

## Preliminary Notes on the Freshwater Tardigrades from the Kamo River, Kyoto\*

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The freshwater tardigrade fauna has been poorly studied in Japan. Previous records are limited to Kanto (Sudzuki, 1975; Ito and Tagami, 1993; Abe and Takeda, 2000; Utsugi, 2005) and Kansai (Biserov *et al.*, 2001) districts. Twenty-seven species (including 7 species identified to genus-level) in 9 genera, 4 families, 2 orders and 1 class have been recorded (the very doubtful record of *Thermozodium esakii* Rahm, 1937 is not included (Rahm, 1937a, b)), and more species are expected to be discovered.

In the present study, we made a preliminary survey on the freshwater tardigrade fauna of the Kamo River, Kyoto (35°2'5.9676"N, 135°46'5.8044"E) between the winter of 2008 and autumn of 2009, and report the following five species including a new record to Japan and possibly new species. Terminology follows Pilato and Binda (2010).

### Systematics

Class Eutardigrada Marcus, 1927

Order Parachela Schuster, Nelson, Grigarick  
and Christenberry, 1980

Family Hypsibiidae Pilato, 1969

Subfamily Hypsibiinae Pilato, 1969

Genus *Isohypsibius* Thulin, 1928

*Isohypsibius* sp.

Remarks: More than 20 specimens were collected. Body length is up to 408  $\mu$ m. Eyes are lacking. Cuticle is smooth. Bucco-pharyngeal apparatus is *Isohypsibius* variant of *Isohypsibius* type, with three macroplacoids, and no peribuccal lamellae nor microplacoids. Claws are of *Isohypsibius*-type with no lunules at their base. Eggs are deposited in the exuvium.

Genus *Pseudobiotus* Nelson, 1980

*Pseudobiotus spinifer* Chang Kaczmarek, Lee & Michalczyk, 2007

Remarks: Four specimens were collected. Body length is

up to 495  $\mu$ m. Dorsal and lateral cuticles are covered with spines. Bucco-pharyngeal apparatus is *Pseudobiotus* variant of *Isohypsibius* type, with two macroplacoids and no microplacoids. Macroplacoids are almost touching each other, which appear to be united into one in some specimens. Claws are well-developed *Isohypsibius* type with short accessory points on the middle of the primary branches of all claws. Two specimens, however, have inner claws in their first pair of legs with hook-shaped basal branches resembling those of a *P. megalonyx* male (Rebecchi and Nelson, 1998). Such a structure was not mentioned in the original description (Chang *et al.*, 2007). No males have been reported in *P. spinifer*, and this resemblance suggests that the two specimens are males though we have observed no other features showing sexuality. A papilla was observed on each leg by Chang *et al.* (2007), but not in the present specimens probably due to the inferior fixation and mounting.

This species has been recorded only from the type locality in South Korea (Chang *et al.*, 2007), and this is the first record of this species from Japan.

*Pseudobiotus* sp.

Remarks: Three specimens were collected. Body length is up to 261  $\mu$ m. They resemble *P. spinifer* in general, but their cuticles have no spines.

Family Macrobiotidae Thulin, 1928

Genus *Macrobiotus* Schultze, 1834

*Macrobiotus* sp.

Remarks: Two specimens were collected. Body length is up to 380  $\mu$ m. Cuticle is smooth. Bucco-pharyngeal apparatus is *Macrobiotus* type with three macroplacoids and no microplacoids. First and second macroplacoids are in contact with each other. Claws are *Macrobiotus* type. Claws of the first three pairs of legs are smooth, whereas those of the fourth have dentate lunules.

Species identification is suspended due to lack of eggs.

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Egg morphology is crucial for species identification of this genus (Ramazzotti and Maucci, 1983).

Family Murrayidae Guidetti, Gandolfi, Rossi & Bertolani, 2005

Genus *Dactylobiotus* R.O. Schuster, 1980

*Dactylobiotus dispar* (Murray, 1907)

Remarks: Over 50 specimens including immature to mature were collected. Body length is up to 640  $\mu\text{m}$ . Cuticle is wrinkled. Bucco-pharyngeal apparatus is *murrayon* variant of *Macrobotus* type, with two macroplacoids and no microplacoids. Claws are *Dactylobiotus* type. Primary branches of claws have accessory points. Secondary branches of claws of the fourth pair of legs are longer than those of the first three pairs. Eggs with conical projections are deposited freely. Apices of projections seem to be flexible, and most of them are divided into two to four.

This species is sub-cosmopolitan (McInnes, 1994), and has been recorded from the Lake Biwa (Biserov *et al.*, 2001) in Japan.

### Perspectives

Although the present survey was done from limited area and time, we were able to collect one species new to Japan (*P. spinifer*) and two possibly new species (*I. sp.* and *P. sp.*). Expansions in sampled area and scale of future surveys would promise many discoveries of new species and new records of freshwater tardigrades from Japan.

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