
Satyu Yamaguti*
Studies on the Helminth Fauna of Japan.
Part 48. Trematodes of fishes, X.
With 2 Plates.

By

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HEMIURIDAE Lühe, 1901.

1. Sterrhurus gymnothoracis Yamaguti, 1904.

Habitat. Stomach of Gymnothorax kidak (Temm. et Schleg.).
Locality and date. Miya, Mikawa Province; April 21, 1941.
A dozen whole mounts subjected to cover glass pressure gave
the following measurements.
S. Yamaguti:

Body proper 2.2–4.75×0.8–1.4 mm; tail 0.85–2.9 mm long; oral sucker 0.18–0.26×0.22–0.3 mm; pharynx 0.1–0.16×0.11–0.15 mm; esophagus bulbous, 0.06–0.13×0.065–0.17 mm; acetabulum 0.45–0.63 mm in diameter; testes 0.15–0.4×0.13–0.36 mm; vesicula seminalis twisted, tripartite, 96–160 μ in maximum width; pars prostatica 38–70 μ wide; ejaculatory vesicle 0.07–0.22 mm wide; ovary 0.1–0.31×0.16–0.38 mm; eggs 18–21×12 μ.

The uterus extends into the tail in one specimen out of 17. This may be looked upon as an exception.

Literature.


2. Tubulovesicula muraenesocis Yamaguti, 1934.

As fixed in acetic sublimate under cover glass pressure the three gravid specimens from the stomach of Conger nystromi (Jord. et Snyd.) from Taizi, Wakayama Prefecture, gave the following measurements.

Body 11.5–14×1.3–1.5 mm, tail portion longer than body proper; oral sucker 0.31–0.35×0.41–0.45 mm; pharynx 0.12–0.15×0.13–0.19 mm; acetabulum 0.6–0.7×0.7–0.75 mm; testes 0.31–0.38×0.27–0.33 mm; vesicula seminalis winding, up to 0.22 mm wide, reaching backward to testicular zone; pars prostatica 1.0–1.35 mm long, extending sinuously between acetabulum and hermaphroditic pouch; hermaphroditic pouch 0.23–0.3×0.17–0.24 mm; ovary 0.17–0.25×0.25–0.33 mm; eggs 36–45×27–33 μ.

The center of the acetabulum lies at the posterior end of the anterior sixth of the body, and the genital pore just ventral to the esophagus; the testes and ovary are confined to the second sixth of the body; the pars prostatica does not extend over the dorsal side of the acetabulum.

As compared with the type not subjected to cover glass pressure and the additional specimens of 1938 and 1940 the present material shows certain differences in the position of the above mentioned organs, but this is merely due to the tail portion being forcibly protruded. It occurs very often that the organ extending over the acetabulum is displaced from its natural position by cover glass pressure.

Literature.


Habitat. Small intestine of *Dorosoma thrissa* Linné.
Locality and date. Miya, Mikawa Province; April 20, 1941.
Material. 9 gravid specimens fixed in acetic sublimate, stained and mounted.

Body 1.1 - 1.45 x 0.26 - 0.42 mm; oral sucker subterminal, with distinct preoral lobe, 54 - 80 x 70 - 100 μ; pharynx 54 - 80 x 51 - 70 μ; esophagus 40 - 60 μ long; ceca terminating a little behind vitellaria, acetabulum 0.15 - 0.21 mm in diameter; testes immediately behind acetabulum, 0.12 - 0.16 x 0.069 - 0.125 mm; vesicula seminalis elliptical, 42 - 60 μ in diameter, dorsal to acetabulum, beyond which it may extend a little further backward; pars prostatica about 0.23 mm long; hermaphroditic pouch 65 - 80 x 42 - 63 μ; genital pore level with intestinal bifurcation; ovary consisting of four rounded lobes, 0.12 - 0.21 x 0.12 - 0.21 mm, immediately behind testes; vitellaria divided into 7 rounded or somewhat elongated lobes, 0.15 - 0.18 mm long, immediately behind ovary or overlapping it. Eggs 15 - 19 x 9 - 11 μ.

Srivastava regards my specimen assigned in 1934 to *L. stellatus* as a "very different parasite" from Looss' species on account of four-lobed ovary and shorter length of the vesicula seminalis. Further he states, "The two species (*L. stellatus* and *L. galeatus*), however, cannot be retained under *Lecithaster* on account of the character of the ovary which, according to Looss, is unlobed," regardless of Looss' description that "Lappen des Keimstockes, soweit erkennbar, ungefähr ebenso breit wie lang." (p. 165) The posterior extent of the vesicula seminalis being very variable individually in *Lecithaster* species cannot be of great taxonomic significance.


Locality and date. Tokoname, Aiti Prefecture; April 16 and 17, 1941.

10 mature specimens subjected to slight cover glass pressure gave the following measurements: Body 0.97 - 1.6 x 0.25 - 0.45 mm, oral sucker 60 - 105 x 80 - 125 μ, pharynx 50 - 75 x 50 - 75 μ, esophagus 30 - 75 μ long, acetabulum 0.13 - 0.2 mm in diameter, testes 0.09 -
0.17 \times 0.075 - 0.12 \text{ mm}, \text{ vesicula seminalis } 35 - 126 \mu \text{ wide, hermaproditic pouch } 50 - 90 \times 25 - 50 \mu, \text{ ovary } 0.15 - 0.3 \text{ mm long, vitellaria } 0.21 - 0.45 \times 0.17 - 0.18 \text{ mm}. \text{ Eggs } 21 - 24 \times 13 - 16 \mu \text{ in life.}

Literature.


**ACCACOELIDAE Looss, 1912.**


A number of this trematode were obtained from the peribuccal connective tissue of *Spheroides spadiceus* at Taizi, Wakayama Prefecture. Though originally found in the stomach of the fish, they may well intrude into the neighboring loose-meshed connective tissue as is the case with *Hypohepaticola callionymi* Yamaguti, 1934, whose natural location is the stomach as suggested in my paper of 1942.

As fixed in alcohol, stained and mounted they gave the following measurements.

Body rather plump. 5.3 - 10 \times 1.2 - 1.8 \text{ mm}; oral sucker sub-terminal, surmounted by body wall, 0.3 - 0.52 \text{ mm long}; pre-pharynx up to 0.15 \text{ mm long}; pharynx 0.25 - 0.35 \times 0.25 - 0.3 \text{ mm}; esophagus 0.5 - 1.0 \text{ mm long, surrounded by accompanying cells; acetabulum 0.95 - 1.1 \text{ mm long, 0.8 - 1.0 mm thick, with a long peduncle, which may be even longer than the forebody when extended and gives the worm a bifurcate appearance; testes 0.4 - 0.88 \text{ mm long, 0.6 - 0.88 mm thick; vesicula seminalis up to 0.15 mm wide; pars prostatica up to 0.7 mm long; ovary 0.27 - 0.53 \times 0.4 - 0.78 \text{ mm}; eggs oval, thick-shelled, 24 - 27 \times 16 - 19 \mu.}

In the parenchyma between the esophagus and the anterior ceca there are numerous small masses of gland-like cells. From the bifurcation of the esophagus are given off dorsally several digitiform diverticles lined with epithelia similar to those of the intestine. In lateral view they form a semicircle around the optical section of the bifurcation. The anterior ceca reach to the level of the pharynx, the posterior intestinal limbs open into the ventral excretory stem at its enlarged posterior end just before the latter unites with
the dorsal stem. The rounded testes lie one behind the other in the middle third of the body, the anterior dorsally and the posterior ventrally. The tubular winding vesicula seminalis reaching to near the anterior testis lies dorsally between the intestinal limbs; anteriorly it passes together with the uterus immediately behind the intestinal bifurcation and comes to the ventral side of the esophagus, where it leads into the pars prostatica. The latter runs straight forward alongside the metraterm and is surrounded by a thick layer of prostate cells. The very short cirrus joins the metraterm just before opening to the outside by a common pore at the level of the posterior part of the oral sucker.

The ovary is subglobular and lies posterodorsal to the posterior testis. There is no receptaculum seminis. The Laurer’s canal opens dorsally at the level of the ovary a little to the right of the median line. The compact shell gland, sharply delimited by lamellar connective tissue, lies immediately in front of the ovary. The tubular branched vitellaria, surrounding the intestine with the divergent terminal branches lateral to it, extend from the level of the vesicula seminalis to a short distance back of the ovary. There is no distinct vitelline reservoir, though the collecting tubule may be distended to take the place of it. The proximal portion of the uterus running forward windingly along the dorsal side of the posterior testis turns backward a short distance behind the intestinal bifurcation and descends between the proximal and the distal ascending portion as far back as the dorsal side of the posterior testis, where it crosses the proximal ascending portion and comes to lie immediately behind the posterior testis. It descends further on along the ventral wall of the body and reaches to a level 0.45–1.05 mm from the posterior extremity, where it turns dorsal and passes horizontally between the two intestinal limbs to lead into the final ascending portion. The latter runs along the dorsal wall of the body, then along the ventral side of the anterior testis and comes in front of this, whence it ascends together with the vesicula seminalis, turning at a wide angle at the base of the acetabular peduncle. The metraterm commences a little behind the pars prostatica and runs close together on its right or left.

The dorsal excretory stem arises from the terminal cloaca just beneath the opening of the ceca. Further details are dealt with in my 1938 paper.

Literature.

DIDYMOZOIDAE Poche, 1907.


Habitat. Gill of Auxis thazard (Lacépède).
Locality and date. Taizi, Wakayama Prefecture; May 27, 1942.

Forebody 0.85 – 1.76 mm in length, with maximum breadth of 70 – 100 μ at level of intestinal bifurcation, whence it tapers anteriorly to a more or less sharp point. Hindbody flexed ventrally some distance behind its middle, cylindrical in young individuals but developing a series of several hemispherical bulges along dorsal side in full-grown individuals, 3.1 – 8.2 mm long by 0.3 – 0.58 mm broad. Oral sucker tapering anteriorly, feebly muscular, 35 – 45 μ long by 15 – 24 μ broad, directly followed by subglobular pharynx 15 – 24 μ long by 17 – 21 μ broad. Esophagus 30 – 50 μ long. Ceca narrow, terminating at posterior extremity of hindbody. No acetabulum. Testes paired, vermiform, 0.045 – 0.19 mm in diameter, situated lengthwise at anterior part of hindbody, each giving rise to a short vas efferens at its anterior end. Vasa efferentia uniting with each other at base of forebody; vas deferens distended with spermatozoa to a maximum width of 30 μ, running in median field of forebody ventral to metraterm and uniting with the latter at its distal end. Genital pore midventral at level of posterior part of oral sucker. Ovarian and vitellarian branches tubular, extending whole length of hindbody along ventral and dorsal side respectively with their end turned back on itself or not; the two ovarian branches unite with each other some distance in front of middle of hindbody to form a short stem which proceeds dorsally toward the shell gland complex. Uterus filling up all available space of hindbody between ovary and vitelline gland; metraterm well developed, dorsal to vas deferens. Eggs bean-shaped, 18 – 22 μ long by 9 – 12 μ broad; hatched embryos 33 × 9 μ in fresh state.

In general anatomy this species agrees completely with Didymozoon minor Yamaguti, 1934 but differs from it in the body being much larger and in the oral sucker and pharynx being about one third as large.

Literature.

7. *Colocynototrema auxis* n. g., n. sp.

Pl. I, Figs. 1–9.

Habitat. Pyloric ceca of *Auxis thazard* (Lacépède).
Locality and date. Taizí, Wakayama Prefecture; May 11, 1941.

Material. 6 whole mounts and 2 complete sets of serial sections.

Two hermaphroditic individuals fused together in form of a pumpkin-like globe and inclosed in a thin, hyaline connective tissue capsule of host origin. In the fresh state blood capillaries from the host fish are well recognizable through the cyst membrane; they run mostly in meridional direction on the surface of the globe, and are connected with one another by anastomoses, thus forming a network extending over the entire surface except on the dome-like prominence at the posterior pole, which is devoid of capillaries and appears ashy pale. The anterior end is depressed and shows at the center a circular pit up to 0.2 mm in diameter, in which the forebodies of the two individuals are placed.

Each worm is divided into a slender free forebody and a hemispherical hindbody which is completely fused with the corresponding part of its fellow to form a pumpkin-like globe up to 3 mm in diameter, whose outer surface is marked by varying number (6–30) of meridional grooves up to 0.4 mm deep at the equator.

In transverse sections the globe looks like a rosette inclosed in a membranous capsule (Figs. 5 & 6); between this capsule and the radial lobules are seen transverse and tangential sections of blood capillaries. The lobules are separated one from another by very narrow slits at the periphery but completely fused at the center, where the convergent interlobular (septal) muscle fibers are more or less strengthened toward the center and are continued from one individual to the other, thus forming a dense feltwork. In the sections through the equatorial region each lobule is club-shaped and contains at the base transversely cut ovarian and vitellarian tubules, the remaining greater part being occupied by the uterus. At the middle of the central lobule of each worm lies the well differentiated metraterm provided with inner circular and outer longitudinal muscles. Between this metraterm and the center of the globe extend the two wide ceca flattened from side to side.

In the tangential section through the anterior pit the two fore-
bodies lie side by side in the center, each containing a pair of dorsal ceca, a central metraterm, a ventral vas deferens and a pair of submedian excretory tubules; the single testis of each individual is situated near the base of the forebody of its own in the lobule next the central one containing the metraterm, so that the plane of the two testes is out of the center of the globe; the contents of the other lobules are similar to those at the equatorial region.

In the section through the base of the posterior dome-like projection is a large central excretory vesicle surrounded by uterine coils, and in the next few transverse sections immediately anterior to it is seen on either side the shell gland complex of each individual at about the same level (Fig. 9).

In the two whole mounts subjected to cover glass pressure the dorsoventrally flattened forebody of each individual is 0.4–2.0 mm in length, with the maximum breadth of 0.18 mm at its anterior portion; the small mouth, opening at the more or less pointed anterior extremity, leads immediately into the somewhat pyriform or elliptical, feebly muscular oral sucker 45–60 μ long by 33–45 μ broad. This in turn is followed by the globular pharynx which is likewise weakly muscular and measures 28–33 μ long by 27–35 μ broad. Esophagus slender, 0.08–0.19 mm long. The two ceca may be somewhat wide at the anterior part of the forebody but narrow at the posterior part. As they enter the hindbody they become much wider and lie in the middle lobule medial to the metraterm, where each of them gives rise to one or more branches according to the number of lobules. These branches run at the level of the testis into the neighboring lobules on the same side as the cecum from which they originated, one for each lobule, and terminate blindly like the two ceca at the base of the posterior dome. In the hindbody the two ceca and their branches show a marked atrophy of the epithelial lining and contain granular detritus together with some decomposed cellular element. There is no acetabulum.

The testis is two-lobed, very thick and crooked, and lies near the anterior surface of the hindbody in the lobule next the middle with its distal end directed medially. The vas deferens arising from the medial end of the testis is somewhat winding, 15–20 μ in diameter, and runs into the forebody, in which it narrows and lies in the median line immediately ventral to the metraterm. It opens in common with the latter on the ventral side of the oral sucker.

The slender, tubular, branched ovary extends transversely at the posterior end of the globe and gives off branches for each lobule; these branches run anteriorly along the peripheral margin.
of the lobule, some of them ending blindly at the anterior end of the lobule, and others being continued from one lobule to the next across the interlobular septum. The stem of the ovary runs medially parallel to the common vitelline duct and becomes somewhat swollen (30 μ broad in a cyst 0.9 mm in diameter) before joining the receptaculum seminis, which is retort-shaped, 60–80 μ wide and lies between the shell gland and the body wall, with its broader base directed to the latter (Fig. 9). The closely massed shell gland cells extend over the uterine duct as well as over the common vitelline duct. The vitellaria are slender, tubular and branched like the ovary, and extend in the same manner in the peripheral area, though more profusely. They are finally united just outside the shell gland to form a short common stem, which enters the shell gland and joins the germ duct just distal to its junction with the receptaculum seminis. The winding uterus enters the next lobule and then another and so on, and upon reaching the end lobule turns back toward the other end of its own hindbody and finally returns to the central lobule, where it leads into the metaterm. Thus it fills up the almost entire lobules except the peripheral area occupied by the ovary and vitellaria. The metaterm runs in the forebody in the median axis between the two ceca and opens to the outside by a common genital pore as mentioned above. Eggs bean-shaped, embryonated, about 12×9 μ.

The voluminous excretory vesicle lies in the posterior dome-like lobe and has no external opening; the paired collecting tubules extend into the forebody to near its anterior extremity, but further details are unable to make out.

This genus is characterized by the general shape of the cyst, the complete fusion of the hindbodies of the two cyst occupants, the single testis, etc. In general anatomy it resembles Didymocystis Ariola, 1902, more closely than any of the known members of the family Didymozoidae. In case the hindbodies of the two cyst occupants of Didymocystis are fused to form a special lobe for the excretory vesicle, then a related derivative will result, though different in the number of the testis.

The generic name refers to the shape of the fused hindbodies resembling the round pumpkin with meridional grooves.

Colocyntotrema n. g.

Generic diagnosis. Didymozoidae Poche, 1907. Cyst round, depressed in front but projecting behind in form of a dome, covered with thin, transparent membrane, containing two hermaphrodites, which are exactly equal in size, symmetrical in shape and fused completely at the hindbody. Blood capillaries from.

Genotype. Colocyntotrema auxis.

8. Phacelotrema claviforme n. g., n. sp.

Pl. I, Fig. 10; Pl. II, Figs. 12–13.

Habitat. Pyloric ceca of Auxis thazard (Lacépède).
Locality and date. Taizi, Wakayama Prefecture; May 11, 1941.

Material. A number of whole mounts stained with Delafield’s or Heidenhain’s hematoxylin, and three complete sets of serial sections.

Two, occasionally three, hermaphroditic individuals fused together in form of an elongated mushroom or a club, and inclosed in a thin connective tissue capsule of host origin. Although the cysts were found free in the lumen of the pyloric ceca, it seems certain that they developed at the beginning in the submucosa from the fact that the mucous membrane envelops occasionally the neck region of the cyst as well as from the fact that the blood vessels filled with red corpuscles persist constantly in the longitudinal grooves between the columns of the hindbodies of the worms. In the fresh state these blood vessels appear like blood-red longitudinal stripes. Under a hand lens the stripes are seen connected with one another by capillary Anastomoses.

Each worm consists of a slender free forebody and a half-cylindrical hindbody or trunk which is completely fused with the corresponding part of its fellow at the two extremities. The forebody is 0.4–1.0 mm long and uniformly broad except at the anterior extremity, where it is enlarged laterally and dorsoventrally and measures 50–90 μ in breadth. When liberated from the capsule the forebodies become free, but they may be imbedded separately or pressed one against the other in the central part of the fused anterior end of the trunk, so that they can not be set free even in the living condition. The club-shaped hindbody, 2.9–5.5 mm long.

by 0.6 - 1.3 mm broad, is usually divided into three columns, which are bundled close together with those of the other individual except at the two extremities where the two hindbodies are completely fused as stated above. In cross sections, therefore, the trunk assumes a typical rosette shape, though one of the three columns may be subdivided externally. For the sake of convenience of reference the columns are called ovarian, vitellarian and ovariovitellarian according to their principal contents, the uterus being common to all. At the fused anterior end of the trunk the semicircular outline of each column is retained, but the parenchyma has lost the partitions of the columns. The posterior extremities of the two worms form a discoid, pin-head-like lobe 0.4 - 0.8 mm in diameter.

The cuticle is very thin and unarmed. The subcuticular musculature is very poorly developed except in the forebody, in which a fairly distinct layer of longitudinal fibers is recognizable. The subcuticular cell layer is thick and compact in the periphery of the hindbody, especially at its two extremities, but practically lacking in the central portion, where the parenchymatous muscles form spoke-like septa separating one column from another. In the external area of the columns, however, the parenchymatous muscles run longitudinally in the depth of the subcuticular cell layer and form a conspicuous sheath for the internal organs. The parenchyma proper is found in the forebody and in the two extremities of the hindbody. In strong contrast with that of the other parts the parenchyma of the caudal lobe is spongy and contain numerous radiating muscle fibers which are converged toward the center of the base of the lobe to be continued into the spoke-like septa mentioned above. Excretory vesicle sacculär, in caudal lobe, without external opening.

The oval or pyriform terminal oral sucker is 40 - 54 μ long by 27 - 37 μ broad near the base and has a very narrow tubular lumen, its muscular elements are poorly developed. The pharynx, immediately following the oral sucker, is small, subglobular and measures 9 - 21 μ long by 10 - 20 μ broad. The esophagus is a narrow cuticular tube only 50 - 90 μ long. It bifurcates into two intestinal ceca which are more or less dilated at the commencement but very narrow elsewhere in the forebody and after running along the central axis of the cyst (one in the vitellarian column, the other in the ovarian or ovariovitellarian column) extend into the caudal lobe, where they terminate in distally somewhat expanded, digitiform tubes directed toward the periphery of the lobe. The intestinal contents are aqueous and partly granular.

There is a single vermiform testis 70 - 110 μ in diameter at the
anterior end of the hindbody in the column, from which the forebody arises. It may be twisted or turn back on itself; occasionally its proximal end may lie at the anterior end of the ovariovitellarian column adjoining the column, from which the forebody originates. The vas deferens runs in the median field of the forebody immediately ventral to the uterus and joins the latter at its distal end. The common genital pore lies in the median line ventral to the oral sucker about 30 μ behind the anterior extremity.

The ovary consists of a short stem and two long tubular winding branches up to 30 μ in diameter; the branches originate at or near the anterior end of the hindbody one in the ovarian column and the other in the ovariovitellarian column; they run backward in the peripheral area of the column and unite with each other at the base of the caudal lobe to form a short stem, which proceeds toward the shell gland and joins the receptaculum seminis. The shell gland surrounding the ootype extends over the uterine duct and lies in the central part of the caudal lobe opposite the same organ of the fellow occupant. The receptaculum seminis is oval to elliptical, 60–100 μ long by 30–60 μ wide, and lies immediately anterior to the shell gland, with its base directed toward the neck of the cyst, into which it may intrude along with the uterine duct. The uterus extends to near the anterior end of the trunk, where it turns backwards at first in the ovariovitellarian column, and after turning back on itself in the caudal lobe runs into the vitellarian column, in which it takes the same course as in the first and then into the ovarian column, in which it forms near the external face of the column an egg reservoir as observed in other members of the family Didymozoidae. This reservoir is surrounded by a layer of glandular cells and has a maximum diameter at the level of the thickest portion of the cyst, but as it proceeds toward the base of the caudal lobe it becomes narrower and is no more distinguishable from the uterus proper. In the ovariovitellarian column, however, the egg reservoir is continued into the metraterm which has a very thick wall of circular muscle fibers and is surrounded by accompanying cells, and runs forward alongside the testis and the initial portion of the uterus proper. In the forebody the metraterm decreases in thickness of its wall and has a nearly uniform diameter of 8–20 μ, and runs in the median field dorsal to the vas deferens, with which it unites just before opening to the outside. The bean-shaped eggs measure 13–16 μ long by 8–10 μ broad. The vitelline gland is divided into a short stem and four slender tubular branches; the stem runs anteroposteriorly in the central portion of the caudal lobe and divides at its base into four slender winding bran-
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ches, three of which extend into the vitellarian column; all four run in the peripheral area of the columns and terminate at the extreme anterior end of the hindbody. The vitelline reservoir is sausage-shaped, more or less curved and 30 – 40 μ in diameter, and lies close to the shell gland with its distal end inclosed in it.

From general anatomy it is certain that the present worm belongs to the Didymozoidae, but the peculiar shape of the cyst readily distinguishes it from any of the known members of the family. The attributive of the compound generic name refers to the hindbody being composed of bundled columns.

*Phacelotrema* n. g.

*Generic diagnosis.* Didymozoidae Poche, 1907. Encysted in pairs, occasionally by threes. Body divided into a slender fore- and a claviform hindbody. Forebody arising from anterior end of hindbody, where it may be folded upon itself or inclosed in hindbody. Hindbody of one individual fused lengthwise with that of its fellow in form of an inverted club with discoid or mushroom lobe at tail end, each divided into 3 or 4 columns externally. Oral sucker terminal, directly followed by small pharynx. Esophagus short, in cervical swelling of forebody. Ceca running along longitudinal axis of cyst, terminating in caudal swelling in elongated blind pouches. Testes single, vermiciform, at anterior end of hindbody. Vas deferens ventral to metraterm, joining it at distal end. Genital pore midventral at level of oral sucker. Ovary divided into a short stem lying in caudal lobe and two long slender branches extending into two columns of hindbody as far as their anterior end; shell gland, receptaculum seminis and vitelline reservoir of two individuals situated in central portion of caudal lobe opposite each other. Uterus extending throughout hindbody and turning back on itself at both extremities of each column, forming egg reservoir distally; metraterm with thick muscular wall, dorsal to vas deferens, uniting with it just before opening outside. Eggs bean-shaped, very numerous. Vitelline gland consisting of a short stem lying in caudal lobe and four slender tubular branches extending throughout trunk; three branches in one column, other in another column along with one branch of ovary. Excretory vesicle saccular, in caudal lobe, without external opening. Parasitic in pyloric ceca of marine fishes.

Genotype. *Phacelotrema claviforme.*

9. *Opephoretrema planum* n. g., n. sp.

Pl. I, Fig. 11; Pl. II, Fig. 14.

Habitat. Pyloric ceca of *Auxis thazard* (Lacépède).

Locality and date. Taizi, Wakayama Prefecture; May 27, 1942.

Two individuals are fused together completely by the hindbodies in form of an irregularly outlined disc 0.85 – 1.25 mm by 0.6 – 1.0 mm, at the center of which lies a circular hole surrounded by a
dense layer of glandular cells. The flattened subcylindrical forebodies are usually folded up in a lateral outgrowth of this pit; occasionally they are seen projecting outside. As measured in the folded-up condition they are $0.2 - 0.4$ mm in length, with a maximum breadth of $65 - 90$ µ at the level of the esophago-bifurcral region. The cuticle is very thin and smooth. The subcuticular musculature is practically absent in the hindbody, but in the forebody the longitudinal fibers are fairly well developed. In the hindbody the subcuticular cell layer appears rather granular, and the parenchyma is greatly reduced owing to excessive development of the uterus. The elliptical or pyriform terminal oral sucker is $40 - 42$ µ long by $27 - 30$ µ broad and has well developed musculature. The pharynx immediately following the oral sucker is subglobular, $12 - 18$ µ long by $17 - 20$ µ broad and consists of poorly developed musculature. The esophagus is narrow and only $30$ µ long. The ceca are also narrow in the forebody, but as they proceed further on in the hindbody they become wider and terminate in a club-shaped sac. There is no acetabulum.

The testis is club-shaped, $0.2 - 0.3$ mm long by $75 - 108$ µ broad and lies in the hindbody near the base of the forebody, toward which the attenuated end is directed. The vas deferens up to $12$ µ wide runs in the median field of the forebody immediately ventral to the metraterm and unites with the latter at the distal end. The common genital pore lies ventral to the posterior part of the oral sucker.

The ovary and vitelline gland are tubular, measuring $0.6 - 1.1 \times 0.045 - 0.05$ mm and $0.9 - 1.35 \times 0.04 - 0.06$ mm respectively, and lie close together in the peripheral area of the hindbody with their attenuated ends directed toward the shell gland. The germiduct arising from the attenuated distal end of the ovary joins the receptaculum seminis and then the vitelline duct. The uterus, narrow and convoluted near the shell gland complex at the commencement, becomes wider and occupies the entire hindbody, leaving a narrow subcuticular cell layer in the periphery. Before leading into the metraterm it becomes swollen to form an egg reservoir common to all Didymozoids. The narrow muscular metraterm, arising from the egg reservoir near the swollen end of the testis, passes along the testis and vas deferens, and finally joins the latter as stated above. The bean-shaped eggs measured in life $13 - 15$ µ long by $9 - 11$ µ broad.

The present worm is characterized by the complete fusion of the hindbodies in the form of an irregularly outlined disc and by the presence of a central hole, in which the forebodies are inclosed.
That all the reproductive organs are single is also worth noting. The compound generic name refers to the possession of a central hole.

**Opeherotrema n. g.**

*Generic diagnosis.* Didymozoidae Poche, 1907. Two individuals completely fused by hindbodies in form of an irregularly outlined disc with a conspicuous central hole, in which two subcylindrical forebodies are inclosed. Oral sucker terminal, muscular; pharynx small, poorly muscular. Esophagus narrow, short; ceca terminating in hindbody in an elongated sac. No acetabulum. Testis single, club-shaped, in hindbody near base of forebody. Vas deferens uniting with metraterm at distal end. Genital pore ventral to oral sucker. Ovary and vitelline gland tubular, single, situated close together in peripheral area of hindbody, with shell gland complex between their attenuated ends. Uterus occupying all available space of hindbody, forming egg reservoir distally; metraterm muscular, running along vas deferens in median field of forebody. Eggs bean-shaped, very numerous. Parasitic in pyloric ceca of marine fishes.

Genotype. *Opeherotrema planum.*

**SYNCOELIIDAE Odhner, 1927.**


Two mature specimens of this worm were found firmly attached to the pharynx of *Decapterus muroadsi* (Temm. et Schleg.) at Taizi, May 11, 1941.

As fixed in acetic sublimate under a cover slip, stained and mounted they gave the following measurements.

Body 8.45–8.88 mm long by 0.55–0.7 mm broad in testicular region; forebody 4.0–4.1 mm long, arched ventrally; hindbody 4.35–4.88 mm long, truncated at tapering posterior end; oral sucker 0.475–0.575 × 0.5–0.55 mm; pharynx 0.275–0.31 × 0.238–0.26 mm; esophagus 0.125 mm long, acetabulum finger-bowl-shaped, 0.38–0.41 mm in diameter, its peduncle 0.85–0.9 mm long; testes 18 in number, arranged in two or three rows, 0.13–0.2 × 0.085–0.25 mm, hermaphroditic pouch 0.21 × 0.18 mm; ovaries 5 in number, placed in zigzag row, 0.16–0.25 × 0.11–0.24 mm; shell gland elliptical, compact, 0.18–0.19 × 0.11–0.13 mm, intercalated between posteriormost ovary and vitellaria; vitellaria 7 in number, massed together immediately behind shell gland, 0.075–0.125 × 0.062–0.11 mm; eggs 33–48 × 24–30 μ.

**Literature.**

S. Yamaguti:

ALLOCREAIDIIDAE Stossich, 1904.


The following account based on two living and several mounted specimens from Spheroides pardalis (Temm. et Schleg.) is to supplement Ozaki's description.

As I pointed out in 1934 the lateral flaps of the forebody are turned over ventrally but do not fuse at all in any of the specimens examined.

The testes are spherical or ovoid, entire or somewhat indented; occasionally the posterior testis may be deeply incised on each side. The cirrus measures 0.6 mm long by 45 μ broad when fully protruded. The vitellaria commence in the acetabular zone in the majority of cases, occasionally a little in front of it. The elongate oval uterine eggs measured in life 66–72 μ long by 33–39 μ broad, though much larger (74−81×48−52 μ) according to Ozaki.

The sigmoid, tubular excretory vesicle opens dorsoterminaly, and runs forward between the two testes dorsally, then between the anterior testis and vesicula seminalis externa and finally curves round the acetabulum to terminate on the left of this sucker. The paired collecting vessels are given off from the vesicle at the level of the anterior end of the anterior testis Flame cell formula: \((2+2+2)+(2+2+2)\times2 = 24\).

From the topography of the genitalia and the excretory system it is certain that the present genus belongs to the Allocreadiidae, in which the genera with anus such as Opecoelus, Opegaster, Opeecoelina and Anisoporus, and those with cloaca such as Opecoeloides, Pseudopecoeloides, Pseudopecoelina and Allolepidapedon are included by some of the recent authors (Manter, Yamaguti). The anus or the cloaca occurs often in the members of this family. The alate condition of the forebody as observed in Bianium may be paralleled with that of the hindbody in Trigonotrema Goto et Ozaki, 1929, which is otherwise a typical member of the Allocreadiidae though not mentioned by the original authors. Under these considerations it seems preferable to relegate the Diproproctaeidae Ozaki, 1928, to subfamily rank and to place it in the Allocreadiidae as suggested by Park.

The following measurements are from 7 gravid specimens fixed in acetic sublimate under a cover slip, stained and mounted.

Body 1.4−2.2 mm long, 0.65−1.2 mm broad at level of ovary. Oral sucker 0.13−0.18×0.13−0.17 mm, pharynx 0.09−0.14×0.12−0.15 mm, acetabulum 0.16−0.24×0.18−0.28 mm. Testes 0.16−0.33
× 0.13 – 0.25 mm, cirrus pouch 0.3 – 0.55 × 0.09 – 0.15 mm, vesícula seminalis externa 0.165 – 0.39 × 0.06 – 0.18 mm, vesícula seminalis interna 0.078 – 0.165 × 0.066 – 0.12 mm. Ovary 0.125 – 0.24 × 0.13 – 0.24 mm, receptaculum seminis 0.08 – 0.12 mm in diameter.

Literature.


Sanguinicolidae Graff, 1907.

12. Psettarium japonicum (Goto et Ozaki, 1929)
Goto et Ozaki. 1930.

The following account based on a gravid specimen found in the washings of the small intestine of Spheroïdes pardalis (Temm. et Schleg.) from Hamazima is to supplement the original description of the species by Goto and Ozaki.

Body 5.4 × 0.9 mm, with a distinct notch on left body margin at level of female pore, armed on each side with comb-like transverse rows of minute spines extending inward a short distance both dorsally and ventrally. The two extremities and the entire dorsal and ventral surfaces except the marginal areas are devoid of spines contrary to Goto and Ozaki's description. Mouth opening ventrally 15 μ from flat conical anterior extremity. Esophagus 0.85 mm long, slender, covered inside with cuticular hairs. Anterior ceca about 0.3 mm long; posterior ceca 0.55 mm long on the left, 1.4 mm long on the right.

The reticular testis commences about 0.1 mm in front of the anterior ceca and extends backward on the dorsal side to the anterior end of the ovary in the median field, to the level of the posterior end of the ovary on the left, and to the level of the male pore on the right. It does not intrude into the field between the two anterior ceca. In Goto and Ozaki's figure (13 and 14) the testis extends along the left side further backward than the female genital pore, but in my specimen it terminates on this side 0.12 mm in front of the female pore. The main vas deferens, running backward ventral to the left portion of the ovary, receives a short
bifurcate branch from the right just in front of the female aperture and then narrows markedly as it enters the cirrus pouch. The cirrus pouch is curved, approximately dumb-bell-shaped, about 0.18 mm long and lies obliquely in the left half of the body, with its posterior end 0.27 mm in front of the posterior extremity. It has a very thin, membranous wall and contains a distinct vesicula seminalis in its anterior bulb 50 μ wide and a well differentiated pars prostatica surrounded by prostate cells in its posterior bulb 72 μ wide. The thick protrusible cirrus opens dorsally just behind the left marginal notch.

The multilobular ovary, 0.37×0.28 mm, lies slightly to the right about 0.56 mm in front of the posterior extremity. The slightly arcuate germiduct about 0.57 mm long runs down on the right of the median line and is distended with spermatozoa at the middle. It joins the vitelline duct in the median line 0.09 mm from the posterior extremity. The ootype lies just on the left of the median line about 0.15 mm from the posterior extremity and is surrounded by a large compact mass of shell gland cells. The uterus winds its way forward medial to the germiduct and vitelline duct and runs toward the left along the posterior border of the ovary, at the left end of which it turns backward and finally opens dorsally in left submedian line 0.44 mm from the posterior extremity. Eggs oval to elliptical, thin-shelled, about 40 μ long. The vitellaria are not follicular, but consist of tubular acini communicating with one another. They fill up most of the space not occupied by other organs, leaving the two extremities free. Unlike the testis they extend over the anterior portion of the uterus. The unpaired median vitelline duct originates at the level of the nerve commissure, though not mentioned or figured by the original authors. It runs backward in the median field somewhat sinuously, overlapping or crossing the right posterior cecum, since the latter approaches the median line or even crosses it, and passes ventral to the median portion of the ovary. Posteriorly it comes to lie in the right submedian line alongside the germiduct and is distended with yolk cells.

This genus was included by Manter in the Aporocotylidae Odhner, 1912, together with Aporocotyle, Sanguinicola, Deontacylix and Paradeontacylix, but I prefer to place it in the Sanguinicolidae Graff, 1907, as I did in 1938. In Psettarium, Deontacylix and Paradeontacylix the posterior ceca never extend as far backward as the posterior extremity, and the genital pores of both sexes are distinctly separated and lie behind the ovary. In Aporocotyle (simplex Odhner, 1900, and orientalis Yamaguti, 1934), however, the posterior ceca reach to the extreme posterior end of the body, and the
male and female genital pores, not appreciably separated one from the other, lie in front of the ovary. From this point of view the Aporocotylidae should contain the type genus only, and the Sanguinicoliidae should include, besides the type genus, Psettarium Goto et Ozaki, 1930, Deontacylix Linton, 1910, and Paradeontacylix McIntosh, 1934. If the above differences be regarded as of mere generic significance, Sanguinicoliidae Graff should have priority over Aporocotylidae Odhner, but it seems desirable to distinguish between the two families as done by Poche and Fuhrmann. These two authors, however, place Deontacylix in the Aporocotylidae.

Literature.

— McIntosh, A., A new blood trematode, Paradeontacylix sanguinicoloïdes n. g., n. sp., from Seriola lalandi with a key to the species of the family Aporocotylidae. Parasit., 26, 463 - 467, 1934.

Explanation of Plates.

Plate 1.

Fig. 1. Fully developed specimen of Colocytotrema auxis, lateral view, 12.5X.
Fig. 2. Same, fore-end-on view, 20X.
Fig. 3. Same, hind-end-on view, 20X.
Fig. 4. Not yet fully developed specimen of Colocytotrema auxis, strongly flattened from side to side, and stained with Heidenhain's hematoxylin, 25X.
Fig. 5. Transverse section of Colocytotrema auxis through equatorial region, 50X.
Fig. 6. Same through central forebody, 50X.
Fig. 7. Same through caudal dome, 50X.
Fig. 8. Same through forebody, 100X.
Fig. 9. Same through shell gland, 140X.

Fig. 10. *Phacotremia claviforme*, lateral view. 12.5X.
Fig. 11. Two mature specimens of *Opephoretrema planum*, 20X.

Plate II.

Fig. 12. Longitudinal section of posterior extremity of *Phacotremia claviforme* through shell gland complex.
Fig. 13. Transverse section of *Phacotremia claviforme* through fore- and hindbodies.
Fig. 14. Flattened mature specimen of *Opephoretrema planum*.

Abbreviations used in Figures.

c = capsule,  d = vas deferens,  e = esophagus,  eg = egg,  ep = epithelia of intestinal mucosa of host,  er = erythrocyte of host,  i = intestine,  gp = genital pore,  m = metraterm,  o = ovary,  os = oral sucker,  ot = ootype,  p = pharynx,  rs = receptaculum seminis,  sg = shell gland,  t = testis,  u = uterus,  vt = vitellaria.
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