

Two Species of *Caligus* (Copepoda: Caligidae) from Amberjacks (*Seriola* spp.) Cultured in Oita Prefecture, Kyushu, Western Japan

Kazuya NAGASAWA¹⁾ and Yutaka FUKUDA²⁾

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

²⁾ Fisheries Research Division, Oita Prefectural Agriculture, Forestry and Fisheries Research
Center, 194-6 Tsuiura, Kamiura, Saiki, Oita 879-2602 Japan

Abstract Two species of copepods of the caligid genus *Caligus* were found parasitic on amberjacks cultured in the Bungo Channel off the coast of Oita Prefecture, Kyushu, western Japan. They are *Caligus spinosus* Yamaguti, 1939 from the gills of yellowtail amberjack (*Seriola lalandi*), and *Caligus lalandei* Barnard, 1948 from the body surface of Japanese amberjack (*Seriola quinqueradiata*). This is the first confirmed record of *C. spinosus* from *S. lalandi* in Japan.

Key words: aquaculture, *Caligus lalandei*, *Caligus spinosus*, Copepoda, fish parasite, *Seriola lalandi*, *Seriola quinqueradiata*

INTRODUCTION

Three species of amberjacks (*Seriola* spp., Perciformes: Carangidae) are cultured in coastal waters of Japan: Japanese amberjacks (*S. quinqueradiata* Temminck and Schlegel), greater amberjack (*S. dumerili* Risso), and yellowtail amberjack (*S. lalandi* Valenciennes). Since only several works have been conducted on the parasitic copepods of *S. quinqueradiata* farmed in Japan (e.g., Fujita *et al.*, 1968; Izawa, 1969; Ho *et al.*, 2001; Cruz-Lacierda *et al.*, 2011), our knowledge on such parasites of amberjacks is very limited. This note reports on two species of *Caligus* found on amberjacks cultured in Oita Prefecture, Kyushu, western Japan.

MATERIALS AND METHODS

A single *S. lalandi* (5,200g body weight) was collected on 6 March 2009 from a floating cage off Tsuiura (33°2'47"N, 131°56'10"E) in Kamiura, Saiki, Oita Prefecture. Also, 10 age-0 *S. quinqueradiata* [15.4–18.0 (mean 16.6) cm fork length] were sampled on 13 July 2009 from a floating cage in Inokushi Cove (32°46'25"N, 131°53'52"E), Kamae, Saeki. Both sampling sites are located in the Bungo Channel. The fishes were brought to the laboratory, where copepods were removed from them and fixed in 70% ethanol. Later, the copepods were soaked in lactophenol and examined using the wooden slide procedure of Humes and Gooding (1964). Voucher specimens are deposited in the crustacean collection at the National Museum of Nature and Science, Tokyo (NSMT-Cr 21850 for *C. spinosus*; NSMT-Cr 21851 for *C. lalandei*). The scientific and common names of fishes follow Froese and Pauly (2011).

RESULTS AND DISCUSSION

Twenty-four (18 adult female and 6 adult male) specimens of *Caligus spinosus* Yamaguti, 1939 (Fig. 1) were found on the gills of a single *S. lalandi* cultured off Tsuiura in Kamiura, Saiki. The morphology of the specimens agrees to the description of the species given by Yamaguti (1939), Yamaguti and Yamasu (1960) and Choe and Kim (2010). Shiino (1960) reported “*Caligus spinosus*” from *S. lalandi* (recorded as *Seriola aureovittata* Temminck and Schlegel) and an unidentified fish from Japan, but his caligid specimens are currently regarded by Choe and Kim (2010) as *Caligus aesopus* Wilson, 1921. While *C. spinosus* is known to infect both *S. quinquerediata* and *S. lalandi* in Korean waters (Choe and Kim, 2010), it was reported only from *S. quinquerediata* in Japan (Yamaguti, 1939; Yamaguti and Yamasu, 1960; Fujita *et al.*, 1968; Izawa, 1969; Ho *et al.*, 2001; Nagasawa *et al.*, 2010; Cruz-Lacierda *et al.*, 2011). Fukuda (1999: 56) stated *C. spinosus* parasitized *S. lalandei* farmed in Oita Prefecture, but he did not provide any morphological characters of the caligids collected. The present collection of *C. spinosus* represents the first confirmed record of this parasite from *S. lalandi* in Japan.



Fig. 1. Female (A) and male (B) specimens of *Caligus spinosus* Yamaguti, 1939 from the gills of yellowtail amberjack (*Seriola lalandi*) cultured off Tsuiura in Kamiura, Saiki, Oita Prefecture. Alcohol-preserved specimens. Dorsal view. Scale bar: 2 mm.

Twenty-seven (19 adult female and 8 adult male) specimens of *Caligus lalandei* Barnard, 1948 (Fig. 2) were taken from the body surface of eight of 10 *S. quinqueradiata* cultured in Inokushi Cove, Kamae. No data were taken on the number of copepods per fish. The specimens correspond to the recent redescription of *C. lalandei* given by Ho *et al.* (2001). The fish examined were transported in June 2009 from nearby Nyudu Cove, where they had been temporarily kept in a floating cage after caught as juveniles at sea between April and May of the same year. Previously, Fukuda (2008) also found *C. lalandei* on *S. quinqueradiata* farmed in Oita Prefecture, where this copepod species is known to parasitize farmed *S. lalandi* as well (Ho *et al.*, 2001). In Japan, *C. lalandei* has so far been reported only from coastal waters of Kyushu.

Ho *et al.* (2001) reported that juvenile *S. quinqueradiata* caught in the western North Pacific off Kyushu, Shikoku and central Honshu, Japan, were infected with *C. spinosus* and *C. lalandei*. Because wild-caught juvenile *S. quinqueradiata* are used as seeds for aquaculture conducted in coastal seas of Japan, both caligid species are considered to be introduced into farming sites with the juveniles. Moreover, once these parasites arrive at the farming sites, they appear to easily establish there by utilizing two species of amberjacks (*S. quinqueradiata* and *S. lalandi*) reared at high densities in sea-cages. Mortalities caused by *C. spinosus* are known for farmed *S. quinqueradiata* (Fujita *et al.*, 1968), but there has been no report about *C. lalandei* as a pathogen of farmed amberjacks.



Fig. 2. Female (A) and male (B) specimens of *Caligus lalandei* Barnard, 1948 from the body surface of Japanese amberjack (*Seriola quinqueradiata*) cultured in Inokushi Cove, Kamae, Saiki, Oita Prefecture. Alcohol-preserved specimens. Dorsal view. Scale bar: 2 mm.

Yamaguti (1936) described *Caligus seriolae* based on a single female specimen from the gills of *S. quinquerradiata* caught in the Seto Inland Sea, Japan. This caligid species has not been found from wild or farmed *S. quinquerradiata* since its original description.

REFERENCES

- Choe, M.-K., Kim, I.-H., 2010. Redescriptions of two morphologically confusing sea lice *Caligus aesopus* Wilson, 1921 and *C. spinosus* Yamaguti, 1939 (Copepoda: Siphonostomatoida: Caligidae) parasitic on amberjacks (*Seriola* spp.) from Korea. *Zootaxa*, **2483**: 23-34.
- Cruz-Lacierda, E. R., Yamamoto, A., Nagasawa, K., 2011. Seasonal occurrence of *Caligus spinosus* and *Parabrachiella seriolae* (Copepoda) parasitic on cage-cultured yellowtail (*Seriola quinquerradiata*) at a fish farm in western Japan. *Bulletin of the European Association of Fish Pathologists*, **30**: 56-63.
- Froese, R., Pauly, D. eds., 2011. FishBase. World Wide Web electronic publication. www.fishbase.org (06/2011).
- Fujita, S., Yoda, M., Ugajin, I., 1968. Control of an ectoparasitic copepod, *Caligus spinosus* Yamaguti, on the cultured adult yellowtail. *Fish Pathology*, **2**: 122-127. [In Japanese.]
- Fukuda, Y., 1999. Diseases of marine fishes and shellfishes cultured in Oita Prefecture diagnosed from 1980 to 1997. *Bulletin of Oita Institute of Marine and Fisheries Science*, **2**: 41-73. [In Japanese.]
- Fukuda, Y., 2008. Diagnosis and control of the diseases of cultured Japanese amberjack. Part 3. External features of diseased fish, and observations of parasites. *Yoshoku*, **45**(10): 48-51. [In Japanese.]
- Ho, J.-S., Nagasawa, K., Kim, I.-H., Ogawa, K., 2001. Occurrence of *Caligus lalandei* Barnard, 1948 (Copepoda, Siphonostomatoida) on amberjacks (*Seriola* spp.) in the western North Pacific. *Zoological Science*, **18**: 423-431.
- Humes, A. G., Gooding, R. U., 1964. A method for studying the external anatomy of copepods. *Crustaceana*, **6**: 238-240.
- Izawa, K., 1969. Life history of *Caligus spinosus* Yamaguti, 1939 obtained from cultured yellow tail, *Seriola quinquerradiata* T. & S. (Crustacea: Caligoidea). *Report of the Faculty of Fisheries, Prefectural University of Mie*, **6**: 127-157.
- Nagasawa, K., Uyeno, D., Tang, D., 2010. A checklist of copepods of the genus *Caligus* (Siphonostomatoida, Caligidae) from fishes in Japanese waters (1927-2010). *Bulletin of the Biogeographical Society of Japan*, **65** : 103-122. [In Japanese with English abstract.]
- Shiino, S. M., 1960. Copepods parasitic on the fishes collected on the coast of Province Shima, Japan. *Report of the Faculty of Fisheries, Prefectural University of Mie*, **3**: 471-500.
- Yamaguti, S., 1936. Parasitic copepods from fishes of Japan. Part 2. Caligoidea, I. Published by the author, 22 pp., 12 pls.
- Yamaguti, S., 1939. Parasitic copepods from fishes of Japan. Part 5. Caligoidea, III. *Volumen Jubilare pro Prof. Sadao Yoshida*, **2**: 443-487, 20 pls.
- Yamaguti, S., Yamasu, T., 1960. New parasitic copepods from Japanese waters. *Publications of the Seto Marine Biological Laboratory*, **8**: 141-152, 3 pls.

大分県で養殖されていたブリ属魚類から得られた ウオジラミ属カイアシ類2種

長澤和也¹⁾・福田 穰²⁾

¹⁾ 広島大学大学院生物圏科学研究科, 〒739-8528 東広島市鏡山1-4-4

²⁾ 大分県農林水産研究指導センター水産研究部, 〒879-2602 佐伯市上浦大字津井浦194-6

要 旨 大分県豊後水道沿岸域で養殖されていたヒラマサ *Seriola lalandi* の鰓からブリウオジラミ *Caligus spinosus* Yamaguti, 1939, ブリ *S. quinqueradiata* の体表からモジャコウオジラミ *Caligus lalandei* Barnard, 1948を採集した。ブリウオジラミの寄生がわが国のヒラマサに初めて確認された。
キーワード：カイアシ類, 魚類寄生虫, 水産養殖, *Caligus lalandei*, *Caligus spinosus*, *Seriola lalandi*, *Seriola quinqueradiata*