

## ***Lernaeenicus ramosus* (Copepoda: Pennellidae) parasitic on a perchlet, *Chelidoperca hirundinacea* (Perciformes: Serranidae), in Suruga Bay, central Japan, with a note on the first record of the copepod from a serranine fish**

Kazuya Nagasawa, Masanori Kawazu

**Abstract.**— The pennellid copepod *Lernaeenicus ramosus* Kirtisinghe, 1956 is a parasite of perciform and blenniiform fishes in the Indo-West Pacific region. A metamorphosed female of the species was collected from a perchlet, *Chelidoperca hirundinacea* (Valenciennes, 1831), caught on the neritic continental shelf of Suruga Bay, central Japan. The copepod is almost exclusively a parasite of groupers (*Epinephelus* spp.) in the serranid subfamily Epinephelinae, but *C. hirundinacea* belongs to a different serranid subfamily Serraninae. The present collection of *L. ramosus* represents its first record from a serranine fish in the Indo-West Pacific region.

**Key words:** fish parasite, new host record, groupers, Serraninae, Epinephelinae

### ■ Introduction

The pennellid copepod *Lernaeenicus ramosus* Kirtisinghe, 1956 is a mesoparasite of perciform and blenniiform fishes in the Indo-West Pacific region, and its known hosts are mostly groupers (*Epinephelus* spp.) in the serranid subfamily Epinephelinae (Nagasawa *et al.*, 2020). In June 2021, we collected a metamorphosed female of *L. ramosus* from a perchlet, *Chelidoperca hirundinacea* (Valenciennes, 1831), in Suruga Bay, an inlet of the western North Pacific Ocean, Shizuoka Prefecture, central Japan. The fish species belongs to the serranid subfamily Serraninae. This collection is reported as the first record for *L. ramosus* from a serranine fish in the Indo-West Pacific region.

### ■ Materials and Methods

The specimen of *L. ramosus* was collected on 10 June 2021 from one of two fresh individuals of *C. hirundinacea*, which were commer-

cially caught with a bottom trawl net on the neritic continental shelf of Suruga Bay on 9 June 2021 and landed at Numazu on the early morning of 10 June 2021. The specimen was fixed and later preserved in 70% ethanol. It was examined with an Olympus SZX10 stereo microscope, and drawings were made with the aid of a drawing tube fitted on the microscope. Morphological terminology follows Izawa (2019). The specimen of *L. ramosus* is deposited in the Crustacea (Cr) collection of the National Museum of Nature and Science, Tsukuba, Ibaraki Prefecture (NSMT-Cr 29416).

### ■ Results

The anterior part of *L. ramosus* was found embedded in the lateral musculature of the perchlet examined (142 mm standard length) (Fig. 1A, B). The copepod inserted its anterior part into the host just above the body axis below the lateral line, and the posterior part protruded externally. The body was dark brown in the fresh

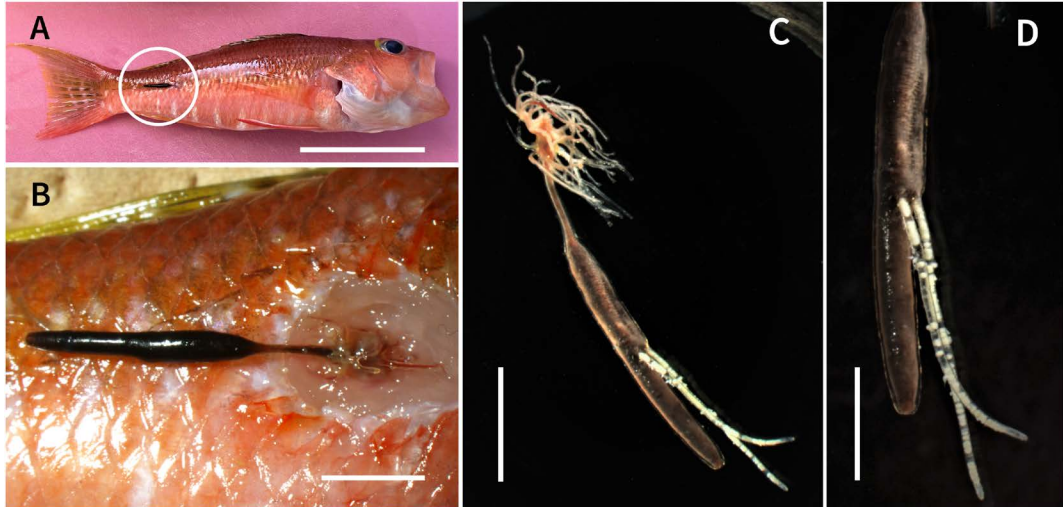


Fig. 1. *Lernaenicus ramosus*, metamorphosed female, NSMT-Cr 29416, 17.0 mm long. A, female (circled) infecting perchlet, *Chelidoperca hirundinacea* (142 mm standard length), fresh specimen; B, close-up of female, fresh specimen; C, habitus, ventrolateral view, fresh specimen; D, posterior body, including posterior region of trunk, abdomen, and a pair of egg sacs, ventrolateral view, fresh specimen. The host tissue was removed to show the head and neck of the female (Fig. 1B). Scale bars: A, 50 mm; B, C, 5 mm; D, 3 mm.

specimen (Fig. 1C, D).

The copepod was a metamorphosed female with a pair of egg sacs (Figs. 1C, D, 2). The body measures 17.0 mm long (from the anterior end of the head to the posterior end of abdomen, excluding the head's holdfasts and the egg sacs) and comprises the head, neck, trunk, and abdomen. The head, 1.2 mm long, has three pairs of branching holdfasts: the anterior and the middle pairs arise from the dorsolateral and the ventrolateral corners, respectively, in the anterior portion of the head, and the posterior pair does from the dorsolateral corner in the posterior portion of the head. Each holdfast is slightly swollen near its base and possesses slender branches. Eight hemispherical lobes are found on the anteroventral surface between the bases of the anterior pair of holdfasts. The oral area was not well visible. Four pairs of legs are located on the ventral surface at a level of the posterior pair of holdfasts. The neck, 4.3 mm long (25% of body length), is slender. The trunk including the abdomen, 11.5 mm long (68% of body length), is fusiform. The

abdomen, 6.0 mm long, is well developed and ends bluntly without caudal rami. The egg sacs are linear, each 8.0 and 8.3 mm long (47 and 49% of body length).

#### Remarks

*Lernaenicus ramosus* was originally described based on females from comet grouper, *Epinephelus morrhua* (Valenciennes, 1833), in the Indian Ocean off Sri Lanka (as Ceylon) (Kirtisinghe, 1956). The copepod has since been reported from India (Pillai, 1985), Australia (Boxshall, 1986), and Japan (see Nagasawa *et al.*, 2020). It was redescribed from Japanese specimens by Shiino (1958) and Izawa (2019). Morphological characters of the copepod specimen collected in this study correspond to those reported by the above authors, especially by Shiino (1958) and Izawa (2019), and the specimen is identified as *L. ramosus*. The species is characterized by three pairs of well developed, branching holdfasts on the head (Figs. 1C, 2).

In addition to *L. ramosus*, three nominal and one unidentified species of the same genus

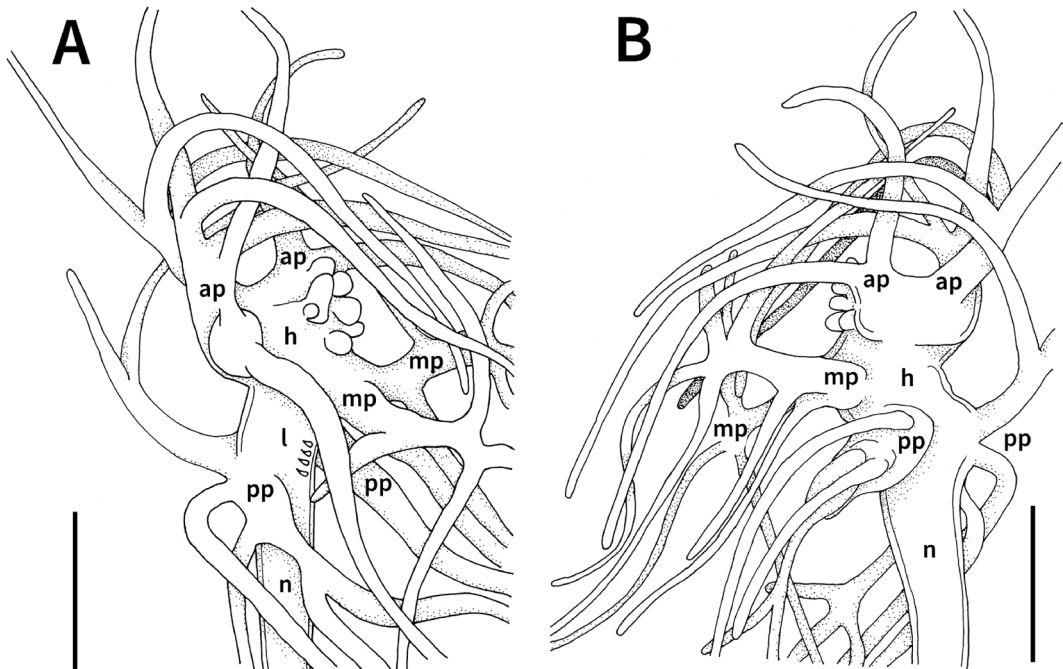


Fig. 2. *Lernaenicus ramosus*, metamorphosed female, NSMT-Cr 29416, 17.0 mm long. A and B, head and anterior region of neck, ventro- and dorsolateral views, respectively. Abbreviations: ap, anterior pair of holdfasts; h, head; l, legs; mp, middle pair of holdfasts; n, neck; pp, posterior pair of holdfasts. Scale bars: A, B, 2 mm.

have been reported from Japanese marine fishes (Nagasawa & Uyeno, 2014): *Lernaenicus ater* Shiino, 1958 (from *Apogon lineatus* Temminck & Schlegel, 1842; Kurtiformes, Apogonidae); *L. quadrilobatus* Yamaguti and Utinomi, 1953 (from *Diaphus* sp.; Myctophiformes, Myctophidae); *L. sayori* Yamaguti, 1939 (from *Hyporamphus sajori* (Temminck & Schlegel, 1846); Beloniformes, Hemiramphidae); and *Lernaenicus* sp. (from *Parapercis sexfasciata* (Temminck & Schlegel, 1843); Perciformes, Pinguipedidae). Of these species, *L. ater* is similar to *L. ramosus* in possessing slender branches in each holdfast on the head but differs from the latter species by the presence of three strongly chitinized branches near the junction with the neck (Shiino, 1958). No similarly chitinized branches are found on the head of *L. ramosus* (Fig. 2).

The known hosts of *L. ramosus* are all serranids, excluding bluestriped fangblenny, *Plagiotremus rhinorhynchus* (Bleeker, 1852) (reported

as *Runula rhinorhynchus*) (Blenniiformes, Blenniidae), from Australia (Boxshall, 1986). The serranid hosts are almost exclusively groupers of the genus *Epinephelus*, consisting of the following eight species: comet grouper, *E. morrhua* (type host); Hong Kong grouper, *E. akaara* (Temminck and Schlegel, 1842); areolate grouper, *E. areolatus* (Forssakål, 1775); yellow grouper, *E. awoara* (Temminck and Schlegel, 1842); longtooth grouper, *E. bruneus* Bloch, 1793; brownspotted grouper, *E. chlorostigma* (Valenciennes, 1828); and blacktip grouper, *E. fasciatus* (Forssakål, 1775) (Nagasawa & Uyeno, 2014; Nagasawa *et al.*, 2020, 2021). In addition to these *Epinephelus* spp., a species of a different serranid genus *Hyporthodus*, i.e., convict grouper, *H. septemfasciatus* (Thunberg, 1793), is also known as one of the hosts of *L. ramosus* from Japan (Nagasawa *et al.*, 2011, 2014). All these groupers belong to the serranid subfamily Epinephelinae. In the present study, *L. ramosus* was found infecting

*C. hirundinacea*, which is a member of the serranid subfamily Serraninae. Thus, the collection of *L. ramosus* reported herein is unusual and represents the first record of the species from a serranine fish in the Indo-West Pacific region.

## Discussion

In Japan, *L. ramosus* was first reported in the late 1950s and early 1960s (Shiino, 1958, 1964) but, due to its outbreaks beginning in the 2000s (Anonymous, 2004; Nagasawa *et al.*, 2010, 2011), the species has expanded its geographical distribution and host range (Nagasawa *et al.*, 2014, 2020, 2021). In this study, the specimen of *L. ramosus* was collected from Suruga Bay, which is a recently reported locality of the species in Japan and also its northeasternmost locality in the Indo-West Pacific region (Nagasawa *et al.*, 2020; Nagasawa & Tawa, 2021). Areolate grouper (*E. areolatus*) is the only known host of *L. ramosus* from Suruga Bay, and perchlet (*C. hirundinacea*) is the second host of the copepod in the bay. Previously, two infected individuals of areolate grouper were collected using rod and line from the coast and at 35 m in depth, respectively, in Suruga Bay (Nagasawa *et al.*, 2020; Nagasawa & Tawa, 2021), but the infected perchlet reported in this paper was caught by a bottom trawler from the neritic continental shelf of the bay. In the western North Pacific Ocean off central Japan, perchlet occurs on the continental shelf at 80–150 (mainly 90–130) m in depth (Toriyama & Horikawa, 1984), and *L. ramosus* is likely to utilize, as its hosts, both serranids inhabiting the shallow coastal waters and those occurring on the deeper continental shelf.

## Acknowledgments

We thank two anonymous reviewers for their comments to improve the manuscript.

## Literature Cited

- Anonymous, 2004. [Ectoparasites of groupers]. Tobiuo Tsushin, Gogai Tobikkusu, 1: 1–2. (In Japanese)
- Boxshall, G. A., 1986. A new genus and two new species of Pennellidae (Copepoda: Siphonostomatoida) and an analysis of evolution within the family. *Systematic Parasitology*, 8: 215–225.
- Izawa, K., 2019. Redescription of *Lernaenicus ramosus* Kirtisinghe, 1956 (Copepoda, Siphonostomatoida, Pennellidae), with description of its male and the postnaupliar developmental stages. *Crustaceana*, 92: 119–128.
- Kirtisinghe, P., 1956. Parasitic copepods of fish from Ceylon. IV. *Parasitology*, 46: 14–21.
- Nagasawa, K., Doi, H., & Yokoyama, F., 2011. Further records of *Lernaenicus ramosus* (Copepoda: Pennellidae) from groupers (*Epinephelus* spp.) in Japanese waters. *Biogeography*, 13: 51–53.
- Nagasawa, K., Mukai, T., Sota, K., & Yamauchi, T., 2010. Heavy infection of groupers *Epinephelus* spp. with *Lernaenicus ramosus* (Copepoda, Pennellidae) in the Sea of Japan. *Biogeography*, 12: 13–15.
- Nagasawa, K., Murase, T., Sonoda, S., & Motoyoshi, H., 2021. Infection of *Lernaenicus ramosus* (Copepoda: Pennellidae) on areolate grouper, *Epinephelus areolatus*, in Kagoshima Bay, southern Japan: the second record of the copepod from Kagoshima Prefecture. *Nature of Kagoshima*, 48: 133–137. (In Japanese with English abstract)
- Nagasawa, K., Suzuki, K., & Muto, F., 2020. Areolate grouper, *Epinephelus areolatus* (Perciformes: Serranidae), a new host record for *Lernaenicus ramosus* (Copepoda: Pennellidae), with comments on the known hosts and distribution records of the copepod in the Indo-West Pacific region. *Crustacean Research*, 49: 15–21.
- Nagasawa, K., & Tawa, A., 2021. Second record of the parasitic copepod *Lernaenicus ramosus*

- sus* (Pennellidae) from areolate grouper, *Epinephelus areolatus*, in Suruga Bay, central Japan. *Nature of Kagoshima*, 47: 219–222. (In Japanese with English abstract)
- Nagasawa, K., & Uyeno, D., 2014. A checklist of copepods of the family Pennellidae (Siphonostomatoidea) from fishes and whales in Japanese waters (1916–2014). *Biosphere Science*, 53: 43–71. (In Japanese with English abstract)
- Nagasawa, K., Yuasa, A., Doi, H., & Isozaki, S., 2014. *Lernaeenicus ramosus* (Copepoda: Pennellidae), a parasite of groupers from off Japan, with two new host records. *Biogeography*, 16: 53–56.
- Pillai, N. K., 1985. The Fauna of India. Copepod Parasites of Marine Fishes. 900 pp. Zoological Society of India, Calcutta.
- Shiino, S. M., 1958. Copepods parasitic on Japanese fishes. 17. Lernaecidae. Report of Faculty of Fisheries, Prefectural University of Mie, 3: 75–100, 2 pls.
- Shiino, S. M., 1964. Results of Amami Expedition. 6. Parasitic Copepoda. Report of Faculty of Fisheries, Prefectural University of Mie, 5: 243–255.
- Toriyama, M., & Horikawa, H., 1984. [Zonal structure of the vertical distribution of benthic fishes in Tosa Bay, central Japan]. In: Anonymous, (ed.), *Proceedings the Meeting of the Benthic Fish Section of Western Japan*, Nansei Regional Fisheries Research Laboratory, Ono, pp. 69–79. (In Japanese)

---



---

#### Addresses

(KN) Graduate School of Integrated Sciences for Life, Hiroshima University, 1–4–4 Kagamiyama, Higashi-Hiroshima, Hiroshima 739–8528, Japan

(KN's present address) Aquaparasitology Laboratory, 365–61 Kusanagi, Shizuoka 424–0886, Japan

(MK) Shimizu Field Station, Fisheries Resources Institute, Japan Fisheries Research and Education Agency, 5–7–1 Orido, Shimizu, Shizuoka 424–8633, Japan

#### E-mail address of corresponding author

ornatus@hiroshima-u.ac.jp