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Studies on Six Species of Cercariae from *Austropeplea ollula* in Shizuoka Prefecture, Japan

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Introduction

To date in Japan, only six species of cercariae, aside from the cercariae of *Trichobilharzia* spp., have been reported from the lymnaeid snails. These are cercariae of *Echinostoma hortense*, *Echinostoma revolutum*, *Fasciola hepatica* and *Plagiorchis muris*, and Cercaria A and Cercaria C by Takahashi (1927). Trichobilharzial cercariae from lymnaeid snails in Japan was first reported by Tanabe *et al* (1953), who found *T. physellae* from *Lymnaea japonica* on Oki Islands, and proved it to be a pathogenic agent of cercarial dermatitis among the inhabitants, especially among the rice field workers. Later, his co-workers, Oda (1958), Uno (1960), Ishida (1960) and Tanaka (1960), described cercaria of *Trichobilharzia ocellata*, *Cercaria okiensis*, *Cercaria mieensis* and Cercaria D respectively. These cercariae, however, are very difficult to distinguish each other because of fundamentally the same structures except their measurements.

As for the cercarial dermatitis (so-called rice field dermatitis) caused by bird schistosome in Japan, the first report was made by Tanabe (1948) from Shimane Prefecture. Since then, many cases of cercarial dermatitis have been reported by many investigators from the following prefectures: Aichi in 1950, Mie in 1952, Shiga and Okayama in 1953, Gifu, Hokkaido and Nagano in 1958, Fukui and Hyogo in 1959, Hiroshima in 1960, Toyama in 1961, Saitama in 1973, Kagoshima in 1975, Chiba in 1976, Ibaraki in 1977 and Tokushima in 1978.

Recently such dermatitis cases were found also in Shizuoka Prefecture, and a comprehensive survey on the cercarial fauna of *Austropeplea ollula* in this prefecture was carried out by the present author in 1976 and 1977. More than thirteen thousand snails were examined, and six species of cercariae, including that of *Trichobilharzia*, were detected. Among them only two species of cercariae could be identified with *Echinostoma hortense* and *Trichobilharzia physellae*. The third species of cercaria was strongly suggestive to identify with *Glypthelmins rugocaudata* (Yoshida, 1916), because of the similarities of its structure and because of the ecological point of view. The other remaining three species of cercariae were considered as new species, for which new names, *Cercaria shizuokaensis* n. sp., *Cercaria cristophora* n. sp. and *Cercaria nigrofurca* n. sp. are proposed respectively.

In this paper these six species of cercariae are described and illustrated with some remarks on each species.

Materials and Methods

The snails, *Austropeplea ollula* (Gould), were abundant in muddy swampy areas such as rice field, irrigation ditch, pond, lake, etc. These snails were collected and brought into the laboratory for the examination of cercariae. Cercariae obtained by crushing the snails were immersed in 0.4% NaCl-solution for preserving several hours. Living materials were used for microscopical observation, whereas measurements were

Table 1 Date, locality and infection rate of cercariae from *Austropeplea ollula*

Date		Locality	Snails examined	Snails infected	C. of *E. h.*	C. of *G. r.*	C. of *T. p.*	Others
1976								
Oct.	23	Fuji(Imaizumi)	31	0				
Nov.	24	〃 (〃)	50	0				
Nov.	26	〃 (〃)	100	0				
Nov.	27	〃 (〃)	375	1(0.3)	1			
1977								
Apr.	18	〃 (〃)	205	0				
Apr.	30	〃 (〃)	195	1(0.5)			1	
May	10	〃 (〃)	135	0				
May	10	Shizuoka(Ooya)	555	1(0.2)	1			
May	16	Fujieda(Masuzu)	70	0				
May	21	Fuji(Imaizumi)	180	0				
June	29	〃 (〃)	615	14(2.3)	14			
July	1	〃 (〃)	900	10(1.1)	9			1(*C. shizuokaensis*)
July	1	Hamamatsu(Shinohara)	717	3(0.4)	2			1(*C. shizuokaensis*)
JulJ	2	Fuji(Imaizumi)	500	3(0.5)	3			
July	7	Hamamatsu(Shinonara)	1,200	0				
July	8	Fuji(Imaizumi)	480	10(2.1)	4		1	5(*C. shizuokaensis*)
July	13	Hamamatsu(Shinohara)	384	6(1.6)	2	4		
Aug.	16	Fuji(Imaizumi)	185	18(9.7)	11	7		
Aug.	16	Hamamatsu(Shinohara)	53	0				
Aug.	16	〃 (Kuramatsuda)	90	2(2.2)		2		
Aug.	16	〃 (Iida)	213	9(4.2)	5	4		
Aug.	20	Fujieda(Hanashi)	163	0				
Aug.	21	Fuji(Imaizumi)	154	13(8.4)	7	6		
Aug.	27	〃 (〃)	115	4(3.5)	1	3		
Aug.	27	Yaizu(Shimooda)	376	2(0.5)	2			
Aug.	27	Hamamatsu(Shinohara)	40	0				
Aug.	27	〃 (Nakatajima)	110	1(0.9)		1		
Aug.	29	Yoshida(Aoyagi)	184	1(0.5)		1		
Aug.	31	Ooigawa-cho	381	1(0.3)		1		
Sep.	1	Kikugawa-cho	600	1(0.2)		1		
Sep.	1	Fuji(Imaizumi)	375	5(1.3)		5		
Sep.	3	〃 (〃)	200	1(0.5)		1		
Sep.	5	〃 (〃)	125	4(3.2)		4		
Sep.	5	Yaizu(Tajiri-kita)	199	1(0.5)		1		
Sep.	8	Fuji(Imaizumi)	543	11(2.0)		11		
Sep.	12	〃 (〃)	60	4(6.7)		4		
Sep.	12	Hamamatsu(Shinohara)	25	0				
Sep.	12	Kosai-cho	546	1(0.2)		1		
Sep.	15	Iwata(Araide)	805	2(0.2)				2(*C. cristophora*)
Sep.	16	Fuji(Imaizumi)	109	12(11.0)		12		
Sep.	24	〃 (〃)	30	13(43.3)		12		1(*C. nigrofurca*)
Sep.	27	〃 (〃)	320	14(4.4)		14		
Oct.	7	〃 (〃)	37	1(2.7)		1		
Ocr.	20	Hamamatsu(Shinohara)	124	0				
Oct.	28	Fuji(Imaizumi)	138	23(16.7)		23		
Dec.	1	〃 (〃)	45	1(2.2)		1		
		Total	13,087	194(1.48)	62 (0.5)	120 (0.9)	2 (0.02)	10(0.08)

made on specimens fixed in 10% hot formalin. All drawings were scaled to such measurements, and were illustrated semidiagrammatically without camera lucida. In some drawings, the gland cells were omitted on the right side, and the flame cells on the left side to make the figure clear.

Table 1 indicates the date and locality of collecting the snail, with the number of snails examined and infected. The cercaria of *Echinostoma hortense* showed a high infection rate during the spring and summer seasons, whereas that of *Glypthelmins rugocaudata* did so during the autumn season, though the reason is unknown yet. Cercariae of *Trichobilharzia physellae* were found only two times from the same locality, Fuji City (Imaizumi-District), where some farmers complained of a itching on their legs. The other three new species of cercariae, *Cercaria shizuokaensis*, *C. cristophora* and *C. nigrofurca*, showed rather rare occurrences.

Description of Cercariae

1. Cercaria of *Trichobilharzia physellae* (Talbot, 1936) (Fig. 1)

Measurements :

body .....247(230–280) × 69(50–86) μm
anterior organ... ...80(77– 85) × 48(45–50) μm
acetabulum ..... 32(29– 36) × 29(24–34) μm
tail stem .....290(230–330) × 42(29–48) μm
tail furca.....217(202–240) × 24(22–26) μm

Oculate, apharyngeal brevifurcate distome furcocercous cercaria. The body is elongated cylindrical in shape. The body surface is covered with many backward directed minute spines, being more dense at the anterior part. About eight pairs of short sensory hairs are observed on the lateral surface. The anterior part of body is occupied by a pear-shaped anterior organ which is homologous to oral sucker, and is delimited posterior portion. The mouth opens subterminally. There is no pharynx. A long rhabdocoel esophagus ends in front of acetabulum with a short bifurcation. One pair of pigmented eye spots with a lens is situated in front of the anteriormost penetrating gland cells. At the level of two thirds of body, a well developed but small acetabulum is located just between the penetrating glands. Five pairs of penetrating gland cells occupy the posterior half of body, the anterior two

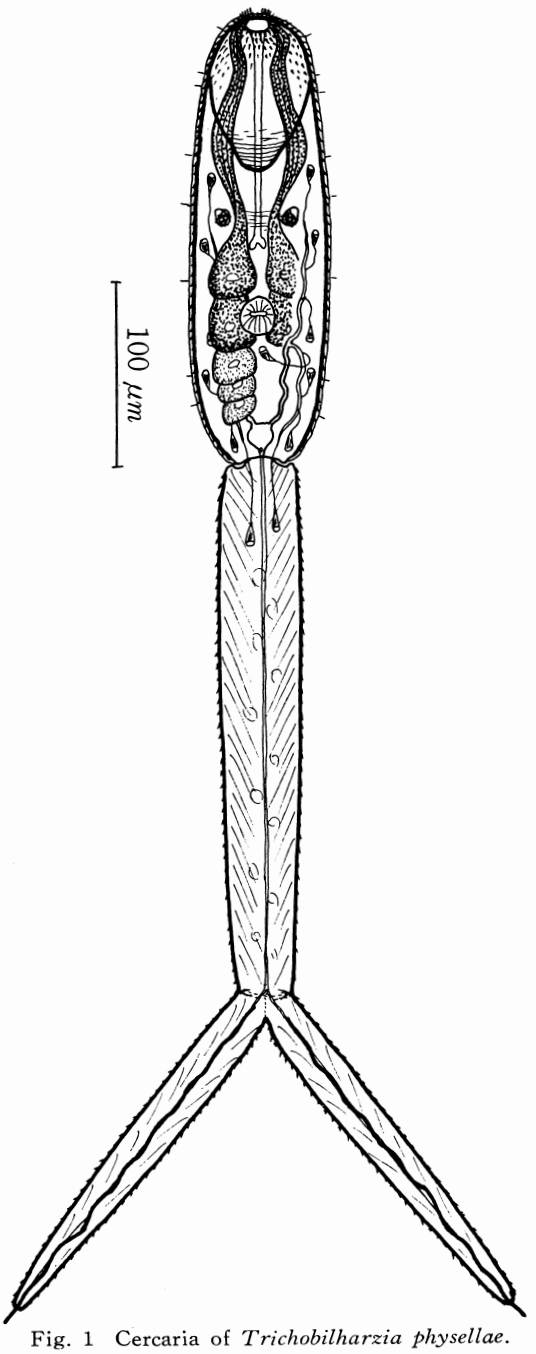

Fig. 1 Cercaria of *Trichobilharzia physellae*.

of which contain coarse granules and the posterios three are filled with fine granules. Their ducts run forward and open at the anterior top of the body. Each opening is provided with a sharp-pointed penetrating spine respectively. A small, non-epithelial excretory vesicle situates at the distal end of the body. The islet of Cort is present. Two main collecting tubes arise from the vesicle, run forward until the level of acetabulum, where they divide into an anterior and a posterior branches respectively. The flame cell formula is $2[3+3+(1)]=14$.

The tail stem is much longer than the body. It is beset with many minute spines but no hair on the surface. One pair of flame cells is observed at the anterior part of the tail stem. The tail furcae are slightly shorter than the body, and are more slender toward the end of tail. A dorso-ventral finfold on the whole length of the furcae is connected each other around the distal end of the furcae.

The sporocyst is a whitish, delicate filamentous in shape. It contains a number of immature and mature cercariae.

Remarks: At present five different species of trichobilharzial cercariae have been reported from *Lymnaea japonica* in Japan. These are; cercaria of *T. physellae*, that of *T. ocellata*, *Cercaria okiensis*, *Cercaria mieensis* and Cercaria D of Tanaka (1960). Comparing with these cercariae, the present one seems to be identifiable with that of *T. physellae*, though there exists some small differences of the measurements on the cercaria. These measurements, however, would be fallen within a size range given for the cercaria of *T. physellae*.

At the same time, it is valuable to note that this cercaria brought about a typical dermatitis on the forearms of a volunteer. The preliminary experiment showed that, about 20 minutes after putting the cercaria on his forearm, he complained of a itching. Then several reddish erythemata were observed on the region. These erythemata and itch feeling lasted about one week, and became to diminish slowly day by day. These symptoms of the cercarial dermatitis were just as same as that complained by the rice-field workers in Imaizumi-District where this cercaria was found. So it would be concluded that this cercaria is a pathogenic agent of the cercarial dermatitis in Imaizumi-District, Fuji City, Shizuoka Prefecture.

2. Cercaria of *Echinostoma hortense* Asada, 1926 (Fig. 2)

Measurements:

body .....291 (259–317) × 150 (125–155) μm
oral sucker..... 48 (46– 50) × 50 (46– 53) μm
prepharynx ... 13 (7– 20) μm in length
pharynx ..... 22 (16– 24) × 18 (16– 21) μm
acetabulum ... 55 (48– 62) × 62 (55– 70) μm
tail .....508 (442–557) × 58 (55– 62) μm

Moderate sized echinostome cercaria. The body is fusiform in shape, being more blunt posteriorly. The surface is covered with thick smooth cuticle, without any spine, but with about thirteen pairs of short sensory hairs on the lateral side. About 28 collar spines, comprising 8 corners, 6 laterals and 14 dorsals, are barely observed in two alternate rows. The head collar is not conspicuous. A well developed spherical oral sucker is subterminal. A mouth leads into a short prepharynx, pear-shaped pharynx and a long esophagus which divides into two ceca terminating near the posterior end of the body. A transverse nervous commissure is observed across the prepharynx. The acetabulum is larger than the oral sucker, and situates slightly posterior to the middle of body. Except for the cephalic region the body cavity is filled with densely compacted cystogenous gland cells which make the body very opaque. These gland cells are composed of at least two kind cells, one being filled with rod-like materials and the other one with coarsely granulated materials.

The non-epithelial excretory vesicle is at the posterior end of the body. From its antero-median portion one pair of main collecting tubes arises, runs forward passing the side of the acetabulum until the level of the prepharynx, where it twists into a triangular loop and runs backward to con-

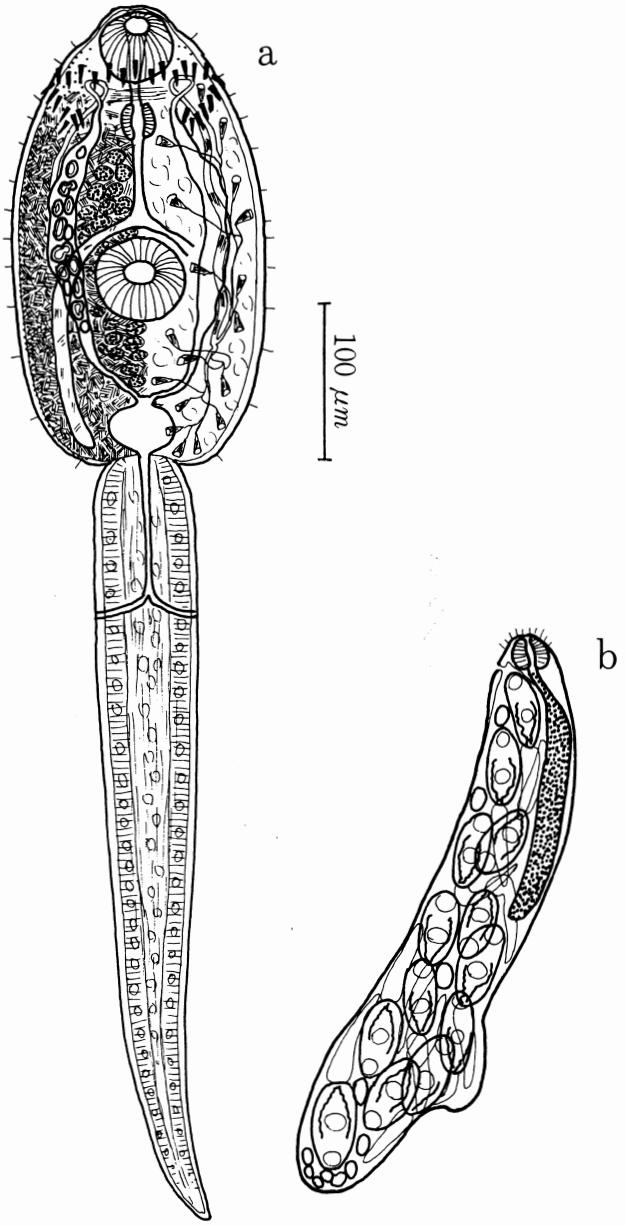

Fig. 2 Cercaria of *Echinostoma hortense*.
a. cercaria, b. redia

nect with the secondary collecting tubes. A portion of the ascending main collecting tube between the acetabulum and the pharynx is inflated and filled with 20 to 30 refractile excretory concretions. In the descending main collecting tube, about four groups of cilia are observed. The flame cell formula is constructed as 2[(3+3+3)+(3+3+3)]=36. The tail is much longer than the body. Its surface is smooth without any spine or hair. A caudal excretory tube arises from the posterior margin of the ex-

cretory vesicle, then divides into two side branches to open on lateral sides of the tail at its anterior fifth.

The redia is sausage-shaped and less than 1 mm long, being more blunt in the posterior part. The collar and the locomotive appendages are inconspicuous. Many sensory hairs are located around the mouth opening. A well developed pharynx is followed by a gut containing dark brown ingesta. More than ten cercariae with some germ balls are contained in one redia.

Remarks: This cercaria is apparently identifiable with the cercaria of *Echinostoma hortense* which was reported by One (1930), Asada (1939), Yamaguti (1941) and Okamoto (1954). As well as its morphology, the life cycle of this cercaria was also reported in details by these senior investigators. According to them, fishes and tadpoles will act as its second intermediate host, and dogs, rats and mice will serve as its final host.

As shown in Table 1, this cercaria was found from a wide areas such as Fuji, Hamamatsu, Yaizu and Shizuoka, but the incidence was rather limited in June, July and August. These might be caused by changes in the occurence of the second or final hosts.

3. Cercaria of *Glypthelmins rugocaudata* (Yoshida, 1916) (Fig. 3)

Measurements:

body .....406 (384–447) × 206 (182–221) μm
oral sucker..... 74 (70– 79) × 80 (74– 84) μm
stylet ..... 23 (20– 24) × 8 (7– 9) μm
prepharynx..... 13 (10–20) μm in length
pharynx ..... 30 (24– 36) × 46 (43– 48) μm
acetabulum ... 56 (53– 60) × 55 (53– 58) μm
tail.....433 (394–470) × 51 (46–58) μm

Lophocercous xiphidiocercaria belonging to Ornatae group of Lühe (1909). The body is ellipsoidal in shape, and provided with many backward directed minute spines on the surface, being more dense anteriorly. A well developed spherical oral sucker is situated at the anterior part of the body, in which a sharply pointed, non-shouldered stylet is embedded. The mouth opening is followed by a short prepharynx, a pyriform pharynx, a long esophagus and two intestines. The posterior portion of the intestine looks like a linear series of cells. A transverse nervous commissure is across the prepharynx. Along the body side, a short anterior and a long posterior nervous cord are also recognized. A well developed but small acetabulum situates slightly posteriorly to the middle of the body. About five pairs of penetrating gland cells are located between the pharynx and the acetabulum. Their ducts open near the apical sides of the stylet. Beside them many cystogenous gland cells filled with fine granules are scattered in the body.

A thick lined epithelial, two-chambered excretory vesicle situates at the posterior part of the body. One pair of main collecting tubes from the vesicle runs forward in zigzag course, and divides at the side of the acetabulum into an anterior and a posterior collecting tube. Each tube receives 9 flame cells grouping in three. Thus the flame cell formula is represented as $2[(3+3+3)+(3+3+3)]=36$. A slender tail with a smooth cuticle, as long as the body, is shallowly inserted in the body end. Along the whole length of dorsal and ventral median line a caudal fin-fold is provided. These are connected each other around the tail tip. The caudal excretory tube is obliterated.

The sporocyst is 2–4 mm long, and has a brownish yellow tinge because of pigmented materials within the wall. Usually several, sometimes several tens sporocysts are tangled by some mucous materials in the liver of the snail host, so that it looks like a complicated branched one. Several cercariae with some germ balls are contained in one sporocyst.

Remarks: This is the first report on a lophocercous xiphidiocercaria from lymnaeid snails in Japan. It has already been known that the lophocercous xiphidiocercariae are generally found among the member of Haematoloechidae or Macroderoidiae. The morphology of this cercaria is very similar to that of *Glypthelmins* of Macroderoididae. If it be true, the present cercaria would make their metacercariae on the skin of

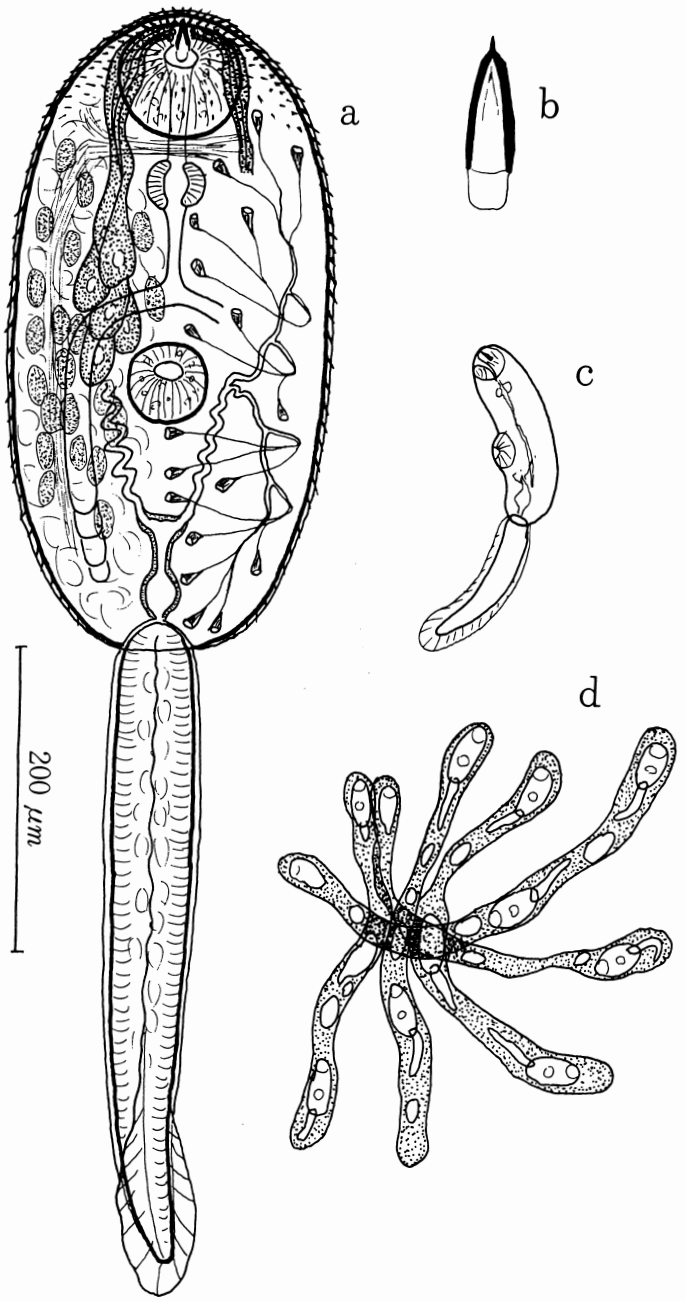

Fig. 3 Cercaria of *Glypthelmins rugocaudata*.
a. cercaria, b. stylet, c. lateral view of cercaria, d. tangled sporocyst

frogs. When the frog ingests its moult the metacercariae would develop to adult flukes in the frog.

Recently Uchida and Itagaki (1975) reported a high incidence of adult flukes of *Glypthelmins rugocaudata* (Yoshida, 1916) parasitic in frogs from the lacalities where this cercaria was found in Shizuoka Prefec-

ture. As shown in Table 1, the incidence of this cercaria was the highest rate among six species of cercariae from the snail. The localities from where this cercaria was obtained were as wide as everywhere surveyed, i. e., Hamamatsu, Fuji, Yoshida, Ooigawa, Kikugawa, Yaizu, Kosai, etc. This ecological aspect seems to correspond to that reported by Uchida and Itagaki (1975) who found the adult flukes from frogs in Shizuoka Prefecture.

Based on these facts mentioned above, the present author dared to identify the present cercaria with that of *Glypthelmins rugocaudata* (Yoshida, 1916), instead of proposing a new cercarial name. A future ex-

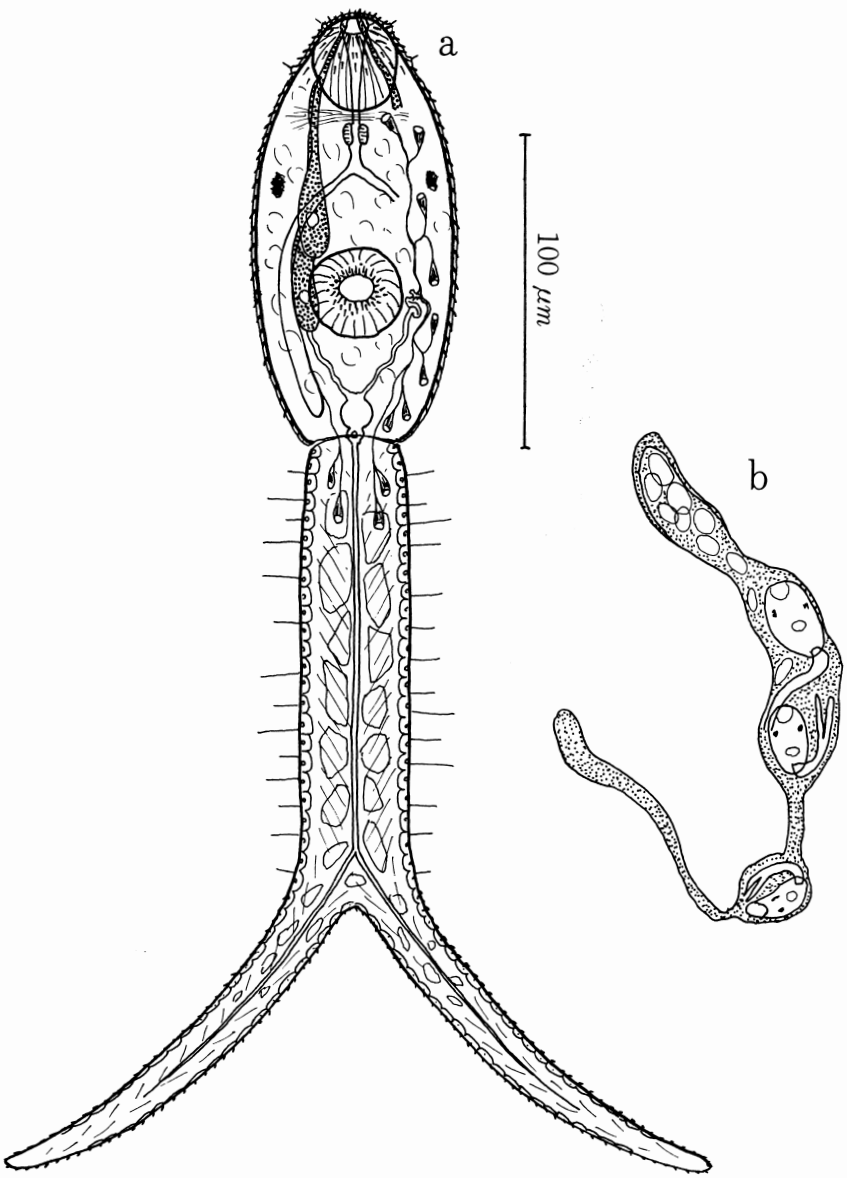

Fig. 4 *Cercaria shizuokaensis* n. sp.
a. cercaria, b. sporocyst

periment on the life cycle of this cercaria would be expected to prove the justification of this identification.

4. *Cercaria shizuokaensis* n. sp. (Fig. 4)

Presumptive adult form : Diplostomatidae (*Diplostomum* or *Alaria*)

Snail host : *Austropeplea ollula*

Date, locality and infection rate :

On the whole, 7 out of 13087, or 0.05 %

July 1, 1977, Fuji (Imaizumi),
1 out of 900, or 0.1 %

July, 1, 1977, Hamamatsu (Shinohara),
1 out of 717, or 0.1 %

July 8, 1977, Fuji (Imaizumi),
5 out of 480, or 1.0 %

Measurements :

body .....140(113-168) × 58(55-62) μm
oral sucker ..... 32(29- 36) × 29(26-34) μm
acetabulum ..... 29(26- 34) × 31(29-36) μm
tail stem .....125(100-144) × 40(38-48) μm
tail furca .....154(149-161) × 15(12-17) μm

Specific description :

Oculate, pharyngeal longifurcate distome furcocercaria. The body is ellipsoidal in shape, tapering slightly in the anterior part of the body. The body surface is covered with many backward directed minute spines, more densely at the anterior part. A well developed oral sucker is oval in shape, situated at the anterior portion of the body. The acetabulum is nearly the same size to the oral sucker, and is located slightly posterior to the middle of the body. Around the opening of the acetabulum, many small spines arranging in alternative concentric rows are observed. One pair of small pigmented eye spots is located near the shoulder of ceca. A distinct pharynx follows the oral sucker with a short pharynx, and is followed by a short esophagus and ceca extending almost to posterior extremity. Two pairs of penetrating gland cells are at the both sides of the acetabulum. Their ducts extend to the tip of body, and open around the mouth opening. A transverse nervous commissure is across the prepharynx. The non-epithelial excretory vesicle is small. One pair of collecting tubes arises from the vesicle, then it divides into an anterior and a posterior collecting tubes near the side of the acetabulum. The anterior tube receives four flame cells grouping in two, and the posterior tube does so too. Moreover two pairs of flame cells are sent to the anterior part of the tail stem. Thus the flame cell formula is constructed as $2[(2+2)+(2+2+[2])]=20$. An islet of Cort is present.

A tail stem is slightly shorter than the body, and is provided with more than 10 pairs of sensory hairs, but no spine. The tail furca, on the while, is slightly longer than the body, and is provided with many minute spines, but no sensory hair. Beneath the tail surface are arranged one layer of epidermal cells, inside of which is occupied with several large vacuolated materials (caudal body). The caudal excretory tube from the vesicle runs backward along the axis of the tail, extends into the furcae, then disappears.

The sporocyst is whitish filamentous in shape, about two mm long, and is fairly mobile. Many yellowish pigments are scattered in the wall of the sporocyst. Numerous flame cells are also observed in the wall too. Only a few cercariae with several germ balls are contained in a old sporocyst.

Remarks : The general feature of this cercaria indicates that the presumptive adult form is a member of Diplostomatidae. The life cycles of many genera and species of this family have already been known in the other countries, According to the references, the present cercaria seems to be much related to the genus *Diplostomum* or *Alaria*. In the case of *Diplostomum*, the second intermediate host would be some fresh water fish or tadpole of *Rana*. Adults would be obtainable from birds such as pigeon, duck, chick, etc., after feeding them with this metacercaria. In the case of the genus *Alaria*, cercariae would penetrate into the tadpole of *Rana* spp. in which they become mesocercariae. The mesocercariae would develop into metacercariae and adults after feeding dog, cat, fox, mink, and so on according to the species.

To date in Japan, two diplostomatid cercariae have already been reported. These are *Cercaria pseudodivaricata* (Ando, 1918) from *Semisulcospira libertina*, and *Cercaria longissima* (Suzuki et Nishio, 1914) from *Oncomelania nosophora*, which are closely related but differ from the present species because of lacking the eye spots. The present species is, therefore, considered to be the third diplostomatid cercariae in Japan, for which a new name, *Cercaria shizuokaensis* n. sp. was proposed.

5. *Cercaria cristophora* n. sp. (Fig. 5)

Presumptive adult form : Sanguinicolidae?
Snail host : *Austropeplea ollula*
Date, locality and infection rate :

On the whole, 2 out of 13087, or 0.02 %

Sept. 15, 1977, Iwate (Araide),
2 out 805, or 0.2 %

Measurements :

body ..... 95(84-108) × 36(31-41) μm
tail stem .....160(130-180) × 19(17-22) μm
tail furca ..... 30(26- 34) × 8(7- 9) μm

Specific description :

Small sized furcocercous cercaria with a dorsal fin-fold on the body. The body is ellipsoidal in shape, being more acute anteriorly, and being curved ventrally. A prominent dorsal finfold is observed along the dorsal median line of the posterior four fifths. The thin body wall is covered with many minute spines which are distributed more densely around the mouth part. The anterior part of the body is provided with a lot of muscles so that it forms an anterior organ. At the anterior tip of the body is furnished with one pair of lip-like papillae which forms a mouth opening. An indistinct esophagus is barely observable through the anterior organ, but the other digestive system is not differentiated yet. The body cavity is filled with various sized, not yet differentiated parenchymatous cells only.

The tail stem is much longer than the body, and is provided with many weakly developed oblique muscles in it. The surface of the tail stem has neither spine nor hair, but many fine annulations. The tail

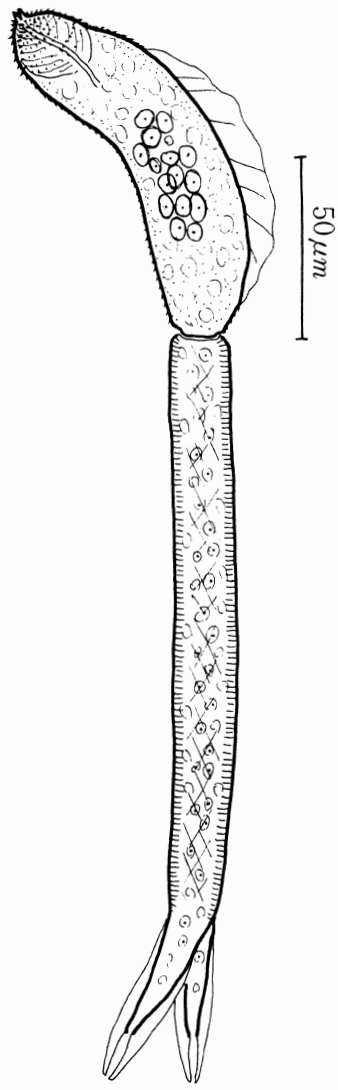

Fig. 5 *Cercaria cristophora* n. sp.

furca is short lanceolate in shape, and is provided with a dorso-ventral fin-fold on the whole length around the furcal tip. A comparative long cup-shaped projection is observed at the distal end of the furcal ramus.

Remarks : About twenty species of dorsal fin-folded furcocercariae have been reported in the world, and are known to belong to the families of Apolocotylidae, Sanguinicolidae, Spirorchiidae and Clinostomatidae. Comparing the present cercaria to these cercariae, it seems to develop to the member

of Sanguinicolidae because of similarities of the cercarial body structure. So it is expected that this cercaria would penetrate into the blood system of fishes directly to reach maturity.

To date in Japan, only one species of dorsal fin-folded furcocercaria has been reported by Ueno (1930), who found it from the snail, *Stenothyra japonica*, in Kumamoto, and named it as Cercaria E. Comparing the present cercaria with Cercaria E of Ueno, the present one is much smaller than the latter which is 120 μm in the body length and 234 μm in the tail length. Moreover there exists a big difference on the snail host between them. The present cercaria was, therefore, recognized as a new species, for which a new name, *Cercaria cristophora* n. sp. was proposed.

6. *Cercaria nigrofurca* n. sp. (Fig. 6)

Presumptive adult form : Unknown

Date, locality and infection rate :

On the whole, 1 out of 13087, or 0.01 %

Sept. 24, 1977, Fuji (Imaizumi), 1 out of 30, or 3.3 %

Measurements :

body	173–192 × 77–96	μm
tail stem	230 ×	48 μm
tail furca	115 ×	28 μm

Specific description :

Brevifurcate, distomatous furcocercaria. The body is cylindrical or ellipsoidal in shape, covered with many minute backward directed spines, being more dense anteriorly. A well developed oral sucker is subterminal, within which two or three pairs of cephalic glands are barely observed. The mouth opening leads into a small pharynx which is situated at the posterior margin of the oral sucker directly. The pharynx is followed by a long narrow esophagus and two broad ceca terminating near the posterior end of the body. The ceca are composed of about 5 cells each, and are yellowish tinge because of the contents. A small but well developed acetabulum situates slightly posterior to the middle of the body. Around the opening of acetabulum, many small spines

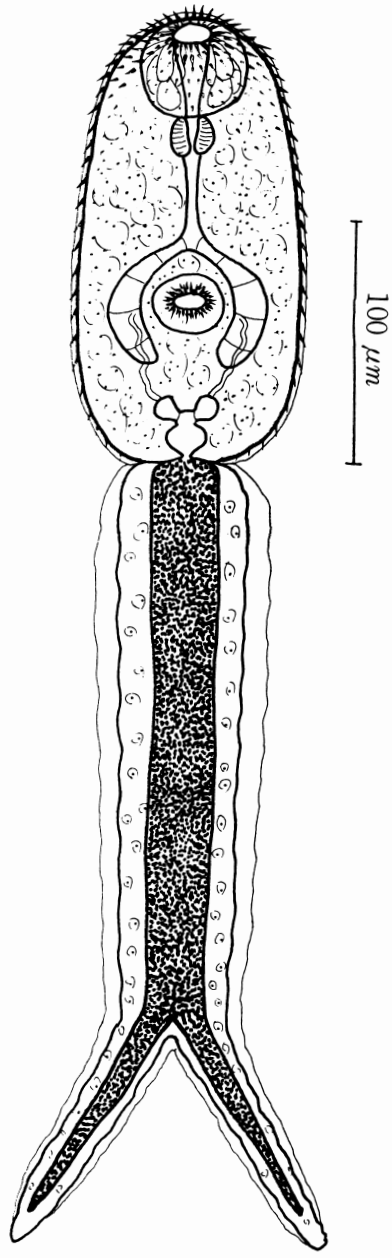

Fig. 6 *Cercaria nigrofurca* n. sp.

are arranged circularly. A clover-shaped triangular excretory vesicle situates at the posterior end of the body. Two main collecting tubes arise from its anterior corner, but the other parts of the excretory system could not be detected.

The tail stem is longer, but the furca is shorter than the body. The tail surface is covered with a rather thick but very frail cuticle. It has neither spine nor hair. The cavity of the tail is filled with darkly pigmented granules which may be originated from the excretory granules.

Remarks: The general appearance of this cercaria seems to be related with the member of Fellodistomatidae or Gymnopyallidae. Approximately ten cercariae belonging to these two families have been reported, but these are all reported from marine bivalves, and not from fresh water snails. A new name, *Cercaria nigrofurca* n. sp. was proposed to this cercaria.

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References

1) Asada, J. (1939): Description of a new species of Echinostomatidae and its life history. Vol. Jubilare Yoshida, 1, 39-69 (in Japanese).
2) Hasegawa, O. (1958): Studies on the rice-field dermatitis in Hokkaido (1). Hokkaido Eiken Shoho, 11, 57-60 (in Japanese).
3) Ishida, H. (1960): Studies on the dermatitis-producing cercaria, *Cercaria mieensis* n. sp. in man, 2. Jap. J. Parasit., 9, 724-729 (in Japanese with English summary).
4) Ito, J. (1964): A monograph of cercariae in Japan and adjacent territories. Prog. Med. Parasit. Japan, 1, 395-550.
5) Komiya, Y. and Goto, J. (1951): Survey on so-called rice pad itch in Aichi Prefecture, and on the morphology and ecology of agent cercaria. Koshu Eisei, 10, 32-33 (in Japanese).
6) Komiya, Y. and Ito, J. (1952): The morphology of *Cercaria sturniae* Tanabe, 1948 (cercaria of *Giganthobilharzia sturniae* Tanabe, 1951), a cause of cercaria dermatitis in Japan. Jap. J. Med. Sc. Biol., 5, 215-220.
7) Lühe, M. (1909): Trematoda. In die Susswasserfauna Deutschlands, Heft 17, pp. 217.
8) Oda, T. (1958): Studies on the schistosome dermatitis distributed in the rice pad in Okinoshima Islands (1-2). Okayama Eiken Nempo, 8, 41-62 (in Japanese).
9) Okamoto, F. (1954): Experimental studies for trematodes in the south of Hokkaido (1). Jap. J. Parasit., 2, 216-220 (in Japanese),
10) Ono, S. (1930): On a new echinostoma, *Echinostoma campi* n. sp. in North East of China and its life cycle, especially on the second intermediate host. Jap. J. Zool., 42, 7-16 (in Japanese).
11) Suzuki, N., Ozu, S., Aida, C., Takei, S. and Sawaura, S. (1973): The paddy field dermatitis in Saitama Prefecture, 2. Noson Igaku, 21, 484-490 (in Japanese with English summary).
12) Suzuki, S., Kawanaka, M., Ishida, T., Yamamoto, S. and Hashiguchi, S. (1976): Paddy field dermatitis in Kagoshima Perfecture. Noson Igaku, 25, 604-613 (in Japanese with English summary).
13) Takahashi, S. (1927): Studies on the life cycle of *Fasciola hepatica* L. in Japan, especially on the intermediate host. Fukuoka Ika Daigaku Zasshi, 20, 587-617 (in Japanese).
14) Tanabe, H. (1948): On a cause of "Koganbyo" (schistosome dermatitis along the Lake Shinji in Japan). Yonago Igaku Zasshi, 1, 2-3 (in Japanese).
15) Tanabe, H., Oda, T. and Uno, T. (1953): On the schistosome dermatitis distributed in Okinoshima Islands. Jap. J. Parasit., 171.
16) Tanaka, M. (1960): Studies on *Trichobilharzia physellae* in Oki Islands 2, Four kinds of schistosome cercariae parasitic in *Lymnaea japonica* in Oki Islands. Jap. J. Parasit., 9, 604-609 (in Japanese with English summary).
17) Tsuchimochi, K. (1926): On the cercariae parasitic in Formosan Lymnaeidae. Taiwan Igakkai Zasshi, 257, 1-22 (in Japanese).
18) Uchida, A. and Itagaki, H. (1975): Studies on the amphibian helminths in Japan. 2, The distribution of *Glypthelmins rugocaudata* (Yoshida, 1916) (Trematoda; Plagiorchiidae) in Japan and its new hosts. Jap. J. Parasit., 24, 87-90.
19) Ueno, N., Ishii, K. and Abe, H. (1930): On the cercariae parasitic in fresh water snails in Kumamoto Prefecture. Kumamoto Igakkai Zasshi, 6, 965-976 (in Japanese).
20) Uno, T. (1960): Studies on the schistosome

dermatitis in Oki Islands and Dogo Island, with a description of a new species, *Cercaria okiensis* n. sp. Osaka Ika Daigaku Zasshi, 20, 1031-1043 (in Japanese).
21) Yamaguti, S. (1941): Zur Entwicklungsgeschichte von *Echinostoma hortense* Asada, 1926, mit besonderer Berücksichtigung der Structur der Cercarie. Z. Parasitenk., 12, 273-276.
22) Yamaguti, S. (1975): A synoptical review of life histories of digenetic trematodes of vertebrates. Keigaku Shuppan Co., Tokyo, 1-590, with 219 plates.
23) Yasuraoka, K. *et al.* (1977): Paddy field dermatitis in Yatabe-machi, Ibaraki-ken. Jap. J. Parasit., 26, 33.
24) Yokogawa, M. *et al.* (1976): Paddy field dermatitis in Noda City, Chiba Prefecture. Jap. J. Parasit., 25, 366-370 (in Japanese with English summary).
25) Yoshida, S. (1916): On a new species of frog trematode (*Enodiotrema rugocaudatum* n. sp.). Ann. Zool. Jap., 9, 73-79.

静岡県のヒメモノアラガイに寄生する6種のセルカリアについて

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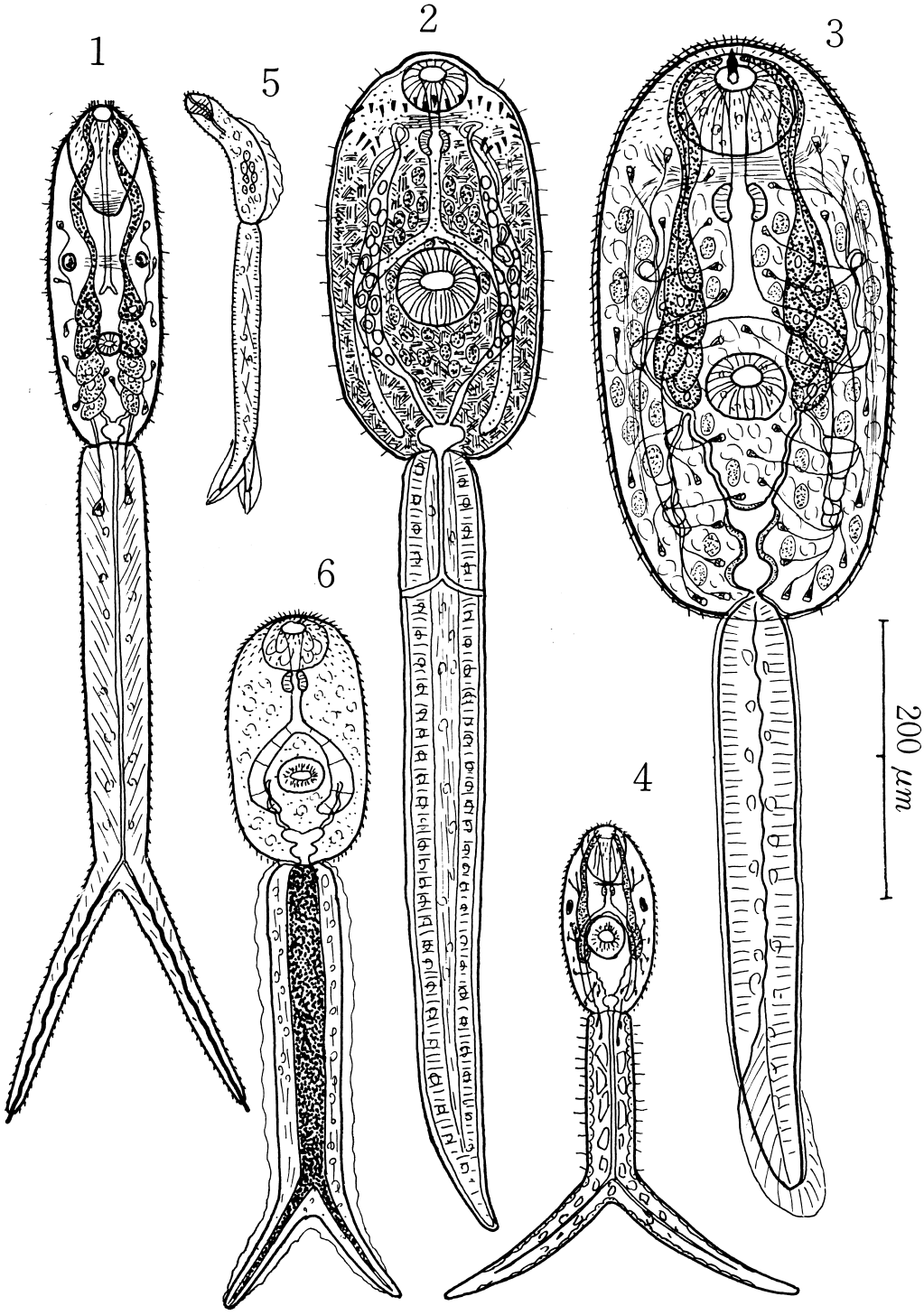
静岡県では近年，水田性皮膚炎を訴える地域が発生したので，1976年から1977年にわたり県下各地のヒメモノアラガイを採集してセルカリアの調査を行つた．水田性皮膚炎の実態については後報にゆづり，今回はセルカリアの記載をおこなつた．総計13,087個の貝から6種類のセルカリアを検出したが，そのうち2種は *Trichobilharzia physellae* および *Echinostoma hortense* と同定した．次の1種は形態的には *Glypthelmins* に属するものであり，内田・板垣 (1975) が静岡県のカエルから *Glypthelmins rogocaudata* の成虫を高率に報告しているので，そのセルカリアと同定した．他の3種はいずれも新種であり，それぞれ *Cercaria shizuokaensis* n. sp., *Cercaria cristophora* n. sp. および *Cercaria nigrofurca* n. sp. として記載した．

Explanation of Plates

1. Cercaria of *Trichobilharzia physellae* (Talbot, 1936).
2. Cercaria of *Echinostoma hortense* (Asada, 1926).
3. Cercaria of *Glypthelmins rugocaudata* (Yoshida, 1916).
4. *Cercaria shizuokaensis* n. sp.
5. *Cercaria cristophora* n. sp.
6. *Cercaaia nigrofurca* n. sp.

(Semidiagrammatic drawings by the same scale)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