

Redescription of the Adult of *Metagonimus hakubaensis* (Digenea: Heterophyidae) from Nagano, Japan

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Abstract: Metacercariae of *Metagonimus hakubaensis* Shimazu, 1999 (Digenea: Heterophyidae) were obtained from the lamprey *Lethenteron reissneri* (Dybowski) (Agnatha: Petromyzontidae) collected in the stream at Kamishiro, Hakuba Village, Nagano Prefecture, central Japan. They were experimentally fed to golden hamsters. Gravid adult worms were recovered from the small intestine of the golden hamsters 22 days after infection. The adults were fixed in hot formalin, stained and mounted in Canada balsam. Whole-mounted adults were described and compared in morphology with the slightly flattened type series. In the present specimens, the ventral sucker was usually slightly larger than or as large as, or rarely slightly smaller than, the oral sucker; and the sucker ratio was 1: 0.94-1.21 instead of 1: 0.75-1.06 in the slightly flattened type series.

Key words: *Metagonimus hakubaensis*, Digenea, Heterophyidae, adult, morphology.

Metacercariae of a species of the genus *Metagonimus* Katsurada, 1912 (Digenea: Heterophyidae) were found encysted in the lamprey *Lethenteron reissneri* (Dybowski) (Agnatha: Petromyzontidae) collected in a stream in Hakuba Village, Nagano Prefecture, central Japan. They were experimentally fed to rats and gravid adults were recovered from the small intestine of the rats 22 days after infection. The adults were described as a new species, *M. hakubaensis*, by Shimazu (1999). Shimazu (1999) mentioned nothing about the type locality of this species in the original description. A natural final host for the species has not yet been known.

The gravid adults used as the type series in the original description were slightly flattened, fixed in AFA and mounted in Canada balsam (Shimazu, 1999). Recently, new ovigerous adults were obtained and fixed in hot formalin. In this paper, these hot formalin-fixed adults are described and compared in morphology with the slightly flattened type series.

Materials and Methods

Fourteen adults (90-115 mm in total body length) of lampreys (*Lethenteron reissneri*) were collected in the same stream as in Shimazu (1999) at Kamishiro, Hakuba Village, on 28 April 2001. Metacercariae were isolated from the fish by the method of Shimazu (1999). Metacercariae of unknown number were orally given to three golden hamsters by a stomach tube. The golden hamsters were examined 22 days after infection. Adult worms recovered were fixed in hot 10% neutralized formalin, stained with Mayer's hematoxylin and mounted in Canada balsam. Drawings were made with the aid of a drawing tube. Measurements are given in micrometers. The sucker ratio has been defined by Shimazu (1999). Representatives of the specimens studied have been deposited in the National Science Museum, Tokyo (NSMT-PI 4624).

Results

A total of 174 ovigerous adults were found in the posterior third part of the small intestine of

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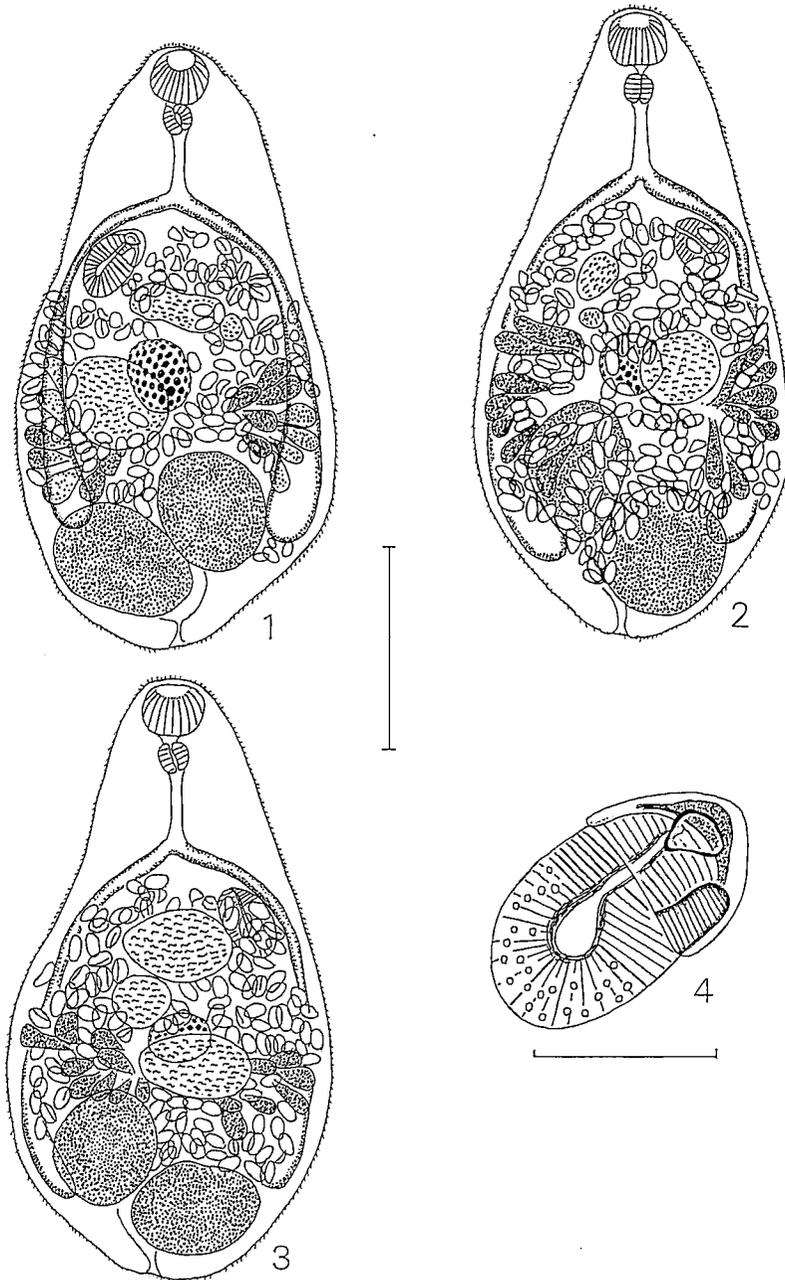
the three golden hamsters. The morphology of whole-mounted specimens was as follows, with measurements of ten specimens.

Description (Figs. 1-4). Body oval (Figs. 1-3), 526-663 long by 273-339 wide. Tegument covered with scales. Eyespot pigment dispersed in forebody. Brown body pigmentation light. Oral sucker elliptical, subterminal, 47-58 long by 51-66 wide. Prepharynx very short. Pharynx globular, 23-31 in diameter. Esophagus 51-82 long, bifurcating into two ceca at about junction of anterior and middle thirds of body. Ceca ventral, short, extending posteriorly to posterior border of anterior or left testis. Ventral sucker oblong, lying obliquely, just internal to shoulder of right cecum, embedded in parenchyma, opening at anterior tip of its anterior part protruded into ventrogenital sac (Fig. 4), usually slightly larger than or as large as, or rarely slightly smaller than, oral sucker, 58-66 long by 31-43 wide; sucker ratio 1: 0.94-1.21. Ventrogenital sac large, thick-walled, anterosinistral to ventral sucker, opening ventrally through genital pore, accompanied by several gland cells. Gonotyls two (Fig. 4); ventral one tall, muscular, projecting from ventrosinistral base of ventrogenital sac; dorsal one crescent, lying transversely at about midlevel of ventrogenital sac. Testes globular or elliptical, diagonal in posterior part of body, usually contiguous; anterior or left testis 90-128 long by 82-113 wide; posterior or right one 97-156 long by 82-105 wide. Seminal vesicle bipartite, postbifurcal, 78-97 long by 27-47 wide. Pars prostatica small, with prostatic cells around it. Cirrus pouch absent. Ejaculatory duct short, uniting with metraterm to form a genital atrium like a hermaphroditic duct opening into ventrogenital sac between dorsal gonotyl and ventral sucker. Ovary almost globular, median, about equatorial, 51-78 long by 47-78 wide. Ootype-complex not worked out. Seminal receptacle usually posterodextral or rarely posterodorsal or dorsolateral to ovary, large, elliptical, 59-117 long by 78-117 wide. Uterus occupying all available space between intestinal bifurcation and testes, usually overlapping ante-

rior testis (Figs. 1 and 2), rarely not overlapping testes (Fig. 3); metraterm short. Eggs operculate, fully embryonated when laid, 28-34 by 14-18 in balsam. Vitelline follicles dorsal, clavate, distributed between level of anterior border of ovary and midlevel of anterior testis. Excretory vesicle ventral, Y-shaped, bifurcating posterior to ovary, with short arms; excretory pore posteroterminal.

Discussion

The type series (gravid adults) were experimentally obtained from rats 22 days after infection and slightly flattened before fixation in AFA (Shimazu, 1999). The present specimens (gravid adults) were obtained from golden hamsters 22 days after infection and fixed in hot 10% neutralized formalin. It does not appear that these two lots of the specimens are significantly different in morphology and measurements from each other except for the following points. (1) The sucker ratio is a little smaller in the type series than in the present specimens. In the slightly flattened type series, the ventral sucker (51-70 μm long by 39-51 μm wide) is usually smaller than, or rarely as large as or slightly larger than, the oral sucker (43-58 μm long by 58-78 μm wide); and the sucker ratio is 1: 0.75-1.06 (Shimazu, 1999). In the present hot formalin-fixed specimens, however, the ventral sucker (58-66 μm long by 31-43 μm wide) was usually slightly larger than or as large as, or rarely slightly smaller than, the oral sucker (47-58 μm long by 51-66 μm wide); and the sucker ratio was 1: 0.94-1.21. It seems likely that the slight flattening before fixation made the oral sucker slightly wider in the type series; and, as the result, their sucker ratio became a little smaller than that of the present specimens. (2) The uterus occupied all available space between the intestinal bifurcation and the testes, usually overlapping the anterior testis, but rarely not overlapping the testes in the present specimens. (3) The type series are somewhat wider as expected.



Figs. 1-4. *Metagonimus hakubaensis*, adults, experimental infection in golden hamsters, 22 days after infection. 1. Entire worm, ventral view. 2. Entire worm, dorsal view. 3. Entire worm, dorsal view. 4. Ventral sucker and ventrogenital sac, ventral view. Scale bars: 200 μm in Figs. 1-3; 50 μm in Fig. 4.

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Reference

- Shimazu, T. (1999): *Metagonimus hakubaensis* sp. n. (Digenea, Heterophyidae) from Nagano, Japan: Morphology and life cycle. Bull. Natn. Sci. Mus., Tokyo, Ser. A, **25**, 87-99.