

New record of a freshwater fish parasite *Argulus coregoni* (Branchiura: Argulidae) from Akita Prefecture, northern Honshu, Japan

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Abstract: An adult male of *Argulus coregoni* Thorell, 1864, was collected from the body surface of an ayu, *Plecoglossus altivelis altivelis* (Temminck & Schlegel, 1846), in the middle reaches of the Ani River, a tributary of the Yoneshiro River, Akita Prefecture, northern Honshu, Japan. The previous northernmost record of *A. coregoni* in Japan is from Fukushima Prefecture, and the present collection extends its geographical distribution from Fukushima Prefecture northward to Akita Prefecture in Japan.

Key words: *Argulus coregoni*, Branchiura, fish parasite, ayu, *Plecoglossus altivelis altivelis*, new locality record

Despite the fact that *Argulus coregoni* Thorell, 1864, a skin parasite of freshwater fishes, has been well studied in Japan for various aspects of the biology (see Nagasawa, 2009, 2011; Nagasawa & Morikawa, 2019b, for the literature), much still remains poorly understood on its geographical distribution in northern Japan, such as Hokkaido and northern Honshu. The species has so far been found from central and western Japan, and no information is available on its occurrence in northern Honshu (Fig. 1). The previous northernmost record of *A. coregoni* is from Fukushima Prefecture, where it was found on torrent catfish, *Liobagrus reinii* Hildendorf, 1878 (Siluriformes: Amblycipitidae) (Nagasawa & Ishikawa, 2015). Recently, we collected *A. coregoni* from ayu, *Plecoglossus altivelis altivelis* (Temminck & Schlegel, 1846) (Salmoniformes: Plecoglossidae), in Akita Prefecture, which is located further north from Fukushima Prefecture. This collection extends the geographical distribution of *A. coregoni* from Fukushima Prefecture northward to Akita Prefecture in Japan (Fig. 1).

A branchiuran argulid was found on the body surface of an ayu (about 24 cm in total length) caught by “tomozuri” angling in the middle reaches of the Ani River (40°06′47″N, 140°23′50″E), a tributary of the Yoneshiro River, at Ura-ta-Shirosaka, Kita-Akita, Akita Prefecture, on 28 July 2015. It was carefully taken by fingers, fixed, and preserved in 99.5% ethanol. This argulid was later sent to the laboratory at Hiro-

shima University, Higashi-Hiroshima, Hiroshima Prefecture, where it was cleared in a drop of lactophenol, examined using the wooden slide technique of Humes & Gooding (1964), and identified as *A. coregoni*. It is retained by the first author (KN) for a taxonomic study of *Argulus* spp. from Japanese freshwater fishes but will be deposited in the Crustacea collection of the National Museum of Nature and Science, Tsukuba, Ibaraki Prefecture.

The specimen of *A. coregoni* (Fig. 2) collected is an adult male, 5.2 mm long and 3.5 mm wide: its morphology corresponds to the descriptions of the species provided by Tokioka (1936), Yamaguti (1937), and Hoshina (1950). The specimen has a digitiform process on the dorso-posterior margin of the second leg, which is one of the morphological features to characterize the male of *A. coregoni* (Tokioka, 1936; Yamaguti, 1937).

The first case of infection by *A. coregoni* on the riverine ayu was reported as early as 1937 from the Hozu River, Kyoto Prefecture, central Japan (Yamaguti, 1937), and for over the 70 years over from 1938 to 2010, no similar infection was reported in Japan. However, since 2011, *A. coregoni* has often been found from the riverine ayu in central and western Japan, including Tochigi (Nagasawa *et al.*, 2015), Gifu, Aichi, Shiga (Nagasawa *et al.*, 2018), Mie (Nagasawa *et al.*, 2018; Nagasawa & Morikawa, 2019b), Kochi (Nagasawa & Ikeda, 2011), and Shimane prefectures (Nagasawa & Morikawa, 2019a). Based on these results, currently, the ayu has been regarded

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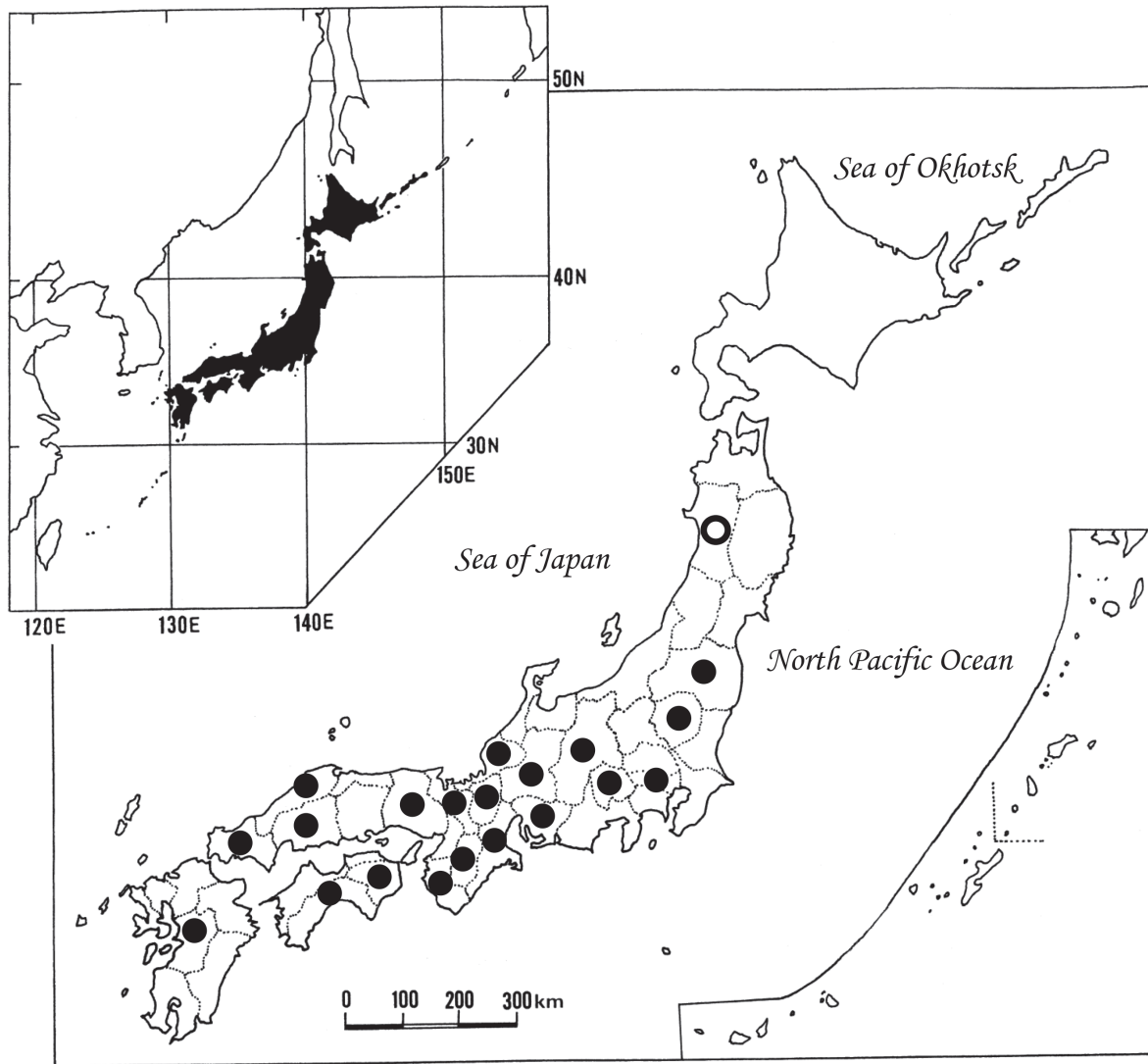


Fig. 1. A map of Japan, showing Akita Prefecture with a new record of *Argulus coregoni* in this paper (open circle) and other prefectures where *A. coregoni* was previously found (closed circles) (see Nagasawa, 2009; Nagasawa and Morikawa, 2019b, for the literature). Prefectural boundaries are represented by dotted lines.

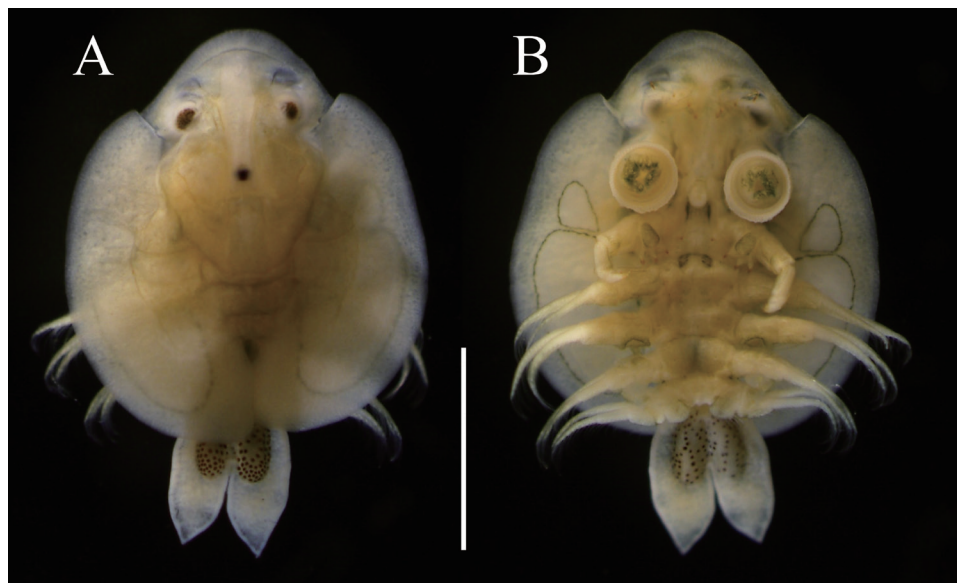


Fig. 2. *Argulus coregoni*, adult male (5.2 mm long), from the body surface of *Plecoglossus altivelis altivelis* in the middle reaches of the Ani River, Akita Prefecture, northern Honshu, Japan. A, dorsal view; B, ventral view. Ethanol-preserved specimen. Scale bar: 2 mm.

as the important host of *A. coregoni*, especially in the middle reaches of rivers (Nagasawa *et al.*, 2018; Nagasawa & Morikawa, 2019b). The argulid is also found in the upper reaches of rivers, where it uses salmonids as the major hosts (*e.g.*, Nagasawa & Kawai, 2015). In this study, the specimen of *A. coregoni* was collected from the ayu in the middle reaches of the Ani River, Akita Prefecture, which may suggest that this fish species serves as the host for *A. coregoni* in similar reaches of rivers in northern Honshu, as well. The ayu widely occurs in inland waters of Japan ranging from southern Kyushu to southern Hokkaido and is important in commercial and recreational fisheries. It is necessary to study the distribution and host-association of *A. coregoni* infecting the ayu in a wide area of Japan.

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