

First Record of *Limnotrachelobdella okae* (Hirudinida, Piscicolidae) as Prey for Fishes: A Case of Heavy Predation by *Oncorhynchus masou ishikawae* (Teleostei, Salmonidae)

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Abstract. Nine and three specimens of the fish leech *Limnotrachelobdella okae* (Moore, 1924) were found in the stomach and oral cavity, respectively, of a satsuki-masu salmon *Oncorhynchus masou ishikawae* caught at the mouth of the Kiso River, Mie Prefecture, central Japan in March 2009. The specimens from the oral cavity were likely expelled from the stomach immediately after fish capture because one of them was slightly digested and the cavity is not usually an attachment site for *L. okae*. The leeches found appear to have been fed on by the fish in coastal waters of Ise Bay, into which the Kiso River empties, when they detached from fish hosts. This is apparently the first record of *L. okae* as prey for fishes.

Key words: *Limnotrachelobdella okae*, *Oncorhynchus masou ishikawae*, fish leech, satsuki-masu salmon, prey.

Introduction

The piscicolid leech *Limnotrachelobdella okae* (Moore, 1924) is an ectoparasite of fishes in brackish and coastal marine waters in Far East Asia (Nagasawa *et al.*, 2008a, b; Yamauchi *et al.*, 2008). The leech is known to parasitize farmed fishes as well as wild fishes in Japan (Nagasawa & Fukuda, 2008; Nagasawa *et al.*, 2009; Nagasawa & Hirai, 2009). Attachment sites are the skin and fins of fishes. Currently we were requested by an angler to identify twelve strange animals from the stomach and oral cavity of a satsuki-masu salmon *Oncorhynchus masou ishikawae* Jordan & McGregor caught at the mouth of the Kiso River, central Japan. The animals were identified as *L. okae* and are thought to have been fed on by the fish while they were unattached to fish hosts. Our observation of *L. okae* as being not a

parasite but prey is reported here.

Materials and Methods

A satsuki-masu salmon *Oncorhynchus masou ishikawae* (ca 33 cm in fork length) was fished with rod and line by Mr. Akihiko Soga at the mouth of the Kiso River (35°01'56"N, 136°44'22"E), Kiso-Misaki, Mie Prefecture on the morning of March 27, 2009. When he removed a hook from the fish immediately after capture, he found three unusual animals in the oral cavity, brought them back to his home, where the animals were kept in a jar containing fresh water for two days. When he also opened the fish at home, he found nine animals in the stomach and kept them in a freezer. The animals from the oral cavity were brought on March 29 to the Port of Nagoya Public Aquarium, Nagoya, Aichi Prefecture, where they were fixed in 70% ethanol and photographed. Later, all of the animals from the oral cavity and stomach

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Fig. 1. *Limnotrachelobdella okae* (two recently fixed specimens) from the oral cavity of a satsuki-masu salmon *Oncorhynchus masou ishikawae* caught at the mouth of the Kiso River, Mie Prefecture, Japan. A. A slightly digested specimen, ventral view, B. A specimen that survived in fresh water for *ca* 50 hours after fish capture (part of the posterior urosome was ventrally bent), ventral view. Scale bar: 30 mm.

were transported to the laboratory of Hiroshima University, where they were identified, measured, and preserved in 5% formalin. Voucher specimens are deposited in the annelid (An) collection at the National Museum of Nature and Science, Tokyo (NSMT-An 401). The scientific names of fishes used in this paper follow Nakabo (2002).

Results

Twelve specimens from *Oncorhynchus masou ishikawae* were all identified as *Limnotrachelobdella*

okae (Fig. 1). Nine specimens from the stomach were partially digested when found. When three other specimens from the oral cavity were brought to the Port of Nagoya Public Aquarium (approximately 53 hours after fish capture), one was also slightly digested but two were still alive despite the fact that they had been kept in fresh water in a jar for two days.

Although nine and one specimens from the stomach and oral cavity, respectively, were not precisely measured due to partial digestion, they were 59.5–94.1 (mean 78.4) mm in total length (TL) (including the suckers) and 7.4–22.7 (16.5) mm in maximum body width (MBW). The two complete specimens from the oral cavity were as big as 110.1–112.2 (111.1) mm TL and 18.5–23.2 (20.9) mm MBW.

Discussion

Limnotrachelobdella okae is a fish parasite in brackish- and coastal marine waters although it is sometimes carried to fresh waters by anadromous fishes such as salmonids (Nagasawa *et al.*, 2008a). The satsuki-masu salmon, from which the leech specimens were taken, was collected at the mouth of the Kiso River, which empties into Ise Bay. This salmon has been shown to migrate to Ise Bay in fall but go back for spawning in spring to rivers including the Kiso River (Honjyo, 1985). Based on its size and capture date, the salmon examined was most likely an adult that was just about to conduct upstream migration after overwintering in Ise Bay. On the other hand, *L. okae* is known to occur as benthos in Ise Bay (Ganmanee *et al.*, 2004). Most of the leech specimens sampled were so big (up to 112 mm TL) that they were regarded as fully grown adults. The blood feeding of *L. okae* likely occurs largely during the winter and spring months (December to April) (Nagasawa *et al.*, 2009) and it is reasonable to suppose that, after feeding, like other piscicolids, adults of this species detach from hosts and are free living (as benthos) for reproduction. Therefore, the leeches found appear to have been fed on by the fish in coastal waters of Ise Bay when the leeches were

unattached for reproduction.

On the other hand, another possible explanation is that the salmon directly took the leeches parasitizing other fishes, although no information is yet available on fish hosts of *L. okae* in Ise Bay. This possibility is, however, quite low because cleaning behavior to feed on fish ectoparasites has never been reported for this fish species.

We found three specimens of *L. okae* in the fish's oral cavity. These specimens were probably expelled from the stomach immediately after fish capture because one of them was slightly digested and the oral cavity is not an attachment site for *L. okae*, which usually occurs on the skin and fins of fishes (Nagasawa *et al.*, 2008b). Furthermore, two of the three specimens survived in fresh water more than 50 hours after they were removed from the fish, indicating that the leech shows high tolerance to a wide range of salinity. This is a reason why live specimens of *L. okae* can be found even in fresh water after transported from the coastal sea by migratory fishes (Nagasawa *et al.*, 2008a).

The present paper apparently represents the first record of *L. okae* as prey for fishes. This study indicates that as many as twelve leeches were preyed on by a single fish of *Oncorhynchus masou ishikawae* in Ise Bay. According to Honjyo (1985), the salmon feeds mainly on larval and juvenile planktonic crustaceans and small pelagic fishes but also takes benthic invertebrates such as annelid polychaetes and ghost shrimps (*Callinassa japonica*) in this bay. Thus, the leech can be regarded as one of those benthic animals eaten by the fish. Free-living leeches are known to be preyed on by fishes (*e.g.* Sakano & Yodo, 2004; Alp *et al.*, 2008).

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