

Rediscovery of a Fish Acanthocephalan, *Acanthocephalus minor* (Echinorhynchida: Echinorhynchidae), in the Lake Biwa Basin, Central Japan, with a Review of the Fish Acanthocephalan Fauna of the Basin

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Specimens of the echinorhynchid acanthocephalan *Acanthocephalus minor* Yamaguti, 1935 were collected from the rectum of a dark sleeper, *Odontobutis obscura* (Temminck and Schlegel, 1845), in an irrigation canal near Lake Biwa, Shiga Prefecture, west-central Japan. This represents a rediscovery of *A. minor* in the Lake Biwa basin after a gap of nearly 80 years. It appears not to be distributed in Lake Biwa proper, but to occur rarely in rivers and irrigation canals of a limited coastal area around the lake. To date, 10 nominal species of acanthocephalan in four families and three orders have been reported from fish in the Lake Biwa basin. Among these, striking morphological similarities between *Acanthocephalus aculeatus* Van Cleave, 1931 and its congener *A. opsariichthydis* Yamaguti, 1935 are noted. It is furthermore suggested that *A. gotoi* Van Cleave, 1925 could not maintain its population after the basin's wild population of its major host, *Anguilla japonica* Temminck and Schlegel, 1846, disappeared in the mid-1960s.

Key Words: *Acanthocephalus minor*, Acanthocephala, *Odontobutis obscura*, fish parasite, faunistic review, Lake Biwa basin, Japan.

Introduction

Lake Biwa is located in west-central Honshu, being the largest (670 km²) and oldest (over four million years old) lake in Japan (Horie 1984). The fauna of this lake and its watershed has been intensively studied and includes many endemic species (Timoshkin *et al.* 2011; Kawanabe *et al.* 2012). The acanthocephalan fauna of fish in the Lake Biwa basin is also well studied: to date, 10 nominal species in four families and three orders have been reported (Table 1). Among these species, the extent of occurrence of *Acanthocephalus minor* Yamaguti, 1935 in Lake Biwa and the lake's drainage basin remains poorly understood. This species has not been reported since 1936, when it was collected from the dark sleeper *Odontobutis obscura* (Temminck and Schlegel, 1845) caught in Lake Biwa (Fukui and Morisita 1936). Amin (2005) and Amin *et al.* (2007) examined the acanthocephalans isolated from more than 500 inspected fish belonging to 30 species in 12 families collected in Lake Biwa and its tributaries between 1997 and 2002 as part of a large-scale survey involving 62 fish species in total from the region, but did not recover *A. minor* from them; moreover, they did not mention *A. minor* in their discussion of the fish acanthocephalan fauna of the Lake Biwa basin.

Recently, we found 10 individuals of *A. minor* infecting the rectum of a specimen of *O. obscura* collected in an ir-

rigation canal near the Ado River, one of the rivers flowing into Lake Biwa. Here we report on this find which represents a rediscovery of the species in the Lake Biwa basin after a gap of nearly 80 years. We also take this opportunity to review the fish acanthocephalan fauna of the Lake Biwa basin based on the literature published between 1918 and 2014.

Materials and Methods

One specimen of *O. obscura* was collected using a hand net on 14 July 2014 in an irrigation canal (35°19'54"N, 136°2'44"E) along the lower reaches of the Ado River at Adogawacho-Kawashima, Takashima city, Shiga Prefecture, Honshu, west-central Japan. The fish was transported alive to the laboratory at Hiroshima University, Higashi-Hiroshima city, Hiroshima Prefecture, where it was measured for standard length (SL) in millimeters and examined for metazoan parasites. Of the 10 acanthocephalans found, eight individuals were flattened between slides and cover glasses with slight pressure, fixed in 70% ethanol, stained in Heidenhain's iron hematoxylin, dehydrated through a graded ethanol series, cleared in xylene, and mounted in Canada balsam, while the remaining two individuals were preserved in 100% ethanol for future molecular study. The stained specimens were used for measurements and counts.