

## Data

# Two crustacean parasites, *Argulus japonicus* (Branchiura) and *Lernaea cyprinacea* (Copepoda), from freshwater fishes in Gunma Prefecture, Japan, with a new host record for *A. japonicus*

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**Abstract:** Two crustacean parasites were collected from freshwater fishes caught in a brook flowing into Lake Akagi Onuma, Gunma Prefecture, central Honshu, Japan. They were the argulid branchiuran *Argulus japonicus* Thiele, 1900 from freshwater minnow (*Opsariichthys platypus*) and the lernaeid copepod *Lernaea cyprinacea* Linnaeus, 1758 from stone moroko (*Pseudorasbora parva*). These collections represent the first and second records in Gunma Prefecture for *A. japonicus* and *L. cyprinacea*, respectively. *Opsariichthys platypus* is a new host record for *A. japonicus*. A brief review is also given of the fish parasites reported from Gunma Prefecture.

**Key Words :** *Argulus japonicus*, *Lernaea cyprinacea*, fish parasites, new prefecture record, new host record

## Introduction

Gunma is an inland mountainous prefecture (6,362 km<sup>2</sup>) located in the central part of Honshu, the main island of Japan, and is surrounded with five other prefectures (Saitama, Tochigi, Fukushima, Niigata, and Nagano). The Tone River, the second longest river in Japan, originates in Gunma Prefecture, and salmonids, such as land-locked masu salmon *Oncorhynchus masou masou* and char *Salvelinus leucomaenis pluvius*, occur in its upper reaches. There are several lakes, where commercial and recreational fisheries targeting Japanese smelt *Hypomesus nipponensis* are conducted. Salmonids, ayu *Plecoglossus altivelis altivelis*, and common carp *Cyprinus carpio* are cultured in this prefecture.

The parasite fauna of freshwater fishes of Gunma Prefecture is poorly known. Only 13 species of fish parasites have been reported so far: *Ichthyobodo* sp. (as *Costia* sp.) (Kinetoplastida: Ichthyobodonidae) from rainbow trout *Oncorhynchus mykiss* (Nobusawa *et al.*, 1983); *Ichthyophthirius multifiliis* (Ciliophora: Ichthyophthiriidae) from rainbow trout *O. mykiss* (Nobusawa *et al.*, 1983); *Clonorchis sinensis* metacercaria (Trematoda: Opisthorchiidae) from cyprinids (Takano, 1927; Komiyama *et al.*, 1950; Suzuki *et al.*, 1957); *Isoparorchis hypselobagri* metacercaria (Trematoda: Isoparorchidae) from Japanese gudgeon *Pseudogobio esocinus esocinus* and Amur catfish *Silurus asotus* (Nihei *et al.*, 1964; Suzuki *et al.*, 1967); *Metagonimus yokogawai* metacercaria (Trematoda: Herterophyidae) from cyprinids (Nihei *et al.*, 1964); *Eudiplozoon nipponicum* (as *Diplozoon nipponicum*) (Monogenea: Diplozoidae) from common carp *C. carpio* (Kamegai *et al.*, 1966; Kamegai, 1968); *Gyrodactylus* sp. (Monogenea: Gyrodactylidae) from salmonids (Nobusawa *et al.*, 1983); *Bothriocephalus acheilognathi* (as *B. opsariichthydis*) (Cestoda: Bothriocephalidae) from common carp *C. carpio* (Nakajima and Egusa, 1977); *Khawia sinensis* (Cestoda: Caryophyllidae) from common carp

*C. carpio* (Nakajima and Egusa, 1978); *Ligula interrupta* plerocercoid (Cestoda: Ligulidae) from big-scaled redbfin *Tribolodon hakonensis* (Nagasawa and Katahira, 2013); *Philometroides* sp. (Nematoda: Philometridae) from common carp *C. carpio* (Goto, 1978); *Lernaea cyprinacea* (Copepoda: Lernaeidae) from a bagrid *Pseudobagrus tokiensis* (Yamaguti, 1939); and *Salmincola californiensis* (Copepoda: Lernaeopodidae) from masu salmon *O. masou masou* (Hoshina and Nishimura, 1976). Of these parasites, only five species (*C. sinensis*, *I. hypselobagri*, *M. yokogawai*, *L. interrupta*, and *L. cyprinacea*) were reported from wild fishes, indicating that much remains unknown about the parasites of wild fishes in Gunma Prefecture.

Since 2012, we have conducted various surveys to clarify the fauna of fish parasites of Gunma Prefecture. Two crustacean parasites are reported in this paper.

## Materials and Methods

Fishes were collected with a hand net in a brook (36°32' 52" N, 139°11' 9" E) flowing into Lake Akagi Onuma at Akagisan in Fujimi Town, Maebashi City, on 25 August and 15 September 2012, and 20 July and 4 September 2013. The fishes caught on the first three dates were fixed in 5% formalin and brought to Hiroshima University, where they were identified, measured for standard length (SL, mm), and examined for crustacean parasites using a stereoscopic microscope, whereas those caught on 4 September 2013 were transported alive to Tokyo University of Marine Science and Technology, Tokyo, and were examined in the same way. The fishes examined were: freshwater minnow *Opsariichthys platypus* (Cyprinidae) (*n*=8, 78–112 mm SL, 25 Aug. 2012; *n*=2, 97–100 mm SL, 15 Sep. 2012; *n*=13, 91–124 mm SL, 20 July 2013; *n*=4, 98–117 mm SL, 4 Sep. 2013); big-scaled redbfin *Tribolodon hakonensis* (Cyprinidae) (*n*=1, 113

mm SL, 25 Aug. 2012;  $n=1$ , 86 mm SL, 4 Sep. 2013); stone moroko *Pseudorasbora parva* (Cyprinidae) ( $n=1$ , 72 mm SL, 4 Sep. 2013); char *Salvelinus leucomaenis pluvius* (Salmonidae) ( $n=3$ , 122-135 mm SL, 4 Sep. 2013); and goby *Rhinogobius* sp. (Gobiidae) ( $n=4$ , 31-41 mm SL, 4 Sep. 2013). Crustacean parasites were preserved in 70% ethanol. Voucher specimens will be deposited in the Crustacea (Cr) collection housed at the National Museum of Nature and Science in Tsukuba City, Ibaraki Prefecture. The scientific names of fishes are those recommended in Nakabo (2013), and the English names (if known) are adopted from Froese and Pauly (2013).

## Results and Discussion

Two species of crustacean parasites were found. They were *Argulus japonicus* Thiele, 1900 (Branchiura: Argulidae) and *Lernaea cyprinacea* Linnaeus, 1758 (Copepoda: Lernaeidae).

### *Argulus japonicus*

A female and a male of the species (Fig.1) were collected from two *Opsariichthys platypus* (112 and 105 mm SL) caught on 25 August 2012. They were found on the skin near the pectoral fin. The female and the male were 4.5 and 3.1 mm long, respectively. Furthermore, two females and two males of *A. japonicus* were found in a plastic bag, in which 13 *O. platypus* were kept after they were collected and fixed in 5% formalin on

20 July 2013. The females and the males were 2.5-3.7 mm and 1.5-2.1 mm long, respectively.

*Argulus japonicus* was originally described from Japan (Thiele, 1900). In this country, it is found in all of the four major islands, i.e., Hokkaido, Honshu, Shikoku, and Kyushu (Nagasawa *et al.*, 2010, 2012; see Nagasawa, 2009, 2011 for the earlier literature). In Honshu, it has been reported from 11 prefectures: Ibaraki, Tokyo, Kanagawa, Shizuoka, Mie, Shiga, Nara, Osaka, Hyogo, Shimane, and Yamaguchi (Nagasawa *et al.*, 2013; see Nagasawa, 2009 for the earlier literature). The species was found for the first time in Gunma Prefecture in this study.

The known hosts of *A. japonicus* are various freshwater fishes, mostly cyprinids. Nevertheless, there is no record of this parasite from *O. platypus* (formerly *Zacco platypus*) which is distributed in Japan (see Nagasawa, 2009), China (see Chen *et al.*, 1973; Song and Kuang, 1980; Kuang and Qian, 1991), Taiwan, and Korea (see Han *et al.*, 1998; Choi and Yang, 1998). Thus, *O. platypus* is recorded herein as a new host for *A. japonicus*.

### *Lernaea cyprinacea*

A postmetamorphic adult female of the species was found on a single *Pseudorasbora parva* (72 mm SL) caught on 4 September 2013. The anterior part of its body was inserted into the host's trunk musculature near the dorsal fin. The specimen was 4.5 mm long. No egg sacs were present.

In Japan, the species occurs in many prefectures from Hokkaido

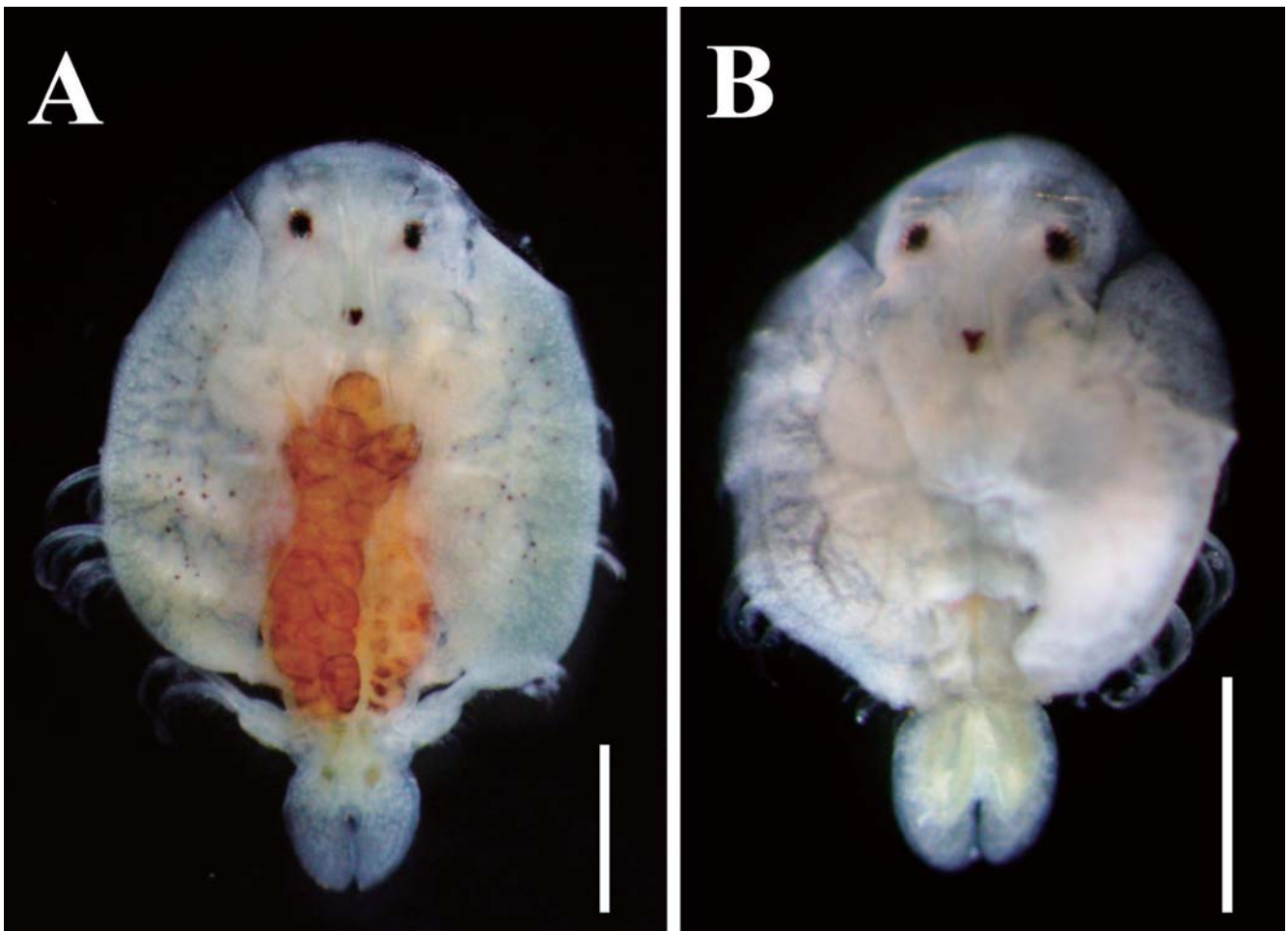


Fig. 1. *Argulus japonicus* Thiele, 1900 from freshwater minnow (*Opsariichthys platypus*) caught in a brook flowing into Lake Akagi Onuma, Gunma Prefecture. A, female, dorsal view; B, male, dorsal view. Scale bars: 1 mm in A and B.

to Okinawa (Nagasawa *et al.*, 2007; Uyeno *et al.*, 2011; Nagasawa, 2013; Nagasawa and Nitta, 2014). It is a common parasite of freshwater fishes in this country, where it has been reported from more than 30 species of fishes and also from amphibians (Nagasawa *et al.*, 2007). There is one record of the species from Gunma Prefecture: Yamaguti (1939) found it from a bagrid *Pseudobagrus tokiensis* (as *P. aurantiacus*). Thus, the present collection represents the second record for the species in Gunma Prefecture. *Pseudorasbora parva* is known to serve as a host of the species in other prefectures of Japan as well (Nakai, 1927; Matsui and Kumada, 1928).

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## 群馬県産淡水魚類に寄生していた甲殻類2種(チョウ, イカリムシ)と チョウの新宿主記録

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**要旨:** 群馬県前橋市にある赤城大沼に流れ込む細流で採集した淡水魚類を調べたところ, オイカワにエラオ類のチョウ *Argulus japonicus*, モツゴにカイアシ類のイカリムシ *Lernaea cyprinacea* の寄生を認めた. チョウは群馬県から初記録, イカリムシは2度目の記録であり, オイカワはチョウの新宿主である. 群馬県産淡水魚類の寄生虫相に関する簡単な総括も行った.

**キーワード:** チョウ, イカリムシ, 魚類寄生虫, 群馬県初記録, 新宿主記録