1990

Binder 053, Didymozobidae E-L [Trematoda Taxon Notebooks]

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Epithelionematobothrium n. g.
Yamaguti, 1970

GENERIC DIAGNOSIS: Didymozoidae, Nematobothriinae. Complete hermaphrodites, free in connective or adipose tissue. Body filiform, long, blunt-pointed at head end, but rounded at tail end. Oral sucker globular, terminal; pharynx small, weakly muscular; esophagus short; intestinal limbs lined nearly throughout with epithelia which are very prominent and form longitudinal ridges at greater middle portion, terminating at posterior extremity at different levels. No acetabulum. Testis single, winding, anterior to ovary, may be moniliform at some places; seminal vesicle tubular, winding; ejaculatory duct well differentiated, muscular. Common genital pore a short distance posterior to head end. Ovary tubular, winding, may be moniliform at some places, arising immediately behind testis; seminal receptacle present. Genital junction in posterior third of body. Vitelline gland tubular, loosely winding, extending between posterior extremity and genital junction. Uterus forming only one loop at posterior extremity; metraterm well differentiated. Eggs elliptical, numerous. Free in adipose or connective tissue of subserosa of stomach of marine teleosts.

TYPE SPECIES: *E. mulloidichthydis* n. sp., in *Mulloidichthys pfluegeri*; Hawaii.

266 *Epithelionematobothrium mulloidichthydis* n. g., n. sp.

(Fig. 266) Yamaguti, 1970

HABITAT: Convoluted in connective or adipose tissue of subserosa of stomach of *Mulloidichthys pfluegeri*; Hawaii.

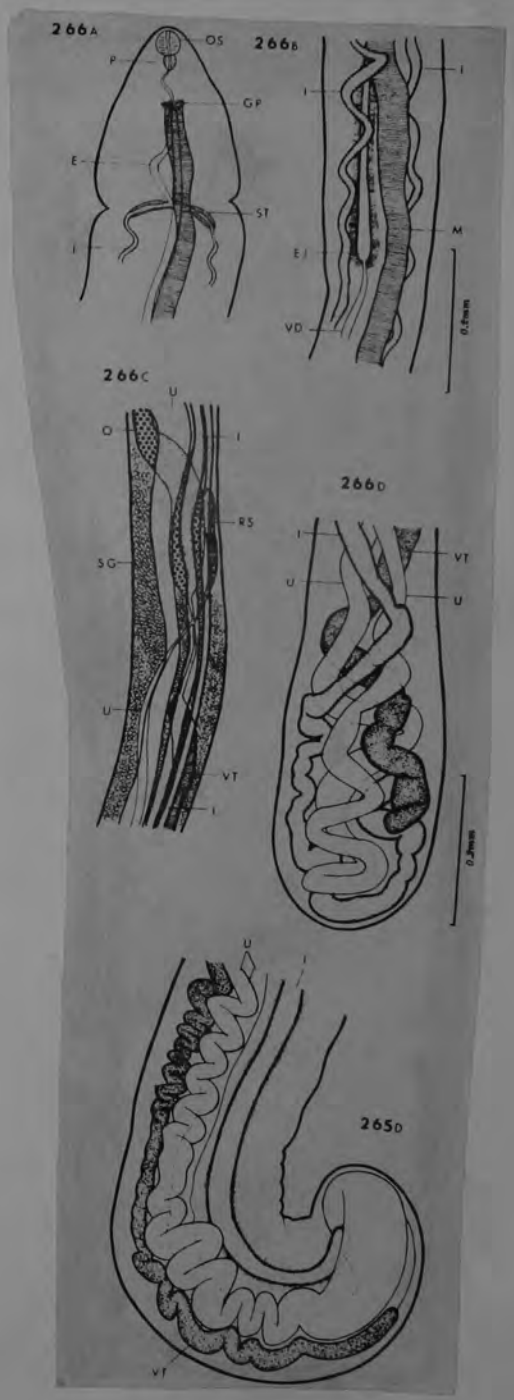
HOLOTYPE: U. S. Nat. Mus. Helm. Coll., No. 63832.

DESCRIPTION (based on three whole mounts): Body very narrow, filiform, 130-280 mm long, 0.3-0.35 mm wide in midregion; head end abruptly tapering to a blunt point; tail end rounded. Oral sucker globular, terminal, 40-50 μ in diameter, with very small terminal opening, followed by small, weakly muscular pharynx 25 μ in diameter. Esophagus short, narrow, slightly undulating, bifurcating at a distacne of about 0.25 mm from head end in the type. Beginning of ceca lined with cuticle and provided with circular muscle, like rudimentary "stomach" portion; ensuing portion narrow, lined with rather flat epithelia, but the whole remaining portion is lined with prominent epithelia which are arranged in longitudinal rows and project into the lumen in longitudinal ridges except in the posteriormost portion. From this structure it seems very likely that a very active digestive function is ascribed to this intestine. In the type one cecum turns forward at the posterior extremity and terminates shortly away from it, overlapping the posterior end of the vitelline gland, whereas the other cecum terminates 2.98 mm from the tail end; in one paratype the two ceca also end at different levels at the posterior extremity. No acetabulum.

Testis single, tubular, winding, very long (in one paratype it is just twice as long as ovary, up to 0.18 mm wide, originating just anterior to anterior end of ovary, terminating in the type 280 mm long at a distacne of 12.5 mm from head end, where it passes into the wide, tubular, winding, seminal vesicle (7.5 mm long lineally in the type), 60-70 μ wide. Ejaculatory duct 1.18 mm long in the type, slightly enlarged and provided with circular muscles posteriorly, but tapering anteriorly and provided with longitudinal muscles for greater anterior part, running alongside metraterm, with which it opens outside very close together midventrally at a distance of 0.06-0.12 mm from head end.

Ovary single, tubular, winding, constricted at irregular intervals into beads-like formation like testis, tapered at distal end and joining vitelline duct at a distance of 17 mm from tail end in the type. Receptaculum seminis elongate, tubular, 0.2-0.3 mm long, directed forward from genital junction. Vitelline gland tubular, nearly of uniform width throughout (40-60 μ wide in the type), loosely winding, originating near posterior extremity. Uterine duct descending, very narrow at beginning. Uterus proper turning back on itself at posterior extremity; final ascending uterus proper rather straight for greater part, without forming circumscribed dilatation. Metraterm well differentiated. Eggs elliptical, embryonated, 23-26 X 10-14 μ. Excretory system not made out.

DISCUSSION: This *Nematobothrium*-like genus is characterized by the prominent intestinal epithelia extending nearly the whole length of the gut, the unusually posterior position of the genital junction, and the genital pore being well apart from the oral sucker. The generic name refers to the most prominent feature of the intestinal epithelia. The "stomach"-like differentiation of the beginning of the ceca suggests that this worm develops from the larva of the *Monilicaecum* type (p.234).



EPITHELIONEMATOBOTHRIUM

Glomeritrematinae ~~n. subfam.~~ YAMAGUTI, 1958

Subfamily diagnosis. — Didymozoidae: Complete hermaphrodites. Body filiform, not divided into two regions, strongly entangled and fused together to form a globular mass. Cyst rounded.

Glomeritrema Yamaguti, 1942

Generic diagnosis. — Didymozoidae, Glomeritrematinae: Complete hermaphrodites enclosed in pairs in a rounded cyst supplied with capillary network from host fish. Body filiform, not divided into two distinct regions, strongly entangled, with anterior extremity in central part of cyst. Oral sucker and pharynx present. No acetabulum. Ceca narrow, degenerate posteriorly. Testes single, tubular, winding, extending further forward than shell gland complex. No vesicula seminalis. Vas deferens winding, joining metraterm to form hermaphroditic duct, which runs forward as direct continuation of the metraterm and opens by the side of the oral sucker. Ovary tubular, winding, extending posterior to shell gland, partly anterior to it. Shell gland intermediate between center and periphery of cyst. Uterus extending to posterior extremity, then turning forward, forming reservoir-like dilatation in center of cyst before leading into muscular metraterm. Excretory system? Parasitic in subcutaneous tissue of marine fishes.

Genotype: *G. subcuticola* Yamaguti, 1942 (Pl. 28, Figs. 365 & 366), in *Tetrapterus mitsukurii;* Naha, Okinawa.

GLOMERITREMA

Gonapodasmiinae Ishii, 1935

Subfamily diagnosis. — Didymozoidae: Incompletely gonochoristic, without marked sexual dimorphism, encysted or free in host tissue. Body slender, female larger or longer than male. Acetabulum present or absent. Ceca terminating at or near posterior extremity. Testes two, very long and parallel to each other, or strongly winding one behind the other in anterior part of body. Vas deferens winding, seminal vesicle present or absent. Ovary and vitellarium single; former anterior, latter posterior, to genital junction. Uterus first ascending and then descending. Excretory vesicle bifurcating anteriorly into short arms.

Key to genera of Gonapodasmiinae

Testes parallel to each other, extending almost entire length of body ..... *Gonapodasmius*

Testes winding one behind the other in anterior part of body ..... *Paragonapodasmius*

Gonapodasmius Ishii, 1935

Generic diagnosis. — Didymozoidae, Gonapodasmiinae: Incompletely gonochoristic Didymozoidae, without marked sexual dimorphism, though the female is much larger than the male and brownich, while the male is greyish opaque. Single or paired, rarely by threes or fours, enclosed in cyst or not. Body filiform, entangled. Oral sucker and pharynx present. Acetabulum usually present. Ceca reaching to posterior extremity. Genital pore near or behind oral sucker. Male: Testes long, parallel to each other. Vas deferens sinuous, may form seminal vesicle. Female organs obsolete. Excretory vesicle divided into two short divergent arms a little in front of intestinal bifurcation. Female: Ovary and vitellarium narrow, tubular, winding, former anterior to shell gland, latter posterior to it. Uterus reaching to posterior extremity. Excretory vesicle as in male. No male genitalia. Parasitic in gill, mouth cavity or flesh of marine fishes.

Genotype: *G. haemuli* (G. A. et W. G. MacCallum, 1916) Ishii, 1935, syn. *Koellikeria h.* G. A. et W. G. MacCallum, in gill of *Haemulon flavolineatum;* New York.

Other species:

G. cypseluri Yamaguti, 1940, in submucosa of buccal cavity of *Cypselurus agoo;* Hamazima, Japan.

G. okushimai Ishii, 1935, syn. *Nematobothrium Okujimai* Dollfus, 1935 (Pl. 26, Figs. 339—342), in muscle of *Pagrosomus major;* Japan.

G. pacificus Yamaguti, 1938, in gills of an epinephelid; Pacific, Japan.

G. pristipomatis (Yamaguti, 1934), syn. *Nematobothrium p.* Y. (Pl. 27, Fig. 375), in gills of *Pristipoma trilineatum* and mouth cavity of *Epinephelus akaara;* Inland Sea of Japan.

Key to species of *Gonapodasmius* from Hawaiian fishes

Yamaguti, 1970

1. Acetabulum relatively well developed, close to intestinal bifurcation; seminal receptacle absent 2
   Acetabulum poorly developed, far posterior to intestinal bifurcation; seminal receptacle large, cylindrical; testes arising at or near posterior extremity; genital pore submedian ..... *G. spilonotopteri*
2. Ovary strongly winding, twisted ..... *G. branchialis*
   Ovary straight ..... *G. menpachi*

298. *Gonapodasmius branchialis* n. sp.

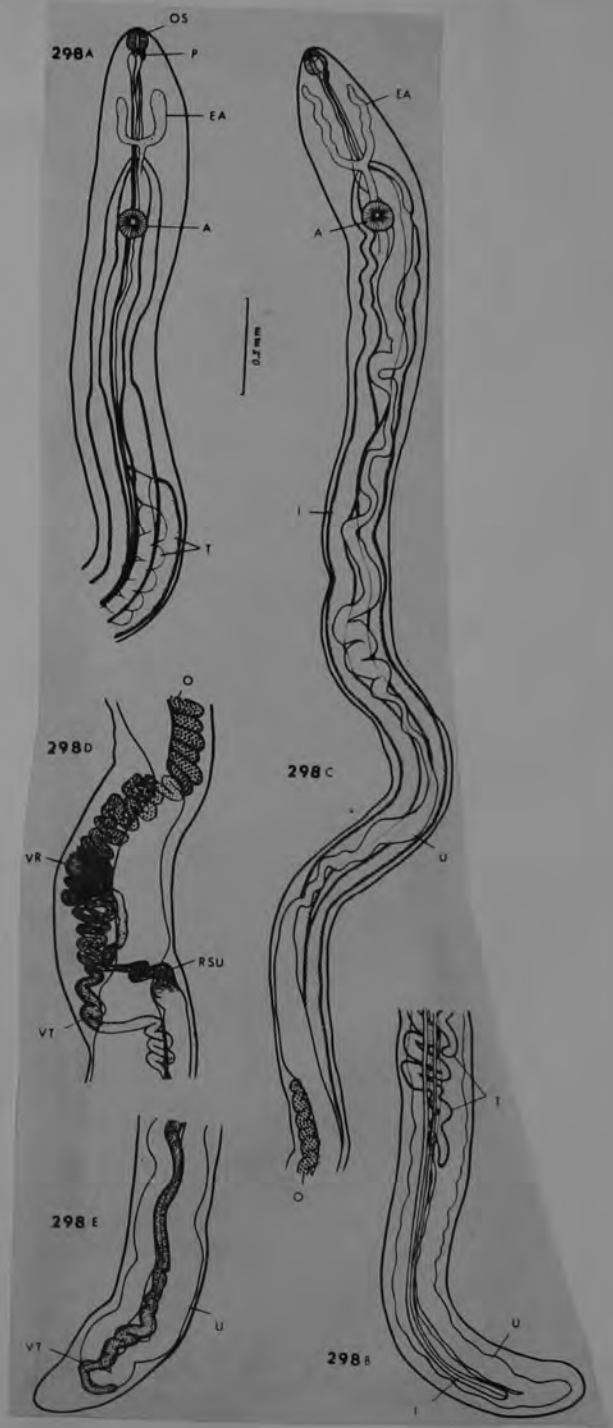
(Fig. 298) Yamaguti, 1970

HABITAT: Encysted in pairs or singly in gill lamellae of "sea bass" (scientific name unknown, type host) and on or in olfactory organ of *Epinephelus quernus*; Hawaii.

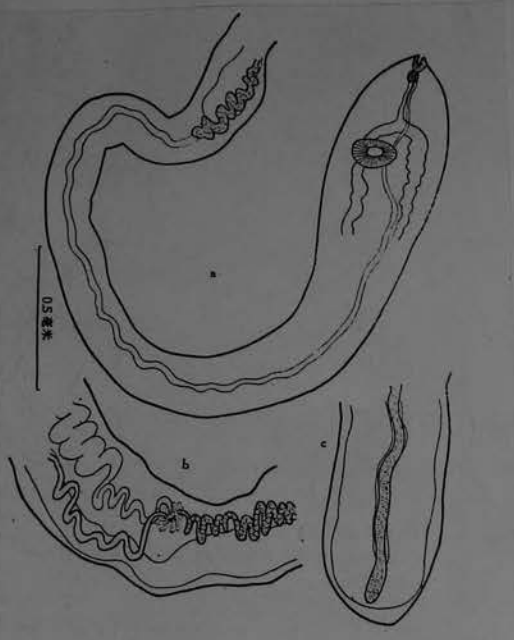
HOLOTYPE: U. S. Nat. Mus. Helm. Coll., No. 63857.

DESCRIPTION (based on 15 males and 25 females): MALE. Body filiform, opaque, 4.3-21 mm long, with nearly uniform width of 0.2-0.28 mm. Mouth terminal; oral sucker 46-85 X 46-75 μ; pharynx rudimentary, 25-50 X 20-45 μ; esophagus slender, 0.1-0.48 mm long; ceca functional anteriorly, but obviously non-functional at posterior ends reaching to posterior extremity. Acetabulum 70-115 μ in diameter, situated a little behind intestinal bifurcation, 0.3-0.72 mm posterior to head end. Testes long, tubular, paired, originating usually at different levels 0.34-4.4 mm from posterior extremity and terminating at nearly same level 0.8-2.0 mm from head end. Vas deferens narrow, median, provided with longitudinal and circular muscle fibers, opening ventral to oral sucker or immediately behind it. Of the female organs only an empty uterine loop was observed near the posterior extremity and an empty muscular distal uterine portion alongside the vas deferens. Even in three mature specimens the female gonads could not be definitely located. FEMALE. Body filiform, 13-140 mm in length, with maximum width of 0.25-0.5 mm. Preovarian anterior portion attenuated, though somewhat enlarged (0.22-0.4 mm) in bifurco-acetabular region. Oral sucker 37-86 X 46-78 μ; pharynx 25-58 X 23-50 μ; esophagus 0.15-0.5 mm long; ceca terminating at or near posterior extremity. Acetabulum 70-130 μ in diameter, situated a short distance behind intestinal bifurcation, 0.35-1.0 mm from head end. Ovary tubular, strongly winding or twisted, 2.0-5.6 mm long lineally (only 0.9 mm long in small contracted specimen), beginning at variable distances from head end. Receptaculum seminis absent. Genital junction very variable in position (2.3-80 mm from head end), dividing body in ratio of 1:1.4-9.7. Initial descending portion of uterus containing abundant sperm, forming receptaculum seminis uterinum. Uterus turning back on itself at posterior extremity. Eggs bean-shaped, 16-20 X 9-13 μ in life. Vitellarium single, tubular, may arise at extreme posterior end of body or at a distacne of 1.9 mm in a specimen 16 mm long, whereas it originates only 0.3 mm away from the same point in a larger specimen 51 mm long, suggesting great variability in this respect. In the type the vitelline gland forms a bulbous reservoir 75 X 55 μ just before joining the germiduct. No male genitalia.

DISCUSSION: In the male of the present species the ovary and vetellarium could not be detected, even in those exceptional specimens bearing numerous eggs in the uterus, whereas in the male of the closely related *Gonapodasmius pacificus* Yamaguti, 1938, the ovary has been observed. *G. menpachi* n. sp. is more completely gonochoristic and is definitely wider than the present species. The specific name refers to the habitat of the holotype. It is to be noted that the females from the olfactory organ are longer than those from the gill lamellae.



Gonapodasmius pacificus Yamaguti, 1938



4A 太平洋分性吸虫(雄) *Gonapodasmius pacificus* Yamaguti, 1938 的腹面图
a. 虫体前部； b. 生殖联系； c. 虫体后部

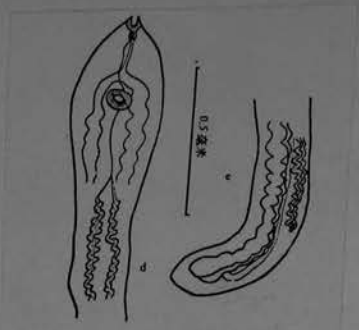


图 24B 太平洋分性吸虫(雄) *Gonapodasmius pacificus* Yamaguti, 1938 的腹面图。
d. 虫体前部； e. 虫体后部

from Guì Shen, 1983
Xisha Islands,
Guangdong Province,
CHINA

299. *Gonapodasmius menpachi* n. sp.

(Fig. 299) Yamaguti, 1970

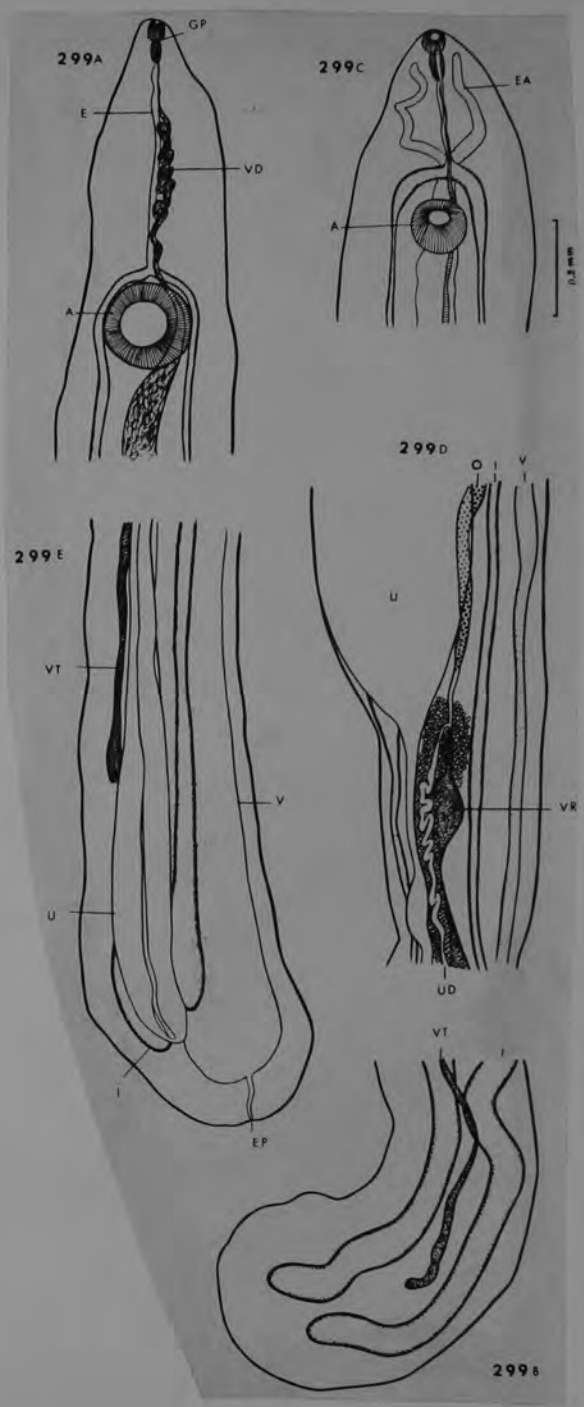
HABITAT: Body cavity of *Myripristis berndti* (local name "u'u" or "menpachi"); Hawaii.

HOLOTYPE: U. S. Nat. Mus. Helm. Coll., No. 63858.

DESCRIPTION (based on one entire male and one entire female and a number of fragments): MALE. Body about 60 cm long in life, 58 cm long after fixation, up to 0.8 mm wide in midregion. Oral sucker terminal, 70-90 × 80-90 μ; pharynx 60 × 40-50 μ. Esophagus 0.35-0.55 mm long, bifurcating a little in front of acetabulum; ceca widened and terminating at rounded, curved, posterior extremity. Acetabulum 0.19-0.25 mm in diameter, immediately postbifurcal. Testes parallel to each other; their posterior origin could not be made out. In one paratype both testes markedly swollen distally, 0.25 mm and 0.27 mm wide, respectively, one terminating at a distance of 8.75 mm from head end and the other about 1.0 mm further behind. Vas deferens winding, strongly distended with sperm at irregular intervals in this paratype, but straight and showing few bulbous swellings in the type. Of the female organs only the rudimentary vitelline gland can be traced backward as a narrow string from a point 66 mm from head end down to near the posterior extremity; neither uterus nor ovary detectable. FEMALE. Body 498 mm long in mounted condition, with maximum width of about 0.8 mm some distance anterior or posterior to genital junction; acetabular region somewhat widened as is usual with other known members of the genus. Oral sucker terminal, 63-75 × 50-60 μ; pharynx 40-45 × 40-55 μ; esophagus 0.25-0.4 mm long, bifurcating about halfway between pharynx and acetabulum when extended, but immediately in front of latter when contracted; ceca inflated, terminating at posterior extremity. Acetabulum 0.12-0.18 mm in diameter, with its center at a distance of 0.54-0.9 mm from head end. Ovary tubular, straight, 80-140 μ wide, beginning 18 mm (18 mm in one paratype) from head end in the type. Genital junction 65 mm posterior to anterior end of ovary in the type (93 mm from head end). No seminal receptacle observed. Vitelline gland single, tubular, swollen at irregular intervals, running alongside uterus, originating 1.2 mm from posterior extremity.

Descending uterus turning back on itself 0.35 mm from posterior extremity, ascending uterus opening midventrally at posterior end of oral sucker; eggs oval, thick-shelled, 18-20 × 12-15 μ in life. Male organs entirely lacking. Excretory vesicle divided into short, wide, symmetrical arms dorsal to intestinal bifurcation.

DISCUSSION; This species resembles *Gonapodasmius pristipomatis* (Yamaguti, 1934) in general anatomy, but it was found free in the body cavity or among parietal connective tissue of the host and never encysted in gills as is the case with the latter species, and it possesses eggs which are shorter and wider.



300. ***Gonapodasmius spilonotopteri*** n. sp.

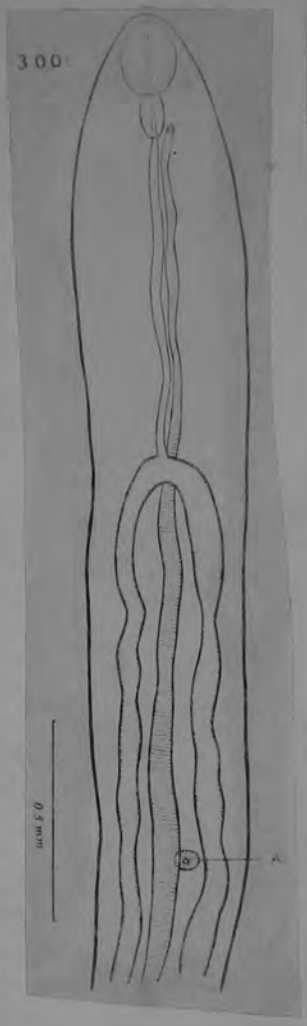
(Fig. 300) Yamaguti, 1970

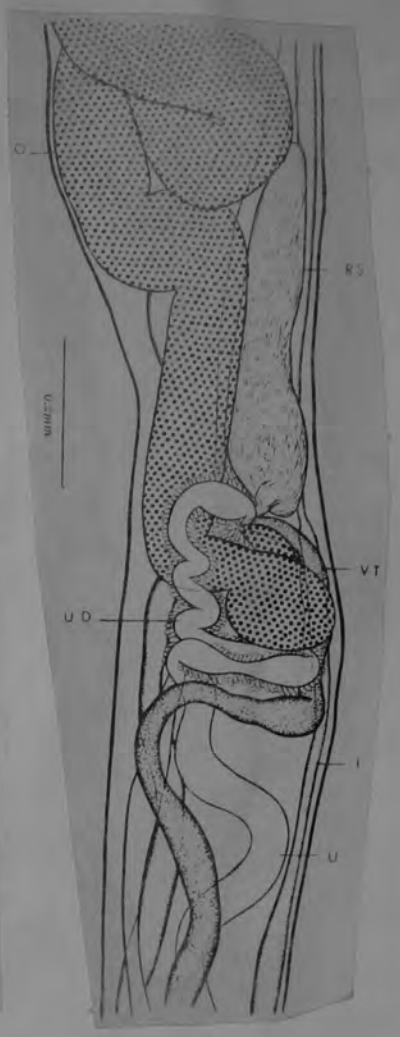
HABITAT: Free beneath inner surface of operculum and gill opening of *Cypselurus spilonotopterus* and *C. spilopterus*; Hawaii.

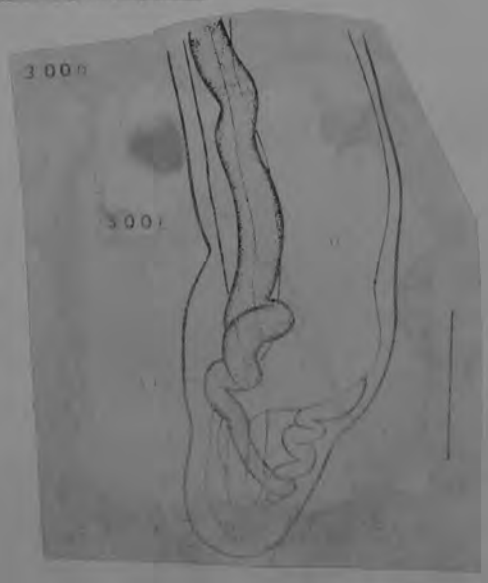
HOLOTYPE: U. S. Nat. Mus. Helm. Coll., No. 63859.

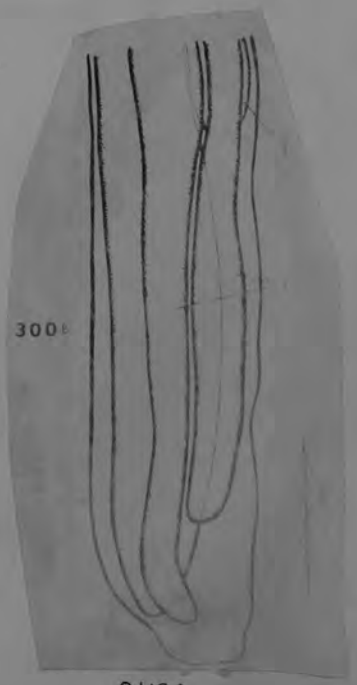
DESCRIPTION (based on five males and four females, all entire): MALE. Body very narrow, 6.3-21 mm long, 0.1-0.35 mm wide; anterior extremity blunt-pointed, slightly enlarged in esophageal region; posterior extremity blunt. Oral sucker terminal, ovoid, 35-107 X 32-88 μ; pharynx 23-60 μ in diameter; esophagus 0.2-0.42 mm long; ceca terminating at posterior extremity. Acetabulum 33-54 μ in diameter, 0.25-0.6 mm posterior to intestinal bifurcation, 0.6-1.2 mm from head end. Testes parallel to each other, 6.2-14.5 mm long lineally, originating at different levels short of posterior extremity, terminating 1.0-6.5 mm posterior to head end. Genital pore posterolateral to pharynx or oral sucker. FEMALE. Body filiform, 56-141 mm long, 0.28-0.38 mm wide in uterine region. Oral sucker terminal, oval, 93-112 X 58-93 μ; pharynx 28-46 μ in diameter; esophagus 0.25-0.53 mm long; ceca terminating at posterior extremity. Acetabulum 33-54 μ in diameter, 0.45-1.1 mm from head end, 0.1-0.45 mm posterior to intestinal bifurcation. Ovary tubular, 5.4-15 mm long lineally, comparatively wide, originating 6.0-10.0 mm posterior to head end. Seminal receptacle cylindrical, 0.5 X 0.1 mm in the type, directed forward from genital junction, containing numerous scattered yolk cells in addition to sperm. Genital junction dividing body in approximate ratio of 1:4-8. Uterus first descending, then ascending; metraterm not very distinct. Eggs bean-shaped, 20-23 X 12-16 μ. Vitellarium up to 70 μ wide, extending between posterior extremity and genital junction. Excretory system unknown.

DISCUSSION: This species differs from the most closely related *Gonapodasmius cypseluri* Yamaguti, 1940 from *Cypselurus agoo* of Japan in the submedian position of the genital pore. In *G. cypseluri* the genital pore is midventral.









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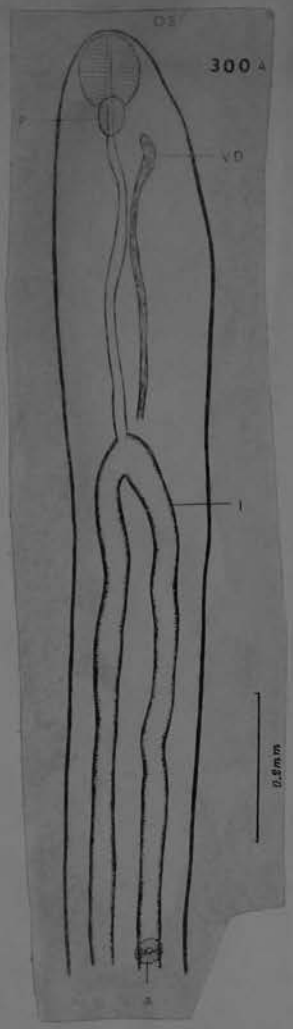


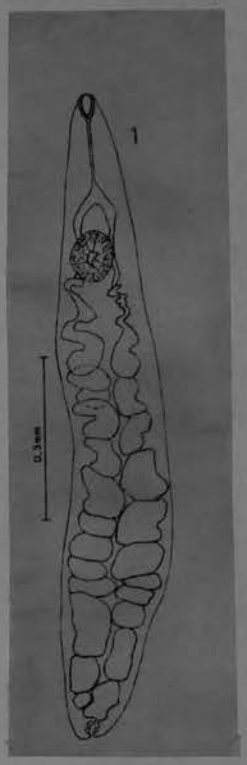
From Yamaguti, 1970

GONAPODASMIUS

Immature Didymozoid A
(Fig. 1)

Host: *Puntius binotatus* (Cuvier and Valenciennes) (Cyprinidae).
Habitat: Small intestine.
Locality: Tarabanan Concepcion, Palawan Island, Philippines.
Date: 16 May 1962.
Specimen: USNM Helm. Coll. No. 60294.
Description (based on one specimen): Body unarmed, elongate, 1,213 by 201. Forebody 264; hindbody 859. Parenchyma vesicular. No eyespots or eyespot pigment. Mouth terminal. Oral sucker 42 by 30, within body, composed of weak outer longitudinal and strong inner circular muscles and greater inner area of large, vesicular, transparent cells. Acetabulum 93 by 81, muscular, embedded in body parenchyma, at level of anterior body fourth. Sucker length ratio 1 : 2.21. Pharynx 12 by 13, muscular, contiguous with oral sucker. Esophagus 138 long, narrow, bifurcation posterior to midforebody. "Stomach" absent. Ceca with narrow and inflated areas, descending in undulating fashion, terminating 44 from posterior extremity. Parenchymal glands fill entire body in zone beneath thin subcuticular longitudinal muscle layer. No reproductive fundaments. Excretory bladder postcecal, thick walled, lumen 32 by 18, pore terminal.

Discussion: This form differs from those described as *Torticaecum* and *Distomum fenestratum*, but resembles *Monilicaecum* in having its oral sucker composed of muscular and nonmuscular elements rather than being entirely muscular. It differs from *Monilicaecum* in lacking a "stomach" at the cecal bifurcation.



FROM FISCHTHAL AND KUNTZ, 1964

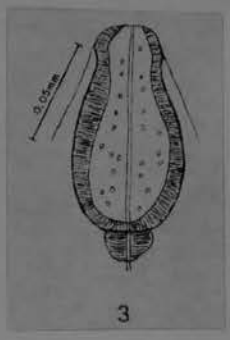
Immature Didymozoid B
(Figs. 2 and 3)

Host: ***Euthynnus yaito*** Kishinouye (Scombridae).
Habitat: Small intestine.

Locality: Puerto Princesa, Palawan Island, Philippines.
Date: 20 May 1962.
Specimens: USNM Helm. Coll. No. 60296 (three slides with one specimen each).

Discussion: This form closely resembles Immature Didymozoid A, possessing most of its features but lacking an acetabulum. In the latter respect it differs from all previously described immature didymozoids with the exception of *Didymocystis katsuwonicola* (Okada, 1926) (syn. of *D. wedli* Ariola, 1902) described by Ishii (1935). Adults of most didymozoid genera lack an acetabulum. The structure of the oral sucker is as described for Immature Didymozoid A and *Monilicaecum*, and unlike the entirely muscular one of *Didymocystis wedli*.

Measurements and some pertinent data (based on five specimens): Body 1.420 to 2.455 by 305 to 410. Parenchyma especially vesicular anteriorly. Oral sucker 57 to 82 by 40 to 50. Acetabulum absent. Pharynx 11 to 21 by 18 to 23. Esophagus 215 to 264 long, 11 to 26 maximum width, thin walled, straight, rarely slightly undulating, width gradually increasing toward bifurcation. Ceca terminating 85 to 180 from posterior extremity.



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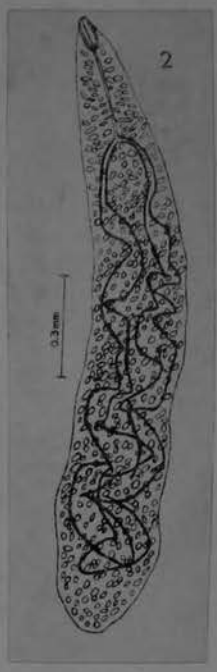

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FROM FISCHTHAL AND KUNTZ, 1964

Immature Didymozoid C

(Fig. 4)

Synonym: *Distomum fenestratum* Linton, 1907 (in part).

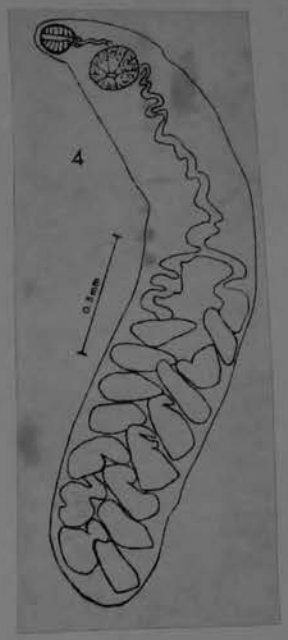
Hosts: *Brevoortia tyrannus* (Latrobe) (Clupeidae); *Ammodytes americanus* DeKay (Ammodytidae); *Etrumeus sadina* (Mitchill) (Dussumieriidae).

Locality: Woods Hole, Massachusetts.

Specimens on deposit: USNM Helm. Coll. Nos. 8407 (one specimen) and 36135 (one specimen) from *B. tyrannus*; 8406 (two specimens) from *A. americanus*; 8408 (one specimen) from *E. sadina*.

Discussion: This form closely resembles *Distomum fenestratum* but differs significantly in having the cecal bifurcation considerably postacetabular. In two of the above specimens the exact level of cecal bifurcation could not be seen, but the esophagus definitely extended postacetabular. Numbers 8406, 8407, and 8408 were described by Linton (1940) as *Distoma fenestratum* Linton, 1907; 36135 was collected by G. A. MacCallum, the label bearing the designation *D. fenestratum*. *Nematobothrium* sp. larvae (Chulkova, 1939) Nikolaeva, 1962 (syn. *Didymozoon* larvae Chulkova, 1939) may be a synonym of Immature Didymozoid C; Chulkova (1939) showed the esophagus extending considerably postacetabular. There is no evidence to indicate that their form belongs to *Didymozoon* or to *Nematobothrium*.

Measurements (based on five specimens): Body 1,572 to 2,280 (in four) by 315 to 360 (in two), depth (in one) 218; forebody (in four) 167 to 273, hindbody (in four) 1,205 to 1,959; oral sucker 53 to 91 (in four) by 56 (in two), depth (in one) 43; acetabulum 85 to 123 (in five) by 109 to 119 (in three), depth 75 to 104 (in two), sucker length ratio (in four) 1:1.27 to 1:2; pharynx (in two) 22 to 24 by 16 to 20; esophagus very long, cecal bifurcation (in three) 126 to 460 postacetabular.



FROM FISCHTHAL AND KUNTZ, 1964

Larval forms whose adults are unknown:

1. *Monilicaecum* Yamaguti, 1942

Generic diagnosis. — Family unknown. Body slender, tapering to a sharp point; mouth terminal, without oral sucker; pharynx present; esophagus long, slender. A transversely elongated "stomach" portion with thick granular lining present in front of acetabulum which is embedded in parenchyma in anterior third of body. Ceca moniliform, winding, apparently devoid of epithelial lining, terminating near posterior extremity. No genital anlagen. Excretory vesicle saccular or claviform, with terminal pore.

Genotype: *M. ventricosum* Yamaguti, 1942, in flesh and body cavity of *Cololabis saira;* Pacific coast of Japan.

Monilicaecum-group metacercariae SHIMAZU, 1978

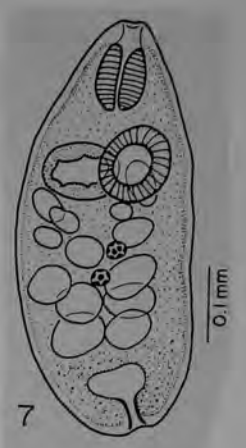
(Figs. 7-10)

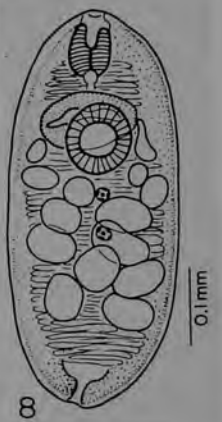
A total of 35 specimens were obtained from five species of chaetognaths: three from *S. enflata* (1–2 Nov. 1972); one from *S. ferox* DONCASTER (12 June 1976); 11 from *S. nagae* ALVARIÑO (9 May 1969, 12–3 June 1976, and 7 Aug. 1976); ten from *S. neglecta* AIDA (26–7 Sept. 1975); two from *S. pacifica* TOKIOKA (1 Nov. 1972 and 26 Sept. 1975); and eight from *S. regularis* AIDA (26–7 Sept. 1975). They were found free commonly in the trunk coelom, or rarely in the head coelom or the ovary, of these hosts, one parasite per one host. The following description is based on 20 better-prepared whole-mounts. Of the 35 specimens 11 have been lost during the preparation.

In the trunk coelom of the fresh raw *S. nagae*, one trematode was observed to wander about and to penetrate through the host's intestinal wall quite easily, probably without injuring it so much (NAGASAWA, pers. comm.).

Specimen Nos. NSMT-Pl-1806 ~ 1827.

Description. Metacercariae, not encysted. Body oval, elongate or not, flattened, 0.100–0.180 mm long by 0.050–0.090 mm wide, when contracted; or spindle-shaped, 0.185–0.383 mm long by 0.042–0.084 mm wide, when extended. Cuticle thick, not spinous, transversely striated. Parenchyma partly transversely vesicular. Oral sucker usually ellipsoidal, sometimes globular, 0.011–0.042 mm long by 0.010–0.023 mm wide, slightly embedded into anteriormost portion of body. Ventral sucker almost round, 0.019–0.042 mm long by 0.020–0.048 mm wide, usually embedded in body parenchyma, near level of anterior third of body. Pharynx not seen. Oesophagus not clearly observed, sometimes forming at its beginning portion a small swelling (? pharynx) about 0.006 mm in diameter in larger specimens. "Stomach" present at intestinal bifurcation, thick-walled, globular or transversely ovoid, anterior, dorsal or lateral to ventral sucker, sometimes enclosed in a transversely rectangular structure nearly as wide as body proper. Intestinal caecum of each side moniliform, consisting of a series of 4–8 inflated chambers, which are very thin-walled and filled with fluid stainable with carmine, become progressively larger towards the posterior end of the



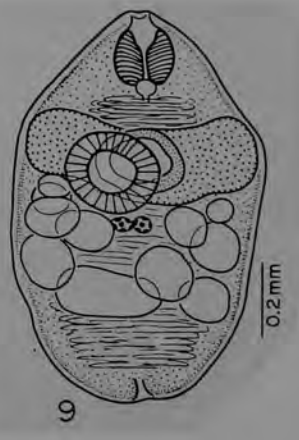


Discussion. The present metacercariae or larvae belong to the group *Monilicaecum* of the family Didymozoidae POCHE, 1907, in possessing the stomach, the chambered intestines, and the ventral sucker. They cannot be identified even to the generic level. The name *Monilicaecum* is in use as a collective larval-group-name (YAMAGUTI, 1970). The group in Hawaiian fishes comprises the larvae representing several different genera and species (YAMAGUTI, 1970).

The host chaetognaths may have acquired the present larvae chiefly by swallowing small infected copepods, presumably the second intermediate host, thus possibly serving as paratenic hosts to transport them to other paratenic hosts such as small fish or to the fish final host itself, when ingested by these animals. YAMAGUTI (1970) has discussed in detail the life history of the Didymozoidae.

REIMER *et al.* (1975) reported didymozoid metacercariae in a copepod, a polychaete, five coelenterates, and eight chaetognaths (*Pterosagitta draco* KROHN, *S. bipunctata*, *S. enflata*, *S. friderici*, *S. hexaptera*, *S. minima*, *S. serratodentata*, and *Spadella* sp.) from the Atlantic Ocean, off North-west Africa. They stated that "Die Exemplare liessen meist eine sog. Magenbildung erkennen, waren also den Larvengenus Torticaecum zuzuordnen." On account of the stomach, however, their larvae are very likely to be placed in the *Monilicaecum*.

DOLLFUS (1960 a) described a metacercaria as a new species, *Metacercaria sagittae*, from *S. inflata* [sic] taken in the Mediterranean Sea, off Algiers. He did not mention whether his trematode had the stomach or not. He stated that "Je ferai seulement remarquer que l'extrémité antérieure avec sa ventouse orale axiale continuée par le pharynx rappelle celle des *Didymocystis* [Didymozoidae], ..." *M. sagittae* is indeed similar to the didymozoid metacercariae known from the invertebrate hosts, but it seems distinct from all of them because of the pharynx larger than the oral sucker. DOLLFUS recognized in his specimen, as small as 0.26 mm long by 0.06 mm wide, two very large, globular testes located symmetrically just behind the ends of the intestines. This is questionable. A re-examination of *M. sagittae* is needed.



-over-

A *Monilicaecum*-group larva (NSMT–Pl–1828) was found free in a plankton sample including chaetognaths (*S. neglecta* and *S. regularis*), copepods, and other lower forms of marine life, taken in Sagami Bay, off Jôgashima, adjacent to Suruga Bay, on 23 June 1977 (NAGASAWA's data). Its morphology and measurements were: somewhat fusiform body 0.171 mm long by 0.050 mm wide; oral sucker curved, not measured; ventral sucker 0.014 mm long by 0.021 mm wide; stomach 0.011 mm long by 0.020 mm wide, enclosed in a glandular structure; intestines 5-chambered; and elongate excretory vesicle 0.030 mm long. It is possible that this larva may have emerged from its host, such as a chaetognath or a copepod, injured during the sampling.

IMMATURE
DIDYMOZOIDS

Kamegaia n. g.
Yamaguti, 1970

GENERIC DIAGNOSIS: Didymozoidae, Didymozoinae. Cyst formed by host tissue, moderately thick. Forebody more or less scoop-shaped; hindbody somewhat convex dorsally and ventrally, crenulated oval in outline, provided all over with numerous lobular protuberances. Oral sucker rudimentary, directly followed by muscular pharynx; esophagus short, bifurcating at level of widest part of forebody. Ceca giving off a number of wide lateral diverticles in hindbody. Testes double, tubular, winding, unbranched, situated near anterosinistral corner of hindbody. Vas deferens winding forward along with metraterm. Genital pore ventrolateral to oral sucker. Ovary consisting of a short stem and five, irregularly bifurcating, very narrow, main branches extending in greater part of hindbody. Receptaculum seminis round, small, near genital junction. Vitelline gland divided into five main branches which bifurcate irregularly and terminate in long or short, terminal tubules, more extensive than ovary. Uterus extending primarily in network-like manner, largely on ventral side of hindbody, giving off one loop or two for each marginal lobe; no egg reservoir; metraterm strongly muscular and convoluted at anterior end of hindbody. Eggs very small, somewhat bean-shaped, embryonated. Encysted in pairs in muscle wall of intestine of marine teleosts.

TYPE SPECIES: *K. kawakawa* n. sp., in beginning of small intestine of *Euthynnus yaito*; Hawaii.

254. ***Kamegaia kawakawa*** n. g., n. sp.

(Fig. 254) Yamaguti, 1970

HABITAT: Encysted in pairs in muscle wall of beginning of small intestine of *Euthynnus yaito* (local name "kawakawa"), to which the pyloric appendages are attached.

HOLOTYPE: U. S. Nat. Mus. Helm. Coll., No. 63825.

DESCRIPTION (based on two, not yet full-grown specimens): Forebody flattened subcylindrical, 1.1-1.9 mm long, enlarged near head end up to about 0.4 mm wide, arising from depression at anterior end of hindbody surrounded by crenulate body folds. Oral sucker rudimentary, 18-35 μ wide, practically terminal, followed directly by acorn-shaped, strongly muscular pharynx 0.09-0.1 mm long by 67-75 μ wide; esophagus contracted and surrounded by gland cells at beginning, sigmoid, wider elsewhere, 0.25 mm long lineally in the type, bifurcating into moderately wide ceca; in the hindbody the two ceca give off a number of wide lateral diverticles, each of which extends into each marginal lobe of the hindbody. No acetabulum. Hindbody somewhat convex laterally and dorsoventrally, provided all over with numerous lobular protuberances, 5.8 X 4.3 mm in holotype. As flattened under cover glass the interlobular space appears as irregular grooves, though not shown in the figure.

Testes double, very long and narrow, unbranched, winding irregularly at left anterior part of hindbody alongside uterine loops, with which they extend at right angles to the surface of the marginal lobes. Vas deferens winding, 30 μ wide, opening together with metraterm ventrolateral to oral sucker, forming a prolapsus in the type.

Ovary consisting of a short stem and five, very narrow, long, main branches which bifurcate irregularly and occupy greater part of hindbody except for anterior extremity and most of testicular area. Genital junction near left edge of hindbody at about equatorial level. Seminal receptacle rounded, about 90 μ in diameter, filled with yolk cells in the type. Vitelline gland divided near genital junction into five, very narrow, long, main branches which bifurcate irregularly and are distributed more extensively than the ovarian branches. No vitelline reservoir. Uterus extending irregularly, largely in ventral part of hindbody in immature worms, giving off one loop or two for each marginal lobe at right angles to the surface, not forming egg reservoir. Metraterm strongly muscular and convoluted in anteriormost marginal lobe surrounding base of forebody, but less muscular distally in forebody. Eggs oval or somewhat bean-shaped, small, embryonated, 12-14 X 7-9 μ. Excretory system not made out.

DISCUSSION: This didymozoid genus is characterized by the body shape and the disposition of the testes, ovary, and vitelline gland. It differs from *Lobatocystis* Yamaguti, 1965, from the same host species in the body being crenulated all around and in the testes being unbranched. It is worth noting that the oral sucker is rudimentary in strong contrast with the pharynx and that the ceca are markedly diverticulate. This genus is named for Mr. Shunya Kamagai in acknowledgment of his tremendous efforts in drafting the complex internal structure of this worm. The specific name refers to the local name of the host.

KAMEGAIA

Koellikeriinae Ishii, 1935

Subfamily diagnosis. — Didymozoidae: Completely or incompletely gonochoristic, with more or less marked sexual dimorphism (male always smaller than female). Encysted in pairs. Body divided into a scoop-shaped forebody and a reniform hindbody but undivided in male of *Tricharchen*. Acetabulum may be present. Ceca terminating in hindbody or forebody. Male: Testes tubular, single or double, in hindbody. Vas deferens winding. Female genitalia rudimentary or lacking in male. Female: Ovary and vitellarium tubular, branched or not, in hindbody. Uterus occupying all available space of hindbody. Excretory vesicle voluminous in hindbody, narrow in forebody, reaching to near intestinal bifurcation. Male genitalia rudimentary or lacking in female (vas deferens only observed).

Key to genera of Koellikeriinae

1. Male filiform throughout, not divided into two regions; testes 4, situated one after another in midregion . *Tricharchen*
   Male divided into two regions as in female; testes single or double, in hindbody 2
2. Testes single; hindbody flattened and folded upon itself *Coeliotrema*
   Testes usually double; hindbody reniform or rounded, lobed or not ..... *Koellikeria*

Koellikeria Cobbold, 1860
Syn. *Wedlia* Cobbold, 1860
Didymostoma Ariola, 1902

Generic diagnosis. — Didymozoidae, Koellikeriinae: With distinct sexual dimorphism. Encysted in pairs. Male lodged in a hollow of female. Body divided in both sexes into a scoop-shaped forebody and a reniform, oval or rounded hindbody which is much larger in the female than in the male. Oral sucker present. Pharynx and acetabulum present or absent. Ceca extending into hindbody. Testes elongate, double, rarely single, occupying greater part of hindbody. Vas deferens may form winding vesicula seminalis in enlarged portion of forebody. Genital pore near oral sucker in both sexes. Ovary and vitellarium tubular, branched, extending in peripheral area. Uterus strongly convoluted and occupying most of hindbody. Parasitic in gill, mouth cavity, esophagus, stomach and anus of marine fishes.

Ishii divided this genus into two subgenera, *Köllikerizoum* and *Wedlia*, according as the acetabulum is present or absent, but this organ being subject to degeneration is not of more than specific significance in the family under consideration.

Genotype: *K. filicollis* (Rud., 1819) Cobb., 1860, in gill of *Brama raji;* Naples, Nice, North Sea, Ireland, Finistère.

Other species:

K. bipartita (Wedl, 1855), syn. *Didymostoma bipartitum* (Wedl, 1855) Ariola, 1902 (Pl. 26, Fig. 345), in gill of *Thynnus vulgaris;* Triest, Nice, Naples.

K. globosa Ishii, 1935, in mouth cavity and esophagus of *Thynnus orientalis. Euthynnus pelamys* and *Seriola quinqueradiata;* Tokyo.

K. orientalis (Yamaguti, 1934), syn. *Wedlia o.* Y., in small and large intestine of *Germo macropterus;* Kuki, Japan. Also in esophagus and stomach of *Euthynnus pelamys;* Kuki and Inland Sea, and in gill, stomach and anus of *Thynnus thynnus*, Toyama Bay, Japan.

K. reniformis Ishii, 1935, in gill of *Thynnus orientalis, Euthynnus pelamys* and *Seriola quinqueradiata;* Tokyo.

Key to species of *Koellikeria* from Hawaiian fishes

Yamaguti, 1970

1. Egg reservoir very prominent, extending whole length of hindbody 2

   Egg reservoir U-shaped in midregion of hindbody; ovarian branches confined to anterior part of hindbody; vitellarian branches confined to greater posterior part of hindbody; parasitic between pyloric ceca . . . . . *K. pylorica*

   Egg reservoir represented by mere dilation of distal portion of uterus in hindbody; ovarian branches lacking at anterior and posterior ends of hindbody; vitellaria extending all over peripheral area of hindbody; parasitic in submaxillary region . . . . . *K. submaxillaris*

2. Vitellarian branches predominantly occupying anterior region of hindbody; parasitic in retrorbital adipose tissue . . . . . *K. retrorbitalis*

   Vitellarian branches predominantly occupying anterior and posterior ends of hindbody; parasitic in body cavity. . . . . *K. abdominalis*

301. *Koellikeria abdominalis* n. sp.

(Fig. 301) Yamaguti, 1970

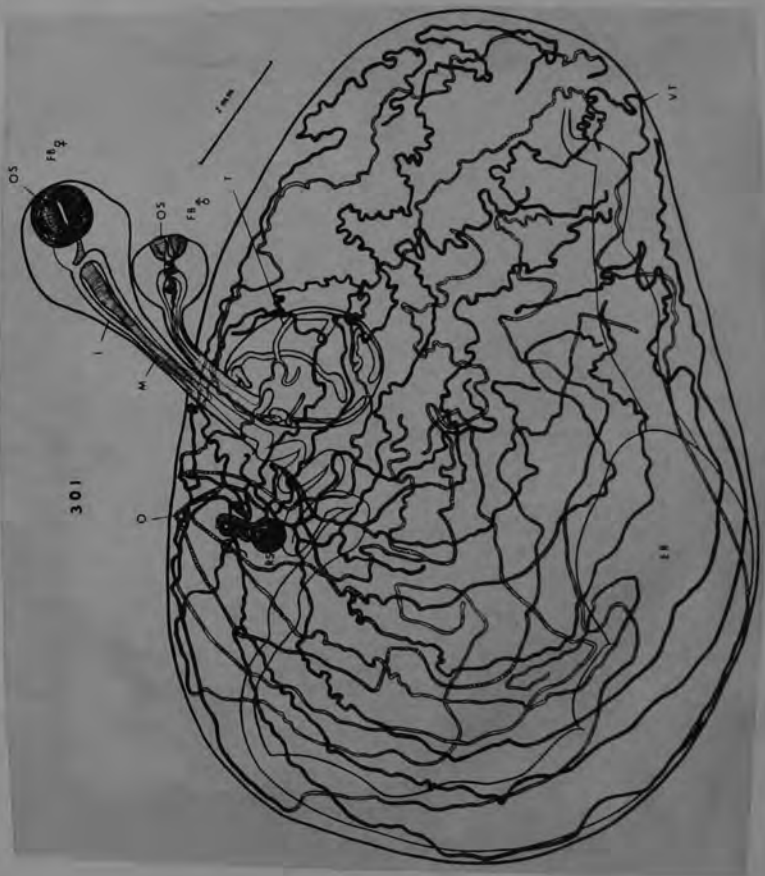
HABITAT: Body cavity of *Neothunnus macropterus*; Hawaii.

HOLOTYPE: U. S. Nat. Mus. Helm. Coll., No. 63860.

DESCRIPTION (based on two whole mounts): MALE. Forebody scoop-shaped, 1.7-1.9 mm long, 0.4-0.6 mm wide in esophago-bifurcal region; hindbody enclosed in hollow of female, occupying oval space (1.2 × 0.95 mm), the anterior end of which lies 0.75 mm posterior to the seminal receptacle of female. Oral sucker terminal, strongly muscular, 0.2-0.25 mm in diameter, directly followed by a small circumscribed muscular swelling of anterior end of esophagus which probably functions as pharynx as in female. Esophagus short; ceca narrow. Testes double, tubular, 60-80 μ wide, winding irregularly along convex side of hindbody. Vasa efferentia joining together at base of forebody of male; seminal vesicle well developed in anterior intercecal field, tortuous, up to 70 μ wide in the type, with its attenuated anterior end opening ventral to oral sucker.

FEMALE. Forebody scoop-shaped like that of male, 2.55 mm long in the type, 0.09-1.2 mm wide in esophageal region. Oral sucker terminal, strongly muscular, 0.45-0.48 × 0.5-0.53 mm, directly followed by bulbous swelling of anterior end of esophagus which is distended with very fine granules stained dark with hematoxylin. Similar granules were also seen in other parts of the esophagus and part of intestine. Esophagus narrow except for its above mentioned anterior swelling; ceca somewhat wider anteriorly, narrow posteriorly, but their terminations in hindbody could not be made out. Hindbody round, rather oval when flattened, 4.4-8.0 × 6.8-13 mm, wider at anterior end than at posterior end. Ovary divided near seminal receptacle into two main branches, of which the left one bifurcates twice into four terminal branches, and the right one gives off three long branches, one of which divides into two terminal branches, thus making a total of eight backwardly directed terminal branches in the type, whose hindbody measures 7 mm by 4.5 mm under cover glass pressure. Seminal receptacle large, rounded, 0.33-0.43 mm in diameter, situated a little anterior to the point where the forebody of the male enters the hollow of the female. In the type the vitelline gland is a little narrower (30-40 μ) than ovary, dichotomously branched as many as several times, finally terminating in the type in 17, very fine, long or short tubules reaching to peripheral area external to uterus. Common stem of vitelline gland unites with that of ovary near seminal receptacle, resulting uterine duct forming double loop near genital junction. In the paratype whose hindbody measures 13 × 8 mm under strong pressure there are 15 (or more) terminal branches of ovary and 31 (or more) terminal branches of vitellaria. This fact shows that the terminal branches of ovary and vitellaria vary greatly according to the body size or age in *Koellikeria*. In the type the initial portion of the uterus is convoluted in the anterior, then middle and posterior, central and peripheral portions of the hindbody and finally leads into the egg reservoir at the posteroventral corner of the hindbody; egg reservoir extending along ventral side (with maximum width of 1.4 mm in the type), then along anterior end of hindbody, where it turns backward to be continued as metraterm; this terminal portion forms several spiral turns before entering the forebody; it describes a sigmoid curve and opens ventral to the oral sucker. Eggs bean-shaped, embryonated, 20-23 × 10-14 μ. Excretory system not made out.

DISCUSSION: This species is characterized by the relatively small number of ovarian branches and very fine, dichotomously branched vitellaria predominantly occupying anterior and posterior ends of hindbody. The specific name refers to the habitat characteristic of this species.



Didymozoidae Poche, 1907

Wedlia orientalis, Yamaguti, 1934

This species was taken from the following habitats.
1. Small and large intestines of Germo macropterus (Kuki; March 30, 1927)
2. Esophagus and stomach of Euthynnus pelamys (Kuki; April 9, 1927)

3. Gill, stomach and anus of *Thynnus thynnus* (Toyama Bay; October 22, 1929).
4. Stomach of *Euthynnus pelamys* (Inland Sea; August 17, 1930).

The cyst is very variable in size according to location. In general the intestinal cysts are smallest and measure about 1.0–2.0 mm in length,

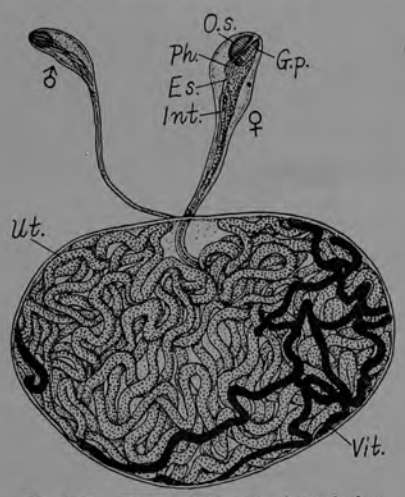


Fig. 136. *Wedlia orientalis*; lateral view. Type, forebody 1.1 × 0.18 mm. (♀). 1.37 × 0.11 mm (♂), hindbody 1.6 × 1.1 mm (♀).

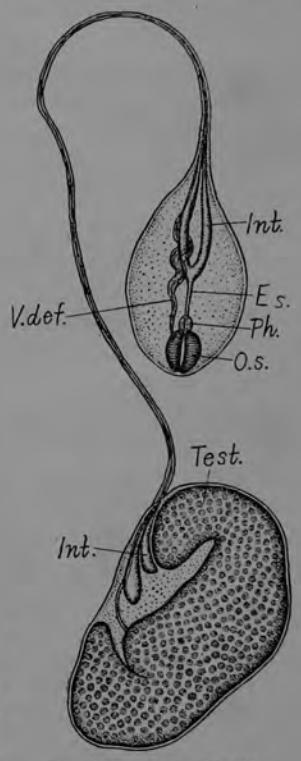


Fig. 137. Male *Wedlia orientalis* liberated from cyst.

while those from the gill or the upper portion of the esophagus are definitely larger.

Since the anatomy of this parasite agrees well with the description given by Odhner for *Wedlia bipartita* (Wedl, 1855), I shall here confine myself to a brief account of the most important characteristics of the worm.

MALE. The forebody, 1.6 × 0.11–0.38 mm, is broadened anteriorly but markedly attenuated posteriorly. The hindbody is bean-shaped and occupied by a relatively large testis. The subterminal oral sucker measures 0.024–0.1 × 0.018–0.088 mm. The small pharynx with poorly deveolped musculature is at most 0.06 mm in diameter. The esophagus bifurcates at about the middle of the cephalic dilatation into simple ceca terminating in the hindbody in voluminous elongated sacs. The testis is vermiform, with its more or less attenuated extremities turning ventrad. The vas deferens

Discussion. This species resembles Wedlia bipartita (Wedl, 1855) so closely that it can only be distinguished by the size of the eggs. According to Odhnerthe eggs of W. bipartita measure 23x14 μ and according to Ariola 21x11.6μ, so that they are definitely larger than in my worm.

302. ***Koellikeria pylorica*** n. sp.

(Fig. 302) Yamaguti, 1970

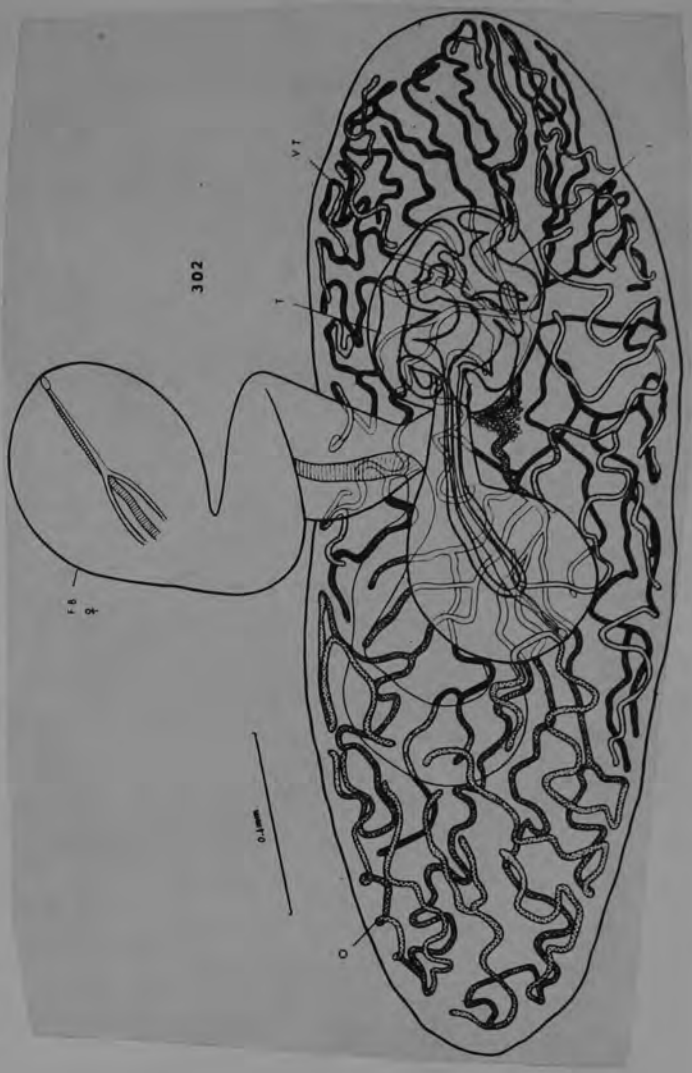
HABITAT: Between pyloric ceca of *Parathunnus sibi*; Hawaii.

HOLOTYPE: U. S. Nat. Mus. Helm. Coll., No. 63861.

DESCRIPTION (based on one mature and two immature specimens): MALE. Forebody scoop-shaped, 0.55-0.6 X 0.2-0.3 mm; hindbody ovoid, 0.4-0.45 X 0.35 mm, enclosed in ventral postequatorial hollow of female hindbody. Oral sucker oval, 23 μ in diameter, weakly muscular; pharynx rudimentary or absent; esophagus 0.11 mm long, bifurcating at widest level of forebody; each cecum cylindrical, winding in hindbody, reaching to posterior extremity. Testes cylindrical, subsymmetrically or irregularly winding, 0.35-0.5 X 0.05-0.06 mm, extending along convex lateral sides of hindbody. Vas deferens running almost straight in forebody, opening midventrally at posterior end of oral sucker. Rudiments of female gonads not detected.

FEMALE. Forebody scoop-shaped, 1.25 mm long by 0.37 mm wide in the type. Oral sucker terminal, musculo-cellular, 28 μ wide; pharynx rudimentary; esophagus 80 μ long; ceca not well traceable in hindbody where they are apparently inflated and run along each convex margin. Hindbody cucumber-shaped, 1.0-2.7 X 0.65-1.2 mm, with rounded extremities. Ovary consisting of a comparatively short stem and four main branches, most of which bifurcate more than once, thus forming 11 terminal branches reaching to periphery of anterior half of hindbody. Vitelline gland consisting, in the type, of a vitelline reservoir, a short stem, and five main branches which divide 2-5 times dichotomously into a total of 47 terminal branches; most of terminal vitelline branches are confined to peripheral area of posterior half of hindbody; reservoir is formed by expansion of distal end of vitelline stem. Genital junction close to anterior end of male hindbody at a postequatorial level. No seminal receptacle observed. Uterus winding throughout hindbody, largely anteroposteriorly inside ovary and vitellaria, finally forming a horseshoe-shaped egg reservoir before entering forebody. Eggs apparently not yet fully developed, small, subglobular, thick-shelled, 8-10 X 7-8 μ in mounted condition. Excretory system not made out.

DISCUSSION: This species is characterized by the branching of the ovary and vitelline gland and their regional distribution in the hindbody. In the related *Koellikeria bipartita* (Wedl, 1855) from the gills of Mediterranean *Thynnus vulgaris*, the ovary and vitelline gland, according to Odhner (1907), are divided into several branches near the genital junction (Text-fig. 5), but their distribution in the hindbody (Pl. fig. 15) is different from that of the present species. No U-shaped egg reservoir is shown in Odhner's figure. The specific name of the present species refers to the location in which it was found.



303. *Koellikeria retrorbitalis* n. sp.

(Fig. 303) Yamaguti, 1970

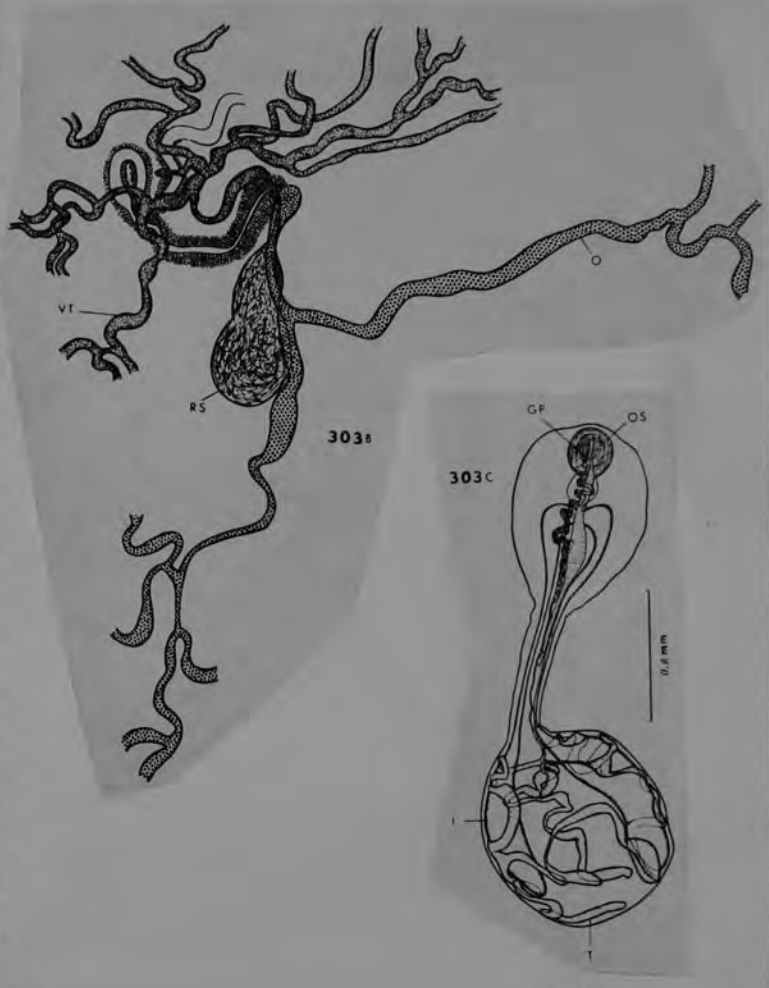
HABITAT: Encysted in pairs in retrorbital adipose tissue of *Parathunnus sibi* (type host) and *Neothunnus macropterus*; Hawaii.

HOLOTYPE: U. S. Nat. Mus. Helm. Coll., No. 63862.

DESCRIPTION (based on six males and seven females, all flattened): MALE. Forebody scoop-shaped, 1.4-5.2 mm long, 0.36-1.1 mm wide in bifurcal region. Hindbody circular, 0.56-3.0 X 0.46-2.5 mm. Oral sucker strongly muscular, globular, 0.13-0.42 mm in diameter, with longitudinal slit-like opening anteroventrally; no muscular pharynx, esophagus may be bulbously expanded, 0.1-0.35 mm long, ceca wide anteriorly, bending backward at right angles, dilated in hindbody and containing brownish ingesta, sometimes eggs too, terminating close to each other at posterior extremity. Testes two, long, tubular, winding irregularly, united anteriorly before entering forebody; each testis usually divided into two branches, sometimes unbranched on one side and trifurcate on the other side, sometimes with accessory branches, making a total of six branches. Vas deferens forming strongly winding seminal vesicle up to 60-100 μ wide in esophago-bifurcal field. Genital pore ventral to posterior end of oral sucker. Female gonads may be seen in some specimens, of which the largest shows a distinct anlage of single tubular ovary as well as of branched tubular vitelline gland. These anlagen are nearly parallel to each other posteriorly, but united anteriorly to form genital junction near the anterior end of the hindbody.

FEMALE. Forebody scoop-shaped as in male, 3.4-6.0 X 0.9-1.3 mm, attached to hindbody near its mid-ventral surface. Oral sucker 0.5-0.67 mm in diameter; pharynx practically absent. Esophagus 0.4-0.5 mm long; ceca narrow in forebody, not traceable in hindbody. Hindbody ovoid, 7-14 X 9-16 mm. Ovary tubular, divided at base of forebody close to seminal receptacle into two (right and left) main branches, each of which bifurcates 3-5 times before terminating into 16 branches near peripheral area of hindbody except for anterior end. Seminal receptacle retort-shaped, 0.45-0.6 X 0.27-0.4mm, almost central, near base of forebody, united with distal end of stem of ovary by a short duct originating from its attenuated end. Vitelline gland consisting of a short sigmoid stem and two main branches which divide dichotomously 3-10 times into 29 terminal branches. These branches extend in the peripheral area of the hindbody almost all over, most predominantly in the anterior region not occupied by the ovarian branches. Uterine duct originating from genital junction, describing a sigmoid curve, and provided with well developed shell gland cells. The proximal portion of the uterus proper occupies the anterior half of the body, the next portion occupies the posterior half, and the distal portion extends windingly along the convex margin from end to end. Eggs bean-shaped, embryonated, 16-20 X 9-12 μ. Excretory system not made out.

DISCUSSION: This species resembles the paratype of *Koellikeria abdominalis* in the number of terminal branches of the ovary and vitellaria, and only differs in the vitellaria predominantly occupying the anterior region of the hindbody and in egg size. In spite of these minor differences, I would like to regard the present species as distinct on the ground that the location of didymozoids is, as far as I am aware, so important that it provides a reliable criterion in distinguishing related forms from the same host speices.



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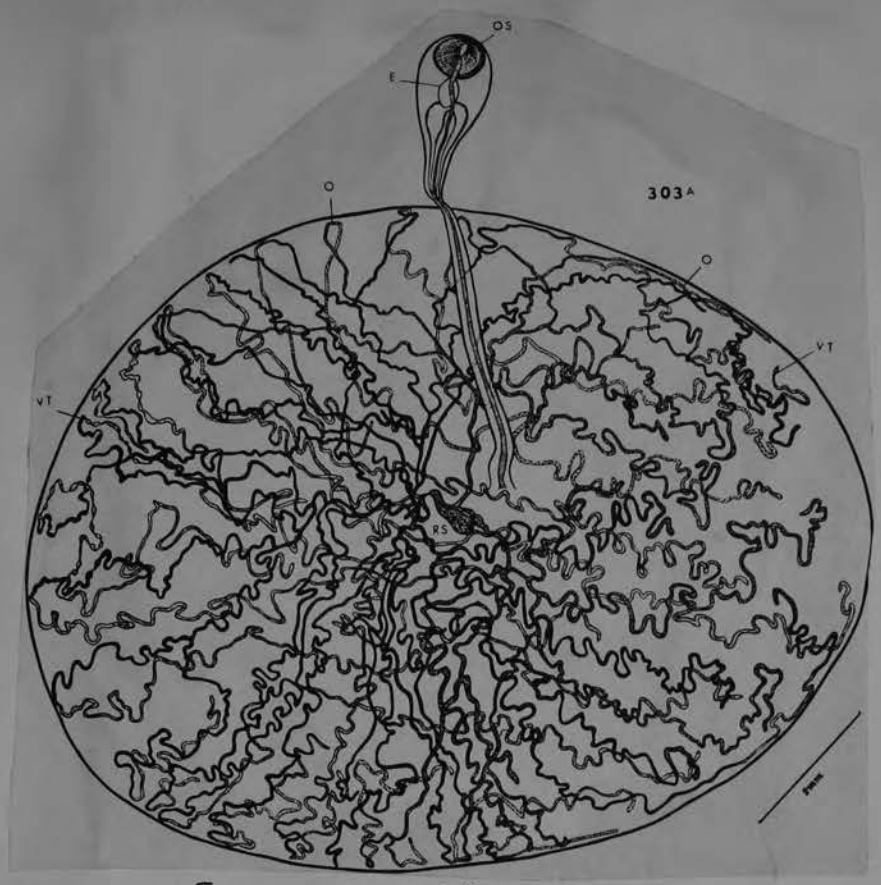


From Yamaguti, 1970

304. *Koellikeria submaxillaris* n. sp.

(Fig. 304) Yamaguti, 1970

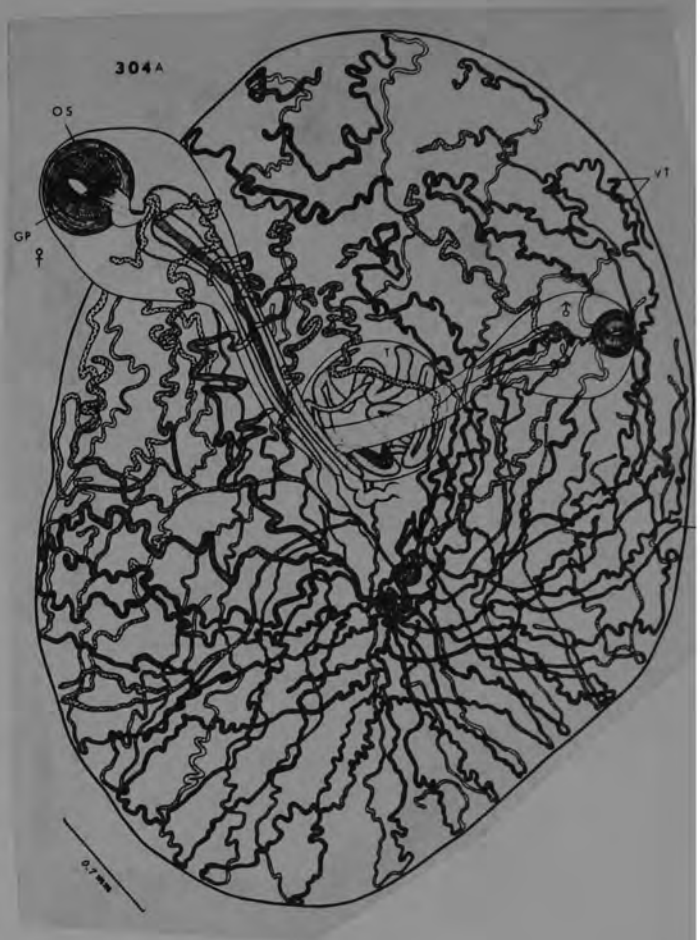
HABITAT: Encysted in pairs in submaxillary region posteroventral to maxillary-palatine articulation or beneath membrane medial to hypohyal of *Neothunnus macropterus* (type host) and *Parathunnus sibi*; Hawaii.

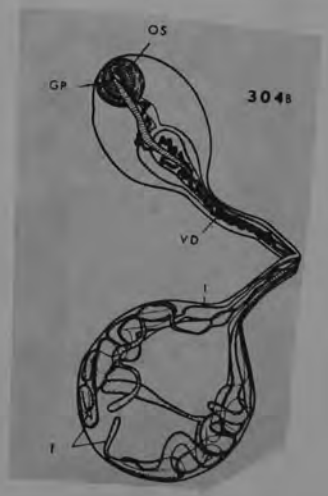
HOLOTYPE: U. S. Nat. Mus. Helm. Coll., No. 63863.

DESCRIPTION (based on ten males and seven females, all flattened): MALE. Forebody scoop-shaped, 1.5-6.4 mm long, 0.6-1.0 mm wide in esophago-bifurcal region. Hindbody oval, 0.95-2.3 X 0.6-2.2 mm, embedded in hollow of female hindbody beside base of forebody of female. Oral sucker large, muscular, 0.2-0.38 X 0.26-0.44 mm; pharynx practically absent; esophagus 0.15-0.4 mm long; ceca narrow in forebody, much swollen and winding in lateral part of hindbody, ending close to each other at posterior extremity. Testes paired, tubular, very long and winding along lateral margin of hindbody, with or without short branches. Vas deferens winding in median field; seminal vesicle twisted, largely in postbifurcal region. Genital pore ventral to oral sucker.

FEMALE. Forebody scoop-shaped, attached to hindbody very close to the hollow, in which the male hindbody is enclosed, 2.5-7.0 mm long, 0.8-1.2 mm wide. Oral sucker very large, 0.45-0.7 X 0.5-0.8 mm; pharynx practically absent; esophagus 0.2-0.5 mm long, often sigmoid, occasionally bulbous at its anterior end; ceca swollen and spirally winding in hindbody as in male. Hindbody oval, 3.5-8 X 3.6-11 mm. Ovary consisting of short right and left stems; in the type the right stem bifurcates two to four times and the left one to five times, making a total of 15 terminal branches, all of which extend toward the marginal area. Seminal receptacle variable in shape, 0.1-0.4 X 0.06-0.25 mm; its center situated in the type about 0.5 mm anterior to anterior margin of above-mentioned hollow. Vitelline gland consisting, in the type, of a central cistern lying a little anterior to seminal receptacle and three anterior and several posterior branches dividing into a total of 24 terminal branches. These branches extend all over the peripheral area of the hindbody, without predominance in a particular body region. Uterine coils occupying all available space of hindbody. Egg reservoir represented by dilation of distal portion of uterus in hindbody before entering forebody. Eggs bean-shaped, embryonated, 18-23 X 11-14 μ. Excretory system not determined.

DISCUSSION: This species is characterized by the long, winding, branched testes and the profusely branched vitellaria and ovary. The specific name refers to the location of the parasite.





KOELLIKERIA

Koellikerioides n. g.
Yamaguti, 1970

GENERIC DIAGNOSIS: Didymozoidae, Koellikeriinae. Enclosed in pairs in round or elongate cysts of host origin; male lodging in central hollow of female hindbody. Forebody scoop-shaped in both sexes; hindbody small, gobular or reniform in male, globular or elongate pisiform in female. Oral sucker strongly developed, muscular; pharynx rather poorly or moderately well developed; esophagus short; ceca extending into hindbody. Testes single; vas deferens opening ventral or ventrolateral to oral sucker. Ovary divided into 2-4 tubular branches. Vitelline gland divided into four to 14 terminal branches. Receptaculum seminis present. Uterus strongly convoluted, occupying all available space of hindbody; metraterm well differentiated, usually accompanied by narrow vas deferens and opening ventral to oral sucker. Eggs bean-shaped, embryonated. Parasitic in gastrointestinal wall or gill region of marine teleosts.

TYPE SPECIES: *K. internogastricus* n. sp., in *Parathunnus sibi* (type host) and *Neothunnus macropterus*; Hawaii.

OTHER SPECIES: *K. apicalis* n. sp., at tip of gill raker of *Parathunnus sibi*; Hawaii.

K. externogastricus n. sp., in *Neothunnus macropterus* (type host) and *Parathunnus sibi*; Hawaii.

K. intestinalis n. sp., in *Parathunnus sibi*; Hawaii.

Key to species of *Koellikerioides* from Hawaiian fishes
Yamaguti, 1970

Encysted lengthwise on inner surface of intestine;
ovary trifurcate ..... *K. intestinalis*
Encysted in stomach wall; ovary bifurcate
Encysted in inner muscule layer of stomach;
vitellaria with 5 terminal branches ..... *K. internogastricus*
Encysted in outer muscle layer of stomach;
vitellaria with 12-14 terminal branches ..... *K. externogastricus*
Encysted at tip of gill raker; ovary quadrifurcate;
vitellaria with about 10 terminal branches ..... *K. apicalis*

308. *Koellikerioides apicalis* n. sp.

(Fig. 308) Yamaguti, 1970

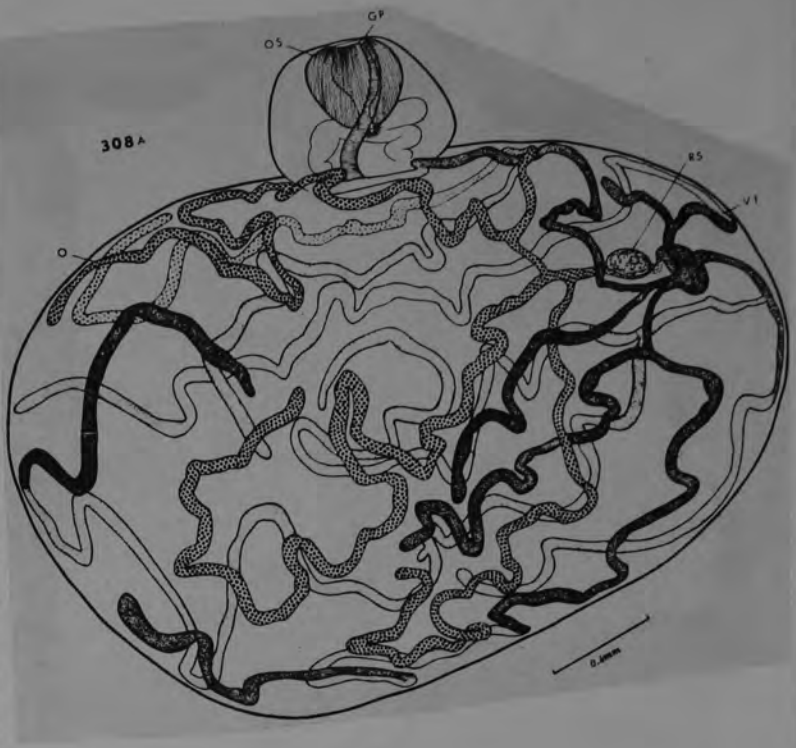
HABITAT: Encysted in pairs at tip of gill raker of *Parathunnus sibi*; Hawaii.

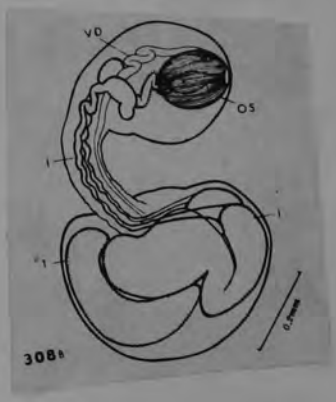
HOLOTYPE: U. S. Nat. Mus. Helm. Coll., No. 63867.

DESCRIPTION (based on three males and seven females, all flattened): MALE. Forebody scoop-shaped, 0.5-0.6 mm long, up to 0.25-0.32 mm wide in esophago-bifurcal region. Oral sucker rounded, muscular, 0.14-0.2 × 0.13-0.18 mm, with terminal opening, pharynx gobular, 40 μ in diameter in the type; esophagus winding, about 0.1 mm long; ceca inflated at beginning, conspicuously inflated in hindbody. Hindbody convex-concave, 0.45-0.6 × 0.35-0.45 mm. Testes single, 0.4-0.55 × 0.1-0.11 mm, sausage-shaped, curved along convex side. Vas deferens opening on left margin of oral sucker in the type.

FEMALE. Forebody scoop-shaped, 1.3-1.5 mm long, 0.5-0.7 mm wide at esophago-bifurcal level. Oral sucker 0.25-0.35 × 0.29-0.38 mm, followed by small muscular pharynx; esophagus sigmoid, 0.2-0.25 mm long; ceca narrow in forebody, but wide and spirally coiled, 1.85-2.8 × 1.4-1.9 mm. Ovarian stem bifurcating three times, making a total of four long, winding, terminal branches ending posterior to middle of hindbody. Seminal receptacle oval, 0.1-0.15 × 0.1 mm, situated near anterior extremity of hindbody. Vitelline gland consisting, in the type, of an inflated common stem turned back on itself and three (one right, one left, and one posterior) main branches; the right branch gives off a short side branch and terminates at the posterior extremity, but the left one bifurcates two times to form three terminal branches, whereas the posterior divides near the stem into two branches, each of which soon bifurcates, so that there are four terminal branches altogether for this posterior main branch. Uterine coils occupying all available space of hindbody; no definite egg reservoir. Eggs bean-shaped, embryonated, 23-26 × 11-14 μ. Excretory system unknown.

DISCUSSION: This species bears a certain resemblance to *Koellikerioides intestinalis* n. sp., but its confinement to the tip of the gill raker seems to justfy its separation as a distinct species. The specific name refers to its peculiar habitat.





306. *Koellikerioides externogastricus* n. sp.

(Fig 306) Yamaguti, 1970

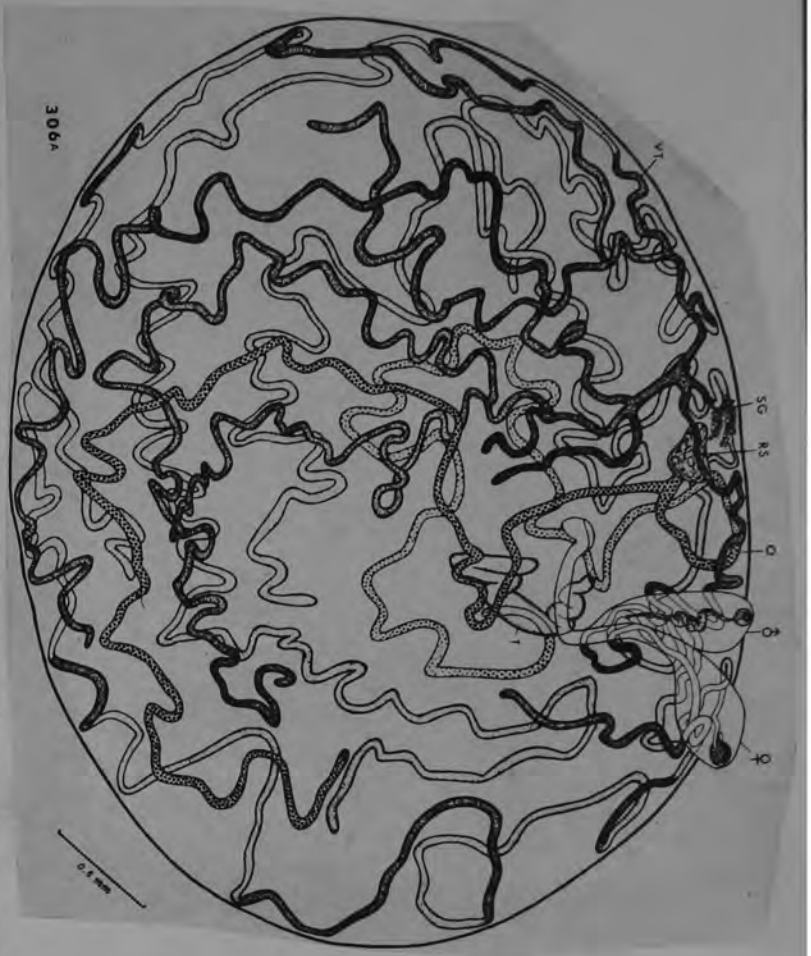
HABITAT: Encysted in outer muscle layer of stomach wall of *Neothunnus macropterus* (type host) and *Parathunnus sibi*; Hawaii.

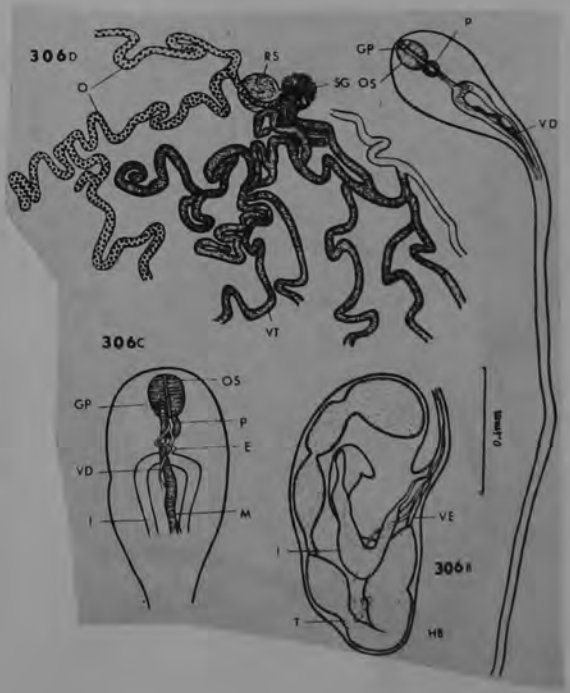
HOLOTYPE: U. S. Nat. Mus. Helm. Coll., No. 63865.

DESCRIPTION (based on 15 male and seven female specimens): MALE. Forebody scoop-shaped, 0.08-3.6 × 0.19-0.4 mm, widest at esophago-bifurcal level. Oral sucker terminal, strongly muscular, longer than wide, 80-110 × 70-95 μ, with ventroterminal aperture; pharynx weakly muscular, 32-58 × 30-58 μ; esophagus somewhat undulating, variable in length, 58 μ long in the type; ceca narrow in forebody, but enlarged in hindbody and terminating near posterior extremity. Hindbody reniform, up to 0.9 × 0.4 mm, enclosed in ventral hollow of female hindbody posterior to seminal receptacle. Testes single, cylindrical, up to 1.45 × 0.16 mm, sometimes irregularly constricted, curved along convex side of hindbody, giving off vas deferens at its anterior end. Vas deferens up to 50-120 μ wide, sigmoid in bifurcal and postbifurcal regions of forebody, opening ventral to oral sucker.

FEMALE. Forebody scoop-shaped, 1.2-3.2 mm long, 0.28-0.5 mm wide in esophago-bifurcal region, attached to hindbody along with male. Oral sucker 0.1-0.18 × 0.07-0.17 mm; pharynx 58-104 × 56-100 μ; esophagus narrow, sigmoid, 80-130 μ long; ceca narrow in forebody, not traceable in hindbody. Hindbody rounded, 5-8 × 4.5-7 mm under moderate cover glass pressure. Ovary consisting of a short stem and two simple, long, winding branches 40-80 μ wide, one branch extending in the right peripheral area of hindbody, and the other in the left peripheral area. Vitelline stem bifurcating four or five times, making a total of 12-14, long or short, terminal branches, occupying whole peripheral area of hindbody. Seminal receptacle 0.26-0.28 × 0.14-0.21 mm, situated close to anterodorsal surface of hindbody, shortly anterior to the hollow enclosing male hindbody. Uterine coils occupying whole hindbody internal to ovarian and vitellarian branches. Egg reservoir may be seen running longitudinally along midventral surface of hindbody. Metraterm well differentiated, opening ventral to oral sucker. In the paratype shown in Fig. 306 C a narrow vas deferens is seen alongisde the metraterm. Eggs bean-shaped, embryonated, 18-21 × 11-14 μ. Excretory system unknown.

DISCUSSION: This species differs from *Koellikerioides internogastricus*, type species of the genus, in the vitellarium terminating in more than a dozen branches instead of five. The specific name refers to the particular location in the stomach wall of the host.





305. ***Koellikerioides internogastricus*** n. g., n. sp.

(Fig. 305) Yamaguti, 1970

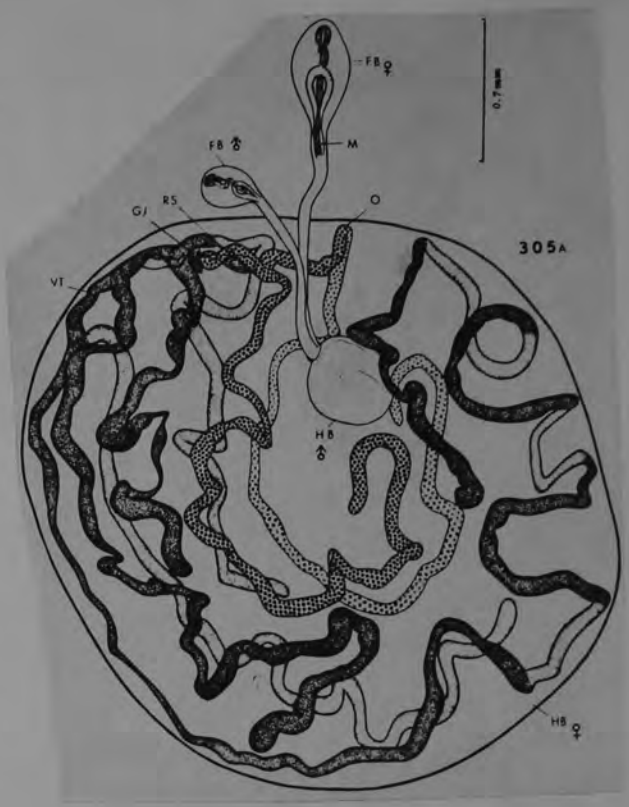
HABITAT: Encysted in inner muscle layer of stomach wall of *Parathunnus sibi* (type host) and *Neothunnus macropterus*; Hawaii.

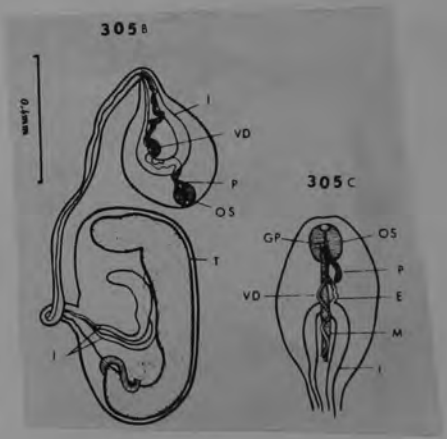
HOLOTYPE: U. S. Nat. Mus. Helm. Coll., No. 63864.

DESCRIPTION (based on 27 flattened whole females and five isolated males): MALE. Forebody scoop-shaped, 0.06-2.1 mm long, 0.09-0.3 mm wide in esophago-bifurcal region, filiform elsewhere. Hindbody reniform, 0.36-0.74 × 0.19-0.43 mm, lodging in a hollow of female hindbody, from which it can be easily pressed out. Oral sucker oval to elliptical, muscular, 46-116 × 39-100 μ, directly followed by weakly developed pharynx 18-46 μ in diameter. Esophagus very variable in length; ceca narrow in forebody, elongate saccular in hindbody. Testes single, elongate cylindrical, arcuate or horseshoe-shaped, 60-240 μ wide, extending along convex side of hindbody. Vas deferens winding and distended with sperm to a width of 30-60 μ in postbifurcal region, opening ventral to oral sucker or pharynx.

FEMALE: Forebody similar in shape to that of male, though a little wider in esophago-bifurcal region, 0.06-1.3 × 0.16-0.32 mm, hindbody about 3.0 × 2.7 mm in holotype. Oral sucker 81-116 × 76-102 μ; pharynx weakly muscular, 23-46 μ in diameter esophagus 0.035-0.1 mm long; ceca narrow in forebody, not traceable in hindbody. Ovary consisting of a short stem and two moderately long tubular branches 40-90 μ wide; latter extending winding, one on each side, surrounding central area of hindbody. Vitelline gland divided into five terminal branches 30-110 μ wide, extending in convex peripheral area of hindbody; one branch resulting from last dichotomy unusually long in the type. Seminal receptacle retort-shaped. Genital junction close to anterodorsal surface of hindbody. Uterus winding irregularly and occupying all available space of hindbody internal to ovary and vitelline gland, not forming egg reservoir before entering forebody. Metraterm well differentiated in median field of forebody, opening ventral to oral sucker. A narrow vas deferens often distended with sperm may be seen overlapping metraterm. Eggs bean-shaped, embryonated, 16-19 × 10-13 μ. Excretory system not made out.

DISCUSSION: This genus differs from the most closely related *Koellikeria* Cobbold, 1860 in the male possessing a single testis instead of two, though the two are similar in other respects. On the basis of this difference I prefer to separate it as a new genus, for which the name *Koellikerioides* is proposed on account of its close relationship with *Koellikeria*. The specific name refers to the particular location in the stomach wall of the host.





307. *Koellikerioides intestinalis* n. sp.

(Fig. 307) Yamaguti, 1970

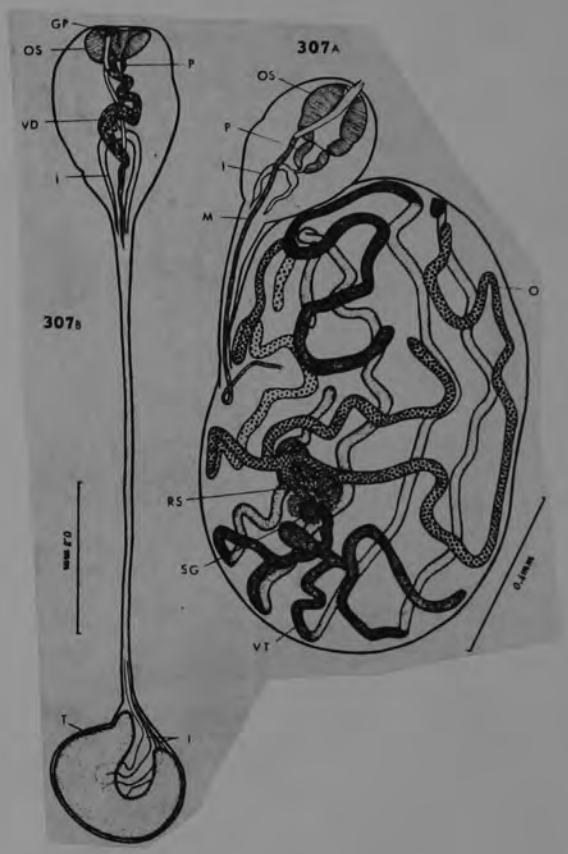
HABITAT: Encysted lengthwise on inner surface of small intestine of *Parathunnus sibi*; Hawaii.

HOLOTYPE: U. S. Nat. Mus. Helm. Coll., No. 63866.

DESCRIPTION (based on seven males and 16 females): MALE. Forebody scoop-shaped, 0.5-1.85 mm long, up to 0.13-0.33 mm wide at level of esophagus. Oral sucker terminal, rounded, 60-160 μ in diameter; pharynx 23-63 μ in diameter; esophagus narrow, 50-140 μ long; ceca inflated and curved in hindbody alongside testis. Hindbody rounded, comparatively small, 0.18-0.35 × 0.15-0.3 mm, enclosed in ventral hollow at about middle of female hindbody. Testis single, sausage-shaped, curved along convex margin of hindbody, 0.25-0.8 × 0.08-0.12 mm; vas deferens arising from one end of testis, swollen and winding in median field in postbifurcal and esophageal regions, opening ventral to oral sucker. Anlage of female gonad not observed, but a straight, apparently nonfunctional metraterm is seen along the distal portion of the vas deferens (Fig. 307 B).

FEMALE. Forebody scoop-shaped, 0.45-0.9 × 0.1-0.42 mm, arising from near equatorial region of hindbody. Oral sucker terminal, muscular, globular, 0.08-0.17 × 0.06-0.16 mm, directly followed by globular muscular pharynx 28-105 μ in diameter; esophagus very short; ceca not traceable in hindbody. Hindbody elongate pisiform, with rounded ends, 0.6-2.35 × 0.5-1.4 mm. Ovary consisting of three tubular branches 35-80 μ wide and a short stem, by which it unites with the stem of the vitelline gland at about one-third of length of hindbody from the anterior extremity; the left branch runs backward on the left side of the hindbody around the base of the forebody and after turning back on itself terminates near the posterior extremity; the other two branches extend backward on the right side of the hindbody, the shorter medial one terminating near the end of the longest vitelline branch and the right one reaching the posterior extremity. Vitelline gland consisting of a short stem and five tubular terminal branches 30-70 μ wide; the extreme right and left are short, and the long other three extend along the dorsal side and reach the posterior extremity, where the longest middle one turns back on itself and terminates on the ventral side near the end of the above mentioned medial branch of the ovary. All the ovarian and vitellarian branches do not intertwine one another because of their being confined to restricted areas. Seminal receptacle elongate saccular, opening into genital junction. Uterine coils occupying whole hindbody inside ovary and vitelline gland, without forming a definite egg reservoir; metraterm running straight to genital pore lying ventral to anterior end of oral sucker, where it forms prominent prolapsus in the type. Eggs bean-shaped, 16-19 × 9-12 μ. Excretory system not made out.

DISCUSSION: This species differs from *Koellikerioides internogastricus* and *K. externogastricus* (see above) in the ovary consisting of three branches. One of the five vitelline branches is very long, like that of *K. internogastricus*. The elongate pisiform shape of the female hindbody and the location on the inner surface of the intestine of the host are also important differential characteristics.



KOELLIKER IOIDES

PEN-TAB

LOOSE LEAF INDEX

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Lagenocystis n. g.
Yamaguti, 1970

GENERIC DIAGNOSIS: Didymozoidae, Didymozoinae. Complete hermaphrodites enclosed in pairs in a lageniform cyst, with hindbodies pressed against each other, with the anterior ends of two partners face to face in strong contrast with *Didymocystis*, in which the posterior end of the hindbody of one partner shuts down against the anterior end of the hindbody of the other partner. Forebody flattened subcylindrical, not scoop-shaped anteriorly. Hindbody flattened ventrally, convex dorsally, more markedly attenuated at anterior end than at posterior end, devoid of genital organs at extreme anterior end. Oral sucker and pharynx rather poorly developed; ceca narrow throughout. Common genital pore ventral to oral sucker. Testes elliptical, tandem on one side of hindbody in midregion. Ovary tubular, divided into two winding branches which extend in opposite directions. Vitellaria tubular, divided into several (nine in the type species) branches extending all over hindbody except for anterior end. Receptaculum seminis elongate. Uterine duct containing developing ova, convoluted near anterior end of hindbody. Uterus proper occupying all available space, most of central area, of hindbody; egg reservoir saccular. Eggs bean-shaped, embryonated. Parasitic on inner intestinal wall of marine teleosts.

TYPE SPECIES: *L. katsuwoni* n. sp. in *Katsuwonus pelamys*: Hawaii.

252. *Lagenocystis katsuwoni* n. g., n. sp.

(Fig. 252) Yamaguti, 1970

HABITAT: Encysted in pairs on inner intestinal wall of *Katsuwonus pelamys*; Hawaii.

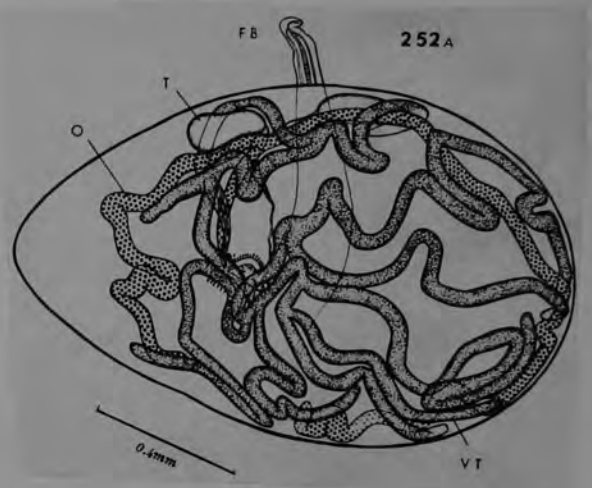
HOLOTYPE: U. S. Nat. Mus. Helm. Coll., No. 63823.

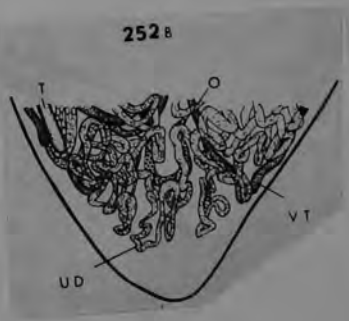
DESCRIPTION (based on 18 whole mounts): Cyst lageniform, supplied with capillary network from host. Forebody subcylindrical, blunt, 0.2-0.5 mm long by 60-150 μ wide near head end, where it is more or less enlarged, attached to ventral side of hindbody slightly anterior to its equator, usually projecting well beyond lateral margin of hindbody. Hindbody oval to pyriform, flattened on ventral side, by which the two partners are in direct contact with each other, rounded at posterior end but blunt-pointed in front. Oral sucker terminal, 13-28 μ in diameter, musculocellular, directly followed by globular, weakly muscular pharynx 9-19 μ in diameter; esophagus short, 30-80 μ long; ceca narrow in forebody, slightly wider in hindbody, but not traceable to their ends.

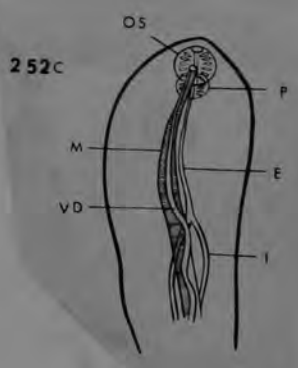
Testes elongate, 70-210 × 65-116 μ, situated tandem in midregion of hindbody on convex side opposite the point where the forebody is attached to the hindbody. Vasa efferentia short, uniting together near distal ends of testes; vas deferens long, straight, often distended with sperm proximally to a maximum width of 25 μ, running distally along metreterm. Common genital pore immediately ventral to oral sucker.

In the type the ovary consists of a comparatively long stem running posterolaterad from the genital junction and two unequal branches 30-40 μ wide, one of which terminates near the equatorial zone, the other of which reaches a little further forward. In one paratype, however, the ovary divides into two, long, widely divergent branches quite differently from that of the type. Genital junction pre-equatorial. Seminal receptacle elongate, rather claviform. Initial portion of uterus containing well stainable ova is convoluted in anterior part of hindbody; uterus proper occupying all available space of hindbody, leaving narrow free space in front. Metraterm forming voluminous saccular egg reservoir before entering forebody, in which it is provided with weak transverse muscles and runs forward in the median field. Eggs bean-shaped, 12-18 × 9-14 μ. Excretory system not made out. Vitelline gland divided dichotomously in dorsal peripheral area, near convex margin of hindbody, into nine terminal tubules which are 30-50 μ wide and extend all over the convex surface of the hindbody, but not over the ventral surface. Excretory system not made out.

DISCUSSION: This species differs from the related *Didymocystoides oesophagicola* n. sp. from esophagus of *Neothunnus macropterus* in the distribution of the vitelline gland. In *D. oesophagicola* the branching of the vitelline gland is limited to the extreme anterior part of the hindbody, the seminal receptacle is very conspicuous, and the genital junction lies close to the anterior extremity of the hindbody, whereas in the present species the vitelline gland divides dichotomously mostly in the equatorial and pre-equatorial region, and the genital junction lies always well apart from the anterior attenuated end of the hindbody. The most outstanding features are that the convoluted uterine duct is confined to the anterior attenuated part of the hindbody and that the extreme anterior end of the hindbody is entirely devoid of internal organs. This genus is further characterized by the lageniform cyst and the forebody being attached to the hindbody on its ventral side well apart from the anterior end. All these features combined justify the creation of a new genus, for which I propose the name *Lagenocystis* with the following diagnosis. The attributive of the compound generic name refers to the shape of the cyst.







LAGENOCYSTIS

Lepidodidymocystis Yamaguti and Kamegai, 1969

GENERIC DIAGNOSIS. Didymozoidae, Didymozoinae. Complete hermaphrodites, encysted in pairs. Forebody small, flattened claviform, attenuated anteriorly, attached to hindbody near its anterior end, papillated at head end, and finely annulated elsewhere. Hindbody smooth, approximately semicircular, truncate at anterior end, conical at posterior end, with distinct longitudinal furrow on concave side, where a cup-shaped, weakly muscular acetabulum is present near base of forebody. Oral sucker terminal, weakly muscular; pharynx spherical, muscular, with well developed postpharyngeal gland cells behind. Esophagus long, narrow, surrounded by small glandular cells throughout its length, bifurcating as it enters hindbody. Ceca strongly winding, terminating at posterior extremity of hindbody. Testes two, tubular, winding in anterior half of hindbody close to concave side; vas deferens narrow, not forming definite seminal vesicle, ciliated just before uniting with metraterm. Common genital pore opening at apex of prominent truncate genital papilla ventral to oral sucker. Ovary single, tubular, long, undivided, winding in axial region of hindbody and reaching to near its posterior end. Vitelline gland tubular, long, undivided, winding from extreme posterior end of hindbody to its anterior end, where it turns backward to join anterior end of ovary, so that genital junction lies near truncate anterior end of hindbody. Seminal receptacle present. Uterus occupying all available space of hindbody, forming four longitudinal loops before leading into conspicuous egg reservoir which extends longitudinally along concave side of hindbody; metraterm well differentiated, ciliated inside throughout its length. Eggs operculate, thick-shelled, not embryonated *in utero*. Excretory system not made out. Parasitic underneath scales, especially below lateral line, of marine teleosts.

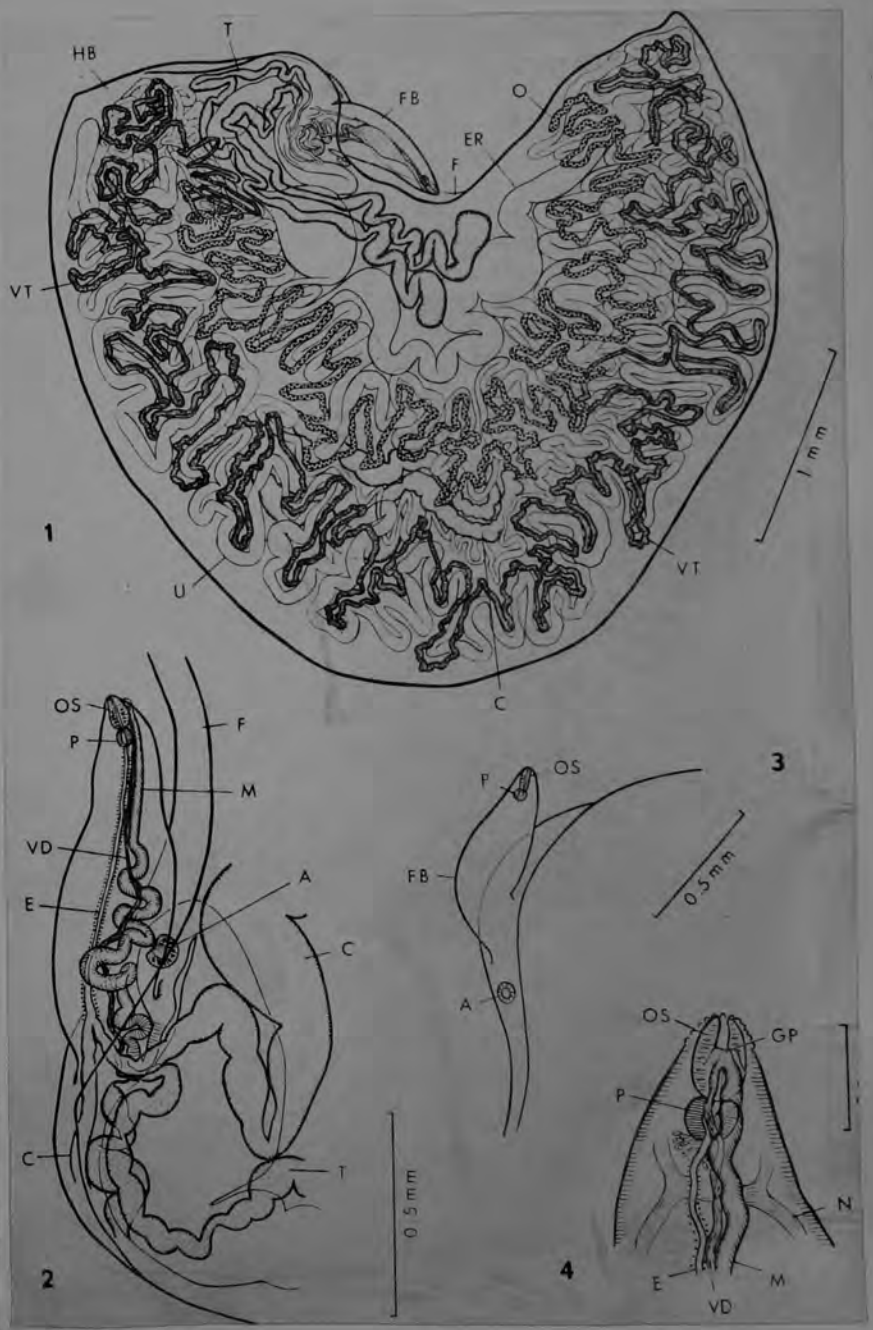
Type species: *Lepidodidymocystis irwini* n. g., n. sp. in *Menticirrhus nasus*; N. Mazatlan. Forebody 0.53-0.82 × 0.13-0.32 mm, hindbody 3.6-5.1 × 2.44-3.58 mm; eggs 12-15 × 9-11 μ.

Didymozoidae

Lepidodidymocystis irwini Yamaguti and Kamegai, 1969

Description

Based on 20 whole mounts. Cysts flattened circular, about 3-5 mm in diameter. Forebody flattened claviform, conspicuously papillated at head end, finely annulated for remaining part, 0.53-0.82 mm long with maximum width of 0.13-0.32 mm posterior to its middle, whence it tapers gradually forward to a more or less sharp point, attached to anterior end of hindbody on its concave side. Hindbody flattened, semicircular, truncate anteriorly and rather pointed posteriorly, 3.6-5.1 × 2.44-3.58 mm; forebody embedded in a distinct longitudinal furrow on concave side of hindbody. Oral sucker terminal, oblong, 66-82 × 43-52 μ, weakly muscular, directly followed by spherical muscular pharynx 42-49 μ in diameter. Immediately behind pharynx clustered large claviform pharyngeal gland cells, with attenuated ends converging toward posterior end of pharynx. Esophagus narrow, 0.46-0.87 mm long, provided with a coat of small glandular cells throughout its length, bifurcating immediately as it enters hindbody; ceca lined with epithelia, strongly winding throughout length of hindbody and terminating at its posterior end. A cup-shaped, weakly muscular acetabulum 59-91 μ in diameter lies on concave side of hindbody near base of forebody. Testes paired, long, tubular, winding, usually close to each other, rarely divergently in anterior part of hindbody near concave side; in type they reach just beyond equatorial level, with their ends somewhat swollen. Vas deferens narrow throughout its length, without forming a definite seminal vesicle, distinctly ciliated just before uniting with metraterm at base of genital papilla. Genital papilla projecting prominently ventral to oral sucker, 25-40 μ in diameter, flattened at apex where wide common genital pore opens. Ovary a single, long, narrow tubule, 23-53 μ wide, irregularly winding in axial region of hindbody, reaching to near its posterior end. Vitelline gland also a single, irregularly winding, narrow tubule, 30-67 μ wide, extending on convex side of hindbody to its extreme posterior end, its anterior portion turns back on itself at truncate anterior end of hindbody and after describing several turns joins proximal end of ovary. This end is often swollen like proximal end of vitelline gland; seminal receptacle 74-178 × 45-97 μ, situated at this genital junction. Uterine duct provided with a thick coat of gland cells, runs sinuously forward to recurrent portion of vitelline gland, where it passes to uterus proper, the latter winding backward to posterior end of the hindbody and then forward to anterior end of hindbody and once more backward, to lead into egg reservoir near the posterior extremity, thus forming four loops altogether and occupying greater part of hindbody; egg reservoir cylindrical, sinuous, close to concave side of hindbody; metraterm well differentiated in forebody, distinctly ciliated inside throughout its length. Egg oval, thick-shelled, operculate, 12-15 × 9-11 μ, ova contained in metraterm not yet embryonated, almost all in 2-cell stage. Excretory system not made out.



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Abstract

A new didymozoid belonging to Didymozoinae Ishii, 1935, is described. It is named after its collector, Mr. Roy Irwin, a graduate student at Tulane University. It was found underneath the scales below the lateral line of a marine teleost, *Menticirrhus nasus* (Gunther, 1868), from N. Mazatlan. The generic name refers to this special habitat. The most outstanding features of this trematode include: (1) flat semicircular hindbody with a distinct longitudinal furrow on concave side, (2) acetabulum present, (3) common genital pore opening at truncate apex of prominent genital papilla, (4) long esophagus, (5) single undivided ovary and single undivided vitelline gland, (6) cylindrical sinuous egg reservoir, (7) metraterm ciliated throughout its length, and (8) eggs not embryonated when laid.

Discussion

In general internal anatomy and habitat this genus bears a marked resemblance to *Dermatodidymocystis* Yamaguti (especially *D. viviparoides* Yamaguti) (in press) but differs from it in the possession of: (1) a longitudinal furrow and an acetabulum on the concave side of the hindbody, (2) a prominent genital papilla ventral to the oral sucker, (3) a uterus regularly forming four longitudinal loops before leading into a prominent egg reservoir, and (4) unembryonated eggs, an important character since most other didymozoid eggs are generally embryonated *in utero*. There is no doubt that the genus in question belongs in the Didymozoinae. It is named in reference to the special habitat (beneath the scales), and defined as follows:

GENERIC DIAGNOSIS. Didymozoidae, Didymozoinae. Complete hermaphrodites, encysted in pairs. Forebody small, flattened claviform, attenuated anteriorly, attached to hindbody near its anterior end, papillated at head end, and finely annulated elsewhere. Hindbody smooth, approximately semicircular, truncate at anterior end, conical at posterior end, with distinct longitudinal furrow on concave side, where a cup-shaped, weakly muscular acetabulum is present near base of forebody. Oral sucker terminal, weakly muscular; pharynx spherical, muscular, with well developed postpharyngeal gland cells behind. Esophagus long, narrow, surrounded by small glandular cells throughout its length, bifurcating as it enters hindbody. Ceca strongly winding, terminating at posterior extremity of hindbody. Testes two, tubular, winding in anterior half of hindbody close to concave side; vas deferens narrow, not forming definite seminal vesicle, ciliated just before uniting with metraterm. Common genital pore opening at apex of prominent truncate genital papilla ventral to oral sucker. Ovary single, tubular, long, undivided, winding in axial region of hindbody and reaching to near its posterior end. Vitelline gland tubular, long, undivided, winding from extreme posterior end of hindbody to its anterior end, where it turns backward to join anterior end of ovary, so that genital junction lies near truncate anterior end of hindbody. Seminal receptacle present. Uterus occupying all available space of hindbody, forming four longitudinal loops before leading into conspicuous egg reservoir which extends longitudinally along concave side of hindbody; metraterm well differentiated, ciliated inside throughout its length. Eggs operculate, thick-shelled, not embryonated *in utero*. Excretory system not made out. Parasitic underneath scales, especially below lateral line, of marine teleosts.

Type species: *Lepidodidymocystis irwini* n. g., n. sp. in *Menticirrhus nasus*; N. Mazatlan. Forebody 0.53-0.82 × 0.13-0.32 mm, hindbody 3.6-5.1 × 2.44-3.58 mm; eggs 12-15 × 9-11 μ.

LEPIDODIDYMOCYSTIS

Lobatocystis ~~n. gen.~~ YAMAGUTI, 1965

GENERIC DIAGNOSIS: Didymozoidae, Didymozoinae. Forebody scoop-shaped, hindbody flattened into triangular form, with one margin usually lobed and the other two margins straight. Oral sucker contiguous with pharynx; esophagus slender, bifurcating at level of widest part of forebody. Ceca probably terminating near posterior end of hindbody. Testes divided into eight long, unbranched tubules radiating from junction of vasa efferentia in anterior part of hindbody. Vas deferens winding forward in forebody along with metraterm and opening together with latter ventral to oral sucker. Ovary divided into slender branches reaching to peripheral area of hindbody. Receptabulum seminis retort-shaped. Vitellaria tubular, very slender, branched, intertwined among ovary and uterus, though extending mostly in peripheral area. Uterus strongly convoluted, occupying all available space of hindbody, without forming egg reservoir before entering forebody; eggs very small, somewhat bean-shaped, thin-shelled. Encysted in pairs in gill arch of marine teleosts.

TYPE SPECIES. *L. yaito* n. sp., in *Euthynnus yaito*; Hawaii.

DISCUSSION: This new genus is characterized by the peculiar shape of the hindbody which is usually lobed on one side, the multiple testes being radially arranged in the anterior part of the hindbody, and the ovary, uterus, and vitellaria being intertwined throughout the hindbody. It is defined as follows.

8. ***Lobatocystis yaito*** ~~n. gen., n. sp.~~ YAMAGUTI, 1965
Fig 8

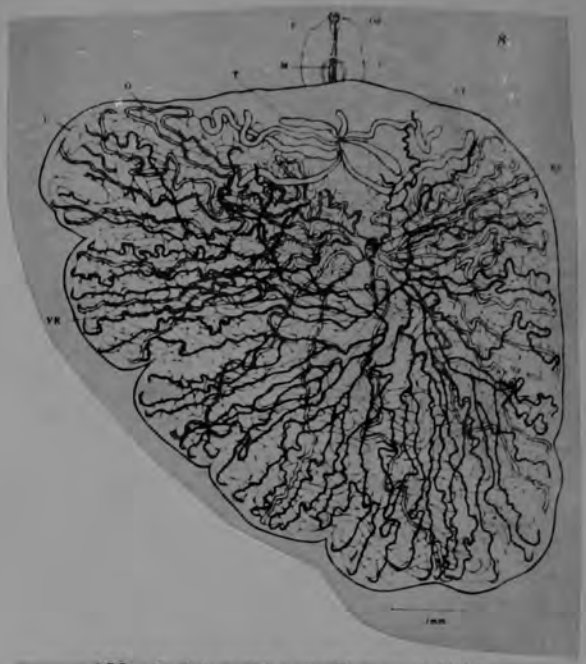
HABITAT: Encysted in pairs in gill arch of *Euthynnus yaito* (local name "kawakawa"); Hawaii.

HOLOTYPE: U. S. Nat. Mus. Helm. Coll., S.Y. No. 26

DESCRIPTION (based on five whole mounts): Body flat, approximately triangular, with its convex side usually divided into six hemispherical lobes, and its flat anterior edge in direct contact with the corresponding edge of its fellow-occupant of the cyst; the forebody arising from this side is pressed flat against the flat surface of the hindbody, another rather flat side of the hindbody being on the same plane as the corresponding side of the other partner, so that the two individuals are enclosed in an elongated, flattened hemispherical cyst. Forebody scoop-shaped, 1.5–2.6 mm in length, with maximum width of 0.74–1.05 mm at level of intestinal bifurcation. Oral sucker prominent, 0.11–0.16 × 0.12–0.18 mm, directly contiguous to pharynx, latter 0.14–0.2 × 0.13–0.2 mm; the two organs appear like a single organ. Esophagus slender, 0.2–0.5 mm long; ceca narrow in forebody, but inflated in hindbody and apparently terminating near posterior extremity.

Testes divided into eight long, tubular, unbranched lobes which are arranged radially from posterior end of vas deferens at base of forebody, the length of the lobes varying from 0.5 to 1.3 mm, and the width from 0.09 to 0.15 mm in the type. Vas deferens winding forward along with metraterm and opening together with latter ventral to oral sucker.

Ovary tubular, slender, irregularly ramified in the central region, sending slender branches into each marginal lobe. It is not possible to make out how many branches there are, because of their being intertwined with uterine coils and vitelline tubules. In *Didymocystis* the ovarian tubules are confined to a particular portion of the hindbody, but in the present genus they extend throughout the hindbody without being confined to a particular region. Receptaculum seminis retort-shaped, 0.25 mm in diameter, situated near the point where the main ovarian tubes meet and join the vitellarian stem. Vitellaria divided into numerous branches, which finally reach the peripheral area of the hindbody, where they form loops ending blindly. Uterus strongly convoluted, looping back on itself many times close to surface of each marginal lobe as well as on other sides, but not forming a definite egg reservoir before leading into metraterm. Metraterm well provided with circular muscles, running straight forward in intercecal field of forebody. Eggs small, somewhat bean-shaped, thin-shelled, 12.5–15 × 7.5 μ.



255. *Lobatocystis yaito* Yamaguti, 1965
(Fig. 255) Yamaguti, 1970

HABITAT: Encysted in pairs in gill arch of *Euthynnus yaito* (local name "kawakawa"); Hawaii.

HOLOTYPE: U. S. Nat. Mus. Helm. Coll., No. 63525.

DESCRIPTION (based on 5 whole mounts): Body flat, approximately triangular, with its convex side usually divided into six hemispherical lobes, and its flat anterior edge in direct contact with the corresponding edge of its fellow-occupant of the cyst; the forebody arising from this side is pressed flat against the flat surface of the hindbody, another rather flat side of the hindbody being on the same plane as the corresponding side of the other partner, so that the two individuals are enclosed in an elongated, flattened hemispherical cyst. Forebody scoop-shaped, 1.5-2.6 mm in length, with maximum width of 0.74-1.05 mm at level of intestinal bifurcation; hindbody about 7 X 5 mm in holotype. Oral sucker prominent, 0.11-0.16 X 0.12-0.18 mm, directly contiguous to pharynx, latter 0.14-0.2 X 0.13-0.2 mm; the two organs may appear like a single organ. Esophagus slender, 0.2-0.5 mm long; ceca narrow in forebody, but inflated in hindbody and apparently terminating near posterior extremity.

Testes divided into eight long, tubular, unbranched lobes which are arranged radially from posterior end of vas deferens at base of forebody, the length of the lobes varying from 0.5 to 1.3 mm, and the width from 0.09 to 0.15 mm in the type. Vas deferens winding forward along with metraterm and opening together with latter ventral to oral sucker.

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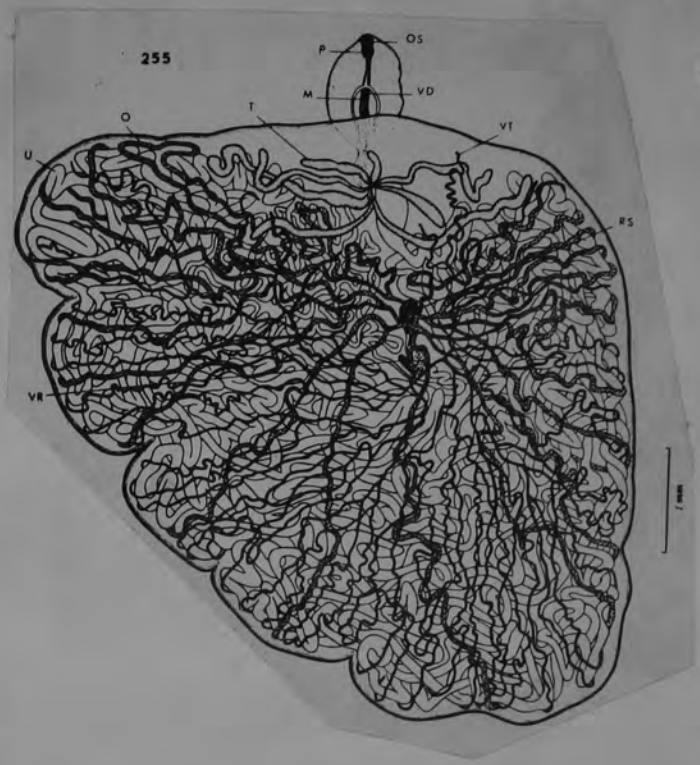
Ovary tubular, slender, irregularly ramified in the central region, sending slender branches into each marginal lobe. It is not possible to make out how many branches there are because of their being interwined with uterine coils and vitelline tubules. In *Didymocystis* the ovarian tubules are confined to a particular portion of the hindbody, but in the present genus they extend throughout without being confined to a particular region. Receptaculum seminis retort-shaped, 0.25 mm in diameter, situated near the point where the main ovarian tubes meet and join the vitelline stem. Vitellaria divided into numerous branches, which finally reach the peripheral area of the hindbody, where they form loops ending blindly. Uterus strongly convoluted, looping back on itself many times close to surface of each marginal lobe as well as on other sides, but not forming a definite reservoir before leading into metraterm. Metraterm well provided with circular muscles, running straight forward in intercecal field of forebody. Eggs small, somewhat bean-shaped, thin-shelled, 12.5-15 × 7.5 μ.

DISCUSSION: This genus is characterized by the peculiar shape of the hindbody which is usually lobed on one side, the multiple testes being radially arranged in the anterior part of the hindbody, and the ovary, uterus, and vitellaria being interwined throughout the hindbody. For the diagnosis of the genus, see *Pacific Science* 19(4): 472.



From Yamaguti, 1970

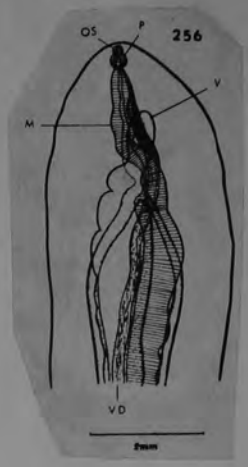
LOBATOCYSTIS

Lobatozoum Ishii, 1935

Generic diagnosis. — Didymozoidae, Didymozoinae: Complete hermaphrodite enclosed in pairs in a moniliform cyst, one end of which is somewhat pointed and the other is thicker and rounded. Body divided into a slender forebody and a long hindbody, whose outer margin forms a series of a dozen hemispherical lobes in mature adults. Forebody projecting from hindbody about middle of smooth inner margin. Pharynx present. One cecum runs to one end of hindbody, while the other runs to the other end. No acetabulum. Testes long, situated divergently in hindbody, one on either side of base of forebody. Genital pore beside oral sucker. Ovary consisting of two opposed stems, each of which has two long and one or two short branches. Vitellaria with two long and a few shorter branches. Uterus occupying all available space of hindbody. Parasitic in marine fishes.

Genotype: *L. multisacculatum* Ishii, 1935 (Pl. 27, Fig. 363), on gills of *Thynnus orientalis* and *Euthynnus pelamys*: Pacific, Japan.

256. *Lobatozoum multisacculatum* Ishii, 1935
(Fig. 256) Yamaguti, 1970



HABITAT: Encysted in pairs on gills of *Katsuwonus pelamys*; Hawaii.

DESCRIPTION (based on four whole mounts): Forebody 2.1-4.7 X 0.3-0.36 mm, attached to middle of hindbody. Oral sucker terminal, circular, muscular, 28-30 μ in diameter; pharynx spherical, 37-42 μ in diameter; esophagus short, 0.14-0.3 mm long, surrounded by gland cells. Ceca could not be definitely traced to their termination, but each cecum appears to end at the extreme end of the hindbody as described by Ishii. No acetabulum. Hindbody 16-19 mm long, up to about 2 mm wide, with about ten hemispherical bulges. The following account of the internal structure of the hindbody is based on a young adult 17 mm long, in which the hemispherical bulges are not yet developed, but in which the distribution of the genital organs was clearly discernible. The two tubular testes extend along the even side of the hindbody, one being about 5.5 mm long by 0.1 mm wide and the other 4.4 mm long by 0.16 mm wide (2.067-2.385 mm long by 79 μ broad after Ishii). They do not meet at the base of the forebody as illustrated by Ishii, but they are separated one from the other by a distance of about 0.8 mm, and the two vasa efferentia are definitely unequal, 0.7 mm and 0.15 mm in respective length. The genital pore is stated and figured by Ishii to be in contact with the lip, but in our specimen it lies exactly ventral to the pharynx.

Ovary consisitng of a short stem situated vertical to long axis of hindbody and two (an anterior and a posterior) short main branches, each of which gives off a side branch before dividing into two long terminal branches reaching to near the anterior or the posterior extremity respectively. There are, therefore, two side branches and four terminal branches altogether in strong contrast with Ishii's figure (Fig. 36), in which only those long branches unite near the shell gland. According to Ishii the four principal vitelline filaments lie roughly parallel to the ovaries nearer to the even border of the hindbody than to the corresponding ovaries. In our specimen there are also four long winding vitelline branches, but nearer to the side opposite the even side. The uterus winds back and forth several times from one end of the hindbody to the other, and finally enters the forebody without forming egg reservoir in the hindbody; metraterm in forebody conspicuously muscular and winding. Eggs bean-shaped, embryonated, 12-15 X 7-10 μ.

DISCUSSION: As far as my observation is concerned, in the present species the genital pore does not lie on the lateral border of the oral lip, as illustrated by Ishii in his figure, but is definitely ventral to the pharynx, and there are six ovarian terminal branches instead of three.


LOBATOZOUM