The present paper reports three new echinostome cercariae with a review of known 18 spp. of Japanese echinostome cercariae. They were found from the brackish water snails collected from a muddy seashore at Urayasu during the past years from 1944 to 1952. One of these, *Cercaria pseudogranifera* n. sp., bearing a strong resemblance to *Cercaria granifera* Ogata, 1943, differed from it in detailed morphological features. Another species, *Cercaria ophthalmomechinata* n. sp. was a peculiar echinostome type in possession of one pair of eye spot. It was found on two occasions from the snail, *Tympanotonus microptera*. A third species, *Cercaria yamagutii* n. sp., characterized by possessing one pair of side branched excretory tube, was found in many occasions in 1944 but rapidly decreased the infection rate in subsequent years of investigation. Materials and methods were omitted here since they were given in details in the former papers of this series (Ito, 1956a; 1956b).

*Cercaria pseudogranifera* n. sp. (Figs. 1–10)

Host: *Tympanotonus microptera* (Kiener).
*Cerithidea* (Cerithidea) *largillerti* (Philippi).
*Cerithidea* (Cerithideopsilla) *cingulata* (Gmelin).

Locality: Muddy seashore at Urayasu in Chiba Prefecture, Tokyo Bay.

Specific diagnosis: Echinostome cercaria. Body of slightly large size 510(480–530) μ long by 220(200–290) μ wide, comparatively thick, which with the densely filled granules and cystogenous materials makes the details of the body extremely difficult to work out. Cuticle devoid of any spination but provided with numerous sensory hairs. Tail much less than the length of the body, 240(180–300) μ long by 57(45–60) μ wide with smooth cuticle. Distal end of the tail modified as an sucker-like holdfast organ. Oral sucker subterminal, smaller than ventral sucker, 61(53–65) μ long by 65(57–69) μ wide, partly

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surrounded by slightly differentiated collar. Collar spines very fine and inconspicuous, making it impossible to determine their number. Ventral sucker 71(57–82) μ long by 83(78–90) μ wide, behind middle of the body. Prepharynx shortly defined, 10 μ in length, followed by muscular, bilobed pharynx, 30(28–32) μ long by 27(24–32) μ wide. Esophagus long, reaching to near the ventral sucker before dividing into two ceca ending just slightly in front of the level of excretory pore. Penetration glands and their ducts so faintly observable that impossible to determine their number. Excretory pore at point of attachment of tail to body, dorsal in position. Excretory bladder small, vesicular, giving off two main collecting tubes from antero-median margin with a common short duct. Each collecting tube, characteristic of echinostome cercariae, making of an ascending trunk and a descending one with a loop at the side of oral sucker. A few minute excretory concretions in the former and a many cilia in the latter. The descending trunk divides into anterior and posterior collecting tubes at the side of the ventral sucker. Flame cell formula 2[(6+6+6)+(4+4+4)] = 60 with a slight variation. Caudal excretory tube bifurcates in a short distance and opens on the lateral side of the tail. Genital primordium, not observable in raw material. Prominent nervous system consists of comissure, ganglions, descending cords and other strands.

Develop in rediae of 1.0–1.6 mm long by 0.16–0.4 mm wide, with collar, locomotive processes and long intestine. It has four pairs of flame cell in the wall, many sensory hairs on the anterior tip, and contains a few various developmental stages of cercarial germ.

Table 1 showed the infection rate of Cercaria pseudo granifera. Due to the numerous infected rediae and cercariae, the liver of snail became dappled white instead of its proper tone. Emerging cercariae swim in the water by waving the elongated tail, sometimes they creep the wall of container with the aid of terminal holdfast organ of the tail. Frequently they encyst there. No prominent taxis or kinesis was observed on the emerging cercariae.

The cercaria is capable of a considerable degree of extension and contraction. In a semi-contracted condition the body has a oval outline, the posterior part being tapered. The collar and the collar spines are faintly recognized even in the free emerging mature cercaria. So the number of its spines could not be determined but seemed to be not less than 36. The body surface is covered with no spines but numerous sensory hairs standing on a papilliform base respectively, the number of which is not less than one hundred. These hairs, 6–9 μ long,
distributed in nearly equal intervals on all over the surface, but more densely distributed around the mouth opening.

The general appearance of the body is strikingly black and opaque due to the densely compacted blackish pigmented granules and cystogenous materials beneath the cuticle except the anterior part of the body. Both of these granules and cystogenous materials have been involved in respective cells at the immature cercarial stages, and then these cells are destroyed and their containing materials are densely scattered beneath the cuticle in the free emerging mature cercarial stage. These make the details of the body extremely difficult to work out (Figs. 1 and 2). The mouth is subterminal, and leads back into a small but well developed pharynx via short prepharynx which is not present in the immature form. A long esophagus and two narrow ceca is observed. On both lateral side of the esophagus are found some granular materials faintly stained with neutral red. These materials are contained in several cells, and, moreover, duct-like
faint strands run forwards from these cells to the openings in front of the oral sucker. These are considered to be the rudimentary penetration gland cells.

The nervous system consists of a nervous commissure across the prepharynx, two ganglionic masses at the both end of the commissure, and several paired nervous cords from each ganglionic mass. Among them the most large cord is a descending one which is provided with about twelve ladder-like transverse strands between the right cord and the left one (Fig. 3).

The excretory system afflict me very much due to the opacity of body and the complexity of the pattern itself. The excretory concretion in the ascending collecting tube is so minute and few in number that they are sometimes entirely absent in some specimens. The cilia, on the other hand, are always observed in the descending collecting tube and the posterior collecting one. Their number is not less than fifteen. The flame cell formula could be determined with a great effort and with the aid of observation of various developmental stages of cercariae. The fundamental formula is observed as $2[(1+1+1)+(1+1+1)]$ in the young germ ball stage. This formula expands in the next stage as $2[(3+3+3)+(3+3+3)]$, and the last completed formula could be constructed as $2[(6+6+6)+(4+4+4)]=60$.

Sometimes the number of flame cells in * mark position varies 7, and that in ** mark position do so as 5 (Fig. 3).
The tail is well developed and is capable of a remarkable degree of extension and contraction. A caudal excretory tube following the excretory bladder runs backwards in the tail, then it divides into two short side branches and opens on the lateral side of the tail at the anterior one fourth or fifth of the tail. The distal end of the tail is modified and acts as a holdfast organ, inside of which is filled with several transparent glandular cells.

The parthenita is a redia of characteristic of echinostome type. A collar and a pair of locomotive appendages are prominent in the immature redia, but they are, usually, indistinctive in the mature one (Figs. 4 and 5). Many sensory
hairs at the anterior tip of the body and four pairs of flame cells in the body wall are recognized in both rediae of mature and immature. Fully developed rediae contain relatively few cercarial germ ball, not more than five of mature cercariae and about ten of immature germ ball.

In attempting to work out the life cycle of the present species numerous cercariae were placed in a glass dish with an amount of diluted salt solution. These cercariae encyst here sooner or later. The cyst is usually ellipsoidal, sometimes spherical in shape, 230–260μ long by 200–220μ wide. The cyst wall is composed of two layers. The outer coarse layer, ca. 7μ thick, is yellowish semitransparent and easily stripped off by mechanical pressure (Fig. 10). The inner transparent one, ca. 3μ thick, is thinner but so stronger than the outer one that could not be tear without injury the metacercaria within it (Fig. 7). Structures of the metacercaria did not show a noticeable difference from those of cercaria except the slight development of the collar spines, though the number of which could not be determined clearly even in the old metacercariae. In order to obtain the adult form, many attempts to infect these 10, 20 or 60 day old metacercariae to mice, rats, hens and ducks were made. All results were, unfortunately, negative.

Discussion—Due to the striking similarities of the locality, the snail hosts and the general appearances of the cercariae between the present new species and *Cercaria granifera* Ogata, 1943, these two forms were considered as the same species by the author at the first time. But the detailed morphological observation revealed a many differences between them. According to Ogata (1943), *Cercaria granifera* has about 28 large collar spines of 22–25μ long, but the present species has so faintly developed collar spines that could not be counted the number exactly even in the metacercarial stage. Moreover their number seemed to be not less than 36 in the latter species. The another main differences in *Cercaria granifera* are the lack of the holdfast organ at the distal end of tail, the existence of densely compacted excretory concretions in the ascending excretory tube, and the comparatively small size of the body compared with the present species.

*Cercaria opthalmoechinata* n. sp. (Figs. 11–14)

Host: *Tympanotonus microptera* (Kiener).
Locality: Muddy seashore at Urayasu in Chiba Prefecture, Tokyo Bay.
Specific diagnosis: Echinostome cercaria with a pair of eye spots. Body of slender large size 490 (440–630) μ long by 140 (120–170) μ wide, with the densely filled granules and cystogenous materials. Cuticle smooth and provided with many sensory hairs at the anterior part. Tail less than the length of the body, 380 (230–490) μ long by 50 (45–52) μ wide with smooth cuticle. Oral sucker 47 (42–56) μ long by 55 (49–60) μ wide. Collar prominent and collar spines ca. 18 μ long by 5 μ wide, the number of them is 36 or 37 arranging in a single uninterrupted row with 2 end group spines on each side. Ventral sucker nearly equal size to oral one, slightly behind the middle of the body. Eye spots inside of the collar, surrounded with thick pigmented granules. Prepharynx shortly defined and is followed by a muscular, bilobed pharynx of 24 (19–26) μ
Fig. 11. Mature Cercaria ophthalmocochinata n. sp. showing the cystogenous materials on the right side and the pigmented granules on the left side.

Fig. 12. Cercarial body showing the excretory system and the arrangement of collar spine.

Fig. 13. Old redia.

Fig. 14. Microphoto of the cercarial body.

long by 19(16–23) μ wide. Esophagus long, dividing into two ceca at the middle of the distance between the pharynx and ventral sucker, and ending just slightly in front of the level of excretory bladder. Excretory bladder small, vesicular, giving rise to a short median stem which divides into two large ascending trunks filled with refractile concretions almost to the oral sucker. Here the trunks loop back, forming the recurrent descending trunks provided with many cilia. Each trunk divides again into anterior and posterior collecting tubes at the side of ventral sucker. Flame cell formula is \(2 \times [(3+3+3+3)+(3+3+3+3+3)] = 54\). Caudal excretory tube bifurcates in a short distance and opens on the lateral side of tail.

Develop in rediae, 1–2 mm long by 0.2–0.4 mm wide, with collar, locomotive appendages and long intestine containing a bright orange colored food fragments. Many sensory hairs on the anterior tip. A few various developmental stages of cercarial germs are involved in a redia.

Only two infections with this species were picked up in October, 1952 from Tympanotonus microptera at Urayasu. This echinostome cercaria is much resembled the former species, Cercaria pseudogranifera in general appearance, but differed from it in many respects, for example, in possessing one pair of eye...
spots, thirty-six of conspicuous collar spines and in lacking the holdfast apparatus at the distal end of the tail.

The most conspicuous structure of this cercaria is one pair of eye spots situating at the lateral side of pharynx. This is recognized even in the stage of immature cercarial germ ball, and is composed of a densely compacted blackish pigmented granules (Fig. 11, 12). The general appearance of the body is, as well as that in *Cercaria pseudogranifera*, remarkably black and opaque due to the densely compacted blackish granules of 1.5μ in diameter and rod-like cystogenous materials of 5μ long beneath the cuticle except the anterior part of the body. So the internal details of the body is very difficult to work out.

Alimentary system and the nervous system did not differ from *C. pseudogranifera* in fundamental schema. The head collar is conspicuously marked off and beset with 36 or 37 collar spines arranging in a single uninterrupted row with 2 end group spines on each side. The size of these collar spines is 16–20μ in length and 4.8–5.4μ in width.

The excretory system is characteristic of echinostome type. The excretory concretions filled in the ascending collecting tube is measured ca. 5μ in diameter. More than 40 pairs of cilia are observed in the descending collecting tube and the posterior collecting tube. The descending collecting tube divides into the anterior and posterior collecting tubes at the side of the ventral sucker. The anterior collecting tube runs forwards receiving 3 branches on the way and terminates in 3 capillaries at the side of the oral sucker. The above mentioned 3 branches bear 3 capillaries respectively and each capillary has one flame cell respectively. The posterior collecting tube runs backwards, gives off 2 branches bearing 6 capillaries respectively and terminates in 3 capillaries at the posterior end of the body. The flame cell formula is, therefore, constructed as follows.

\[2[(3+3+3+3)+(3+3+3+3)]=54, \text{ or } 2[(3×2+3+3)+(3×2+3×2+3)]=54.\]

General appearance of the tail did not differ from that of *Cercaria pseudogranifera* except the lacking of the distal holdfast organ. A caudal excretory tube runs backwards in the middle of the tail, and divides into two short side branches opening on the lateral side at the anterior one-fifth of the tail.

The parthenita is a redia of echinostome type. Its appearance is closely resembled that of *Cercaria pseudogranifera*, but differed from it in the color of contents of intestine. The color of them is somewhat brilliant orange in the present species, while in the former species it is dark brown.

**Discussion**—The most conspicuous feature of this cercaria is one pair of eye spots at the side of the pharynx. None of such echinostome cercaria has been hitherto described. So I proposed a new name, *Cercaria ophthalmoechinata* for this species.

This cercaria seemed to belong to the genus *Echinostoma* because the majority of Echinostoma has 37 collar spines arranging in an uninterrupted row with end group spines as the present cercaria does so. About 18 species of adult
forms of the genus *Echinostoma* have been described in Japan at present, and 5 species of them were clarified their life cycle (see Table 3). As seeing in Table 3, all of these five echinostome cercariae were found from the fresh water snails, and none of them from the brackish water snails hitherto in Japan.

*Cercaria yamagutii* n. sp. (Figs. 15-17)

**Host:** *Tympanotonus microptera* (Kiener).

*Cerithicua* (Cerithidea) *largillerti* (Philippi).

*Cerithidea* (Cerithideopsilla) *cingulata* (Gmelin).

**Locality:** Muddy seashore at Urayasu in Chiba Prefecture, Tokyo Bay.

**Specific diagnosis:** Echinostome cercaria belonging to the genus *Acanthoparyphium*. Body of slightly large size 450(330-510)μ long by 185(160-200)μ wide, ellipsoidal or oval in shape with slightly differentiated collar. Collar spines ca. 14μ long by 4μ wide forming an uninterrupted row without any special end group spines. The number of these collar spines are 23. Cuticle smooth and provided with five pairs of sensory hairs at the anterior part. Tail more than half as long as the body length, 330(310-370)μ long by 45(40-50)μ wide with smooth cuticle. The ventro-terminal oral sucker 55(50-57)μ in diameter and the pharynx 32(29-34)μ long by 28(27-29)μ wide. The prepharynx is distinct. The slender narrow esophagus bifurcates just in front of the acetabulum into two narrow ceca ending in blind near the posterior end of the body. The acetabulum larger than the oral sucker, 70(68-72)μ long by 75(72-86)μ wide, lies at about the junction of the middle with the posterior third of the body. Three pairs of penetration gland and their ducts so faintly recognizable with a great effort. The cystogenous gland cells are filled up in all the available space of the parenchyma and open outside with a short duct respectively. Excretory bladder small and vesicular; anteriorly it gives off a very short median stem which soon divides into two ascending excretory tubes running forwards and giving off several side branches on the way. These side branches are compacted with many excretory concretions. The ascending collecting tube turns back making a loop on either side of the oral sucker and proceeds backwards to receive the anterior and posterior collecting tubes at the side of the acetabulum. This descending collecting tube is provided with many cilia. The flame cell formula is $2[(3+3+3+3)+(3+3+3+3)]=48$. The short excretory tube of the tail bifurcates in a short distance into two lateral tubules opening outside of the tail.

Develop in the rediae with collar, feet and a long intestine which does not reach to the feet. The fully developed redia, up to 2.0 mm long, contains a few various developmental stages of cercarial germ. Many sensory hairs on the anterior tip, and yellow pigments scattered in the body wall. A well developed pharynx measured ca. 50×30μ. The intestine contains a bright orange-colored food fragments.

This cercaria was often encountered in 1944, but was rapidly decreased in its infection rate in subsequent investigation years, 1950, 1951 and 1952 though its reason is unknown at present (see Table 2).

The body is dorso-laterally flattened and is capable of a considerable degree of extension and contraction. In a semi-contraction condition the body is a ellipsoidal or oval in shape with more or less prominent collar at the anterior part of the body. This collar bears 23 collar spines arranging in an uninterrupted row without any end group spines. These wedge-shaped spines decreased their sizes towards the ventral end. The largest dorsal median spine is measured
14.5×3.6μm, and the smallest ventral end one is 8.5×3.6μm. The body wall is comparatively thick and devoid of any spine. On the anterior part of the body, around the mouth opening, are found five pairs of sensory hairs standing on a papilliform base respectively. Three pairs of finely granulated and unnucleated cells are faintly recognizable between the pharynx and the acetabulum. The ducts of them proceed forwards separately to open on the tip of the body. These are considered to be the penetration gland cells. A numerous cystogenous gland cells are scattered in the body; some of them locating on dorso-lateral

<table>
<thead>
<tr>
<th>Species of snail</th>
<th>Year of investigation</th>
<th>1944</th>
<th>1950</th>
<th>1951</th>
<th>1952</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tymanotonus microptera</td>
<td></td>
<td>16</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Cerithidea largillieri</td>
<td>606 (2.5%)</td>
<td>441</td>
<td></td>
<td>181</td>
<td>3284</td>
</tr>
<tr>
<td>Cerithidea cingulata</td>
<td>1006 (0.1%)</td>
<td></td>
<td>103</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>68 (7.3%)</td>
<td></td>
<td></td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>937 (7.3%)</td>
<td></td>
<td>100</td>
<td></td>
<td>44</td>
</tr>
</tbody>
</table>

Table 2. Infection rate of *Cercaria yamagutii* n. sp.

Fig. 15. General feature of *Cercaria yamagutii* n. sp.

Fig. 16. Cercarial body showing the excretory system and the arrangement of collar spine.

Fig. 17. Old redia.
margin of the body are elongated and open by a short duct to the surface of the body respectively.

The excretory system is characteristic of the genus *Acanthoparyphium* of the Echinostomatidae. The side branched two ascending collecting tubes from a small excretory bladder are the most conspicuous feature of this species. These collecting tubes as well as their side branches are filled with a many strong reflective excretory concretions, and these make the details of the body extremely difficult to work out, especially the excretory system itself. The above mentioned side branches are varied in their number from seven to eleven, some of them being long and the other short. The cilia are observed in the descending collecting tube and the posterior collecting one, but their number could not be determined. The flame cell formula could be determined with a great effort. The anterior collecting tube runs forwards receiving 12 flame cells composed of four groups, each of them has three flame cells. The first two groups are located inside of the head collar, the third one on the lateral side of the pharynx, and the last fourth one on the lateral side near the end of the esophagus. The posterior collecting tube receives also 12 flame cells on the way backwards, the first group on the side of the acetabulum, and the other three groups at the behind of the acetabulum. The flame cell formula is, therefore, constructed as follows (Fig. 16).

\[
2 \left[ (3+3+3+3) + (3+3+3+3) \right] = 48.
\]

*Discussion*—The initial report of a cercaria of the genus *Acanthoparyphium* in Japan was made by Yamaguti (1934), but he did not give any specific name for it. The present species is the second one in Japan. These two forms are closely resembled each other in their general shapes and structures, but differed in the snail host, the locality and some internal structures. So these two forms are considered as the different species each other, and I propose for the present species a new name *Cercaria yamagutii* n. sp., which is designed to dedicate to Dr. S. Yamaguti who is the first reporter of this group as well as the comprehensive investigator of the helminth fauna in Japan. There are 8 species of the adult forms of the genus *Acanthoparyphium* in Japan at present, namely, *A. spinulosus* Johnston, 1917, *A. marilae* Yamaguti, 1934, *A. squatarolae* Y., 1934, *A. tyosenense* Y., 1939, *A. suzugamo* Y., 1939, *A. melanittae* Y., 1939, *A. kurogamo* Y., 1939 and *A. charadrii* Y., 1939. The final host of them are limited to birds.

It is not known to which adult form the present species develop. One species of metacercaria belonging to the genus *Acanthoparyphium* had been found by the late Dr. Ogata (private communication) from the muscle of the siphon of a brackish mussel, *Laternula kamakurana* (Pilsbry) at the same locality, Urayasu. According to his suggestion many attempts to infect this cercaria into the above mentioned mussel were carried out by me and the co-worker. All results were, unfortunately, negative.
GENERAL DISCUSSION

The group name "Echinostome cercariae" was originally created by Lühe (1909), and several attempts to subdivide this group were made by the subsequent investigators. Sewell (1922) divided this group into four subgroups, *Echinatoides*, *Coronata*, *Echinata* and *Megalura*. Faust (1924) gave an extensive classification of the group, dividing it into as many as ten subgroups, basing his divisions on the flame cell formula. A great number of these forms have been described in the literature within recent years, and as yet there does not seem to be any definite set of characters that would separate the known species into subgroups. Moreover, many of the known species are described too inadequately for definite assignment, and in many cases a little is known concerning the flame cell formula. So it is considered that the attempts of subdivision of the echinostome cercariae would be made after the establishment of more detailed data on the structure and the life cycle, and this seems to be supported by Cort (1915), Dubois (1929), Miller (1936), Byrd and Reiber (1940), etc.

Table 3. A list of echinostome cercariae in Japan

<table>
<thead>
<tr>
<th>Species</th>
<th>Snail host</th>
<th>Locality</th>
<th>2nd host</th>
<th>Final host</th>
<th>Main investigator</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cercaria of <em>Echinocotamus grandus</em> Kurisui, 1931</td>
<td><em>Semisulcospira libertina</em></td>
<td>Gifu</td>
<td>tadpole</td>
<td>mouse, dog</td>
<td>Y. Kurisu (1931)</td>
</tr>
<tr>
<td>2. Cercaria of <em>Echinocotamus tobi</em> Yamaguti, 1939</td>
<td><em>S. multigranosa</em></td>
<td>Shiga</td>
<td>fish</td>
<td>bird</td>
<td>Yamaguti (1942)</td>
</tr>
<tr>
<td>3. Cercaria of <em>Echinocotamus milei</em> Yamaguti, 1939</td>
<td><em>S. libertina</em></td>
<td>Oita</td>
<td>fish</td>
<td>dog</td>
<td>Koga (1952)</td>
</tr>
<tr>
<td>4. Cercaria of <em>Microparapodium kawaharai</em> Koga, 1952</td>
<td><em>S. libertina</em></td>
<td>Oita</td>
<td>fish</td>
<td>dog</td>
<td>Koga (1952)</td>
</tr>
<tr>
<td>5. Cercaria of <em>Echinocotamus elongatus</em> Miki, 1923</td>
<td><em>Viviparus malleatus</em></td>
<td>several areas</td>
<td>same snail, tadpole, salamander</td>
<td>mouse, dog</td>
<td>Hirayama (1936), Yamaguti (1935)</td>
</tr>
<tr>
<td>6. Cercaria of <em>Echinocotoma kawasenai</em> Kurisui, 1930</td>
<td><em>V. malleatus</em></td>
<td>Okayama</td>
<td>same snail</td>
<td>bird</td>
<td>S. Kurisu (1930)</td>
</tr>
<tr>
<td>7. Cercaria of <em>Echinocotamus rugosus</em> Yamaguti, 1933</td>
<td><em>V. malleatus</em></td>
<td>Kyoto</td>
<td>same snail</td>
<td>rat</td>
<td>Yamaguti (1933)</td>
</tr>
<tr>
<td>8. Cercaria of <em>Echinocotamus radioduplicatus</em> Yamaguti, 1933</td>
<td><em>V. malleatus</em></td>
<td>Kyoto</td>
<td>same snail</td>
<td>rat</td>
<td>Yamaguti (1933)</td>
</tr>
<tr>
<td>9. Cercaria of <em>Echinocotoma hortense</em> Asada, 1926</td>
<td><em>Lymnaea pervia</em></td>
<td>several areas</td>
<td>same snail, tadpole, salamander</td>
<td>mouse, dog</td>
<td>Asada (1926, 1939), Okamoto (1944)</td>
</tr>
<tr>
<td>10. Cercaria of <em>Echinocotaphium koidzumii</em> Tsuchimochi, 1924 (= <em>Cercaria planorbidum</em> Faust, 1924)</td>
<td><em>Lymnaea spp. Planorbis sp.</em> (Formosa)</td>
<td>several areas</td>
<td>same snail, tadpole</td>
<td>bird</td>
<td>Tsuchimochi (1926), Suzuki (1932)</td>
</tr>
</tbody>
</table>
There are numerous data on the Japanese echinostome cercariae investigated by Japanese workers. Among 21 species of them on 15 species were studied their life cycle, and on 9 species were established their flame cell formula. These were reviewed in the Table 3. According to this list, the author inclined to conclude that the subdivision of the echinostome cercariae are in agreement with the classification of the adult Echinostomatidae.

As to the flame cell formula, there seems to be two fundamental groups as far as the present data show. One group is represented as \(2[(2+2)+(2+2)]\) or its expanded formula, and the other \(2[(3+3+3)+(3+3+3)]\) or its expanded formula. Cercariae of *Echinococclus* and *Microparryphium* are belonged to the first group, and that of *Echinostoma* and *Acanthoparyphium* are belonged to the latter as shown in the “List”.

**SUMMARY**

During the years from 1944 to 1952, about seven thousand specimens of brackish water snails, *Tympanotonus microptera*, *Cerithidea lariilierti* and *Cerithidea cingulata*, have been examined from the muddy seashore at Urayasu,
Tokyo Bay, in an effort to study the cercariae these snails harbored. In the present paper three new echinostome cercariae were described in detail under the new name, *Cercaria pseudogranifera*, *Cercaria ophthalmoechinata* and *Cercaria yamagutii*, though none of the study of life history of them brought a success.

*C. pseudogranifera* n. sp. has a strongly black body, faintly developed collar spines and holdfast organ at the distal end of the tail. Flame cell formula of $2[(6+6+6) +(4+4+4)]$. It could encyst itself on the glass dish.

*C. ophthalmoechinata* n. sp. has a pair of eye spots and 36 or 37 prominent collar spines. Flame cell formula of $2[(3+3+3+3) +(3+3+3+3)]$. It seems to belong to the genus *Echinostoma*.

*C. yamagutii* n. sp. is characterized by possessing 28 conspicuous collar spines and side branched ascending collecting tube. Flame cell formula of $2[(3+3+3+3) +(3+3+3+3)]$. This cercaria apparently belongs to the genus *Acanthoparyphium*.

Discussions were made on the classification of the “Echinostome cercariae” with a complete list of Japanese Echinostome cercariae.

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REFERENCES


