

Further records of *Lernaeenicus ramosus* (Copepoda: Pennellidae) from groupers (*Epinephelus* spp.) in Japanese waters

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Abstract. Two and one adult females of the pennellid copepod *Lernaeenicus ramosus* Kirtisinghe, 1956 were found infecting, respectively, a yellow grouper (*Epinephelus awoara*) from the East China Sea and a convict grouper (*Hyporthodus septemfasciatus*) from the Sea of Japan. The former finding of *L. ramosus* represents the first record of this parasite from the East China Sea. *Hyporthodus septemfasciatus* is a new host record for *L. ramosus*. Based on the current and present information on the occurrence of *L. ramosus* in Japanese waters, it is likely that outbreaks of this parasite occurred in the 2000s among grouper populations in several waters of western Japan.

Key words: *Lernaeenicus ramosus*, Copepoda, fish parasite, groupers, new geographic record, new host record

Introduction

Lernaeenicus ramosus Kirtisinghe, 1956 is a mesoparasitic copepod infecting marine teleosts, especially groupers of the genus *Epinephelus* Bloch, 1793 (Perciformes: Serranidae), in the Indo-West Pacific region (Kirtisinghe, 1956; Shiino, 1958, 1964; Boxshall, 1986). In Japan, this parasite was recently reported from the Seto Inland Sea (Doi, 2007; Doi *et al.*, 2008), and two cases of heavy infection on groupers were found in the southern Sea of Japan (Nagasawa *et al.*, 2010). The present note deals with

further records of *L. ramosus* in Japanese waters, including new geographic and host records for this species.

Materials and Methods

A yellow grouper (*Epinephelus awoara* (Temminck & Schlegel)) was commercially caught in the eastern East China Sea (32°91'N, 129°17' E) off the east coast of Shinkamigoto, Nagasaki Prefecture on 5 November 2007, and a convict grouper (*Hyporthodus septemfasciatus* (Thunberg)) was also commercially captured in the southern Sea of Japan (34°14' N, 130°89' E) off Murotsu in Toyoura, Shimonoseki City, Yamaguchi Prefecture on 4 September 2009

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(Fig. 1). Specimens of *L. ramosus* were carefully removed from the fishes, fixed in 70% ethanol, and identified based on Shiino (1958). They are deposited in the Crustacea collection at the National Museum of Nature and Science, Tokyo (NSMT-Cr 21333 from *E. awoara*; NSMT-Cr 21334 from *H. septemfasciatus*). The scientific and common names of fishes follow Froese & Pauly (2011).

Results and Discussion

The yellow grouper (*ca.* 300 mm total length [TL]) from the East China Sea and the convict grouper (250 mm TL) from the Sea of Japan were found infected with two and one adult females of *L. ramosus*, respectively (Fig. 2). In these infections, the anterior part of the parasite was embedded in the host's subcutaneous tissues. The remaining body and egg sacs of the parasite protruded externally from the lateral side of the host's body. The specimens measured 15.5-15.7 (mean 15.6) mm and 14.1 mm (excluding the egg sacs) from *E. awoara* and *H. septemfasciatus*, respectively. They correspond to the morphology of *L. ramosus* reported by Shiino (1958) based on material from blacktip grouper (*Epinephelus fasciatus* (Forsskål)) (as *E. tsirimenaria* [sic]) caught off Japan. In this country, *L. ramosus* has been recorded from the western North Pacific, the Seto Inland Sea, and the Sea of Japan (Fig. 1) (Shiino, 1958, 1964; Doi, 2007; Doi *et al.*, 2008; Nagasawa *et al.*, 2010). Our finding of *L. ramosus* from *E. awoara* represents a new record of *L. ramosus* from the East China Sea. The known sampling localities of *L. ramosus* in Japanese waters are in the southern temperate region, which is more or less affected by the Kuroshio and its branch, the Tsushima Current (Nagasawa *et al.*, 2010). The localities reported in this study also are included in the region affected by the Tsushima Current (Fig. 1).

The geographical distribution of *L. ramosus* is

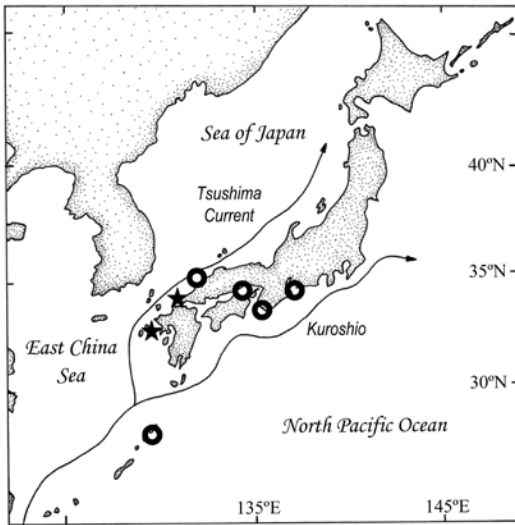


Fig. 1. A map of the Japanese Archipelago, showing the localities where *Lernaenicus ramosus* Kirtisinghe, 1956 was collected in the previous (circles; Shiino, 1958, 1964; Doi, 2007; Nagasawa *et al.*, 2010) and present (stars) studies.



Fig. 2. *Hyporthodus septemfasciatus* (Thunberg) infected with an adult female of *Lernaenicus ramosus* Kirtisinghe, 1956. A, a fish harboring the parasite (arrowhead); B, a close-up view of the parasite at the attachment site. Scale bars: 50 mm for A, 20 mm for B.

yet unclear. This species is found in the Indo-West Pacific region, including India (Kirtisinghe, 1956), Australia (Boxshall, 1986), and Japan, but no report has been published on its occurrence in other countries. We need more information on the distribution of *L. ramosus* in this region, especially in subtropical and tropical areas where our knowledge on the parasitic copepods of marine fishes is very limited.

The host specificity of *L. ramosus* is probably not strict, but this parasite appears to infect groupers (*Epinephelus* spp.) almost exclusively (Nagasawa *et al.*, 2010). To date, it has been reported from four species of groupers: comet grouper (*E. morrhua* (Valenciennes)), Hong Kong grouper (*E. akaara* (Temminck & Schlegel)), blacktip grouper (*E. fasciatus*), and yellow grouper (*E. awoara*) (Kirtisinghe, 1956; Shiino, 1958, 1964; Doi, 2007; Doi *et al.*, 2008; Nagasawa *et al.*, 2010). In this study, we collected a specimen of *L. ramosus* from *H. septemfasciatus*, which is herein added as a new host for the parasite.

According to the fishermen of the Kabashima Branch of the Goto-Fukue Fisheries Cooperative who have been engaged in a grouper fishery in the eastern East China Sea off the east coast of Shinkamigoto, Nagasaki Prefecture, an infection of groupers by *L. ramosus* was first observed in 2006 and its infection level increased in 2007. Similarly, *L. ramosus* was noticed infecting groupers in the Seto Inland Sea from 2002 to 2007 (Doi, 2007; Doi *et al.*, 2008) and in the southern Sea of Japan off Shimane Prefecture in 2004 (Nagasawa *et al.*, 2010). These observations indicate that outbreaks of *L. ramosus* occurred in the 2000s among grouper populations in several waters of western Japan. Since the infection level of *L. ramosus* on groupers is poorly known, we need more work on annual changes in abundance of the species in these waters.

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