

## ***Biacanthus pleuronichthydis* (Copepoda: Taeniacanthidae) from a new fish host *Paralichthys olivaceus* (Pleuronectiformes: Paralichthyidae) in the Seto Inland Sea, Japan**

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**Abstract.** Specimens of the taeniacanthid copepod *Biacanthus pleuronichthydis* (Yamaguti, 1939) were collected manually from the body surface of four broodstock candidates of bastard halibut (*Paralichthys olivaceus*) originally captured in the Seto Inland Sea, off Awaji-shima Island, Hyogo Prefecture, Japan as well as on the bottom of an indoor hatchery tank following a 10% saline water bath of ten other broodstock candidates of the same species. This is the first report of *P. olivaceus* as a host for *B. pleuronichthydis*.

**Key words:** *Biacanthus pleuronichthydis*, Copepoda, fish parasite, *Paralichthys olivaceus*, bastard halibut, new host, saline water bath

### **Introduction**

*Biacanthus pleuronichthydis* (Yamaguti, 1939) is a taeniacanthid copepod infecting pleuronectiform fishes in Japanese waters (Tang & Izawa, 2005). This species was originally described as *Anchistrostos pleuronichthydis* based on female specimens from the body surface of ridged-eye flounder (*Pleuronichthys cornutus* (Temminck & Schlegel)) and spotted halibut (*Verasper variegatus* (Temminck & Schlegel)) caught in the Seto Inland Sea off Tarumi, Hyogo Prefecture, Japan (Yamaguti, 1939a). It was collected subsequently from cinnamon flounder (*Pseudorhombus cinnamoneus* (Temminck & Schlegel)) in Tanabe Bay, Wakayama Prefecture, and from stone flounder (*Kareius bicoloratus* (Basilevsky))

and marbled flounder (*Pseudopleuronectes yokohamae* (Günther)) from Ise Bay, Mie Prefecture (Izawa, 1986). Later, *A. pleuronichthydis* was transferred to the genus *Taenia* by Cressey, 1969 by Dojiri & Cressey (1987), but Tang & Izawa (2005) currently erected a new genus *Biacanthus* to accommodate this species using Izawa's (1986) material. Four known host species (*P. cornutus*, *V. variegatus*, *K. bicoloratus*, and *P. yokohamae*) of *B. pleuronichthydis* belong to the family Pleuronectidae, while the one remaining host species (*P. cinnamoneus*) to the family Paralichthyidae. Both families are in the actinopterygian order Pleuronectiformes.

The bastard halibut (*Paralichthys olivaceus* (Temminck & Schlegel)) is one of the most important target fishes for stock enhancement in Japan. Currently, more than 20 million hatchery-produced juveniles of this species are annually released into Japan's coastal waters. Despite its commercial im-

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portance, the parasitic copepod fauna of *P. olivaceus* is poorly known in this country. Only three species of parasitic copepods, *Acanthochondria sixteni* (Wilson, 1922) (Chondracanthidae), *Lepeophtheirus paralichthydis* Yamaguti & Yamasu, 1960 (Caligidae), and *Phrixocephalus umbellatus* Shiino, 1956 (Pennellidae), have been reported from *P. olivaceus* (Yamaguti, 1939b; Yamaguti & Yamasu, 1960; Dojiri & Ho, 1988; Ho, 2000; Ohtsuka *et al.*, 2007). This study provides the first record of *P. olivaceus* as a host of *B. pleuronichthydis*.

### Materials and Methods

The bastard halibut examined (*ca.* 20–30 cm in total length) were commercially captured in the eastern Seto Inland Sea off the coast of Awaji-shima Island, Hyogo Prefecture, from 17 November to 3 December 2010 and on 5 January 2011. They were landed alive at fishing ports on this island and transferred to a hatchery in Akashi City as broodstock candidates. The fish caught at the former time period were reared in tanks without a quarantine procedure, but four fish later showed disease symptoms and thus were examined for ectoparasites on 13 December 2010. Copepods were collected manually from the fish's body surface and fixed in 70% ethanol. Ten fish caught at the latter date were bathed immediately after their arrival at the hatchery in 10% saline water for five minutes in a 300 l tank. Detached copepods were sampled from the bottom of the tank and preserved in 100% ethanol. Copepods were cleared in lactophenol and examined using the wooden slide procedure of Humes & Gooding (1964). Voucher specimens are deposited in the Crustacea collection at the National Museum of Nature and Science, Tokyo (NSMT-Cr 21568, 21569). The scientific and common names of fishes used in this paper follow Froese & Pauly (2011).

### Results and Discussion

A total of 12 copepods (4 adult females on 13 December 2010; 7 adult females and 1 fifth copepo-

did male on 5 January 2011) were collected and all identified as *B. pleuronichthydis* (Fig. 1). The morphology of the adult female specimens corresponds to that of the species redescribed by Tang & Izawa (2005). The specimen of the fifth copepodid male is identical with the description of the same larval stage provided by Izawa (1968). All (100%) of the four fish examined on 13 December 2010 were each infected with a single *B. pleuronichthydis*. On the other hand, as the fish examined on 5 January 2011 were treated in a group, the prevalence and intensity of the parasite infection could not be determined.

The present collection of *B. pleuronichthydis* from *P. olivaceus* represents a new host record for this parasite. Based on the past and present reports (Yamaguti, 1939; Izawa, 1986; Tang & Izawa, 2005; this study), six species of flatfishes belonging to two pleuronectiform families are known as hosts of *B. pleuronichthydis*, indicating that this parasite is unlikely to show strict host specificity to fishes of this group and thus might occur on other flatfishes



Fig. 1. *Biacanthus pleuronichthydis* (Yamaguti, 1939), ovigerous adult female (dorsal view), from *Paralichthys olivaceus* (Temminck & Schlegel) captured in the Seto Inland Sea off the coast of Awaji-shima Island, Hyogo Prefecture, central Japan. Scale bar: 0.5 mm.

as well. Moreover, although this copepod species so far has been reported only from the seas of central Japan, it most likely occurs in other regions because various flatfishes are widely distributed in coastal waters of Japan.

*Biacanthus pleuronichthydis* is an ectoparasite infecting the host's body surface. Following the saline water bath of the ten *P. olivaceus* broodstock candidates, some individuals of a gill and gill-cavity monogenean *Neoheterobothrium hirame* Ogawa, 1999 (Diclidophoridae) were found on the bottom of the quarantine tank, while others were found dead in hosts' gill cavity (Tamego, unpublished). These results indicate that a 10% saline water bath is useful for removing both *B. pleuronichthydis* (Copepoda) and *N. hirame* (Monogenea) from captive bastard halibut. Nevertheless, we have only limited information on this method thus far, and for a more practical use at hatcheries, further research is necessary to ascertain the susceptibility of ectoparasites to and the tolerance of fish to various concentrations of saline water at different water temperatures and treatment durations.

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