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Two New Species of Marine Cercariae from the Japanese Intertidal Gastropod, *Batillaria cumingii* (Crosse)

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Studies on larval trematodes in Kanagawa and Chiba Prefectures in Japan in 1978–1979 have produced some new cercariae from littoral gastropods (Shimura and Ito, 1980; Ito and Shimura, 1980). This report presents descriptions of two new species of cercariae from *Batillaria cumingii*.

B. cumingii is very commonly found on mud or muddy sand flats in the intertidal zone. The materials for this study were collected at Aburatsubo near the Misaki Marine Biological Station of the University of Tokyo and at Koajiro (about two kilometers distant from Aburatsubo) in Kanagawa Prefecture, and at Kominato near the Kominato Marine Biological Laboratory of the Tokyo University of Fisheries in Chiba Prefecture.

Morphological observations were made in a manner similar to those reported previously (Ito and Shimura, 1980).

Descriptions of the Species

Cercaria batillariae n. sp.

Presumptive adult form: Heterophyidae.

Snail host: *Batillaria cumingii* (Potamidae, Mesogastropoda).

Date, locality and infection rate:
- As a whole, 266/1065 (25.0%)
- July 19, 1978, Aburatsubo, 44/74 (59%)
- Nov. 22, 1978, Aburatsubo, 59/224 (26.3%)
- Mar. 22, 1979, Aburatsubo, 85/212 (40.1%)
- Apr. 28, 1979, Aburatsubo, 50/215 (23.3%)
- May 12, 1979, Aburatsubo, 17/124 (13.7%)
- June 18, 1979, Aburatsubo, 1/20 (5%)
- July 20, 1979, Kominato, 10/196 (5.1%)

Measurements:
- body ..... 165(144–181) × 65(59–73) μm
- oral sucker ..... 27(24–29) × 22(20–24) μm
- eye spot ..... 9(8–10) × 7(6–8) μm
- prepharynx ..... 60(53–66) μm long
- pharynx ..... 9(8–10) × 10(9–11) μm
- tail ..... 351(326–369) × 27(24–29) μm
- lateral fin. ..... 145(134–154) × 13(12–14) μm

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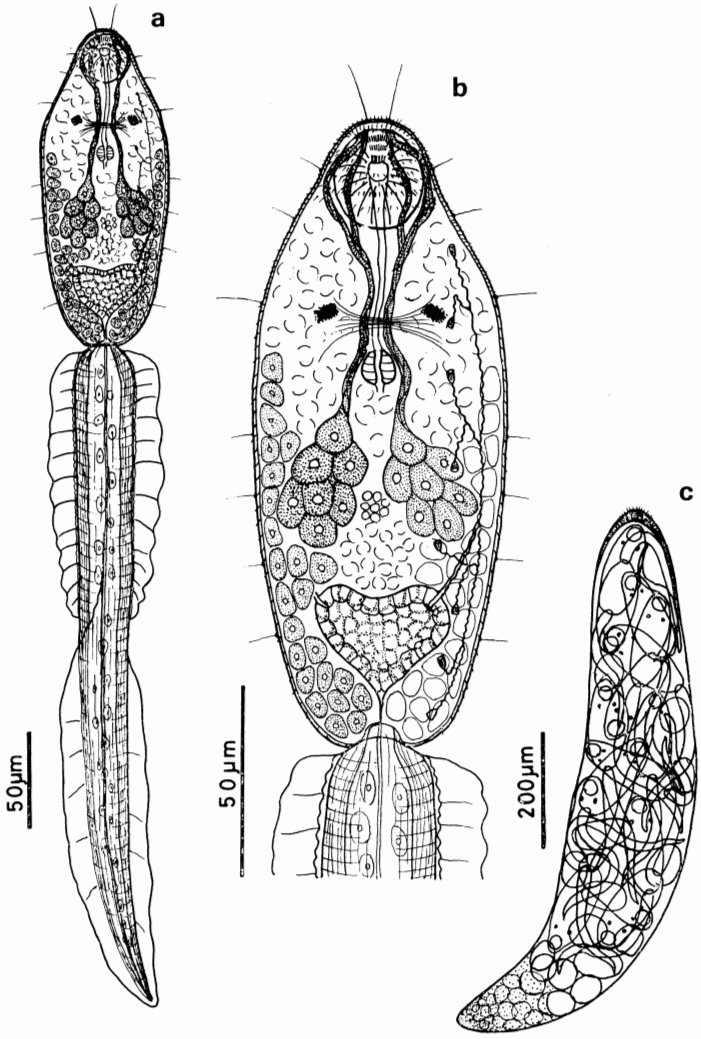

Fig. 1 *Cercaria batillariae* n. sp.
a: cercaria, general feature, ventral view; b: cercaria, body, ventral view; c: ripe redia with mature cercariae and germ balls.

Description:

Cercaria

Biocellate, pleurolophocercous cercaria. The body is elliptical, covered with posteriorly directed, minute spines on the body surface, becoming more dense at the anterior part of the body. Eight pairs of sensory hairs are also found on the body surface. The oral sucker is well developed. In the mouth cavity, three transverse rows of oral spines are found, the number in each row being 7–10, 8–9, and 5–6, respectively. A long prepharynx is followed by a small pharynx, but the remainder of the digestive tract is not discerned. The acetabulum is rudimentary and appears as a small cell mass in the posterior region of the middle third of the body. The penetration gland bodies partially surround an oval-shaped tissue which is interpreted to be the genital

anlage. A pair of prominent rectangular eye spots consisting of fine brown granules is seen at the both sides of the prepharynx. Seven pairs of penetration gland cells are situated at the middle third of the body. Their ducts separate into four bundles of 3:4:4:3 ducts respectively as they run forward along the prepharynx through the dorsal side of the oral sucker, and open in front of the sucker. The cystogenous gland cells are arranged in the lateral fields between the pharynx level and the posterior end of the body. The excretory vesicle is cordate and lined with one layer of epithelium. The main collecting ducts pass forward from the antero-lateral borders of the vesicle to about the mid-body region where they divide into an anterior and a posterior branch. Each of these branches drains two sets of two flame cells each so that the excretory pattern can be expressed by the formula 2 [(2+2)+(2+2)]=16.

The tail is about twice as long as the body, and is provided with a pair of lateral finfolds extending the anterior two-fifths of the tail length, and a dorso-ventral finfold being less creased than the lateral one, beginning very close to the posterior end of the lateral finfolds, and continuing around the tail tip into the ventral finfold which terminates a short distance anterior to the posterior end of the lateral finfolds. The caudal excretory tube runs backward throughout the tail.

Redia

Fusiform or sausage-shaped, about 930 μm long and 150 μm wide. Many short sensory hairs are observed around the mouth opening. The pharynx is followed by a short rhabdocoel gut. It contains about 20 mature and maturing cercariae, and some cercarial embryos.

The specific name, *batillariae,* refers to the generic name of the first intermediate snail host.

Remarks:

It is known that pleurolophocercous cercariae belong to the families Heterophyidae, Cryptogonimidae and Opisthorchiidae, as shown in a number of previous reports. However, cercariae equipped with both lateral and dorso-ventral finfolds have been restricted to the family Heterophyidae as follows: *Cercaria caribbea X* (Cable, 1956), *C. coruscantis* (Holliman, 1961), *C. cursitans* (Holliman, 1961), *C. leyteensis no. 11* (Ito, 1977a), *C. leyteensis no. 12* (Ito, 1977a), *C. vivata* (Holliman, 1961), *Euhaplorchis californiensis* (Martin, 1950a), *Haplorchis pumilio* (Shen, 1959), *H. taichui* (Martin, 1958), *H. yokogawai* (Martin, 1958), *Parastictodora hancocki* (Martin, 1950b) and *Stictodora tridactyla* (Martin and Kunz, 1955). Of these trematodes, the flame cell formulae of *C. cursitans, C. leyteensis no. 11, C. vivata,* and the cercariae of *P. hancocki* and *S. tridactyla* differ from that of the present cercaria. Moreover, *C. leyteensis no. 12, H. pumilio, H. taichui, H. yokogawai* have apparently little relation to the present cercaria, because the cercariae of the former were obtained from freshwater snails, and they also differ from the present species in some morphological features such as the arrangement of the penetration gland cells and their ducts. This cercaria resembles *C. caribbea X, C. coruscantis* and the cercaria of *E. californiensis,* but differs from *C. caribbea X* by having short lateral fiinfolds and three rows of oral spines, from *C. coruscantis* by having oral spines, developed pharynx and distinct cystogenous gland cells, and from *E. californiensis* in the shape of the lateral and dorso-ventral finfolds and the ducts of the penetration gland cells.

An infection experiment was conducted by exposing *Ctenogobius gymnauchen* (Gobiidae), *Rudarius ercodes* (Monacanthidae) and *Hypodytes rubripinnis* (Scorpaeidae) to the cercariae. These experimental fish were retained together with infected *B. cumingii* in the same tank equipped with a recirculating water system filled with

about 30 *l* of sea water at room temperature. Several days after the exposure, these fish were removed from the tank and the fins were examined under a binocular microscope for evidence of penetration of the cercariae and cyst formation. Encysted larvae were found to lodge in the thin membrane between the fin rays of *C. gymnauchen* and *R. ercodes*.

Cercaria hosoumininae n. sp.

(Fig. 2)

Presumptive adult form: Microphallidae.

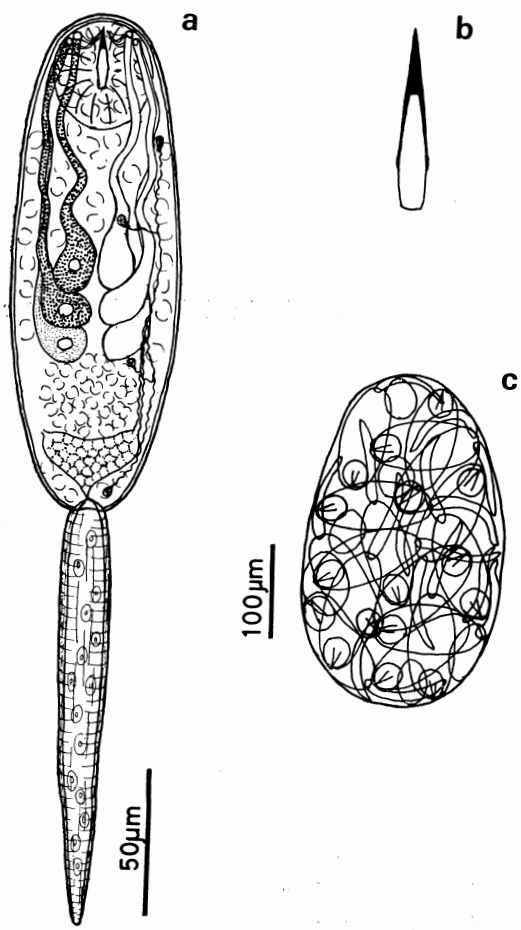

Fig. 2 *Cercaria hosoumininae* n. sp.
a: cercaria, general feature, ventral view; b: stylet, front view; c: ripe sporocyst with cercariae.

Snail host: *Batillaria cumingii* (Potamididae, Mesogastropoda).

Date, locality and infection rate:

As a whole, 93/1201 (7.74%)
July 19, 1978,
Aburatsubo, 7/74 (9.5%)
Nov. 22, 1978,
Aburatsubo, 5/224 (2.2%)
Mar. 22, 1979,
Aburatsubo, 12/212 (5.7%)
Apr. 28, 1979,
Aburatsubo, 5/215 (2.3%)
May 12, 1979,
Aburatsubo, 35/124 (28.2%)
May 12, 1979,
Koajiro, 4/28 (14%)
June 14, 1979,
Koajiro, 11/108 (10.2%)
June 18, 1979,
Aburatsubo, 6/20 (30%)
July 20, 1979,
Kominato, 8/196 (4.1%)

Measurements:

body ..... 166(156–176) × 55(49–63) μm
oral sucker ..... 38(34–39) × 34(29–37) μm
stylet ..... 26(22–28) × 5.5(5–6) μm
tail ..... 142(127–159) × 14(12–15) μm

Description:

Cercaria

Simple-tailed, monostomous, non-virgulate, small xiphidiocercaria of the Ubiquita type belonging to Lühe's Microcotyle group. The body is elongated and oval-shaped without any spine or hair. Within a well developed oral sucker, a solid and non-shouldered stylet is embedded. No digestive system is discernded as yet. Three pairs of penetration gland cells are arranged in a longitudinal row at the middle third of the body. The first two pairs contain coarse granules, and the last is filled with fine granules. On either side of the body, the duct from the anterior cell passes forward

singly while the ducts from the middle and posterior cells form a bundle. As the ducts approach the oral sucker, they turn inward and attenuate, and open at both sides of the apical end of the stylet. The acetabular cell mass is found between the penetration gland cells and the excretory vesicle. The excretory vesicle is epithelial and cordate with a collecting duct passing forward on each side. At the posterior penetration gland cell the duct divides into an anterior and a posterior branch, each of which divides again to give the flame cell formula 2[(1+1)+(1+1)]=8. The slender and aspinose tail is nearly equal in length to the body, and is coated with fine cuticular annulations. No caudal excretory tube is observed.

Sporocyst

Roundish oval, about 350 μm long and 200 μm wide. It contains 15–30 cercariae with some germ balls.

The specific name, *hosoumininae*, refers to the Japanese name of the first intermediate host "**Hosouminina**".

Remarks:

To date, numerous non-virgulate, non-ophthalmic xiphidiocercariae have been reported from marine and freshwater environments; *Cercaria caribbea XXV*, *C. caribbea XXVI*, *C. caribbea XXVII*, *C. caribbea XXVIII*, *C. caribbea XXIX*, *C. caribbea XXX*, *C. caribbea XXXI* (Cable, 1956), *C. lanceolata* (Holliman, 1961), *C. leyteensis no. 17*, *C. leyteensis no. 18* (Ito, 1977a), *C. leyteensis no. 27* (Ito, 1977b), *Gynaecotyla nassicola* (syn. *Cercaria nassicola*) (Rankin, 1940), *Maritrema laricola* (Ching, 1963), *M. setoenensis* (Bridgman, 1971), *Maritreminoides caridinae* (syn. *C. takahashii*) (Ito, 1952), *Microphallus limuli* (Stunkard, 1968), *M. opacus* (Caveny and Etges, 1972), *M. similis* (syn. *C. ubiquita*, *C. ubiquitoides*) (Stunkard, 1957), *Mosesia chordeilesia* (Hall, 1959), *Odhneria odhneri* (Stunkard, 1979), *Spelophallus amnicolae* (syn. *Levinseniella amnicolae*) (Etges, 1953) and *Spelotrema nicolli* (Cable and Hunninen, 1940).

The present species is characterized by the arrangement of three pairs of penetration gland cells, the flame cell formula, the shape of the stylet and the epithelial excretory vesicle. The present species resembles other larvae of the Ubiquita type but differs from all described species. Of these species, only *C. lanceolata*, *C. leyteensis no. 27* and *M. chordeilesia* have three pairs of penetration gland cells, but differ from the present cercaria in the flame cell formula. Other cercariae are described as possessing two or four pairs of penetration gland cells.

Summary

Two new species of marine cercariae are described from the Japanese intertidal gastropod, *Batillaria cumingii* (Crosse) in Kanagawa and Chiba Prefectures.

The first new species, named *Cercaria batillariae* n. sp., is a pleurolophocercous cercaria with a pair of eye spots, seven pairs of penetration gland cells, numerous cystogeneous gland cells, a cordate excretory vesicle and a flame cell formula of 2 [2+2)+(2+2)]=16 in the body, and a pair of lateral finfolds and a dorso-ventral finfold at the tail. Cercariae develop in rediae. Emerged cercariae encysted in the fins of *Ctenogobius gymnauchen* and *Rudarius ercodes* under experimental conditions.

The second one, named *Cercaria hosoumininae* n. sp., is a xiphidiocercaria with a single pointed stylet, three pairs of penetration gland cells, a cordate excretory vesicle and a flame cell formula of 2 [(1+1)+(1+1)]=8. Cercariae develop in sporocysts.

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海産巻貝ホソウミニナ *Batillaria cumingii* (Crosse) に寄生するセルカリアの2新種

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神奈川県の油壺と小網代，および千葉県の小湊の潮間帯に棲息する小型巻貝ホソウミニナ *Batillaria cumingii* (Crosse) から2種類のセルカリアを検出し，新種と認めて，*Cercaria batillariae* n. sp. および *Cercaria hosoumininae* n. sp. と命名記載した．

前者は，体部に1対の眼点と，尾部の側部に1対の，および背腹部に連なる1つの翼状物を有する．侵入腺細胞は7対あり，体側部に多数の被嚢腺細胞が認められる．排泄嚢は心臓形で，炎細胞式は 2〔(2+2)+(2+2)〕=16 である．単性虫はレディアで，約20個体のセルカリアを含む．感染実験により，セルカリアがヒメハゼとアミメハギの鰭膜内で被嚢することを明らかにした．

後者は剣尾セルカリアであり，口吸盤内に大型の穿刺棘を備える．侵入腺細胞は3対あり，1列に並ぶ．排泄嚢は心臓形で，炎細胞式は 2〔(1+1)+(1+1)〕=8 である．腹吸盤は未発育であるが，その原基が認められる．消化器系は観察されなかった．単性虫はスポロシストで，約15～30個体のセルカリアを含む．