A New Species of the Genus *Caprella* (Crustacea: Amphipoda: Caprellidae) Collected from a Gorgonian at 1497 m Depth off Boso Peninsula, Central Japan

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*Caprella nojimaensis* sp. nov. (Crustacea: Amphipoda: Caprellidae), inhabiting the gorgonian *Calcigorgia gracilis* Matsumoto, van Ofwegen, and Bayer, 2019, is described based on a specimen from 1497 m depth in the Nojima Submarine Canyon, off Boso Peninsula, central Japan. The species is closely related to *C. gracillima* Mayer, 1890, but differs from the latter in gnathopod 2 being positioned near the anterior margin of pereonite 2 and in the presence of paired small mid-dorsal projections on pereonites 2 and 5. The body colour of live material is pale pink, with mouth parts and gnathopod 2 fringed with darker pink, revealing protective colouration that matches that of the host gorgonian. The clinging behaviour in situ is “upright” as recorded by the remotely operated vehicle Hyper-Dolphin, and the presence of dense swimming setae on antenna 2 suggests that the caprellid feeds by filtering material suspended in the bathyal zone.

Key Words: Amphipoda, bathyal depth, *Caprella*, new species, off Boso Peninsula, protective colouration.

Introduction

Japan Agency for Marine-Earth Science and Technology (JAMSTEC) has been developing public relations activities as part of the Key Observation and Outreaching of the Hidden Ocean and Organisms (KO-OHO-O) program in collaboration with curators and stuff of the museums and aquariums in Kanto District, central Japan (Nishikawa et al. 2015). Several cruises were organized through KO-OHO-O program to observe topographic and geologic features as well as marine organisms of the bathyal zone in Sagami Bay and off the Boso Peninsula, central Japan, in the north-western Pacific (Fujikawa et al. 2014; Takahashi et al. 2016). During NT12-22 Cruise, the KO-OHO-O members explored the bathyal zone by using a remotely operated vehicle (ROV) Hyper-Dolphin from the R/V *Natsushima* (JAMSTEC). The team observed a specimen of caprellid amphipod inhabiting a gorgonian attached to a rock at 1497 m depth in the Nojima Submarine Canyon off the Boso Peninsula, central Japan. The canyon connects to the So-o Trough and it is situated halfway between the Sagami Trough and the Japan Trench along the north edge of the Philippine Sea Plate (Fig. 1). The observed specimen was collected along with the gorgonian using a manipulator arm and a suction sampler with 6 cm internal diameter installed on the ROV Hyper-Dolphin. The collected specimen is described in the present paper as a new species of the genus *Caprella* Lamarck, 1801 (Amphipoda: Caprellidae).

The clinging behaviour and protective colouration matching the host gorgonian observed in situ were also noted.

Materials and Methods

During the NT12-22 Cruise, the substrata and biota towards the west wall of an unnamed submarine canyon, one of the branches of the Nojima Submarine Canyon off the Boso Peninsula (Takahashi et al. 2016), were observed by using an ultrahigh-sensitivity high-definition television (HDTV) camera mounted on the ROV Hyper-Dolphin (Fig. 1). The transferred video was recorded using a BCT-D124L Digital Betacam system (Sony Co., Tokyo, Japan) installed in the control room of the R/V *Natsushima*. The caprellid and the gorgonian were collected from the rock at 1947 m depth using a manipulator arm and a suction sampler (slurp gun) with 6 cm internal diameter installed on the ROV Hyper-Dolphin. The sample was brought to the ship’s deck approximately 6 h 30 min after its collection and transferred to a glass aquarium (60×35×30 cm). After the cruise, both invertebrates were transported to a cold laboratory of Tokyo Sea Life Park, Edogawa-ku, Tokyo, for observations. The colour of the live gorgonian and caprellid was recorded by a digital single-lens reflex camera (Nikon D7000 with AF-S Micro NIKKOR 60 mm f/2.8G ED; Nikon Co., Tokyo, Japan). Thereafter, the gorgonian and caprel-
lid specimens were fixed separately in a 70% ethanol solution for taxonomic study. The lateral body views of somites, gnathopod 2, and dissected mouthparts and pereopods 5 to 7 were drawn under a microscope equipped with a camera lucida. The gorgonian was identified as *Calcigorgia gracilis* Matsumoto, van Ofwegen, and Bayer, 2019 (Matsumoto et al. 2019). Figure plates for *Caprella* were prepared following the methodology described by Takeuchi (2015) by combining hand-inked sketches with digital inking using Adobe Photoshop CS6 (Adobe Systems Incorporated, San Jose, CA, USA). The type specimen was deposited in the National Museum of Nature and Science (NSMT-Cr).

**Taxonomy**

Order Amphipoda Latreille, 1816
Family Caprellidae Leach, 1814
Genus Caprella Lamarck, 1801
Caprella nojimaensis sp.nov.
(Figs 2–4)

**Type localities.** 34°46.710′N 139°50.311′E, 1497 m depth.

**Material studied.** Holotype, 1 mature female, NSMT-Cr 29015, 34°46.710′N, 139°50.311′E, 1497 m depth, 23 August 2012, R/V Natsushima, NT-12-22, HPD #1426, St. 3, the gorgonian *Calcigorgia gracilis*, coll. R. Mimori.

**Description.** Holotype, mature female, body length, 20.69 mm, NSMT-Cr 29015. Head, 1.21 mm; pereonite 1, 1.65 mm; pereonite 2, 4.29 mm; pereonite 3, 4.19 mm; pereonite 4, 2.87 mm; pereonite 5, 4.09 mm; pereonite 6, 1.22 mm; pereonite 7, 1.18 mm. Pereonite 2 longest followed by pereonite 3 and pereonite 5.

Head and pereonites slender; eye distinctive. Pereonite 2 with paired mid-dorsal projections. Pereonite 5 with small anterolateral projection. Pereonite 5 with small anterolateral projection, paired mid-dorsal projections. Pereonite 4 with round anterolateral projection. Pereonite 5 with small anterolateral projection, paired mid-dorsal projections.

Antenna 1 slender; 0.95× body length; peduncle article 2 longest; peduncle article 3 straight, 0.80× peduncle article 2 length; flagellum 1.20× peduncular length, with 36 articles, proximal article composed of 5 articles. Antenna 2 slender; 0.45× antenna 1 length; peduncle article 2 to flagellum article 1 with dense plumous setae (swimming setae).

Mouthparts. Upper lip width 1.50× depth. Lower lip, inner lobe, setose. Mandible right incisor with 5 teeth, lacinia mobilis with 2 teeth followed by 2 bundle setose; molar distinct with molar flake. Mandible left incisor with 5 teeth, lacinia mobilis with 5 teeth followed by 3 bundle setose; molar large and distinct. Maxilla 1 outer plate with 7 stout apical setal-teeth; palp 2-articulate; article 2 5.0× article 1 with 11 apical to lateral robust or slender setae and single line of lateral setae. Maxilla 2 inner plate, oval, with ap-
proximately 30 setae; outer plate with approximately 30 apical setae. Maxilliped inner plate (basal endite) with setae on entire distal margin; outer plate (ischial endite) \(2.0 \times\) inner plate (basal endite) with 9 stout setae, with approximately 10 setae on inner margin; palp 4-articulate, articles 2 and 3 longest, setose; dactylus falcate.

Gnathopod 1 robust, setose. Gnathopod 2 positions 0.20 from along anterior margin of corresponding pereonite; coxa vestigial; basis \(0.60 \times\) length of pereonite 2, basis projection near distal margin; propodus ovate, large, length \(2.0 \times\) width; palm proximal projection with 1 robust (grasping) seta, palm margin convex, smooth, with midpalmar projection, with narrow sinus, with broad distal shelf. Gill 3 elongate, \(0.70 \times\) corresponding pereonite. Gill 4 elongate, \(0.80 \times\) corresponding pereonite.

Pereopod 5 slender; basis shorter than propodus; propodus with 1 pair of robust setae from approximately 0.4 palm length from articulation with carpus, with approximately 10 setae along palm; dactylus curved. Pereopods 6–7 progressively longer than pereopod 5.

**Behaviour and body colour.** The host gorgonian *Callogorgia gracilis* was scarcely attached to the rock face covered with sediments around the canyon. The seawater temperature and salinity at the collection site were 2.23°C and 34.54 psu, respectively.

The video taken by Hyper-Dolphin shows that the collected specimen of *Caprella nojimaensis* sp. nov. clung to the host using pereopods 5 to 7 in “upright” behaviour (Takeuchi and Hirano 1995) (Fig. 5). The body colour of *C. nojimaensis* sp. nov. in situ was pale pink, the same as that of the host gorgonian, indicating the presence of protective colouration matching that of the host (Fig. 5). The photo taken in the cold laboratory after the collection revealed that most body segments were pale pink, and mouthparts and gnathopod 1 were dark pink (Fig. 6). Gnathopod 2 was pinkish in the distal part of basis and the grasping part of propodus and dactylus.

Careful observations of the video recording made at the collection site confirmed the presence of at least four large individuals of the same species of *Caprella* (three individuals on the gorgonian and one on the rock) in addition to the collected individual (Fig. 7). This observation suggested that the present species widely dwells on the gorgonian and the rock surface of the canyon.

**Etymology.** The specific name *nojimaensis* is derived from the name of the collection site of the new species, Nojima Submarine Canyon.

**Remarks.** The genus *Caprella* is one of the most species diverse genera in the Amphipoda (Crustacea: Malacostraca), containing more than 180 species (see Arfianti, et al. 2018; Horton et al. 2020). *Caprella* spp. are euryhaline marine invertebrates with 1 to 3 cm long body, mostly found in algal communities, on buoys in port areas, and in aquaculture facilities in the temperate region (see Takeuchi et al. 2001, 2003). Most species from this genus are known from the shallow waters (see Arimoto 1976; Takeuchi 1999; Guerra-García et al. 2013), and five species have been recorded until now from deep waters, at depths greater than 300 m,
Fig. 3. *Caprella nojimaensis* sp. nov., holotype, mature female, 20.69 mm body length, NSMT-Cr 29015, collected from 1497 m depth of Nojima Submarine Canyon, off Boso Peninsula, central Japan. A, Antenna; G, gnathopod; P, pereopod. Scale bar: 1.0 mm.
Fig. 4. *Caprella nojimaensis* sp. nov., holotype, mature female, 20.69 mm body length, NSMT-Cr 29015, collected from 1497 m depth of Nojima Submarine Canyon, off Boso Peninsula, central Japan. LL, Lower lip; MD, mandible; MX, maxilla; MXD, maxilliped; UL, upper lip; L, left; R, right. Scale bars: 0.10 mm.
Caprella nojimaensis sp. nov. is most closely related to *C. gracillima* Mayer, 1890, a species reported more than 100 years ago from 96.9–182.9 m depth in mesophotic zone of the Tsugaru Strait, Korean Strait, and off Tokyo (Mayer 1890, 1903; McCain and Steinberg 1970). Mayer (1890) reported three mature females of *C. gracillima* collected in 1882 from the Tsugaru Strait and in the northern coast of Korea facing the Sea of Japan (42°N, 130°30′E). The collection depth of those specimens was recorded as 109.7 to 182.9 m. Mayer (1890) provided a brief description of a small male, but made no notes about the collection record for this male individual. His description and the whole lateral view of antennae and body somites were based on a mature female with a body length of 20 mm. In addition, Mayer (1903) reported a small female of *C. gracillima*, which was collected with *Caprella scaura* Templeton, 1836 and *Paraprotera secunda* Mayer, 1903 at a depth of 96.9 m off Tokyo in 1902. Based on the description and figure of *C. gracilli-
ma in Mayer (1890), *C. nojimaensis* sp. nov. differs from *C. gracillima* in: 1) antenna 2 with dense swimming setae vs. swimming setae sparse in *C. gracillima*; 2) gnathopod 2 positions 1/5 from anterior margin of pereonite 2 vs. 1/2 in *C. gracillima*; 3) pereonite 2 with paired small mid-dorsal projections vs. pereonite 2 smooth in *C. gracillima*; and 4) pereonite 5 with small anterolateral projection and paired small mid-dorsal projections vs. pereonite smooth in *C. gracillima*.

The new species is unique in that it inhabits gorgonians at around 1500 m depth, but its behaviour and morphology are similar to that of *Caprella* spp. inhabiting shallow waters. The presence of dense plumose swimming setae on antenna 2 suggest that *C. nojimaensis* sp. nov. filters the suspended matter flowing along the rocky substrate while assuming upright position. This behaviour is common in caprellids inhabiting shallow waters (see Caine 1977; Takeuchi and Hirano 1995).

The present study confirmed that distribution of the genus *Caprella* extends down the continental slope to a depth of around 1500 m in the Japan Trench near central Japan; this situation is similar to the continental slopes of the similar depth in Chishima/Kuril–Kamchatka Trench located north of the Japan Trench in the north-west Pacific (Vassilenko 1993). *Caprella angulina* Mayer, 1903 was reported to attach to mouthparts of the lithodid crab *Lithodes aequispina* Benedict, 1894 and is distributed in Sagami Bay, central Japan, and the Sea of Okhotsk at a depth of 400–410 m (Takeuchi et al. 1989). Guerra-García and García-Gómez (2003) described *Caprella sabineae* Guerra-García and García-Gómez, 2003 based on specimens collected from Sagami Bay, Japan, at 600 m depth during the Dr. Sixten Bock Japan Expedition in 1914. Onboard laboratory observations of *Caprella subtilis* Mayer, 1903 collected from 309 m depth in Sagami Bay, Japan, revealed that it attaches to swimming benthopelagic holothurians using pereopods 5–7 (or 6–7) in the “upright” position (Lindsay and Takeuchi 2008). Thus, the species from the genus *Caprella* occupy a wide variety of habitats in the bathyal zone of the Japan Trench. Recently, *Abyssododecas styx* Takeuchi, Tomikawa, and Lindsay, 2016 (Phtisicidae) was reported from cold-seep sites at abyssal depths (5313 to 7322 m depth) in the Japan Trench (Takeuchi et al. 2016), which is located approximately 600–700 km north-east from the collection site of the new species.

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Fig. 7. Four individuals of Caprella nojimaensis sp. nov. (red arrows) attached to the gorgonian and on rock and surrounding sediment at around 1500 m depth in the Nojima Submarine Canyon, off Boso Peninsula, central Japan.

References

Arfianti, T., Wilson, S., and Costello, M. J. 2018. Progress in the discovery of amphipod crustaceans. PeerJ 6: e5187.

Arimoto, I. 1934. Caprellidae (Crustacea) collected by T/S "Soyo-maru", Fisheries Training Institute, Ministry of Agriculture and Forestry. Dobutsugaku Zasshi 46: 494–509.

Arimoto, I. 1976. Taxonomic studies of caprellids (Crustacea, Amphipoda, Caprellidae) found in the Japanese and adjacent waters. Special Publications from Seto Marine Biological Laboratory, Kyoto University 3: i–v, 1–229.

Caine, E. A. 1977. Feeding mechanisms and possible resource partitioning of the Caprellidae (Crustacea: Amphipoda) from Puget Sound, USA. Marine Biology 42: 331–336.

Fujioka, K., Hirata, D., Oshima, M., Nemoto, S., Mimori, R., Hotta, M., Noda, C., Kayaba, U., Takahashi, N., Mori, S., Shibata, K., Nishikawa, T., Mitsuzawa, K., and Members of the KO-OHO-O Group, 2014. Preliminary results on submarine topography, geology and biology of the Sagami Bay, based on the ROV HYPER-DOLPHIN during NT08-21 Cruise. Bulletin of the Kanagawa Prefectural Museum (Natural Science) 43: 73–97.

Guerra-García, J. M. and García-Gómez, J. C. 2003. A new species of Caprella (Amphipoda, Caprellidae) from deep waters. Crustacea 76: 581–590.

Guerra-García, J. M., Navarro-Barranco, C., Corzo, J., Cobos-Muñoz, V., García-Adiego, E. M., Giménez, F. S., and García-Gómez, J. C. 2013. An illustrated key to the soft-bottom caprellids (Crustacea: Amphipoda) of the Iberian Peninsula and remarks to their ecological distribution along the Andalusian coast. Helgoland Marine Research 67: 321–336.

Horton, T., Lowry, J., De Broyer, C., Bellan-Santini, D., Coleman, C. O., Corbari, L., Costello, M. J., Danelya, M., Daunvin, J.-C., Fišer, C., Gasca, R., Grabowski, M., Guillot-García, J. M., Hendrycks, E., Hughes, L., Jaume, D., Jazdzewski, K., Kim, Y.-H., King, R., Krapp-Schickel, T., LeCroy, J., Lörrz, A.-N., Mamos, T., Senna, A. R., Serejo, C., Sket, B., Souza-Filho, J. F., Tandberg, A. H., Thomas, J. D., Thurston, M., Vader, W., Väinölä, R., Vonk, R., White, K., and Zeidler, W. 2020. World Amphipoda Database. Caprella Lamarck, 1801. Accessed through: World Register of Marine Species. Available at: http://www.marinespecies.org/aphia.php?p=taxdetails&id=101430 (19 May 2020).

Lamarck, J. B. 1801. Système des animaux sans vertèbres, ou Tableau général des classes, des ordres et des genres de ces animaux; Présentant leurs caractères essentiels et leur distribution, d’après la considération de leurs rapports naturels et de leur organisation, et suivant l’arrangement établi dans les galeries du Muséum d’Histoire Naturelle, parmi leurs dépouilles conservées; Précédé du discours d’ouverture du Cours de Zoologie, donné dans le Muséum National d’Histoire Naturelle l’an 8 de la République. Published by the author and Deterville, Paris, viii + 432 pp.

Latreille, P. A. 1816. Amphipoda. Pp. 467–469. In: Nouveau Dictionnaire d’histoire naturelle, appliquée aux Arts, à l’Agriculture, à
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L’Économie rurale et domestique, à la Médecine, etc. Par une société de Naturalistes et d’Agriculteurs. 2nd edition. Volume 1. Deterville, Paris.

Leach, W. E. 1814. Crustaceology. The Edinburgh Encyclopaedia 7: 383–437.

Lindsay, D. J. and Takeuchi, I. 2008. Associations in the deep-sea benthopelagic zone: the caprellid crustacean Caprella subtilis (Amphipoda: Caprellidae) and the holothurian Ellipinion kumai (Elastoida: Elpidiidae). Scientia Marina 72: 519–526.

Matsumoto, A. K., van Ofwegen, L. P., and Bayer, F. M. 2019. A revision of the genus Calciogorgia (Cnidaria, Octocorallia, Acanthogorgidae) with the description of three new species. Zootaxa 4571: 1–27.

Mayer, P. 1890. Nachtrag zur den Caprelliden. Fauna und Flora des Golfes von Neapel und der angrenzenden Meeres-Abschnitte 17: i–vi, 1–157, pl 1–7.

Mayer, P. 1903. Die Caprelliden der Siboga-Expedition. Siboga-Expedition 34: 1–160, pl 1–10.

McCain, J. C. and Steinberg, J. E. 1970. Amphipoda-1, Caprellidea-1. Pp. 1–78. In: Gruner, H.E. and Holthuis, L.E. (Eds) Crustaceorum Catalogus Part 2, SPB Academic Publishing, the Hague.

Nishikawa, T., Kayaba, U., Baba, C., Mitsuyama, N., Ohashi, M., Matsuura, K., Hirata, D., Fujioka, K., and KO-OHO-O members. 2015. New development of public relations activities through collaboration between JAMSTEC and museums/aquariums—An introduction to geomorphology, geology and biodiversity in the Sagami Bay—. Science Communication (Journal of Japanese Association for Science Communication) 4: 52–59.

Takahashi, N., Mimori, R., Komi, R., Nemoto, S., Iwase, N., Oshima, M., Hirata, D., Shibata, K., Mori, S., Tanaka, Y., Nishikawa, T., Ohashi, M., Mitsuwa, K., Fujioka, K., and members of the KO-OHO-O group. 2016. Visual observation report on topographic and geologic features of the Nojima Submarine Canyon, off Boso Peninsula, with marine organisms, based on the ROV Hyper-Dolphin #1426 dive during NT12-22 Cruise. Bulletin of the Kanagawa Prefectural Museum (Natural Science) 45: 29–39.

Takeuchi, I. 1999. Checklist and bibliography of the Caprellidea (Crustacea: Amphipoda) from Japanese waters. Otsuchi Marine Science 24: 5–17.

Takeuchi, I. 2015. A new species of Paraproto (Crustacea: Amphipoda: Phthisicidae) from South Shetland Islands, Antarctica. Polar Science 9: 368–373.

Takeuchi, I. and Hirano, R. 1995. Clinging behavior of the epifaunal caprellids (Amphipoda) inhabiting the Sargassum zone on the Pacific coast of Japan, with its evolutionary implications. Journal of Crustacean Biology 15: 481–492.

Takeuchi, I., Kihara, M., and Matsumoto, A. K. 2015. A new species of Caprella (Crustacea: Amphipoda: Caprellidae) from on the landward slope of the Japan Trench, North Pacific. Plankton and Benthos Research 14: 124–130.

Takeuchi, I., Takahashi, S., Tanabe, S., and Miyazaki, N. 2001. Caprella watch; a new approach for monitoring butyltin residues in the ocean. Marine Environmental Research 52: 97–113.

Takeuchi, I., Takeda, M., and Takeshida, K. 1989. Redescription of the bathyal caprellid, Caprella ungulina Mayer, 1903 (Crustacea, Amphipoda) from the North Pacific. Bulletin of National Science Museum Tokyo, Series A (Zoology) 15: 19–28.

Takeuchi, I., Tomikawa, K., and Lindsay, D. 2016. A new genus and species of Phthisicidae (Crustacea: Amphipoda) from abyssal depths in the Japan Trench, with special reference to similarities with Southern Ocean genera. Journal of Crustacean Biology 36: 495–506.

Takeuchi, I., Matsumasa, N., and Kikuchi, S. 2003. Gill ultrastructure and salinity tolerance of Caprella spp. (Crustacea: Amphipoda: Caprellidea) inhabiting the Sargassum community. Fisheries Science 69: 966–973.

Vassilenko, S. V. 1993. [Caprogrammarids and caprellids (Amphipoda, Caprellidea) of the continental slope of the Kurile Islands]. Issledovaniya Fauny Morei 46: 130–155. [In Russian with English summary]