Helminthes from the Salmonoid Fish, *Plecoglossus altivelis* T. & S.

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Most of the hosts examined were collected from Lake Biwa and from several streams emptying into the Lake. Our examinations are tabulated as follows:—

Frequency of parasites in *Plecoglossus altivelis* (Jul. 30~Sept. 31)

Number of hosts examined	Kind of parasites	Num. of infected hosts	Infection percentage	Num. of parasites in single host	Habitat
1122	Trematoda	3	0.27	1	intestine
	Cestoda	132	11.76	1-a large number	intestine, stomach, pyloric coeca
	Nematoda	352	31.37	1-ca. 100	intestine, stomach, pyloric coeca, abdominal cavity
	Acantho-cephala	12	1.07	1-3	intestine

Frequency of parasites in fry of *Plecoglossus altivelis* (Dec. 30~March 31)

129	Cestoda	14	10.85	1-8	intestine
	Nematoda	26	20.16	1-24	intestine, stomach, abdominal cavity

TREMATODA

Allocreadium sp.

Description: Body ellipsoidal, somewhat elongated, smooth, 2.23 mm long by 0.73 mm broad in middle part. Oral sucker protruding anteriorly, 0.16 mm in diameter. Ventral sucker larger than oral sucker, 0.296 mm long by 0.31 mm broad, situated on median line a little anterior to one-sixth of the boty length. Prepharynx absent. Pharynx globular, 0.12 mm in diameter. Oesophagus short, 0.093 mm long. Before the ventral sucker it bifurcates into two intestinal coeca. Sexual organs occupy on the whole the entire part behind the ventral sucker. Situation of cirrus pouch and of genital pore, course of uterus and excretory bladder are all indistinct in our specimen. Testes arranged

tandem, close to each other on median line. Anterior testis almost round, 0.41 mm long by 0.44 mm broad, posterior one irregularly ellipsoidal, 0.59 mm long by 0.38 mm broad. Ovarium kidney-shaped, 0.067 mm long by 0.14 mm broad, situated anteior to the anterior testis. Receptaculum seminis elongated gourd-shaped, situated dorsal to ovarium. Vitellaria situated posterior to ventral sucker along both lateral margins to unite behind the posterior testis. Vitelline follicles comparatively gross and not compact. Egg oval, provided with a operculum at one pole, 0.073 mm long by 0.049 mm broad.

Habitat: Intestine.

Identification: Although unfortunately we can not identify the worm from an examination of our single total preparation, it closely resembles *Allocreadium oncorhynchi* EGUCHI, 1931.

CESTODA

Proteocephalus neglectus LA RUE 1911

We reported it in Annotationes Zoologicae Japonenses, **14**, (1).

NEMATODA

Raphidascaris biwakoensis FUJITA 1928

The dimensions of our specimens are in general smaller than those given by FUJITA (9.80 mm in length, 0.40 mm in widest breadth). Male unknown. Female organs immature. Encysted form frequently occured.

Habitat: Abdominal cavity, sometimes intestine.

The dimensions of various parts of the worm are given (in mm) in the following table:—

Length		4.54	Rectum, length	0.097
Breadth (max.)		0.20	Anus(from posterior end)	0.17
Oesophagus	length	0.43	Nerve ring (from head)	0.20
	breadth (max.)	0.076	Excretory pore (from nerve ring)	0.081
Oesophageal appendix	length	0.40	End of ovarium (from head)	2.75
	breadth (max)	0.032	Vagina, length	0.58
			Vulva (from head)	1.07
Intestine	length	3.80		
	breadth (max.)	0.086		

Raphidascaris plecoglossi FUJITA 1928

The dimensions of our specimens are in general smaller than those given by FUJITA (5.50 mm in length, 0.35 mm in widest breadth). Male unknown. Female organs immature. Encysted form frequently occured.

Habitat: Abdominal cavity, sometimes intestine.

The dimensions of various parts of the worm are given (in mm) in the following table:—

Length	4.35	Rectum, length	0.075
Breadth (max.)	0.16	Anus (from posterior end)	0.12
Oesophagus {length	0.41	Nerve ring (from head)	0.20
Oesophagus {breadth (max.)	0.063	Excretory pore (from nerve ring)	0.072
Oesophageal appendix {length	0.4	End of ovarium (from head)	1.50
Oesophageal appendix {breadth (max.)	0.037	Uterus, breadth (max.)	0.020
Intestine {length	3.70	Vagina, length	1.14
Intestine {breadth (max.)	0.086		

Raphidascaris gigi FUJITA 1928

Description: A relatively stout species. Anterior extremity obtusely rounded and posterior extremity somewhat pointed. The surface of the body smooth in general. Male 8.91 mm (6.91~10.38 mm) long by 0.41 mm (0.24~0.50 mm) broad at widest part and the posterior end bent ventrally. Female varies in size according to the degree of its development, as is shown in the following table:—

	mature form	moderate form	minute form
Length:	16.77 mm (16.1~17.79 mm)	9.36 mm (8.50~10.53 mm)	5.65 mm (5.21~6.18 mm)
Breadth(max.):	0.73 mm (0.68~ 0.79 mm)	0.42 mm (0.35~ 0.47 mm)	0.28 mm (0.21~0.41 mm)

Both interlabia and dentigenous ridges absent; three lips without cuticular expansions; two papillae on the dorsal lip and one on each of the two subventral. Each lip forks inwards into two branches. Oesophagus somewhat club-shaped behind, 1.34 mm (1.24~1.50 mm) long by 0.27 mm (0.24~0.32 mm) broad at widest posterior part. It is followed by oesophageal bulb from which oesophageal appendix arises and extends posterad along ventral side. Dimensions of oesophageal bulb and oesophageal appendix are 0.13 mm (0.11~0.17 mm) × 0.19 mm (0.17~0.25 mm) and 0.75 mm (0.65~0.85 mm) × 0.11 mm (0.083~0.14 mm). Intestine 14.55 mm (14.0~15.53 mm) long by 0.40 mm (0.35~0.47 mm) broad. Intestinal coecum absent. Rectum is 0.29 mm (0.26~0.32 mm) and opens to anus situated 0.36 mm (0.32~0.41 mm) anterad from posterior extremity. Distance of nerve ring from anterior extremity 0.48 mm (0.41~0.53 mm). Excretory pore opens ventrally 0.33 mm (0.29~0.35 mm) posterad from nerve ring.

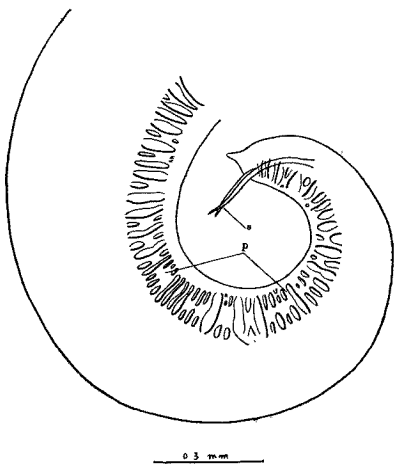

Fig. 1. *Raphidascaris gigi*. Posterior extremity of male, lateral view; *p*. papillae; *s*. spicules.

The papillae in male arranged in longitudinal band on either side of ventral median line; each papilla ramifies irregularly so that it is often dif-

ficult to count its exact number. The arrangement is not always symmetric on both sides. Praeanal papillae on one side are 54 (45~68) in number and 56 (51~61) on the other side; the distance of the first papilla from posterior extremity 1.59 mm (1.21~1.82 mm). Post-anal papillae absent. Two slender spicules not winged and equal in length, 0.36 mm (0.31~0.40 mm) long. Accessory piece (gubernaculum) absent. Vulva at 2.81 mm (2.65~2.97 mm) from anterior extremity; thick walled vagina posterad, 2.89 mm (1.06~4.85 mm) long. Uteri divergent. Two ovaries, the anterior extends to a portion at 0.76 mm (0.24~2.21 mm) posterad from vulva, the posterior to a portion at 0.67 mm (0.083~1.56 mm) anterad from anus or rarely beyond it. Egg globular, 0.049 mm (0.047~0.051 mm) in diameter; shell thin and colourless; contents 2~4 segmented when deposited. At room temperature the eggs develop into embryos after about 10 days and hatch after 22~27 days. The hatched larva 0.26 mm in length by 0.01 mm in widest breadth.

Habitat: Stomach and intestestine in both *Plecoglossus altivelis* and *Salmo irideus*.

Identification: From the description given above it is clear that the worm most closely resembles *Raphidascaris gigi* FUJITA 1928, but our specimen differs from FUJITA's description chiefly in shape of papilla and in presence of accessory piece so that at first sight it appeared to us as a new species. Subsequenty we could identify it with this species by examining the type specimen of *Raphidascaris gigi* which we had by the courtesy of Prof. T. FUJITA.

Our observation on the type specimen runs as follows:—The arrangement and shape of papilla in male agrees in general with our specimen excepting its irregular ramification. We could not observe the post-anal papillae and accessory piece as given in his description. The type specimen measures 5.30 mm in length, 0.30 mm in widest breadth.

ACANTHOCEPHALA

Acanthocephalus aculeatus VAN CLEAVE 1931

Description: With the characters of the genus. Body almost cylindrical; male 1.76 mm (1.56~1.94 mm) long by 0.44 mm (0.38~0.47 mm) broad at widest part; female 6.03 mm (4.74~8.26 mm) long by 1.13 mm (0.91~1.53 mm) broad at widest part. Proboscis cylindrical, 0.30 mm (0.29~0.33 mm) long by 0.17 mm (0.13~0.20 mm) broad in male, 0.53 mm (0.41~0.65 mm) long by 0.21 mm (0.17~0.24 mm) broad in female, carrying 8~10 longitudinal rows of 3~6 hooks each. Hooks at base of proboscis 0.026~0.038 mm in male, 0.015~0.041 mm in female. The largest hook 0.064~0.099 mm in male, 0.083~0.12 mm in female. Embryo within body cavity of gravid female spindle shaped, 0.080

mm (0.060～0.094 mm) long by 0.012 mm (0.009～0.015 mm) broad.

Habitat: Intestine.

Identification: The characters of our specimen agree on the whole with those of *Acanthocephalus aculeatus* VAN CLEAVE 1931 though the size of body and of proboscis, the number of hooks in each row is inferior to the species.

Echinorhynchus sp.

Description: With the characters of the genus. Body slender, cylindrical, 4.41 mm long by 0.41 mm broad at widest middle part in male. Female unknown. Proboscis cylindrical, 0.27 mm long by 0.16 mm broad, carrying 16 longitudinal rows of 6 hooks each. Hooks at base of proboscis 0.017 mm; the largest hook 0.041 mm. Proboscis receptacle 0.78 mm long by 0.21 mm broad at widest posterior part; lemnisci indistinct in our specimen. Testes occupying the anterior half of the body ellipsoidal, arranged tandem, close to each other; the anterior testis 0.62 mm long by 0.32 mm broad, the posterior one 0.59 mm long by 0.32 mm broad. Seven cement glands occupying the posterior half of the bady, oval or ovoidal, arranged in moniliform; the size of each gland 0.21～0.29 mm in diameter.

Fig. 2.
Echinorhynchus sp., male.

Habitat: Intestine.

Identification: Only one male specimen. The specimen resembles in general appearance *Echinorhynchus gadi* MÜLL. or *Echinorhynchus truttae* SCHRANK but the number of rows of hooks and also the number of hooks in each row are smaller than those of the species.

It is a pleasure to record here a debt of gratitude to Professor T. FUJITA for his kindness in sending his valuable type specimen of *Raphidascaris gigi* for our work and we also wish to express our sincere thanks to Dr. S. YOSHIDA and Dr. T. FUKUI for their kind guidance.

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