

## The Fish Leech *Limnotrachelobdella sinensis* (Hirudinida, Piscicolidae) Invaded Kyoto Prefecture, Central Japan

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**Abstract.** Specimens of *Limnotrachelobdella sinensis* (Blanchard, 1896) were collected from the inner surface of the operculum of silver crucian carp *Carassius auratus langsdorfii* in the Kizu River, a tributary of the Yodo River, in Kizugawa, Kyoto Prefecture, central Japan in February 2007. This is the first record of *L. sinensis* in this prefecture. The previous record of the species in Japan was only from the lower reaches of the Yodo River in Moriguchi, Osaka Prefecture during 2000–2005, and the present collection indicates that the leech has been expanding its geographic range in the Yodo River system. Possibility that the species was introduced from outside Japan is discussed.

**Key words:** *Limnotrachelobdella sinensis*, *Carassius auratus langsdorfii*, silver crucian carp, leech, parasite, range expansion.

### Introduction

The piscicolid leech *Limnotrachelobdella sinensis* (Blanchard, 1896) is a parasite found in the gill cavity of common carp *Cyprinus carpio* Linnaeus and crucian carps *Carassius* spp. in Far East Asia (Yang, 1996; Ogawa *et al.*, 2007). This leech was originally described as *Trachelobdella sinensis* based on specimens from China (Blanchard, 1896) but currently is placed in the genus *Limnotrachelobdella* (Sawyer, 1986). It occurs in Korea (Rhee, 1986), Russian Far East (Lukin, 1976; Epshtein, 1987) and Japan (Ogawa *et al.*, 2007) as well as in various localities of China, where both wild and farmed common carp are known to be infested (Moore, 1924; Chen, 1962; Yang, 1987, 1996).

In Japan, Ogawa *et al.* (2007) found *L. sinensis* infesting Japanese crucian carp *Carassius cuvieri* Temminck & Schlegel and silver crucian carp

*Carassius auratus langsdorfii* Cuvier & Valenciennes from the lower reaches of the Yodo River in Osaka Prefecture, central Japan. The authors reported annual and seasonal changes in infestation by the leech on these crucian carps collected during 2000–2005.

In February 2007, we sampled silver crucian carp infested by *L. sinensis* in the Kizu River, a tributary of the Yodo River, in Kyoto Prefecture that is located northeast of Osaka Prefecture (Fig. 1). The known locality of the leech in Japan was restricted to the Yodo River in Moriguchi, Osaka Prefecture (Ogawa *et al.*, 2007) and the present finding has expanded its geographic range to Kyoto Prefecture. We herein report this new distributional record of the leech.

### Materials and Methods

Eight moribund silver crucian carp *Carassius auratus langsdorfii* were collected using a landing

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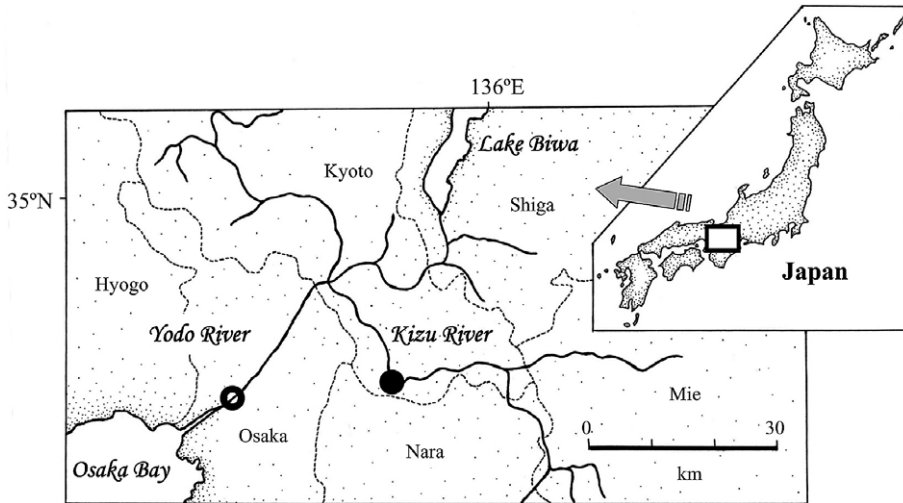


Fig. 1. A map of the Yodo River system, central Japan, showing the sampling localities of *Limnotrachelobdella sinensis*. The localities where Ogawa *et al.* (2007) and we collected leeches are shown by an open circle and a closed circle, respectively. Prefectural boundaries are represented by dashed lines.

net in the Kizu River at Hase (34°44'53"N, 135°48'13"E), Kizugawa, Kyoto Prefecture on February 15, 2007 (Fig. 1). Fish were brought alive to the Aquatic Life Conservation Center, where leeches were taken and fixed in 10% formalin. Ten specimens were later sent to the laboratory of Hiroshima University, where they were identified and photographed. Identification was confirmed by comparison with some specimens presented by Dr. Kazuo Ogawa (The University of Tokyo). Leech specimens are deposited in the annelid (An) collection at the National Museum of Nature and Science, Tokyo (NSMT-An 397 from the Kizu River, NSMT-An 398-400 from Dr. K. Ogawa). The scientific names of fishes follow those recommended by Nakabo (2002).

## Results

All (100%) of the eight silver crucian carp examined [150–215 (mean 182) mm in body length] were found infested by a total of 30 *Limnotrachelobdella sinensis* (2–10 from each fish, mean 3.8). Attachment site was the inner surface of the operculum.

Leech specimens ( $N=10$ ) consist of two size

(large and small) groups (Fig. 2) although their external morphology is identical in both groups. Large specimens ( $N=8$ ) measure 23.0–27.7 (mean 25.1) mm in total length (TL) (including the suckers) and 7.7–11.6 (9.7) mm in maximum body width (MBW), while small specimens ( $N=2$ ) range from 17.5–21.5 (19.5) mm TL and from 4.5–5.7 (5.1) mm MBW. The body is divided into the trachelosome and the much longer and wider, dorsoventrally flattened urosome. The trachelosome tapers toward the oral sucker. The body surface is slightly wrinkled. Eleven pairs of pulsatile vesicles occur on the lateral margins of the urosome: the anterior second to seventh pairs are bigger than the remaining pairs. Two pairs of eye spots are present on the dorsal surface of the oral sucker: eye spots of the anterior pair are larger and more distinct than those of the posterior pair, which are often invisible. The oral sucker is small (up to 2.2 mm in diameter), deeply cupped, and faces ventrally. The caudal sucker also faces ventrally or directly posteriorly but is larger than the oral sucker: its diameter (up to 5.7 mm in diameter) is nearly the same as the width of the posterior end of the urosome. Color in formalin is white.



Fig. 2. *Limnotrachelobdella sinensis* (two fixed specimens) from silver crucian carp *Carassius auratus langsdorfii* in the Kizu River, Kizugawa, Kyoto Prefecture, Japan. Ventral view. Scale bar: 5 mm.

## Discussion

While there has been a 100-year history of research on piscicolid leeches in Japan since 1910 (Nagasawa *et al.*, 2008), *Limnotrachelobdella sinensis* is a species that was discovered as very recently as in 2000 in this country (Ogawa *et al.*, 2007). In 1910, Oka described *Trachelobdella sinensis* from Japan (Oka, 1910) but his specimens were not this species but a different species *Limnotrachelobdella okae* (Moore, 1924). The hitherto known locality of *L. sinensis* in Japan is only the lower reaches of the Yodo River in Moriguchi, Osaka Prefecture. In the present study, we newly collected silver crucian carp infested by *L. sinensis* from the Kizu River at Hase, Kizugawa, Kyoto Prefecture, 43.5 km upstream from Moriguchi, and this collection represents the first record from outside Osaka Prefecture in Japan.

*Limnotrachelobdella sinensis* is known to occur

on fish hosts in a limited period of the year: December to June in China (Yang, 1987) and December to April in Japan (Ogawa *et al.*, 2007). Our specimens collected in February 2007 were 17.7–27.7 mm TL. Similar size was reported for specimens taken in the same month from the Yodo River (Ogawa *et al.*, 2007). Although infestation of fishes by the leech was reported to begin in December (Yang, 1987; Ogawa *et al.*, 2007), the fact we recognized two size groups in our material suggests that infestation occurs more than once after December.

There is concern that *L. sinensis* is an alien species in Japan. Ogawa *et al.* (2007) suggested possibility that the species was recently introduced to the Yodo River system. The following facts imply that it was not present in Japan in the past: 1) despite the fact that numerous works have been conducted for fish parasites in Japan, no report or document of *L. sinensis* had been published before Ogawa *et al.*'s paper (2007), in which they first found it in January 2000; 2) although two species of crucian carps are commercially important or popular in recreational fishing, no information about the leech was available from these fish in Japan; and 3) if the leech had actually occurred before in Japan, it should have been discovered much earlier because it is a large parasite. Based on these facts, it is very likely that *L. sinensis* was recently introduced from outside Japan and has since established its population in the Yodo River system, in which it has now expanded its geographic range from Osaka to Kyoto Prefecture. There is a suspicion that the leech was brought to the Yodo River with introduction of common carp or crucian carp from China (Ogawa, 2007) but we have no data yet about the country of origin.

It is interesting to note that two fish trematodes *Parabucephalopsis parasiluri* (Wang, 1985) and *Prosrhynchooides ozakii* (Nagaty, 1937) were currently discovered in the Yodo River system as well (Urabe *et al.*, 2007). In particular, *P. parasiluri* is definitely an alien species that was introduced with its intermediate bivalve host *Limnoperna fortunei* (Dunker) from the Asian continent (Urabe *et al.*, 2001, 2007). This trematode has caused a serious

negative impact on cyprinid populations and been expanding its range in the river (Urabe *et al.*, 2001, 2008, 2009; Ogawa *et al.*, 2004). The month and year of discovery of the trematode was December 1999 or January 2000 (Urabe *et al.*, 2001), which is identical as that (January 2000) of *L. sinensis*. What we are anxious about is that this case of trematode infection may be followed by *L. sinensis* in the same river. To evaluate its impact on fish populations and geographic range expansion, it is important to periodically survey the occurrence of the leech in various localities of the Yodo River system and adjacent water bodies.

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