

On a New Lepocreadiid Cercaria, *Cercaria isoninae* n. sp.
(Trematoda) from a Littoral Gastropod, *Japeuthria*
ferrea from Kanagawa and Chiba
Prefectures, Japan

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Introduction

In the course of an investigation of marine larval digenetic trematodes in 1979, a new species of ophthalmo-trichocercous cercaria was found in a littoral gastropod, *Japeuthria ferrea* (Reeve), from Kanagawa and Chiba prefectures in Japan. This cercaria probably belongs to the family Lepocreadiidae. In this paper the morphology of the cercaria is described under the name, *Cercaria isoninae* n. sp.

Materials and Methods

The snails, *Japeuthria ferrea* (Reeve) (Buccinidae), were collected from the rocky reef near the Misaki Marine Biological Station, University of Tokyo, Aburatsubo, Kanagawa Prefecture, and in Kominato, Chiba Prefecture, both localities being on the Pacific coast of central Japan. They were examined for cercariae at the laboratory. Naturally emerged cercariae from them were chiefly employed for morphological observations. Cercariae and rediae obtained by crushing the snails were also utilized. For morphological observations, especially of the excre-

tory system, living specimens in diluted sea water were pressed under a cover glass till they became very thin, flat and transparent. These preparations remained alive and in good condition for hours when the margin of the cover glass was sealed with vaseline. The penetration glands and alimentary canal could be easily distinguished by the aid of vital staining with neutral red or Nile blue sulphate. Measurements were taken on 20 specimens fixed in 10% hot formalin, because this fixing technic yielded a comparative stable shape and size of the cercaria. Semidiagrammatic drawings were made to scale from such measurements.

Description of *Cercaria isoninae* n. sp.

Presumptive adult form: Lepocreadiidae
(*Lepocreadium* sp. ?)

Snail host: *Japeuthria ferrea* (Reeve) (Buccinidae)

Date, locality and infection rate:

As a whole, 69 out of 177, or 39.0%

Apr. 28, 1979, Aburatsubo, 9 out of 10, or 90%

May 12, 1979, ,, 3 out of 8, or 38%

June 14, 1979, ,, 36 out of 51, or 71%

June 14, 1979, Kominato, 11 out of 88, or 13%

June 28, 1979, Aburatsubo, 10 out of 20, or 50%

Measurements:

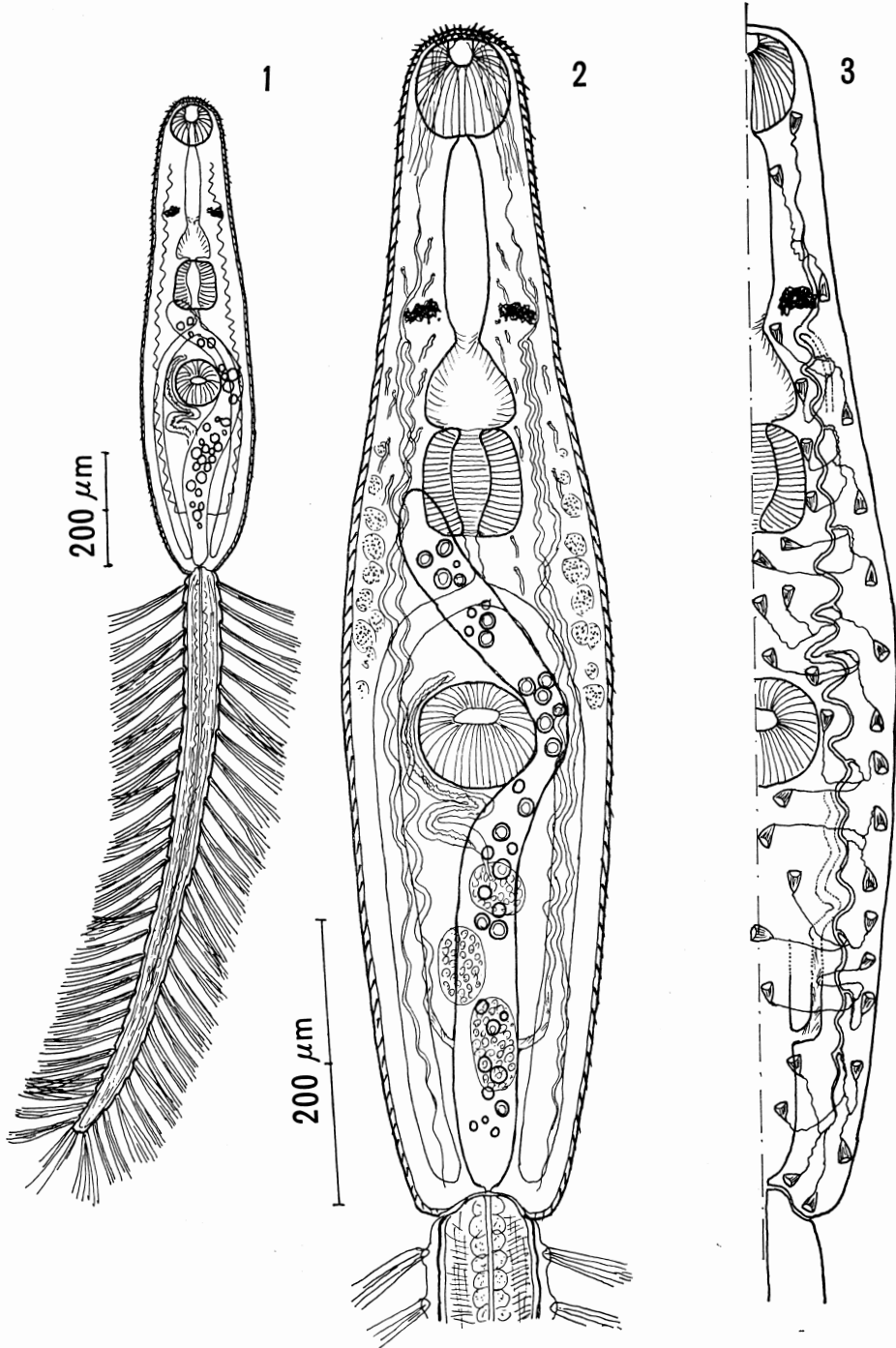
body..... 832(726-895) μm long \times

186(174-213) μm wide

oral sucker... 70(65-80) μm in diameter

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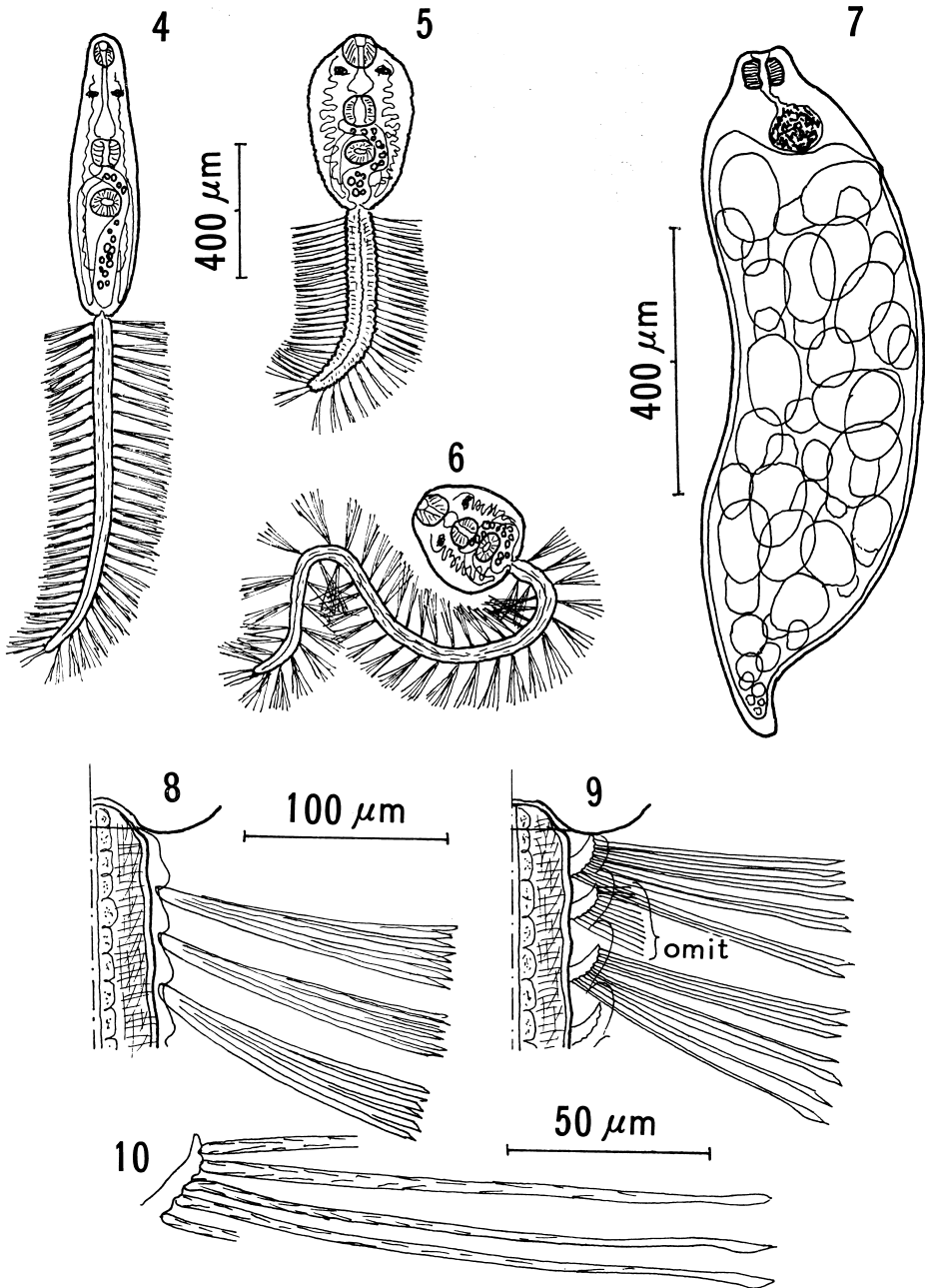
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Explanation of Figures

Cercaria isoninae n. sp.

- Fig. 1 General feature.
- Fig. 2 Enlarged body structure.
- Fig. 3 Flame cell pattern.



Explanation of Figures

- Fig. 4 Typical posture of specimen fixed in hot 10% formalin.
 Fig. 5 Typical posture of living specimen.
 Fig. 6 Typical posture of swimming specimen.
 Fig. 7 Daughter redia.
 Fig. 8 Enlarged setae under no pressure.
 Fig. 9 Enlarged setae under moderate pressure, omitting the second tuft to avoid the complication.
 Fig. 10 Striations on each seta.

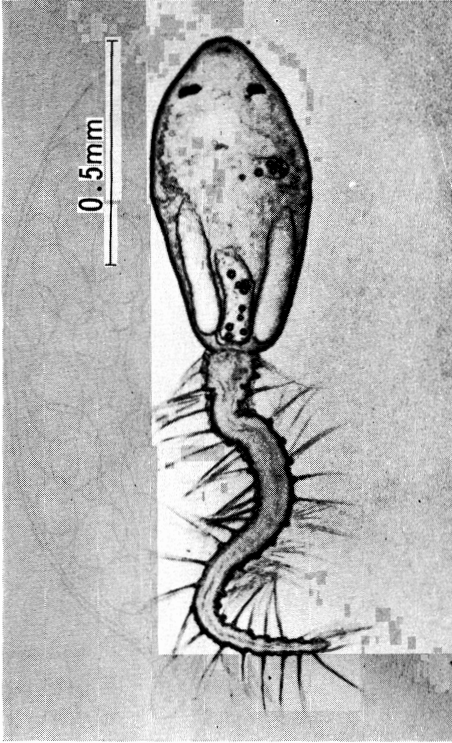


Photo. 1 Living cercaria.

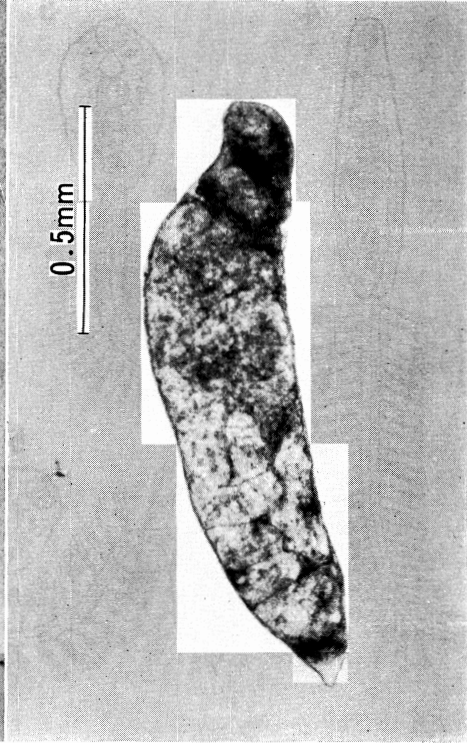


Photo. 2 Daughter redia.

prepharynx...	202(170-230) μm long
pharynx	81(68-90) μm long \times
	68(65-73) μm wide
acetabulum...	77(73-82) μm long \times
	79(75-82) μm wide
tail.....	1017(863-1113) μm long \times
	68(63-77) μm wide
seta	150(145-155) μm long

Specific description :

Ophthalmo-trichocercous cercaria. The body and the tail are capable of extending and contracting remarkably. When fixed in 10% hot formalin, the body is elongated ellipsoidal in shape as shown in Figs. 1 and 2. The body surface is covered all over with triangular spines diminishing in size posteriorly. A well developed oral sucker is almost spherical in shape. The acetabulum, a little larger than the oral sucker, is situated slightly posteriorly to the middle of the body. The mouth opening is followed by a long prepharynx, which is composed of an anterior long cylindrical cavity and a posterior broad, finely striated cavity. A

well developed muscular pharynx, nearly equal in size to the acetabulum, follows the prepharynx, leading to a narrow and short esophagus, which divides in front of the acetabulum into two ceca terminating near the posterior end of the body.

Along the anterior border of the oral sucker, 4 pairs of the openings of penetration glands are arranged in a transverse row, and the ducts are barely observed along both sides of the oral sucker and the prepharynx. A small number of penetration gland cells are faintly observable on both sides of the pharynx. Several skin glands are present beneath the cuticle, especially in the anterior half of the body. The ocelli, aggregations of irregularly disposed pigment granules, lie at the mid-level of the prepharynx. In the posterior one-fourth of the body, two testes are located contiguous and diagonal between two cecal legs. The ovary is observed between the acetabulum and the anterior testis. The primordium of oviduct and/or uterus is faintly

seen behind and on the left side of the acetabulum, which suggests that the location of the genital pore is preacetabular, slightly to the left of the median line.

A large I-shaped, tubulosaccular excretory vesicle extends forward to the region of the pharynx, bending near the side of the acetabulum. It contains about 20 to 50 refractive excretory concretions, which are spherical in shape and with concentric striations, being about $20\ \mu\text{m}$ in its biggest diameter. From the lateral side of the vesicle, at the level of the posterior testis, one pair of the main collecting tubes arises, runs forward in zigzag course to the posterior level of the ocelli, and divides into a very short anterior and a long posterior branch. Several cilia are present inside the terminal broad part of each main collecting tube, near its junction with the vesicle. The anterior short branch has three flame cells, and the posterior one has 33 flame cells in eleven groups as shown in Fig. 3. Thus the flame cell formula is constructed as $2[(3)+(3+3+3+3+3+3+3+3+3+3)]=72$, or $2[(3\times 1)+(3\times 11)]=72$.

The tail is much longer than the body proper, and bears prominent setae along the lateral sides of its whole length. The tail proper is composed of an outer sheath of muscles and an inner vacuolated parenchyma, exhibiting a remarkable extension and contraction. The caudal setae are usually grouped in 28 pairs, sometimes 27 or 29, of lateral tufts and one pair of terminal tufts. Each lateral tuft has a row of 7 setae, sometimes 6 or 8, in dorso-ventral alignment. The terminal tufts have 3 or 4 setae each, which are shorter than those of lateral ones. Under high magnification the base of each seta (finlet or ray) appears multiple, as though 3, 4 or more strands had fused to form each rodlike support, so that several striations are marked on the seta (Figs. 8,—10).

The redia is ellipsoidal with an irregular outline in shape, tapering posteriorly as shown in Fig. 7. It measures 920 to 1,250 μm long and 190 to 240 μm wide. A well developed pharynx, measuring 70 (65 to 73)

μm long and 68 (61 to 71) μm wide, is followed by a relatively short esophagus, which leads to a small saccular gut compacted by brownish ingesta. In the posterior body cavity are contained many germ balls which grow as they proceed toward the anterior part, but all cercarial embryos show no differentiated ocelli, with a rudimentary tail only. The maturation of cercariae seems to take place outside the redia.

As to the behavior of the cercaria, when the infected snail was kept in a glass container with sea water, many cercariae emerged from it every day for more than one month. Most of them emerged at night or early in the morning, although some were shed during the daytime. They darted about in the sea water, with the body retracted and the long tail in advance, showing a slight attraction to light (Fig. 6).

Discussion

There have been reported more than 10 trichocercous cercariae in the world. They are known to develop into the family Fellodistomidae or Lepocreadiidae. According to Yamaguti (1975), fellodistomid cercariae have usually a V-shaped excretory vesicle and no eye-spots, and develop in sporocysts, whereas lepecreadiid cercariae have an I-shaped excretory vesicle and one pair of eye-spots, and develop in rediae. So the present cercaria is considered to belong to the Lepocreadiidae. Eight species of such lepecreadiid cercariae have already been reported from other countries: those of *Lepocreadium album*, *L. setiferoides*, *L. pegorchis*, *Stegodexamene anguillae*, *Neopechona pyri-formis*, *Neophasis oculata*, *Cercaria caribbea* LXV and *Cercaria caribbea* LXVI. The main diagnostic characters of these cercariae with the present one were shown in Table 1. As shown in the table, the present cercaria differs from any of them mainly in the body and the tail size, in the number of caudal tufts and setae, in the species of snail host, in the locality, etc. Therefore the present authors would like to propose a new name, *Cercaria isoninae* to this cercaria,

Table 1 Main diagnostic characters of ophthalmo-trichocercous cercariae

Species of cercariae	Genus of snail host	Body length (μm)	Tail length (μm)	No. of tufts on each side	No. of setae in one tuft	Localities reported	References cited
<i>Lepocreadium album</i>	<i>Conus</i> and <i>Nassa</i>	270-290	550	27-28	4-6	Eulope	Palombi(1937) thru. Yamaguti(1975)
<i>L. setiferoides</i>	<i>Nassa</i>	305	576	35	?	N. America	Martin(1938) and Stunkard(1972)
<i>L. pegorchis</i>	<i>Nassa</i>	224-300	90-190	24-26	variable	Eulope	Bartoli(1967)
<i>Stegodexamene anguillae</i>	<i>Potamopyrgus</i>	220	310-370	37-38	?	New Zealand	McFarlane(1951)
<i>Neopechona pyriiformis</i>	<i>Anachis</i>	150-190	600-650	21	5-6	N. America	Stunkard(1969)
<i>Neophasis oculata</i>	<i>Tectonatica</i>	160-270	440-570	?	?	Soviet	Chubrik(1966)
<i>Cercaria caribbea LXV</i>	<i>Anachis</i>	310-365	524-607	24	6-8	C. America	Cable(1963)
<i>Cercaria caribbea LXVI</i>	<i>Nassarius</i>	570-623	628-670	27	4-6	C. America	Cable(1963)
<i>Cercaria isoninae</i> n. sp.	<i>Japeuthria</i>	726-895	863-1113	27-29	6-8	Japan	Present authors

designating to indicate the Japanese name "Isonina" of its first intermediate, littoral snail host.

With regard to the life cycle of this cercaria, it is presumable that some littoral invertebrates will serve as the second intermediate host, and some marine fishes will act as the final host. A variety of littoral invertebrates, such as annelids, molluscs, echinoderms and arthropods, were experimentally exposed to cercarial infection. Some of them seemed to attract the cercariae, but failed to get the metacercariae yet. The results will be reported in the future.

Summary

Cercaria isoninae n. sp., a new cercaria of ophthalmo-trichocercous type, was described from a littoral marine gastropod, *Japeuthria ferrea* (Reeve), taken in Kanagawa and Chiba Prefectures, central Japan. This cercaria is the first record from Japan, and presumed to belong to the family Lepocreadiidae, Trematoda.

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神奈川県および千葉県のイソニナ (*Japeuthria ferrea*) に寄生する
 Lepocreadiidae の 1 新種 *Cercaria isoninae* n. sp. について

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神奈川県油壺および千葉県小湊で岩礁から採集されたイソニナ (*Japeuthria ferrea*) より、レポクレアディウム科に属する 1 新セルカリが高率に寄生しているのが認められた。

眼点を有する大型のセルカリアで、尾部に 27~29 対、尾末端に 1 対の総状の毛をもち、1 つの総は約 7 本ずつの鱗からなっている。体内には 2 個の睾丸と 1 個の卵巢が明らかに認められ、それらの付属器官も微かにみとめ

られる。排泄嚢は咽頭に達する長大な I 字形で、焰細胞式は $2[(3 \times 1) + (3 \times 11)] = 72$ である。

世界の各地から報告されている約 8 種の近似のセルカリアと比較すると、本種は明らかに大型である点、尾の総状の毛の数の異なる点などで同定しうる種類はみあたらず、また日本からの初めての発見でもあるので、宿主貝の和名を用いて、*Cercaria isoninae* n. sp. として報告した。