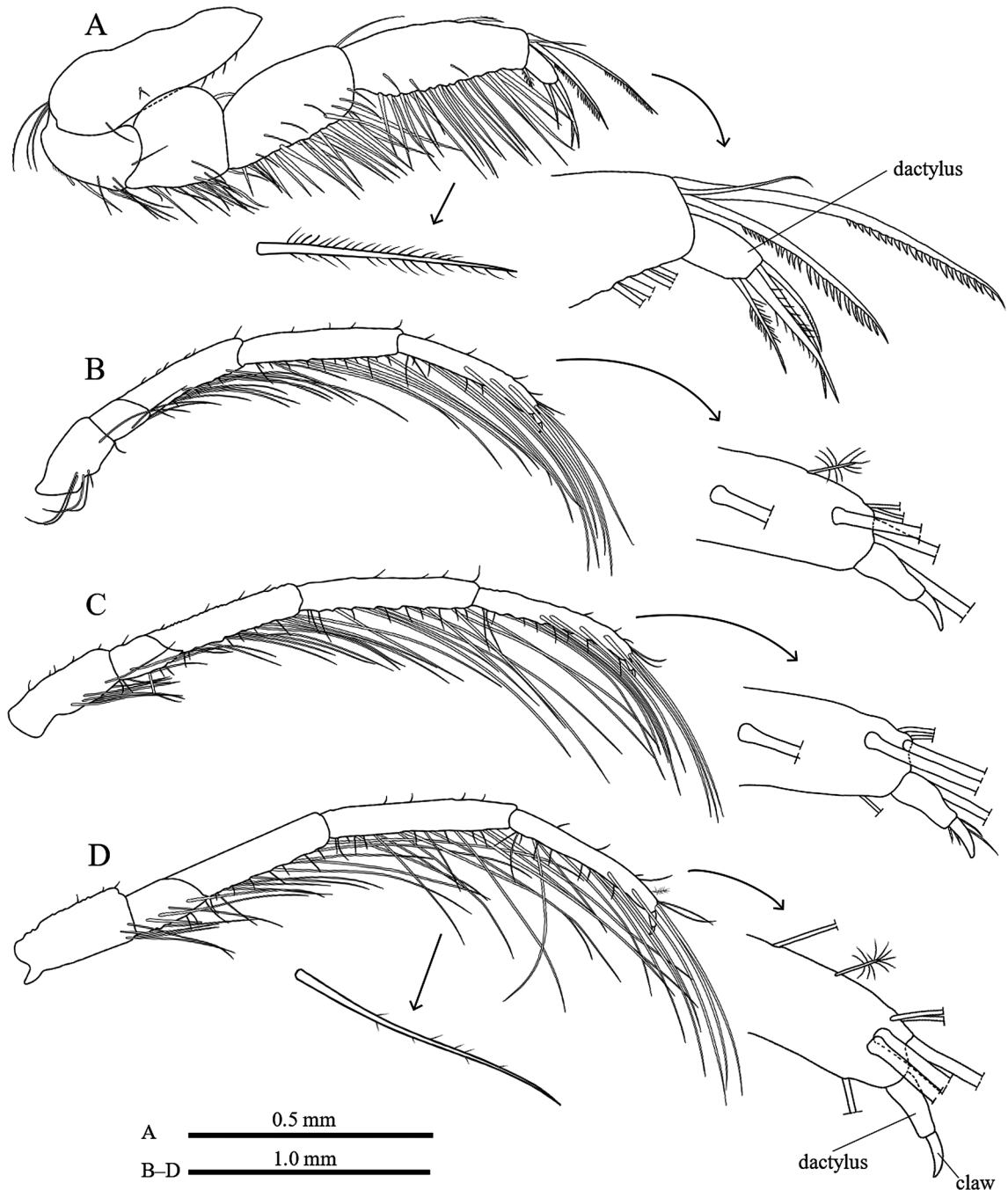


Fig. 19. *Spectrarcturus crassibrevis* sp. nov., holotype, non-ovigerous female (SMBL-V0906). A, Right pereopod 1, lateral; B, right pereopod 2, lateral; C, right pereopod 3, lateral; D, right pereopod 4, lateral.

2–4: basis longest article, 3.5 times as long as wide, with some plumose setae on distoventral angle and some short simple setae on dorsal margin; ischium 0.4 times as long as basis, 1.4 times longer than wide, ventral margin with several plumose setae; merus as long as ischium, 0.9 times longer than wide, ventral margin with many plumose setae, 1 plumose seta distodorsally; carpus 1.6 times as long as merus, 1.7 times longer than wide, ventral margin with many plumose setae, 1 plumose seta distodorsally; propodus 1.2 times as long as carpus, 2.7 times longer than wide, ventral margin with many plumose setae and dorsal margin with 1 setulate seta, superior margin with 1 simple and 3 setulate setae; dactylus shortest, 0.2 times as long as propodus, 1.8 times longer than wide, without claws, superior margin with 2 serrate and 2 setulate setae, 1 plumose and 1 clavate denticulate setae.

Pereopod 2 (Fig. 19B) distoventral angle of basis and ven-

tral margin of ischium to propodus with many bifid filtering setae; ischium half times as long as basis, dorsal margin without setae; merus 2.6 times as long as ischium, dorsal margin with few short simple setae; carpus 1.5 times as long as merus, dorsal margin with few short simple setae; propodus as long as carpus, with 1 plumose seta distodorsally, few short simple setae dorsally; dactylus shortest, 0.07 times as long as propodus, with 1 claw; claw as long as dactylus.

Pereopod 3 (Fig. 19C) similar to pereopod 2 except in the number of short simple and plumose setae on basis, ischium and propodus: basis with few short simple setae on dorsal margin; ischium with 1 short simple seta on dorsal margin; propodus with few short simple setae on dorsal margin.

Pereopod 4 (Fig. 19D) similar to pereopod 2 except in the number of short simple and plumose setae on basis, ischium and merus: basis with few short simple setae on dorsal margin; dorsal margin of ischium and merus without setae.

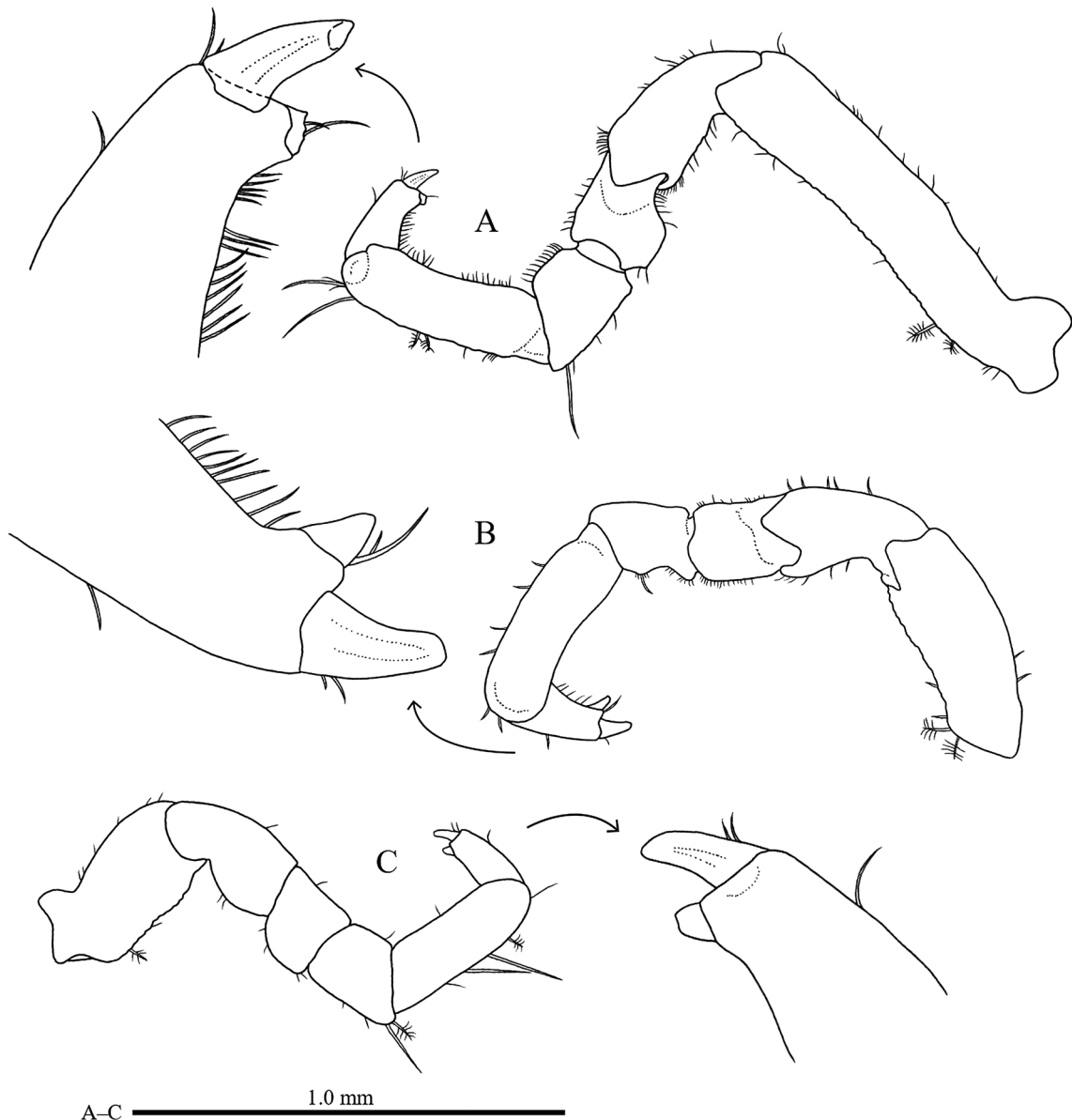


Fig. 20. *Spectrarcturus crassibrevis* sp. nov., holotype, non-ovigerous female (SMBL-V0906). A, Left pereopod 5, lateral; B, left pereopod 6, medial; C, right pereopod 7, lateral.

Pereopod 5 (Fig. 20A) basis with 2 plumose setae and few short simple setae on ventral margin, with few short simple setae on dorsal margin; ischium 0.5 times as long as basis, few short simple setae on dorsal and ventral margins; merus 0.3 times as long as ischium, with few short simple setae on dorsal and ventral margins; carpus 1.5 times as long as merus, with few short simple setae on dorsal and ventral margins and 1 long simple seta on distal angle; propodus 2.3 times as long as carpus, with few short simple setae on dorsal and ventral margins and 2 long simple setae and 2 plumose setae on ventral margin; dactylus 0.3 times as long as propodus, with 2 claws distally, and several short simple setae on dorsal and ventral margins; dorsal claw shorter than dactylus.

Pereopod 6 (Fig. 20B) similar to pereopod 5 except in the number of plumose and short simple setae on propo-

dus: propodus with few short simple setae on dorsal margin, ventral margin without setae.

Pereopod 7 (Fig. 20C) similar to pereopod 5 except in the number of plumose and short simple setae on basis, carpus and propodus: basis with 1 plumose seta and few short simple setae on ventral margin, with few short simple setae on dorsal margin; carpus with few short simple setae on dorsal and ventral margins and 1 long simple and 1 plumose setae on distal angle; propodus with few short simple setae on dorsal and ventral margins and 2 long simple setae and 1 plumose seta on ventral margin.

Pleopod 1 (Fig. 21A) protopod 3.3 times as long as wide, with 3 coupling hooks on inner margin; exopod as long as endopod, 6.2 times longer than wide, with 8 plumose setae on distal margin; endopod with 9 plumose setae on distal margin; several plumose setae as long as rami.

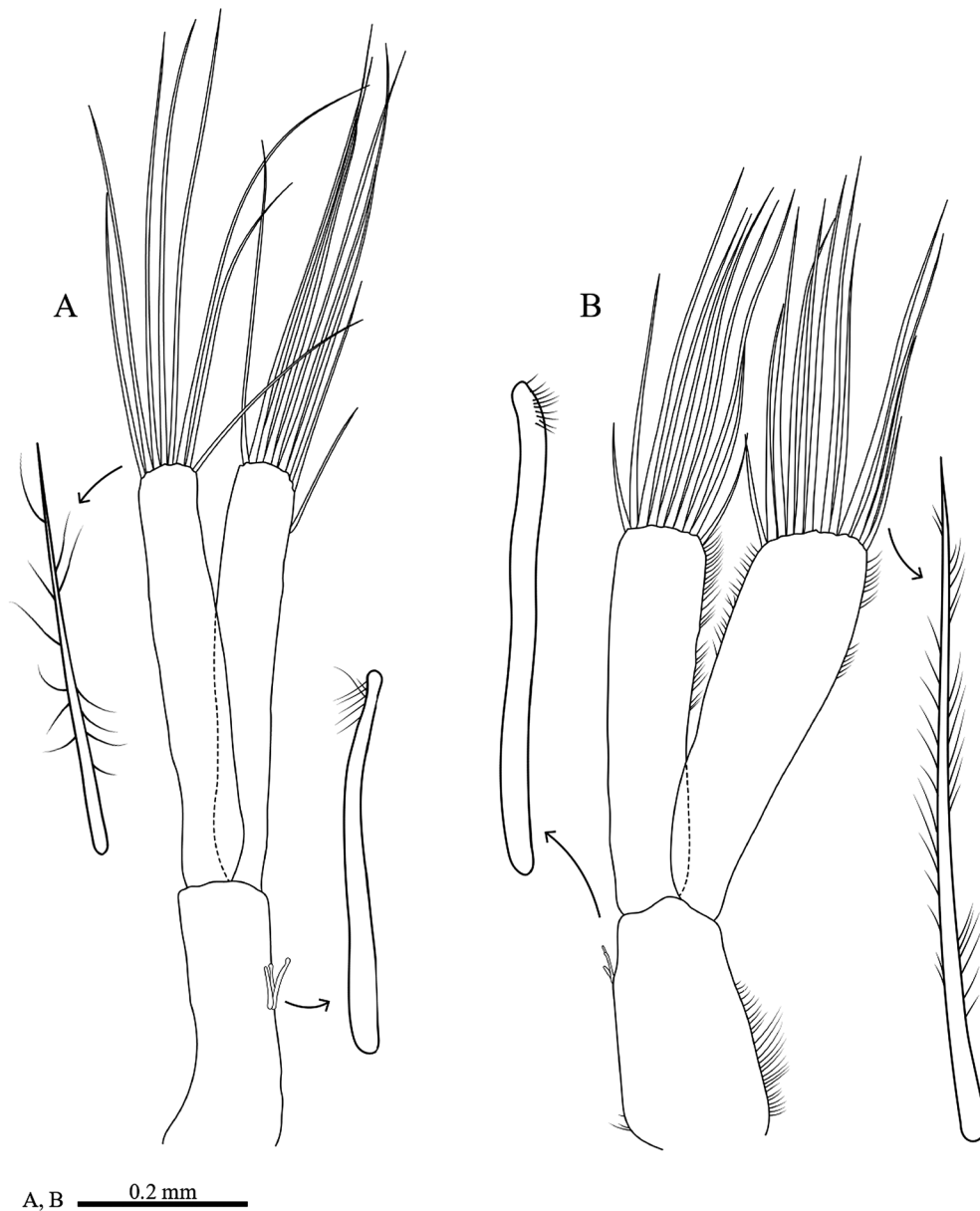


Fig. 21. *Spectrarcturus crassibrevis* sp. nov., holotype, non-ovigerous female (SMBL-V0906). A, Right pleopod 1, dorsal; B, right pleopod 2, ventral.

Pleopod 2 (Fig. 21B) protopod 1.9 times as long as wide, with 3 coupling hooks on inner margin, and several fine setae on outer margin; exopod as long as endopod, 3.5 times longer than wide, with 12 plumose setae on distal margin, several fine setae on inner and outer margins; endopod with 10 plumose setae on distal margin and several fine setae on

outer margin; all plumose setae shorter than rami.

Pleopod 3 (Fig. 22A) protopod without setae; endopod rounded distally, 0.8 times as long as exopod, with 2 plumose setae and few fine setae on inner margin; exopod without setae.

Pleopod 4 (Fig. 22B) similar to pleopod 3 except in the

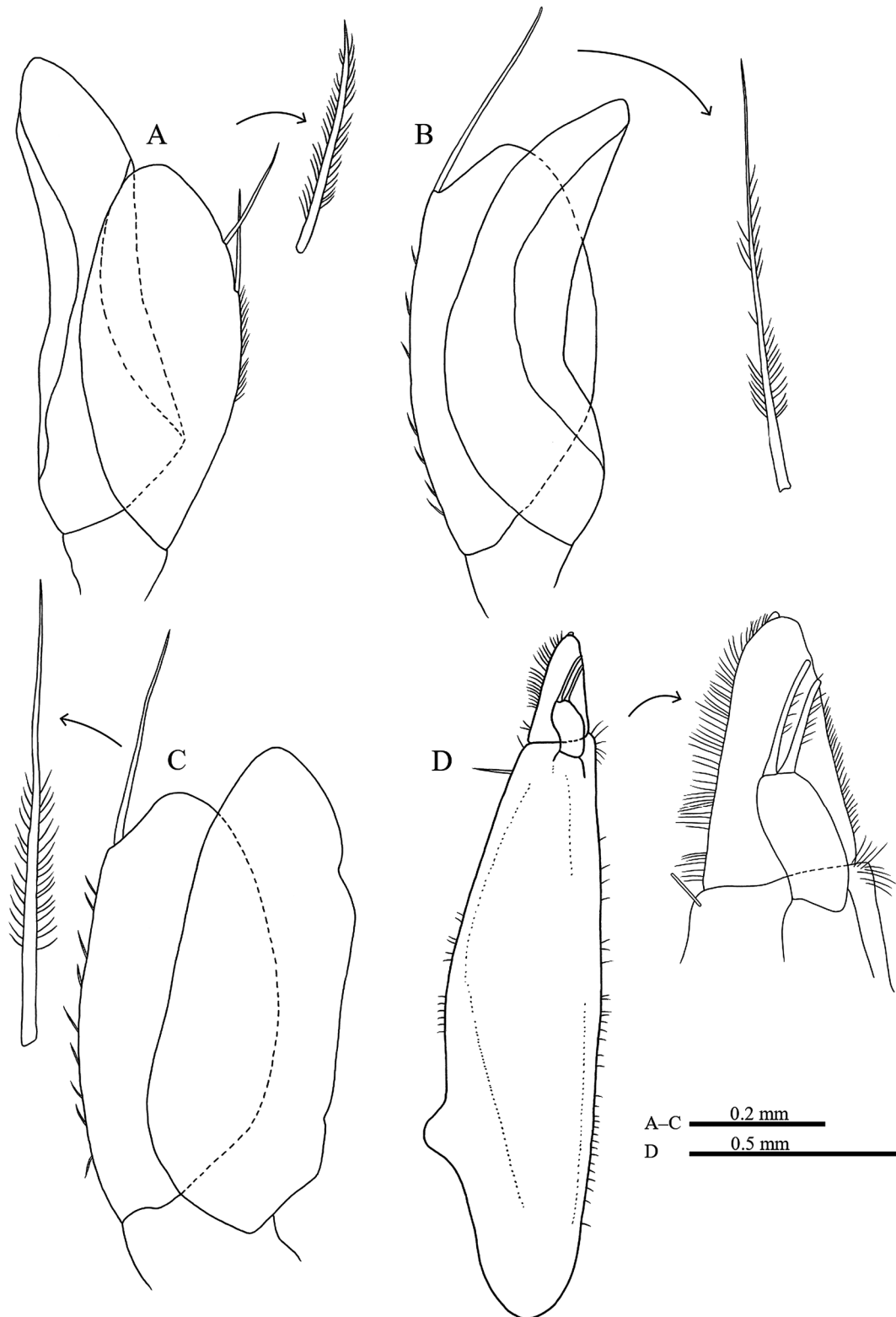


Fig. 22. *Spectrarcturus crassibrevis* sp. nov., holotype, non-ovigerous female (SMBL-V0906). A, Right pleopod 3, dorsal; B, right pleopod 4, ventral; C, right pleopod 5, ventral; D, right uropod, internal.

number of simple and plumose setae on endopod: endopod with 1 plumose seta and 7 simple setae on inner margin.

Pleopod 5 (Fig. 22C) similar to pleopod 3 except in the number of simple and plumose setae on endopod: endopod with 1 plumose seta and 9 simple setae on inner margin.

Uropod (Fig. 22D) biramous: protopod inner and outer margins with several thin simple setae; exopod half as long as endopod, with 2 plumose setae distally; endopod with several short simple setae on inner and outer margins and 1 seta distally (broken).

Color. Ethanol-preserved specimens whitish; eye light brown.

Etymology. The specific name is a Latin compound adjective, derived from blunt short spines.

The Japanese acronym for the species name “Futotoge” comes from “blunt spines” on their dorsal surfaces.

Remarks. Since neither the holotype nor the paratype of *Spectrarcturus crassibrevis* sp. nov. possesses oostegites, and the fourth thoracic segment is narrow, these specimens are considered to be immature females. Therefore, although their morphology may differ somewhat from that of mature individuals, *S. crassibrevis* sp. nov. can be distinguished from all other *Spectrarcturus* species based on the following combination of characters: pereonites 1–7 each with 2–4 short blunt submedial spines; pleotelson with four short blunt submedial and two lateral spines.

Key to the Species of *Spectrarcturus* (Females) Modified from Stransky et al. (2020)

1. Posterior end of pleotelson bifid 2
- Posterior end of pleotelson rounded, acute or truncated 4
2. Distolateral spine on article 3 of antenna about as long as article width *S. hystrix* (Sars, 1877)
- Distolateral spine on article 3 of antenna short, much shorter than article width 3
3. Pleotelson with tubercles on most dorsal surface *S. murchisoni* (Benedict, 1898)
- Pleotelson only with long spines on anterior part *S. intermedius* (Richardson, 1899)
4. Pleotelson bluntly truncated, slightly convex apically *S. chlebovitschi* (Kussakin, 1972)
- Pleotelson rounded or pointed apically 5
5. Pleotelson widely rounded apically; body without dense setae 6
- Pleotelson pointed apically; body densely setose 7
6. Body with numerous short, rounded tubercles 8
- Body with several long, slender spines on each pereonite 9
7. Pleotelson distally narrowly pointed; pereonite 4 twice as long as pereonite 3 *S. fabulosus* (Gurjanova, 1955)
- Pleotelson distally narrow, tongue-like; pereonite 4 1.7 times as long as pereonite 3 *S. furcatus* (Kussakin, 1982)
8. Antenna article 3 with spines *S. iturupicus* (Kussakin and Mezhev, 1979)

- Antenna article 3 without spines *S. bispinosus* sp. nov.
- 9. Bases of pereopods 5–7 with spines; antenna considerably shorter than body length *S. toporoki* (Kussakin, 1972)
- Bases of pereopods 5–7 without spines; antenna as long as body length 10
- 10. Pereonites each with slender spines *S. regularis* sp. nov.
- Pereonites each with short blunt spines *S. crassibrevis* sp. nov.

Data Availability Statement

All data supporting the findings of this study are included in the published article.

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Author Contributions

Yuzumi Okumura: Conceptualization; Investigation; Visualization; Writing – original draft; Writing – review & editing. Tomoyuki Nakano: Conceptualization; Writing – review & editing. Michitaka Shimomura: Conceptualization; Resources; Supervision; Writing – review & editing.

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Declarations

Competing interests. The authors declare no conflicts of interest.

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