

**A New Cercaria, *Cercaria shikokuensis* n. sp. (Trematoda),
from Littoral Gastropods in Kagawa Prefecture, Shikoku, Japan**

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(Accepted for publication; April 13, 1989)

Abstract

Cercaria shikokuensis n. sp., a new cercaria of philophthalmid group, is described from littoral gastropods, *Cerithidea rhizophorarum* and *Batillaria cumingii*, collected in Kagawa Prefecture, Shikoku, Japan. This cercaria is characterized by an opaque body containing bacilliform cystogenous materials; 58 collar spines; the flame cell formula $2[(3 + 3 + 3) + (3 + 3 + 3)] = 36$; and invaginated glandular tail end.

Introduction

Littoral gastropods, *Cerithidea rhizophorarum*, *Batillaria cumingii* and *B. multiformis*, are abundant on the mud flats in the tidal zone of estuaries of Kagawa Prefecture. Several cercariae were found in these snails. One new philophthalmid species which mainly infects in *C. rhizophorarum* is described in this paper.

Materials and Methods

In Kagawa Prefecture, Shikoku, *C. rhizophorarum* is found in estuaries of the Kunita River, the Kanakura River and the Doki River, *B. cumingii* in the Kanakura River and the Kabe River. These snails were collected at each estuary and examined at the laboratory. Cercariae and rediae were obtained by splitting the snails. They were fixed in 10% hot formalin solution and ten cercariae and rediae were measured. The living cercariae were also used in morphological observation. To determine the exact number of the flame cells the cercariae fixed in Karnovsky's

fixative, 1% osmium tetroxide and embedded in epoxy resin (Spurr, 1969) were successively sectioned longitudinally in 1.4 μm thick with ultramicrotome. All sections were mounted on slide glasses, stained with 0.5% toluidine blue solution for 6 min at 58—60°C, washed for 2 min in tap water and dried. The position of the flame cells in all sections were marked on the photographs and flame cell were counted.

Descriptions of *Cercaria shikokuensis* n. sp.
(Fig. 1)

Snail hosts: *Cerithidea rhizophorarum*, *Batillaria cumingii*.

Locality and infection rate: *C. rhizophorarum* were infected with this cercaria in the Rivers Kunita, Kanakura and Doki. The highest infection rate was obtained in the Doki River. But in *B. cumingii* only one snail from the Kabe River in July was found infected (Table 1).

Measurements:

Cercaria
body 536(440—639) \times 206(105—262) μm
oral sucker 71(64—79) \times 66(64—69) μm
pharynx 28(23—33) \times 22(18—26) μm
acetabulum 76(72—79) \times 80(69—87) μm
tail 500(440—555) \times 68(63—81) μm

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Table 1 Locality and infection rate of *Cercaria shikokuensis* n. sp. in 1985—1986

<i>Cerithidea rhizophorarum</i>				
	Aug.—Sep.	Oct.—Dec.	March	July
Kunita R.	1/41 (2.4)	6/41 (14.6)	0/41 (0.0)	2/43 (4.7)
Kanakura R.	3/41 (7.3)	2/40 (5.0)	1/40 (2.5)	3/40 (7.5)
Doki R.	12/40 (30.0)	24/40 (60.0)	20/40 (50.0)	32/42 (76.0)

<i>Batillaria cumingii</i>				
	Aug.—Sep.	Oct.—Dec.	March	July
Kanakura R.	0/11 (0.0)	0/40 (0.0)	0/41 (0.0)	0/40 (0.0)
Kabe R.	0/23 (0.0)	0/10 (0.0)	0/39 (0.0)	1/40 (2.5)

Numbers represent infected snails/examined snails and percentage in parentheses.

Redia

body 1554(1226—2231) × 458(409—492) μm
 pharynx 45(38—54) × 40(36—61) μm
 intestine 632 μm long
 cercariae contained 10

Specific description:

Philophthalmid cercaria without eyespots. The cercaria is capable of a considerable degree of extension and contraction. The cercariae swim lashing the body and easily encyst on the glass. The 58—59 collar spines (6.8—7.0 μm × 1.4—1.5 μm) are recognized. Body is opaque and body surface posterior to the collar spines is thickly covered with secretory substances, under which numerous spines (about 70 transverse rows, 38 of which are anterior to ventral sucker) are buried. Triangular region anterior to ventral sucker is aspinose zone. Many sensory hairs arise around the oral sucker; nine pairs on the lateral side of the body; four pairs on the ventral surface; a few on the tail. Eight ducts of cephalic glands open at the dorsal part of the oral sucker (the surface structure including distribution of sensory hair and argentophilic structures will be discussed in following paper in detail). The mouth is followed by a long and narrow prepharynx, and a pharynx. An esophagus bifurcates about 3/4 the distance from pharynx to acetabulum. Narrow ceca extend to level of ex-

cretory bladder. The ceca have lumen space in immature cercariae, but they are tightly closed in mature cercariae. Cystogenous glands with the bacilliform granules fill the body (Fig. 1a). The secretory materials obscure the internal structures. About ten cephalic glands exist on each inner side of collecting tubes between level of pharynx and bifurcating point of ceca. Excretory bladder is a little smaller than the ventral sucker and connects with two large ascending collecting tube through one short tube. The trunks loop back behind the oral sucker, forming the recurrent descending trunks provided with eight pairs of a bundle of cilia. The descending trunks divide into anterior and posterior collecting tubes at the side of the ventral sucker. The anterior collecting tube runs closely along the ascending tube. The flame cell formula is observed as 2[(3 + 3 + 3) + (3 + 3 + 3)] = 36. The number of the flame cell were also ascertained by the method previously reported (Harada and Suguri, 1988). The web of minute inter-cellular space well develops all over the body and connects with the excretory system. This network is thought to play an important role in the excretory function. The distal end of the tail is invaginated and shows glandular structure.

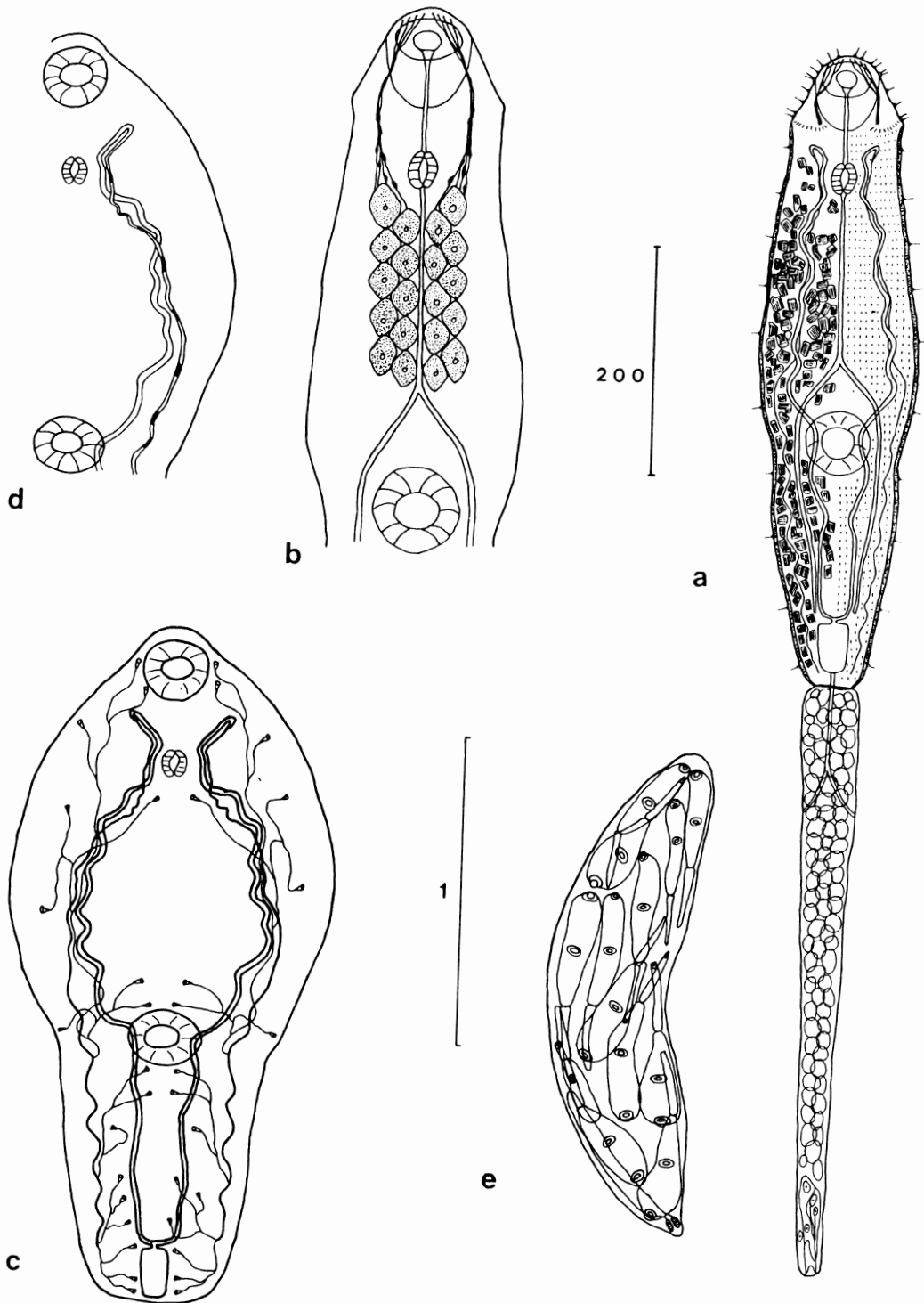


Fig. 1 *Cercaria shikokuensis* n. sp. a; General feature, ventral view. Intestine, main excretory tubes, cystogenous materials (left side) and surface spines (right side) are shown. Bar = 200 μ m. b; Cephalic glands and their ducts. c; Enlarged structure of excretory system. d; Position (solid band) of the bundles of cilia in excretory tube. e; Redia with mature and immature cercariae. Bar = 1mm.

Table 2 Characteristics differentiating allied cercariae.

Species of Cercaria	Body length (μm)	Tail length (μm)	No. of collar spines	No. of flame cells	Localities	References cited
<i>Cercaria granifera</i>	440	280-440	28	?	Japan (Chiba)	Ogata (1943)
<i>Cercaria pseudogranifera</i>	510	240	>36	60	Japan (Chiba)	Ito (1957)
<i>Cercaria sensifera</i> (= <i>Parorchis avitus</i>)	210-470	120-260	64-68	36	USA	Stunkard & Shaw (1931)
<i>Cercaria purpurae</i> (= <i>P. acanthus</i>)	360-1000 570-921	180-820 450-675	64 70	36 36	Scotland USA	Rees (1937) Holliman (1961)
<i>P. a. australis</i>	370-670	265-595	60-66	36	Australia	Angel (1954)
<i>Himasthla quissetensis</i>	468	332	31	48	USA	Holliman (1961)
<i>Cercaria caribbea</i> LIX	690-752	470-502	58	many	Curaçao	Cable (1963)
<i>Cercaria pustulosa</i>	647	324	58	48	USA	Holliman (1961)
<i>Cercaria shikokuensis</i> n. sp.	536	500	58	36	Japan (Kagawa)	Present author

Discussion

This cercaria is closely related to *Cercaria pseudogranifera* Ito, 1957, among known-Japanese species, but it differs definitely in the flame cell pattern. *C. shikokunensis* is different from *C. granifera* Ogata, 1943 by the size and number of collar spines. As for the species that have been reported outside of Japan, the present species resembles *Cercaria sensifera* (= *Parorchis avitus*), *C. purpurae* (= *P. acanthus*), cercaria of *P. a. australis*, cercaria of *Himasthla quissetensis*, *Cercaria caribbea* LIX, and *C. pustulosa*. Characteristics differentiating allied cercariae are shown in Table 2.

Acknowledgements

The author wishes to thank Dr. S. Suguri, Associate Prof. of Kagawa Medical School, and Dr. J. Ito, Emeritus Prof. of Shizuoka University, for valuable advice and critical reading of the manuscript. He also express his gratitude to Dr. A. Ishii, Prof. of Okayama University, Dr. S. Saito of Yamagata University and Dr. S. Tani of Aikita University for their invaluable comments.

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