

***Sarcotaces* sp. (Copepoda: Philichthyidae), a parasite of a blacktip grouper, *Epinephelus fasciatus*, from off the Ryukyu Islands, southern Japan**

Kazuya Nagasawa^{1*}, Daisuke Uyeno² and Minoru Toda³

¹ Graduate School of Biosphere Science, Hiroshima University,
1-4-4 Kagamiyama, Higashi-Hiroshima, Hiroshima, 739-8528 Japan

² Graduate School of Environment and Engineering, Kagoshima University,
1-21-35 Korimoto, Kagoshima, 890-0056 Japan

³ Okinawa Churashima Research Center, Okinawa Churashima Foundation, 888 Ishikawa,
Motobu, Okinawa, 905-0206 Japan

Abstract. Specimens of the philichthyid copepod *Sarcotaces* sp. were collected from gall-like cysts formed in the trunk and peduncle muscles under the skin of a blacktip grouper, *Epinephelus fasciatus* (Forsskål, 1775), from off Amami-oshima Island, the Ryukyu Islands, southern Japan. This finding constitutes the first record of copepod of *Sarcotaces* from the Ryukyu Islands. As many as eight cysts, each containing a large adult female, a dwarf adult male, and many eggs and nauplii of *Sarcotaces* sp., were observed in this fish.

Key words: blacktip grouper, Copepoda, *Epinephelus fasciatus*, fish parasite, *Sarcotaces* sp.

Groupers with several skin swellings caused by large parasites in the muscle are well known among local fishermen of the Ryukyu Islands, southern Japan. These fish are disliked and have no commercial value at fish markets. Recently, we had the opportunity to examine a blacktip grouper, *Epinephelus fasciatus* (Forsskål, 1775) (Perciformes: Serranidae), showing such skin swellings and found that the cause was the philichthyid copepod *Sarcotaces* sp. Some of the local fishermen suppose that such muscle parasites of groupers may parasitize humans, but this note reports that the parasites are a species of copepod that is not infective to humans.

One individual of *E. fasciatus* (205 mm in standard length, Fig. 1A) was caught commercially on 18 March 2013 in coastal waters of Amami-oshima Island, one of the Ryukyu Islands, Kagoshima Prefecture, southern Japan (detailed information on the

sampling site was not obtained). This fish was first examined in fresh conditions at the laboratory of the Okinawa Churashima Foundation, Motobu Town, Okinawa Prefecture, where two cysts were detected in the right peduncle muscle of the fish (Fig. 1B) and a female of *Sarcotaces* sp. (Fig. 1C) was found in each cyst by the naked eye. The fish and the copepods were fixed in 10% neutralized formalin and then transported to the laboratory at Hiroshima University, Higashi-Hiroshima City, Hiroshima Prefecture, where all cysts were removed from the fish, and copepods were taken from the cysts. Specimens of the copepods were re-fixed and preserved in 70% ethanol. The fish specimen is deposited at the General Research Center of the Okinawa Churashima Foundation (OCF-P20130220-6), whereas the copepod specimens are retained by one of the authors (D.U.) for further taxonomic work. The scientific names of fish used in this paper follow those recommended by Nakabo (2013).

*Corresponding author: ornatus@hiroshima-u.ac.jp

The specimen of *E. fasciatus* was found to harbor a total of eight cysts, consisting of six and two cysts formed in the trunk and peduncle muscles, respectively (Fig. 1B, 1D). Four cysts were observed under the fish skin in each side of the fish body, and they formed a cluster in the left trunk muscle. The cysts were gall-shaped and surrounded by the host's tis-

sues, measuring 21–43 (mean 28) mm long and 9–20 (15) mm wide (n=8). Each cyst contained a large adult female, a dwarf adult male, and many eggs and nauplii of *Sarcotaces* sp. The posterior end of the female protruded externally through the skin of the fish (Fig. 1B). The female's body with a tuberculated surface was ovoid and up to 40 mm long in a fresh

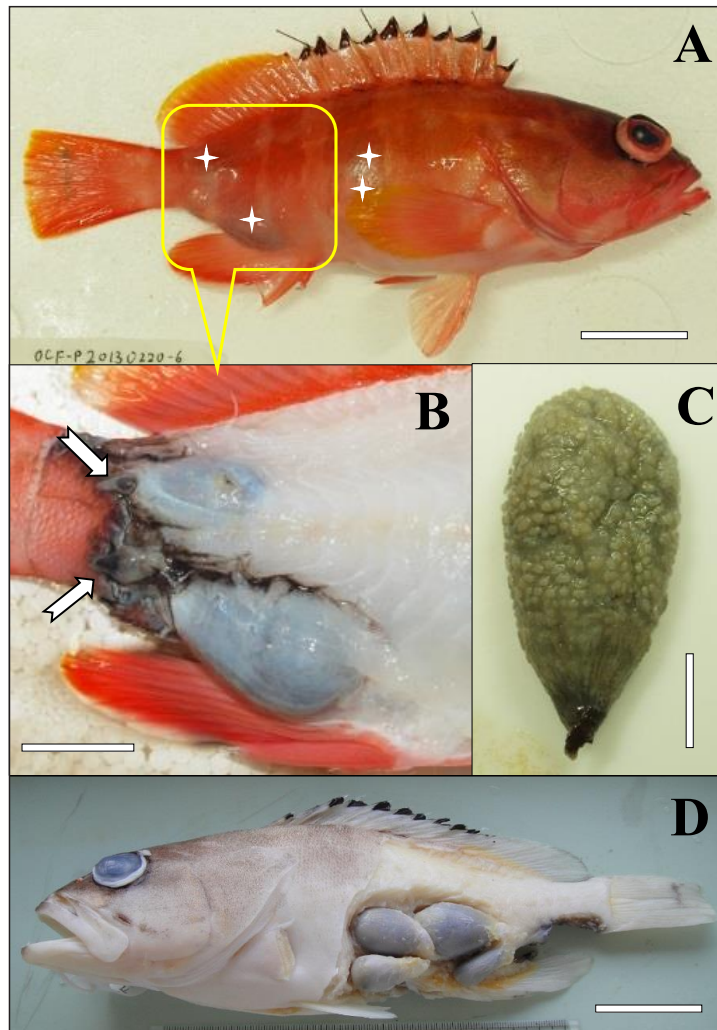


Fig. 1. *Sarcotaces* sp. infecting the muscles of *Epinephelus fasciatus* (Forsskål, 1775) (OCF-P20130220-6). A, fish with four swellings, indicated by crosses, of the right lateral skin, fresh specimen; B, two cysts containing *Sarcotaces* sp. in the peduncle muscle of fish, fresh specimen. Arrows indicate the posterior end of female parasite; C, adult female of *Sarcotaces* sp., lateral, fresh specimen; D, fish harboring a cluster of four cysts in the left trunk muscle. This formalin-preserved specimen is the same fish shown in Fig. 1A. Scale bars: A, D, 30 mm; B, 20 mm; C, 10 mm.

specimen (Fig. 1C). The specimens of *Sarcotaces* sp. are being identified and will be described in a separate paper.

Sarcotaces is a small genus of philichthyid copepods, currently consisting of only seven valid species (Walter, 2015). Three of these species, *S. arcticus* Collett, 1874, *S. verrucosus* Olsson, 1872, and *S. nambiensis* Reimer, 1991, occur outside Japan (Yamaguti, 1963; Reimer, 1991), but the other four species have been reported from Japan: *S. pacificus* Komai, 1924, from *Antennaris striatus* (Shaw, 1794) (as *A. tridens* and *A. nox*) and *Antennaris* sp. (Lophiiformes: Antennariidae) (Komai, 1924; Heegaard, 1947; Shiino, 1953; Izawa, 1973, 1974); *S. komaii* Shiino, 1953, from *Satyrichthys amiscus* (Jordan & Starks, 1904) (as *Peristedion amiscus*) (Scorpaeniformes: Peristediidae) (Shiino, 1953; Izawa, 1974) and *Antimora microlepis* Bean, 1890 (as *A. rostrata*) (Gadiformes: Moridae) (Matsubara & Asano, 1943, as an ink sac; Matsubara, 1963: 1297, as a crustacean parasite; Avdeev & Avdeev, 1975); *S. japonicus* Izawa, 1974, from *Gymthorax kidako* (Temminck & Schlegel, 1847) (Anguilliformes: Muraenidae) (Izawa, 1974); and *S. shiinoi* Izawa, 1974, from *Acromyster nezumi* (Asano, 1958) (as *Promyallantor nezumi*) (Anguilliformes: Congridae) (Izawa, 1974). Also, there are two records of unidentified species of *Sarcotaces* in Japan each from *Semicossyphus reticulatus* (Valenciennes, 1839) (Perciformes: Labridae) (Yamaguti, 1963: 315) and *Saurida elongata* (Temminck & Schlegel, 1846) (Aulopiformes: Synodontidae) (Momoyama & Tensha, 2006). The finding of *Sarcotaces* sp. in this study represents the first record of copepod of the genus from the Ryukyu Islands. *Epinephelus fasciatus* is a new host of this parasite.

We thank Mr. Takanori Maekawa of Maekawa Fishery Co. Ltd. for providing data and the fish specimen. We are also grateful to Mr. Kei Miyamoto of Okinawa Churashima Foundation for assistance

during this study. Thanks go to an anonymous reviewer for useful comments to improve the manuscript.

References

- Avdeev, G. V. & Avdeev, V. V., 1975. Parasitic Crustacea of the genus *Sarcotaces* Olsson, 1872 (Copepoda) from fishes of the Pacific Ocean. *Bull. Pac. Sci. Inst. Fish. Oceanogr.*, **96**: 227–231. (In Russian).
- Heegaard, P., 1947. Discussion of the genus *Sarcotaces* (Copepoda) with a description of the first known male of the genus. *Kungl. Fysiograf. Sällsk. Lund Forhandl.*, **17**(12): 1–8.
- Izawa, K., 1973. On the development of parasitic Copepoda I. *Sarcotaces pacificus* Komai (Cyclopoida: Philichthyidae). *Publ. Seto Mar. Biol. Lab.*, **21**: 77–86.
- Izawa, K., 1974. *Sarcotaces*, a genus of parasitic copepods (Cyclopoida: Philichthyidae), found on Japanese fishes. *Publ. Seto Mar. Biol. Lab.*, **21**: 179–191.
- Komai, T., 1924. Notes on *Sarcotaces pacificus*, n. sp., with remarks on its systematic position. *Mem. Coll. Sci., Kyoto Imp. Univ., Ser. B.*, **1**: 265–271, 1 pl.
- Matsubara, K., 1963. *Fish morphology and hierarchy*. xi+1605 pp., 135 pls., Ishizaki Shoten, Tokyo. (In Japanese).
- Matsubara, K. & Asano, N., 1943. On the ink-sac of a gadid fish, *Antimora microlepis* Bean. *J. Oceanogr. Soc. Japan*, **2**(2): 11–15. (In Japanese).
- Momoyama, K. & Tensha, K., 2006. Ugly-looking parasitic infections and other abnormalities of wild fish and shellfish in the coastal or inland waters around in Yamaguchi Prefecture. *Bull. Yamaguchi Pref. Fish. Res. Ctr.*, **4**: 143–161. (In Japanese with English abstract).
- Nakabo, T. (Ed), 2013. *Fishes of Japan with picto-*

- rial keys to the species. Third edition.* xlix + 2428 pp., Tokai Univ. Press, Hadano. (In Japanese).
- Reimer, L. W., 1991. *Sarcotaces namibiensis* sp. nov., the first evidence of the genus *Sarcotaces* Olsson, 1872 in the South Atlantic (Copepoda). *Crustaceana*, **60**: 139–144.
- Shiino, S. M., 1953. On *Sarcotaces* Olsson, the genus of parasitic copepod, found in Japan. *Ann. Rep. Pref. Univ. Mie, Sect. 2, Nat. Sci.*, **1**: 171–183. (In Japanese with English abstract).
- Walter, T. C., 2015. *Sarcotaces* Olsson, 1872. In Walter, T. C. & Boxshall, G. (Eds), World of Copepods database. World Register of Marine Species at <http://www.marinespecies.org/aphia.php?p=taxdetails&id=347968> (Accessed on 20 June 2015).
- Yamaguti, S., 1963. *Parasitic Copepoda and Branchiura of fishes*. 1103 pp., Interscience Publ., New York.

(Received June 30, 2015; Accepted August 17, 2015)