1990

Binder 100, Hemiuridae Lectithasterinae P-Z [Trematoda Taxon Notebooks]

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The genus Progonus Looss,1899 (Syn.:Genarches Looss,1902; Genarchopsis Ozaki,1925) as noted by Srivastava (1933) differs from Derogenes only in that the ceca unite posteriorly.

The "Genarches mülleri " and "Genarches infirmus" of Linton (#### (1940) are very doubtful members of the genus Progonus. In the former the ends of the ceca were not mentioned or figured, while in Genarches infirmus the ceca end blindly. The description of a cirrus sac enclosing both prostatic gland and seminal vesicle in G.infirmus is doubtless an error and that species appears to belong to Derogenes.

HEMIURIDAE

Syncoeliinae ?
Derogenetinae

PROGONUS Looss,1899

Synonym: Genarches Looss,1902

Small, with elongated,flattened, narrowed at both ends, body. Suckers well developed, skin smooth. Esophagus almost lacking. Genital pore at hind edge of pharynx. Genital sinus short,pars prostatica and seminal vesicle not greatly elongated, the latter not reaching behind ventral sucker. Testes and ovary globular. Vitellaria likewise simple, compact, and not divided, on each side of ovary. Eggs 56 μ long. Stomach dwellers. Type species P.mulleri (#Levinsen) .

Modified diagnosis by Srivastava (1933): Small distomes with elongated,flattened or cylindrical body tapering at both ends; suckers strongly developed; skin entire. Prepharynx present, esophagus absent, ceca continuous into each other at the hind end of body. Genital pore near the hind end of the pharynx or behind the intestinal bifurcation; genital sinus is formed by the union of the male and female ducts and opens on a genital papilla; pars prostatica and the seminal vesicle not strikingly elongated and the latter does not reach the acetabulum. Testes and ovary simple, rounded or oval. Vitellaria consist of two glands which may be lobed or compact,lying one on either side close behind the ovary. The uterine convolutions may or may not stretch back up to the hind end of vitellaria. Excretory system as typical of the subfamily i.e.Y-shaped with the cornua uniting dorsal to the oral sucker or pharynx. Parasitic in the intestine and stomach of fresh-water and marine fishes.

Srivastava considers Genarchopsis Ozaki,1925 a synonym of Progonus. He gives the following key to species.

Uterus extends behind the shell gland mass reaching up to the posterior part of vitellaria.....1

Uterus does not extend posteriorly up to the vitellaria.....2

1. Genital pore at hind end of pharynx.....P.mulleri
#. Genital pore a little behind the intestinal bifurcation.....P.ovocaudatum

2. Uterine coils confined to intercecal space....P.goppo
Uterine coils not confined to intercecal space but extending to body wall on either side.....P.pisicola

Genarchopsis

HEMIURIDAE

Progonus mülleri (Levinsen,1881) Looss

From Odhner 1905:
Length 1.3 to 2. Width 0.37 to 0.4
Oral sucker 0.15 to 0.18
Ventral sucker 0.32 to 0.4
Ceca unite.
Short esophagus
Pharynx 0.085,globular
Genital pore median,behind pharynx. Genital papilla or cone as in Derogenes. No cirrus sac. Small seminal vesicle with muscular walls.
Testes round, not exactly at same level.
Vitellaria spherical, not lobed, a little smaller then the other glands.
Seminal receptacle present.
Laurer's canal without outer opening.
Uterus extends backward then foward. Eggs thin shelled, 54 to 60 by 25 to 29 µ.
Testes preovarian. Uterus partly post-ovarian
Hosts: Cottus scorpius
Gadus morrhua f.ovak

eggs without filament

Progonus muelleri (Levinsen, 1881) Looss, 1899

SYNONYMS: *Distoma muelleri* Levinsen, 1881
Genarches† *muelleri* (Levinsen) Looss, 1902
Genarchopsis muelleri (Levinsen) Yamaguti, 1953.

HOSTS AND LOCALITIES

Anarhichas lupus, stomach, (1/8),
Green Bank (45°N., 55°W.; depth 82 m).

†*Progonus* Looss, 1899, was considered to be preoccupied by *Progona* Berg, 1882, an insect, and a replacement name *Genarches* Looss, 1902, was proposed. ICZN Art. 56(*a*) states that two names differing in only one letter are not to be considered homonyms and, therefore, *Progonus* stands.

Artediellus uncinatus, stomach, (1/5),
Hamilton Inlet Bank (54°N., 55°W.; depth 176 m).

Glyptocephalus cynoglossus, stomach, (1/6),
Banquereau (45°N., 57°W.; depth 180 m).

Hippoglossoides platessoides, stomach, (1/13),
Banquereau (45°N., 57°W.; depth 180 m).

Lepidion eques, stomach, (1/1),
St. Pierre Bank (46°N., 57°W.; depth 340 m).

Limanda ferruginea, stomach, (5/5),
Sable Island Bank (43°N., 61°W.; depth 92 m).
(44°N., 61°W.; depth unknown).
Grand Bank (46°N., 51°W.; depth 180 m).

Lophius americanus, stomach, (1/2),
St. Pierre Bank (46°N., 57°W.; depth 192 m).

Lumpenus lampretaeformis, stomach, (3/6),
Hamilton Inlet Bank (54°N., 54°W.; depth 188 m).
Grand Bank (47°N., 52°W.; depth 172 and 168 m).

Lycodes reticulatus, stomach, (2/3),
Grand Bank (47°N., 48°W.; depth 172 m).
(47°N., 52°W.; depth unknown).

Lycodes vahli, stomach, (3/7),
Grand Bank (48°N., 50°W.; depth 168 m).
(47°N., 52°W.; depth 172 m).
(46°N., 51°W.; depth 80 m).

Myoxocephalus scorpius, stomach, (2/2),
Green Bank (45°N., 55°W.; depth 82 and 88 m).

Reinhardtius hippoglossoides, stomach, (1/4),
Hamilton Inlet Bank (54°N., 54°W.; depth 192 m).

Triglops murrayi, stomach, (6/12),
Grand Bank (47°N., 48°W.; depth 172 m).
(49°N., 51°W.; depth 188 m).
(47°N., 52°W.; depth 168 m).
Banquereau (45°N., 57°W.; depth unknown).

Urophycis tenuis, stomach, (1/2),
St. Pierre Bank (46°N., 57°W.; depth 192 m).

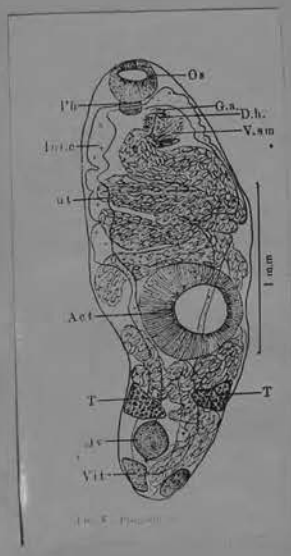
Although there are no previous records of this parasite in eastern Canadian waters it has been recorded in the nearby areas of west Greenland (Levinsen 1881, Brinkmann 1975) and Massachusetts (Linton 1940). Its distribution also includes the northeast Atlantic Ocean, the Arctic Ocean and the north Pacific Ocean. It is probably more common than at present appreciated as it is, as Brinkmann (1975) points out, easily confused with *Derogenes varicus*. Brinkmann tabulates an admirable summary of the points of difference between the two species, of which the cyclocoel and the thin-shelled eggs of *P. muelleri* are probably the most readily recognized.

From BRAY, 1979

HEMIURIDAE

Progonus ovocaudatum Srivastava, 1933

1.5 to 2.3 by 0.5 to 0.8
Oral sucker 0.048 to 0.64
Ventral sucker 0.096 to 0.12 in middle of body
Genital pore median just behind intestinal bifurcation.
Small contractile genital papilla.
Excretory system as in other species.
Pharynx 0.01 in diameter. No esophagus. Ceca unite in front of vitellaria.
Testes somewhat triangular, partly extracecal, slightly asymmetrical, in middle of post-acetabular portion. Seminal vesicle a curved tube lying in two turns to right of midline.
Ovary close behind left testis. Shell gland complex median, behind ovary, just in front of intestinal arc.
Laurer's canal present. Seminal receptacle absent.
Uterus well developed, extending posteriorly between vitelline glands to posterior end of body.
Eggs numerous, golden yellow, 37 by 17 μ, with a small polar filament at hind end.
Vitellaria compact, symmetrical, in posterior end and behind intestinal anastomosis.
Host: Ophiocephalus punctatus
intestine
Locality: Allahabad



Progonus pisicola Srivastava, 1933

Size 3.3 to 3.4 by 1.12. Uniformly borad anterior to acetabulum, tapering posteriorly.
Oral sucker 0.33 to 0.34
Ventral sucker 0.66 to 0.68 posterior to midbody.
Pharynx 0.12 to 0.14. No esophagus. Ceca unite posteriorly.
Excretory vesicle Y-shaped, crura unite dorsal to pharynx.
Genital pore sinistral or median, at level of pharynx.
Genital cone present.
Testes extracecal, slightly oblique, shortly behind ventral sucker
Seminal vesicle free in parenchyma well anterior to ventral sucker.
Ovary intracecal behind right testis.
Vitellaria asymmetrical, post-ovarian, compact, unlobed.
Laurer's present. Seminal receptacle absent.
Uterus does not extend posteriorly beyond shell gland complex.
Eggs golden yellow, 48 by 15 μ bearing a polar filament 0.04 mm. in length.
Hosts: Ophiocephalus punctatus.
stomach
Locality: Allahabad

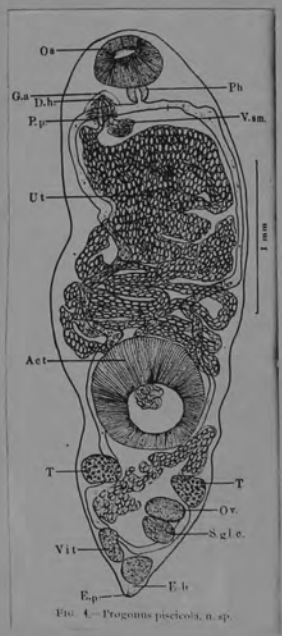


FIG. 4.—Progonus pisicola, n. sp.

PROGONUS

HEMIURIDAE

Subfamily Lecithasterinae

Prolecitha obesa, n. gen., n. sp. (Figs. 6-7) Manter, 1961

Dichadena obesa (Manter, 1961) Manter, 1969

HOST: houndfish or needlefish (Belonidae).

NUMBER: 3

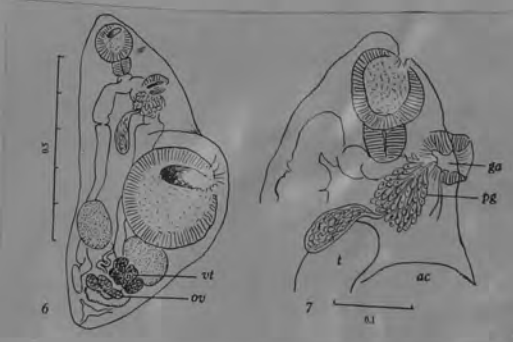
LOCATION: intestine.

HOLOTYPE: U. S. Nat. Mus. Helminth. Coll. No. 39448.

DESCRIPTION: (based on 3 specimens, 1 without eggs; 2 with few eggs): Body smooth, spindle-shaped, cylindrical, widest at acetabular level near midbody, tapering toward each end almost to a point; ecsoma lacking; length 0.684 to 0.944; width 0.368 to 0.435. Oral sucker 0.100 to 0.114, acetabulum 0.268 to 0.288; sucker ratio 1 : 2.5 to 2.6. Forebody 0.301 to 0.455, or almost ½ body length. Pharynx 0.064 to 0.072 long by 0.064 wide; esophagus very short; ceca wide, with deep constriction near middle of forebody, extending to near posterior end of body where one or both bend inward to meet the other but not fusing. Testes large, usually longer than wide, slightly diagonal to symmetrical, overlapping acetabulum, either one or both may be dorsal to acetabulum. Seminal vesicle an elongate sac, immediately preacetabular, narrowing to become a tube, pars prostatica, surrounded by well developed prostatic gland forming spherical mass of cells free in parenchyma. Sinus sac lacking. Genital atrium more or less spherical, with very thick muscular walls forming sucker-like structure (Fig. 7) which may be partially protruded. Ovary deeply trilobed with lobes directed more or less anteriorly, near posterior end of body. Vitellaria preovarian, consisting of 7 rounded, separated lobes, side by side between ovary and testes, usually 3 ventral and 4 dorsal vitellaria, overlapping testes. Uterus entirely preovarian; eggs in early stages of development; most mature ones 8 to 13 by 8 to 10 microns. Excretory vesicle with very short median stem, forking at level of posterior ends of ceca.

DISCUSSION: This genus is a member of the Lecithasterinae because of its smooth body, lack of ecsoma, and 7-partite vitellaria. It is most like *Aponurus* and *Lecithophyllum* which possess rounded separated vitellaria. However, it is clearly distinctive in that the vitellaria are anterior to the ovary. In no other hemiurid are the vitellaria entirely preovarian, hence the name *prolecitha*. It differs from *Aponurus* and *Lecithophyllum* also in its large, muscular genital atrium and lobed ovary.

DIAGNOSIS OF PROLECITHA: Lecithasterine with 7 rounded, preovarian vitelline lobes; ovary trilobed; testes preovarian; genital atrium forming a protrusible, very muscular, sucker-like structure. *Type species: P. obesa*, from marine fishes (Belonidae) in Fiji.



Immature form collected from muscles of silversides, Pranesus capricornensis, by John C. Pearson Heron Isl. Aug. 1963 A123

Dichadena obesa **(Manter, 1961) n. comb.**

Manter, 1969

SYNONYMS: *Prolecitha obesa* Manter, 1961; new synonymy. *Prolecitha beloni* Nagaty and Abdel Aal, 1962; new synonymy.

HOSTS AND LOCALITIES: One adult specimen from *Tylosurus leiurus* (Bleeker) ?; needlefish; Belonidae; New Caledonia. One immature specimen in muscles of *Pranesus capricornis* Woodland, 1961; Atherinidae; hardyhead; Heron Isl., Australia.

LOCATION OF ADULT: Intestine.

DISCUSSION: The immature specimen was collected by Dr. J. C. Pearson at Heron Island in 1963. It reveals characters which led me to restudy paratypes of *Prolecitha obesa* from Fiji. The most outstanding of the characters was the union of the two ceca to form a cyclocoel at or near the level of the ovary. The ends of the ceca are obscured by eggs or by the ovary in most of the Fijian specimens but one shows such union clearly. A seminal receptacle is present.

Siddiqi and Cable (1960) showed that in *Dichadena* Linton, 1910, the ceca unite dorsal to the ovary. The vitellaria are preovarian, the ovary lobed, and a seminal receptacle is present. These characters also occur in *Prolecitha* Manter, 1961, which now does not seem to deserve generic rank and is considered a synonym of *Dichadena* Linton, 1910.

Dichadena obesa differs from *D. acuta* Linton, 1910, in its much shorter hindbody, much shorter pars prostatica, preacetabular seminal vesicle, and smaller eggs. The figure of *Prolecitha beloni* from *Belone strongylurus* (= *Tylosurus strongylurus* (Van Hasselt)) in the Red Sea suggests a cyclocoel. What the authors interpreted as excretory arms were probably the uniting ceca. The ovary is four-lobed in the New Caledonian and Australian specimens and a 4th lobe is present in at least one of the Fijian specimens. The other characters which supposedly separate *P. beloni* from *P. obesa* are individual variations seen in Fijian specimens. Thus, *P. beloni* should be considered a synonym of *Dichadena obesa*. The single specimen from New Caledonia shows the seminal vesicle bent once, with both parts inflated with sperm cells. The pars prostatica is actually a short tubular prostatic vesicle surrounded by conspicuous prostatic cells.

Cable and Nahhas (1963) described the cercaria of *Dichadena acuta* developing in the snail *Zebrina browniana* D'Orbigny in the Caribbean. The occurrence of immature *D. obesa* in the muscles of the hardyhead indicates that such fishes may serve either as intermediate or as paratenic hosts.

Probably not- Dichadena obesa (Manter, 1961) Manter, 1969 Hemiuridae

PROLECITHA BELONI ~~n. sp.~~. NAGATY AND ABDEL AAL, 1962

(Fig. 3)

Description based on whole mount of single specimen from *Belone strongylurus* locally called "Kherm". Body smooth elongate. ovoid. small 0.81 long and 0.27 wide, widest at acetab, ular region 0.36. Ecsoma (tail) absent. Oral sucker 0.12 by 0.14 subterminal: 0.03 from anterior extremity. surmounted by preoral lobe. Pharyny well developed 0.08 by 0.06, overlapping posterior broder of oral sucker. Intestinal caeca slightly sinuous, blind ends are not distinct, probably extend a short distance behind posterior border of ventral sucker. The latter is large 0.20 by 0.27 transversely occupying almostentir e width of body, overlapping caeca, anterior border of acetabulum just anterior to middle of body anteroposteriorly, in middle and posterior third of body length; 0.20 from oral sucker. Ratio of oral to ventral suckers 0.5 : 1.

FIG. 3

Testes ovoid, symmetrically one on either side of body, right testis 0.12 by 0.08 and left testis 0.11 by 0.06 with their posterior end broader than anterior, immediately posterolateral to acetabulum in fourth fifth of body length. Vesicula seminalis large, rounded, measuring 0.14 in diameter, preacetabular with posterior border overlapped by anterior border of acetabulum. Genital atrium ovoid with genital pore postbifurcal, median. No other details of structure of latter organs could be discerned.

Ovary four lobed each measuring 0.05 by 0.06, two lobes are on either side and overlapping; those on right slightly overlapping right testis. Lobes lie in anterior part of posterior third of body length and are immediately posterior to posterior broder of acetabulum. Receptaculum seminis absent. Vitellaria consist of a group of seven large ovoid follicles, preovarian. in fourth fifth of body length, overlapping ,posterior border of acetabulum, in between the two testes with vitelline duct passing between them. Uterus could not be seen. Excretory vesicle small, bladder-shaped and surrounded by a cluster of small cells, two excretory ducts are wide and slightly sinuous and unite immediately posterior to ovary, their extention beyond testes can not be seen.

Comparisons:

This species resembles *Prolecitha obesa* Manter, 1961, but differs from it in having: (1) ovary four lobed, two lobes on either side and overlapping instead of being deeply trilobed; (2) vesicula seminalis large, rounded, posterior broder overlapped by anterior border of acetabulum instead of being elongate immediately preacetabular; (3) genital atrium median postbifurcal instead of being protrusible and (5) the vitellaria partially overlapped by posterior border of acetabulum instead of being postacetabular.

PROLECITHA

Prolecithochirium ~~n. g.~~ Yam., 1970.

GENERIC DIAGNOSIS: Hemiuridae, Lecithochiriinae. Body elongate, with rudimentary tail; cuticle smooth. No pre-acetabular pit. Oral sucker subterminal, surmounted by preoral lobe. Esophagus practically absent. Ceca not extending into tail. Acetabulum larger than oral sucker, pre-equatorial. Testes diagonal, postacetabular. Seminal vesicle preacetabular, sigmoid, may be tripartite. Pars prostatica not differentiated proximal to prostatic vesicle. Prostatic vesicle well developed, enclosed in hermaphroditic pouch which extends over the hermaphroditic duct. Prostatic cells well developed around base of hermaphroditic pouch. Hermaphroditic duct cylindrical, opening directly outside ventral to pharynx. Ovary immediately behind posterior testis. Vitellaria consisting of two compact lobes. Uterus first descending, then ascending, not extending into tail. Excretory arms united dorsal to oral sucker. Parasitic in stomach of marine teleosts.

TYPE SPECIES: *P. pterois* n. sp., in *Pterois sphex*; Hawaii.

Yam., 1970.

193. *Prolecithochirium pterois* ~~n. g., n. sp.~~
(Fig. 193) Yam., 1970.

HABITAT: Stomach of *Pterois sphex*; Hawaii.
HOLOTYPE: U. S. Nat. Mus. Helm. Coll., No. 63780.
DESCRIPTION (based on a single whole mount): Body elongate, rather plump, 1.4 mm long, 0.35 mm wide in middle third. Tail rudimentary, 0.12 mm long, completely enclosed in posterior end of body proper. Cuticle thick, unarmed. Oral sucker subterminal, 0.13 × 0.12 mm, surmounted by inconspicuous preoral lobe, directly followed by globular pharynx 60 μ in diameter. Esophagus practically absent. Ceca wide, terminating blindly near posterior extremity, without entering tail. Acetabulum 0.3 mm in diameter, pre-equatorial. No pre-acetabular pit as seen in most *Lecithochirium* species.

Testes rounded, comparatively large, 0.13 × 0.14 mm, situated obliquely tandem immediately behind acetabulum in midregion of body. Seminal vesicle sigmoid, apparently tripartite, distended with sperm, with maximum diameter of 80 μ at its posterior swelling; its smaller anterior swelling connected with prostatic vesicle by a short simple narrow passage. Prostatic vesicle round, 40 μ in diameter, completely enclosed in hermaphroditic pouch. Hermaphroditic duct muscular, short, cylindrical, opening directly outside ventral to posterior end of pharynx. Hermaphroditic pouch approximately pyriform, 80 × 54 μ, with distinct wall of longitudinal muscle fibers, completely enclosing prostatic vesicle and hermaphroditic duct. Prostatic cells well developed around base of hermaphroditic pouch. No genital atrium differentiated.

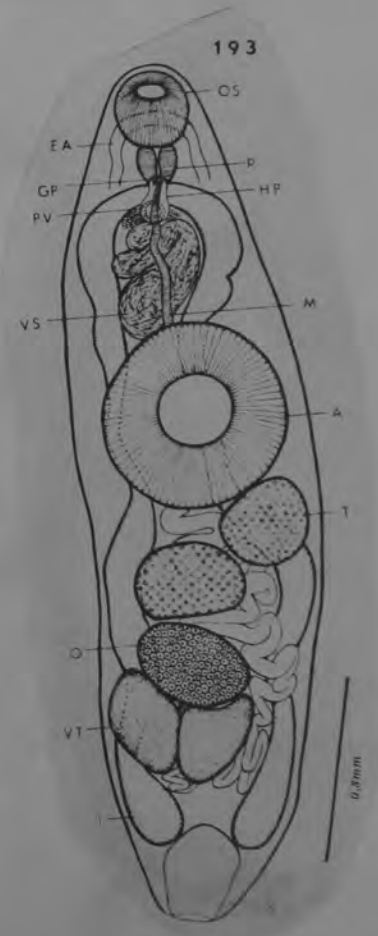
Ovary oval, 0.12 × 0.19 mm, lying transversely immediately behind posterior testis at junction of middle with posterior third of body, a little out of median line. Vitellaria consisting of two compact juxtaposed masses which are 0.17 mm long by 0.11-0.12 mm wide and pressed against each other immediately behind ovary. Uterine duct turning round posterior end of vitellaria and passing along left side of ovary and posterior testis and then between two testes dorsally; metraterm well differentiated, running forward in median field ventral to seminal vesicle and, after penetrating hermaphroditic pouch, joins the anterior end of prostatic vesicle to form hermaphroditic duct. Eggs oval, small, embryonated, 18-21 × 10-12 μ in life. Excretory vesicle Y-shaped, with terminal pore; arms united dorsal to oral sucker.
DISCUSSION: This genus differs from the most closely related *Lecithochirium* Lühe, 1901, as shown in the following table.

TABLE 2

DIFFERENTIATING *Prolecithochirium* FROM *Lecithochirium*

CHARACTER	*Lecithochirium*	*Prolecithochirium*
TAIL	distinct	rudimentary
PRE-ACETABULAR PIT	usually present	absent
PARS PROSTATICA	differentiated proximal to prostatic vesicle	none
VITELLARIA	usually consisting of seven rudimentary lobes	consisting of two compact lobes

Yam., 1970.



/PROLECITHOCHIRIUM

Pseudobunocotyla ~~n. gen.~~ YAMAGUTI, 1965

GENERIC DIAGNOSIS. Hemiuridae, Bunocotylinae.[3] Body cylindrical, without tail, with collar-like ridge around oral sucker and another immediately behind acetabulum. Oral sucker large, terminal; pharynx small, esophagus short, ceca terminating separately near posterior extremity. Acetabulum very large, prominent, anterior. Testes tandem, postacetabular; seminal vesicle sigmoid, more or less overlapping acetabulum; pars prostatica large, surrounded by large prostate cells which are well delimited from the surrounding parenchyma. Hermaphroditic duct well differentiated, enclosed in muscular hermaphroditic pouch. Genital pore immediately postbifurcal. Ovary well separated from posterior testis by uterine coils; receptaculum seminis present. Vitellaria consisting of two compact masses situated directly tandem immediately behind ovary. Uterine coils reaching posterior extremity when fully developed. Eggs small, elliptical. Excretory vesicle tubular; arms united dorsal to pharynx or esophagus. Stomach parasites of marine or brackish water teleosts.

TYPE SPECIES: *P. aua* n. sp., in *Chanos chanos;* Hawaii.

Chanidae
"palum herring"
"milk fish"
can live in brackish
as fresh water

DISCUSSION: The present genus differs from *Bunocotyle* Odhner, 1928, in several important points, shown in Table 1.

Genolinea ampladena Manter and Pritchard, 1960, probably may be transferred to *Pseudo-Bunocotyla,* although in this species the postacetabular ridge represented by a mere transverse, ventral, cuticular line is stated by the authors to be present in three specimens and absent in three other specimens. It agrees completely with the present genus in general anatomy, especially in the terminal genitalia.

[3] Subfamily diagnosis given in Systema Helminthum, vol. 1 (p. 267–268) must be emended so as to include *Pseudobunocotyla.*

TABLE 1

DIFFERENTIATING CHARACTERISTICS OF *Bunocotyle* AND *Pseudobunocotyla*

CHARACTER	*Bunocotyle*	*Pseudobunocotyla*
Ceca	united posteriorly	terminating separately
Prostatic complex	poorly developed or lacking	very strongly developed
Vitellaria	single	double, tandem
Receptaculum seminis	absent (?)	present

5. ***Pseudobunocotyla awa*** ~~n. gen., n. sp.~~ YAMAGUTI, 1965

Fig. 5

HABITAT: Stomach of *Chanos chanos* (local name "awa"); Hawaii.

HOLOTYPE: U. S. Nat. Mus. Helm. Coll., S.Y. No. 23.

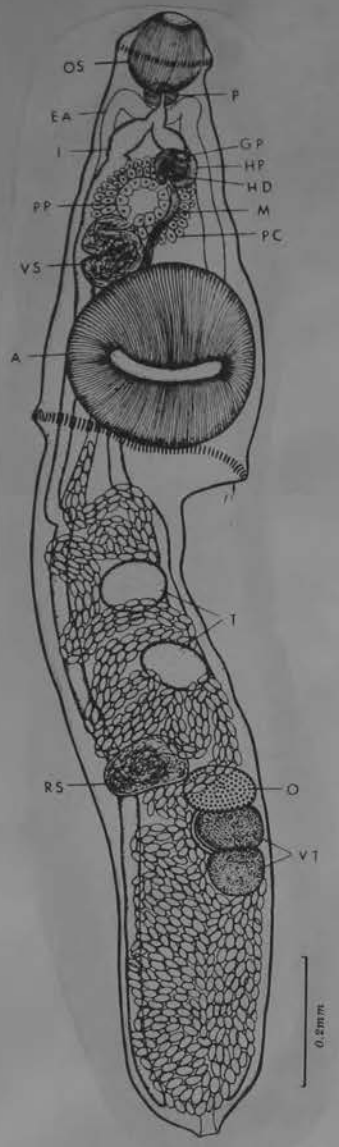
DESCRIPTION (based on 10 whole mounts): Body cylindrical, without tail, 0.8–1.7 mm long, 0.14–0.35 mm wide at postacetabular ridge, which encircles the body. On each side this annular ridge, well provided with longitudinal subcuticular muscle bundles, may be a more or less prominent, blunt-pointed cone directed posterolaterad. Around the oral sucker is a collar-like ridge which, however, may be straightened out when the oral sucker is protruded, or shifted forward as a ring when the oral sucker is retracted. Oral sucker bowl-shaped, terminal, 70–140 × 70–120 μ, directly followed by a small pharynx 23–50 × 35–60 μ; esophagus short, ceca widened anteriorly, terminating blindly near posterior extremity. Acetabulum large, prominent, 0.19–0.37 × 0.19–0.35 mm, situated at junction of anterior with middle third of body.

Testes subglobular to oval, 30–100 × 32–110 μ, postacetabular, slightly obliquely tandem in middle third of body, may or may not be separated by uterine coils. Vesicula seminalis tubular, sigmoid, 25–70 μ wide, overlapping anterodextral margin of acetabulum, with its tapering anterior end opening into pars prostatica. Pars prostatica rounded, 40–70 μ in diameter, lined with large vesicular epithelia and surrounded by large prostate cells which are delimited sharply from the surrounding parenchyma. At the distal end of the pars prostatica originates the wide eversible hermaphroditic duct which is lined with transversely wrinkled cuticle and enclosed in a muscular hermaphroditic pouch 79 μ in diameter in the type. Genital pore wide, median, opening immediately behind intestinal bifurcation.

Ovary subglobular to oval, 42–70 × 50–100 μ, situated ventrally at anterior end of middle third of body. Receptaculum seminis large, 60–120 μ in greater transverse diameter, anterodorsal to ovary. Laurer's canal? Vitellaria consisting of two compact oval masses measuring 37–60 μ by 46–100 μ and lying directly tandem immediately behind ovary; vitelline ducts united near their origin into a common duct which runs forward to the oötype situated dorsal to the ovary. Uterine coils descending to posterior extremity and then ascending, occupying all available space of hindbody; metraterm running forward ventral to pars prostatica and joining hermaphroditic duct at anterior end of pars prostatica. Eggs elliptical, 30–38 × 18–20 μ. Excretory pore terminal; excretory vesicle tubular; excretory arms united anteriorly dorsal to pharynx or esophagus.

eggs drawn too small

—over—



DISCUSSION: This genus differs from *Bunocotyle* Odhner, 1928 in several important points, particularly in the ceca terminating separately without being united, in the prostatic complex being very strongly developed, and in the vitellaria being double instead of single. For further details, see *Pacific Science* 19(4): 466-467.

Yam., 1970.

Pseudobunocotyla ampladena (Manter & Pritchard, 1960) ~~n. comb.~~ Yamaguti, 1970

Genolinea ampladena, n. sp. (Figs. 24-26)

Manter & Pritchard 1960

HOST: *Acanthurus olivaceus* Bloch and Schneider, locally known as naenae or orange spot tang (Acanthuridae); 6 specimens from 2 of 7 hosts examined.

LOCATION: Stomach.

HOLOTYPE: U. S. Nat. Mus. Helminth. Coll., No. 39158.

DESCRIPTION (based on 6 specimens): Body elongate, more or less cylindrical, 1.112 to 1.407 by 0.208 to 0.302, widest at level of acetabulum, each end bluntly rounded. A transverse cuticular line extends across the body ventrally just posterior to acetabulum in three specimens; not visible in other three specimens. Oral sucker ovate, retracted into body, 0.072 to 0.104 wide by 0.074 to 0.120 long; body wall forms a rim around the sucker; rim thickened dorsally. Acetabulum about ⅓ body length from anterior end, sometimes just anterior to midbody; 0.160 to 0.227 wide by 0.168 to 0.240 long; sucker ratio 1:2 to 2.7; aperture transverse. Transverse muscle fibers in both anterior and posterior lips of acetabulum, better developed in posterior lip; sphincter muscle absent. Pharynx 0.032 to 0.048 long by 0.043 to 0.061 wide; esophagus 0.016 to 0.054 long; ceca rather narrow, ending blindly near posterior end of body.

Testes tandem, contiguous, just anterior to middle of hind-body, separated from acetabulum by uterus. Seminal vesicle preacetabular or overlapping

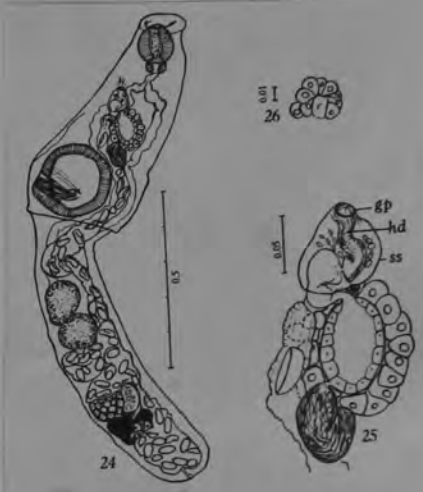
only anterior edge of acetabulum, to left of midline, a short wide tube bent sharply near middle. Prostatic vesicle intercecal, large, ovoid, 0.064 to 0.086 long by 0.040 to 0.069 wide, surrounded by a single layer (double in one specimen) of large cuboidal cells; pars prostatica a short, wide duct which joins metraterm at base of sinus sac, surrounded by a few small gland cells. Sinus sac pyriform, well developed, 0.067 to 0.080 long by 0.056 to 0.064 wide; basal third of hermaphroditic tube swollen, sac-like, thin-walled; distal two thirds a muscular tube opening on a cone-shaped elevation partially protrusible through genital pore; only a few small gland cells in sinus sac. Almost all species of *Genolinea* show this bipartite condition of the hermaphroditic tube.

Ovary rounded to transversely oval; 0.048 to 0.080 long by 0.067 to 0.083 wide, posterior to middle of hindbody; Laurer's canal present; seminal receptacle dorsal and to the left or right of ovary, almost as large as ovary, 0.056 to 0.083 long by 0.0040 to 0.067 wide. Vitellaria two compact masses immediately postovarian; usually obliquely tandem, tandem in one specimen, almost symmetrical in holotype. Uterus extends posterior to vitellaria to near posterior end of body, coils between ovary and testes, and between testes and acetabulum; metraterm short or nearly as long as prostatic vesicle, with longitudinal muscles. Eggs yellowish, relatively large, 30 to 40 by 14 to 21 microns; those in proximal portion of uterus distinctly smaller than those near sinus sac.

Excretory vessels join dorsal to pharynx.

The name *ampladena* is derived from *amplus* (= large) and *adenos* (= gland) and refers to the large prostatic cells surrounding the prostatic vesicle.

DISCUSSION: Although the transverse marking across the body posterior to the acetabulum suggests the genera *Stomachicola*, *Theletrum* or *Opisthadena*, it is not visible on three specimens and should not be considered as demarking an eesoma. Another variable character is the tandem, oblique, or symmetrical position of the vitellaria. The species differs from all others in the genus in its large ovate prostatic vesicle surrounded by a single layer of large cuboidal cells. Another distinctive character is the wide acetabulum with narrow, transverse aperture. The body size is smaller than in other species except *G. oncorhynchi* Margolis and Adams, 1956, which is probably the nearest related species. *G. oncorhynchi* has a sphincter in the acetabulum and smaller eggs.



150. *Pseodobunocotyla ampladena* (Manter et Pritchard, 1960) n. comb.

Syn. *Genolinea ampladena* Manter et Pritchard, 1960

(Fig. 150)

HABITAT: Stomach of *Acanthurus olivaceus* and *Acanthurus dussumieri* (new host); Hawaii.

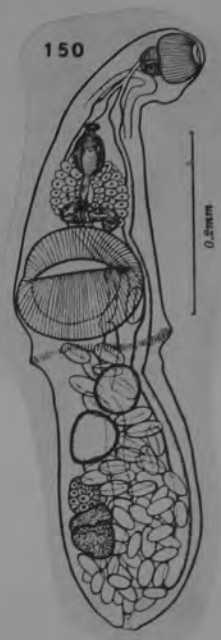
DESCRIPTION (based on 14 whole mounts): Body elongate, subcylindrical, 0.6-1.4 mm long, 0.12-0.3 mm wide at level of acetabulum or postacetabular ridge. Oral sucker terminal, 51-109 X 46-116 μ, with circular fold at midlevel; pharynx 23-42 X 25-56 μ; esophagus 23-65 μ long; ceca terminating near posterior extremity. Acetabulum 123-256 X 102-220 μ, situated in anterior part of middle third of body or a little more anteriorly, with distinct postacetabular circular ridge.

Testes subglobular, 46-100 X 28-128 μ, obliquely tandem, close together, in posterior part of middle third of body or at its junction with posterior third. Seminal vesicle rather tubular, turned back on itself immediately anterodorsal to acetabulum, measuring as a whole 25-46 μ in transverse diameter. Pars prostatica oval, 23-58 X 14-58 μ, surrounded by a layer of unusually large prostatic cells. Hermaphroditic sac ovoid, 32-109 X 30-93 μ; hermaphroditic duct well developed, C-shaped proximally, but straight and muscular distally, may be everted out of genital pore. Genital pore median, postbifurcal.

Ovary rounded, 28-81 X 35-116 μ, submedian, ventral, in anterior part or middle of caudal third of body. Vitellaria consisting of two compact masses, immediately behind ovary, tandem, diagonal or juxtaposed, each measuring 30-58 X 46-105 μ. Seminal receptacle immediately lateral or anterolateral to ovary, relatively large. Laurer's canal absent. Uterus reaching to posterior extremity, finally joining pars prostatica to form hermaphroditic duct. Eggs elliptical, 37-47 X 16-23 μ in life. Excretory pore terminal; vesicle Y-shaped, with arms united anteriorly.

DISCUSSION: The present species differs from the only known species of the genus, *Pseudobunocotyla awa* Yamaguti, 1965 from *Chanos chanos*, in the eggs being definitely larger. Manter and Pritchard (1960) state that the Laurer's canal is present in this species, but I have been unable to detect it. Further, they did not pay much attention to the circumoral and postacetabular ridges because of their variability, but I regard these two characters as most important features of *Pseudobunocotyla*, to which the present species was transferred from *Genolinea*. It is interresting to note that the host of this second species of the genus is also a plant feeder like that of the type species, though it belongs to a different family.

Yam., 1970



Pseudobunocotyla lobata (Manter & Pritchard, 1960) n.comb.

Genolinea lobata, ~~n. sp.~~ (Figs. 9-10) Manter & Pritchard, 1960

HOST: *Acanthurus sandvicensis* (Streets), manini or convict tang (Acanthuridae, surgeonfishes); 4 specimens from 3 of 56 hosts.

LOCATION: Stomach

HOLOTYPE: U. S. Nat. Mus. Helminth. Coll., No. 39169.

DESCRIPTION (based on 4 specimens): Body small, without ecsoma, 1.434 to 2.352 long by 0.268 to 0.348 wide at acetabulum and most of hindbody, forebody slightly tapered, both ends rounded. Oral sucker 0.115 to 0.144 wide by 0.088 to 0.121 long, embedded in body with a rim of body wall around mouth, rim thicker dorsally. Acetabulum about ¼ from anterior end, rounded, 0.192 to 0.235 wide by 0.173 to 0.221 long, aperture horizontal. Sucker ratio 1:1.6 to 1.7. Pharynx 0.051 to 0.074 long by 0.064 to 0.080 wide; esophagus narrow and short; ceca widen immediately at bifurcation, turn and extend to near posterior end of body, end blindly.

Testes diagonal, separated from acetabulum and from each other by uterus, rounded to oval, 0.112 to 0.168 long by 0.136 to 0.203 wide; seminal vesicle tubular, slender, coiled once or twice, preacetabular; pars prostatica expanded into small, rounded prostatic vesicle, surrounded by numerous, small prostatic cells; sinus sac short, containing muscular hermaphorditic duct; genital pore median to submedian at level of intestinal bifurcation.

Ovary oval, 0.112 to 0.198 long by 0.147 to 0.205 wide; seminal receptacle elongate oval, dorsal and partly anterior to ovary, 0.201 to 0.248 long by 0.136 to 0.160 wide; vitellaria two, immediately postovarian, diagonal to symmetrical, contiguous, variously lobed (Figs. 9-10), 0.128 to 0.200 long by 0.120 to 0.203 wide; uterus descends almost to tips of ceca (but not beyond) and ascends dorsally, separating gonads and expanding between anterior testis and acetabulum, narrowing dorsal to acetabulum and joining pars prostatica at base of sinus sac. Eggs 27 to 32 by 14 to 18.

Excretory pore terminal, exerttory crura extend forward to oral sucker, turn somewhat backwards and medianly, and seem to terminate dorsal to pharynx without joining.

G. lobata is named for the lobed condition of the vitellaria.

DISCUSSION: This species has all the generic characteristics of *Genolinea* except the "unlobed, tandem or slightly diagonal vitellaria" and the branches of the excretory system uniting dorsal to the pharynx. It seems to us that a new genus would be unjustified, and for the present the species is added to *Genolinea* in which it is the only species with lobed vitellaria.

G. lobata resembles *G. manteri* Lloyd, 1938 but differs in smaller sucker ratio, smaller eggs, more anterior seminal vesicle, and the embedded oral sucker. In the latter respect *G. lobata* resembles *G. ampladena* Manter & Pritchard, 1960 (also from Hawaii), but the prostatic vesicle is less well developed, the sucker ratio is smaller, and the eggs are shorter.

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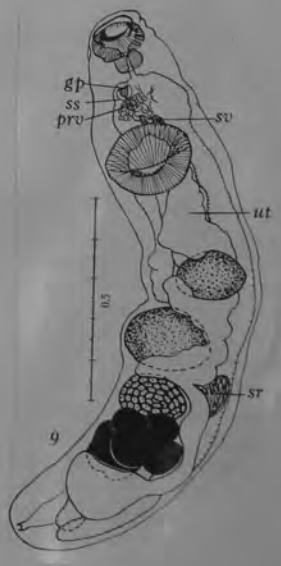

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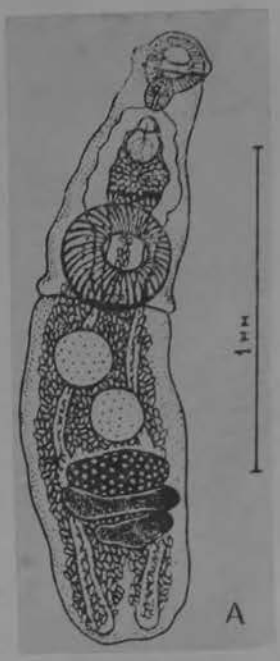
Pseudobunocotyla notothenieae Kurochkin, 1975

Host: Notothenia macrocephala Günther
Locality: Pacific Ocean south of New Zealand
(region of Aukland and Campbell islands)

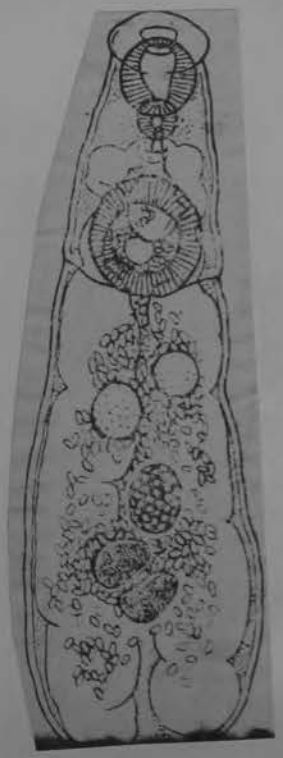
Reference (in Russian) on shelf with Russian Worker



Pseudobunocotyla yamagutii Kurochkin, 1975

Host: Pleurogrammus azonus Jordan et Metz, 1913
Locality: Sea of Japan in region of Sangarskogo Sound (or Strait)

Reference in (Russian) on slide with Russian Works

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PSEUDOBUNOCOTYLA

Dichadena

~~Lecithaster~~

~~Dichadena~~ acuta (Linton, 1910) n. comb.

Body smooth, fusisorm, more tapering anteriorly, widest back of ventral sucker, 1.55 by 0.58 mm. Oral sucker 0.08; ventral sucker 0.31 mm., oral sucker scarcely 1/3 diameter of ventral sucker. Probably no esophagus. Ceca obscured by eggs. Genital pore median, midway between suckers; cirrus short, cirrus sac oval with numerous cells, from this oval pouch a long prostatic tube passes diagonally to left margin reaching behind ventral sucker. Prostatic tube clavate, prostate cells confined to posterior half. Oval seminal vesicle at caudal end of prostate. Testes two, contiguous, tandem, to the left, halfway between ventral sucker and posterior end. Ovary at median border of posterior testis, ~~oval~~, transversely extended. Shell gland dorsal to ovary. Seminal receptacle large, oval, postovarian. Yolk gland of 7 rounded lobes, divided into two masses, Eggs numerous, filling most of body, 24 by 14 u.

Host: Teuthis caeruleus

PSEUDODICHADENA Yamaguti, 1971

Pseudodichadena lobata Yamaguti, 1971 nom. nov. pro Dichadena acuta of Siddiqi and Cable, 1960, nec Linton, 1910

Dichadena acuta Linton, 1910 (FIGURE 121)

Synonym:

Lecithaster acutus (Linton) Manter, 1947.

Hosts: *Acanthurus caeruleus*, *A. bahianus*.

Site: intestine and stomach.

Locality: Mona Island; Puerto Real, P.R.

Deposited specimen: No. 39391.

In erecting the genus *Dichadena*, Linton (1910) was unable to see the intestine and described the ovary as being entire in *D. acuta*. Manter (1947) identified as that species a form that had a lobed ovary and, for that reason, transferred *D. acuta* to *Lecithaster* in which, however, the ceca end blindly. He did not observe the cyclocoel intestine, which probably would have been overlooked by us except for 1 excessively flattened specimen. As that feature is of generic significance, we propose that the genus *Dichadena* be restored to include *D. acuta* as the type and only species. Our material is identified as that species but differs from Linton's description in the length and shape of the pars prostatica and seminal vesicle to a degree that may prove to be of specific magnitude. Skrjabin and Guschanskaja (1955) recognized the genus *Dichadena* and transferred *Lecithaster galeatus* Looss, 1907, to it because of the unlobed ovary. However, Looss (1907*b*) clearly described ceca ending blindly in that species and for that reason it is to be excluded from *Dichadena* and belongs instead in either *Lecithaster* or *Mordvilkoviaster* Pigulevsky, 1938.

121

from Siddiqi + Cable, 1960

However, we have found in surgeon fishes from both Curaçao and Jamaica specimens which range from ones with a distinctly lobed ovary to those in which that structure is smooth. Moreover, that variation is not correlated with the size and presumably maturity of the worms as is true of the testes in some trematodes. However, the cyclocoele hemiurids that we have seen in Caribbean surgeon fishes are otherwise so much alike that we prefer to regard them as a single species in which the shape of the ovary is variable.

FROM CABLE AND NAHHAS, 1963

-OVER-

In the following diagnosis of the cercaria, measurements are in millimeters and are from spontaneously shed larvae observed alive under a freely-floating coverglass. Their being non-motile, it was unnecesary to restrain or kill them for that purpose.

Cercaria of *Dichadena acuta* Linton, 1910 (Fig. 1-8)

DIAGNOSIS: Minute, cystophorous cercaria with caudal vesicle into which long delivery tube and body of larva retract before emerging from host. Cyst transparent, bearing a long, thread-like excretory appendage at anterior end; cuticle of cyst elevated to form 8 meridional ridges, 4 of which are continuous with edges of a pair of posterior, ear-like appendages about 0.040 wide and 0.017 thick. Cyst 0.070-0.075 long including posterior appendages, 0.054 wide including ridges, 0.040 without them. Body poorly developed, with distinct preoral lobe; suckers and pharynx embryonic, beginning of digestive tract barely evident. Excretory vesicle small, epithelial; from it, a common excretory tube extends anteriorly, dividing posterior to ventral sucker to form two tubes which unite dorsal to pharynx; at about midlevel of forebody, each side of loop joined by collecting tubule receiving capillaries from 2 flame cells and one capillary extending to posterior end of body, evidently to serve flame cell seen in embryo but apparently disappearing later. Development in elongate germinal sacs up to 1.5 mm. long; anterior end of sac glandular, with birthpore but no distinct pharynx or gut; young embryos concentrated near posterior end of sac.

HOST: *Zebina browniana* D'Orbigny.

LOCALITY: Outer Piscadera Baai, Curaçao, N.A. and presumably other Caribbean regions and Gulf of Mexico where the adult trematode is known to occur.

FROM CABLE AND NAHHAS, 1963

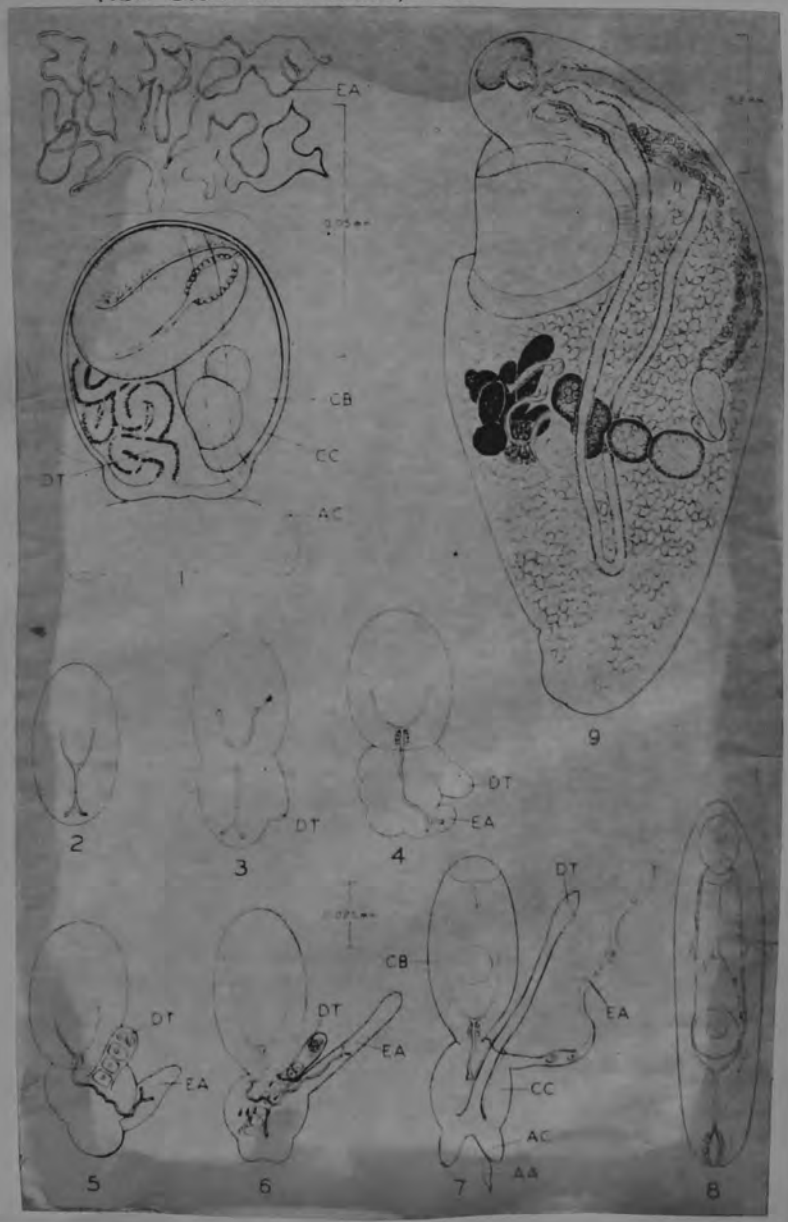


Plate 1. *Dichadena acuta*

Abbreviations: AA, accessory appendage; AC, ear-like appendage; CB, body of cercaria; CC, caudal cyst; DT, delivery tube; EA, excretory appendage.

Figure 1. Spontaneously shed cercaria with body and delivery tube withdrawn into caudal cyst.

Figures 2-7. Embryos of cercariae, showing development of tail and excretory system.

Figure 8. Body of cercaria with excretory system shown.

Figure 9. Adult from intestine of *Acanthurus hepatus*.

Dichadena acuta Linton, 1910

Synonym: Lecithaster acutus (Linton) Manter, 1947.

Hosts: Acanthurus bahianus (C); *A. coeruleus* (J); *A. hepatus* (C, J).

Site: stomach.

CURAÇAO + JAMAICA; FROM NAHHAS + CABLE, 1964

Bermuda ?

PSEUDODICHADENA

Pseudodinosoma ~~n. g.~~ Yamaguti, 1970.

GENERIC DIAGNOSIS: Hemiuridae, Hemiurinae. Body small, elongate, with distinct cuticular serration anteriorly. Oral sucker subterminal; pharynx well developed; esophagus short; ceca not extending into tail. Acetabulum a little larger than oral sucker, well apart from anterior extremity. Testes diagonal, postacetabular. Seminal vesicle tubular, extending a little back of acetabulum, winding or convoluted distally anterior to acetabulum. Pars prostatica bipartite; proximal portion tubular, partly winding, outside of hermaphroditic pouch, surrounded by prostatic cells; distal portion bulbous, lined with tall epithelia, enclosed in hermaphroditic pouch. Hermaphroditic duct arising from anterior end of prostatic bulb, enclosed in hermaphroditic pouch of longitudinal muscle fibers. Genital pore median, opposite pharynx. Ovary posttesticular; vitellaria divided into two, slightly indented, compact masses. Uterus not extending into tail. Eggs small, bean-shaped, embryonated. Excretory arms uniting dorsal to oral sucker. Stomach parasites of marine teleosts.

TYPE SPECIES: *P. macrorchis* n. sp.

Yamaguti, 1970.

PSEUDODINOSOMA

Campbell and Monroe, 1977

Pseudolecithaster ~~gen. n.~~

Generic diagnosis: Hemiuridae, Lecithasterinae. Body small, fusiform, smooth, ecsoma lacking. Oral sucker subterminal; preoral lobe present; pharynx well-developed; esophagus absent; ceca reaching near posterior extremity. Acetabulum larger than oral sucker, in anterior ⅓ of body. Testes postacetabular, symmetrical. Seminal vesicle saccular, anterior to acetabulum; prostatic vesicle bulbous, surrounded by prostatic cells. Hermaphroditic duct enclosed in sinus sac. Genital pore median, immediately posterior to intestinal bifurcation. Ovary multilobed, posttesticular. Vitellarium a rosettelike mass of claviform lobes. Uterine coils entirely anterior to ovary, eggs small. Arms of excretory vesicle uniting dorsal to pharynx. Parasites of marine teleosts.

Type and only species:

P. antimorae

Remarks

Yamaguti (1971) listed six genera in the subfamily Lecithasterinae that have a single, multilobed vitelline gland like *Pseudolecithaster*. They are: *Macradena* Linton 1910, *Monorchimacradena* Nahhas and Cable 1964, *Dichadena* Linton 1910, *Pseudodichadena* Yamaguti 1971, *Lecithaster* Lühe 1901, and *Neodichadena* Yamaguti 1971. These genera may be differentiated from *Pseudolecithaster* by the lack of a bulbous prostatic vesicle, vitellarium with 12 or more lobes, and the following: in *Lecithaster* the seminal vesicle is dorsal or posterodorsal to the acetabulum; *Monorchimacradena* possesses a single testis and the hermaphroditic duct is swollen at the base; in *Pseudodichadena* the ceca are united posteriorly and the pars prostatica is extremely long; the tubular or saccular seminal vesicle of *Macradena* lies beside the anterior testis; and the seminal vesicle of *Dichadena* and *Neodichadena* is located between the anterior testis and acetabulum.

Pseudolecithaster antimorae ~~sp. n.~~
(Figs. 12–14) Campbell and Munroe, 1977

Description (75 specimens; 7 measured): With characters of the genus. Body 1.2 to 4.4 mm (2.2 mm) by 390 to 960 (600), rounded anteriorly, somewhat pointed posteriorly. Forebody ¼ of total body length. Oral sucker 170 to 260 (216) by 180 to 270 (227); preoral lobe 45. Acetabulum 250 to 380 (327) by 240 to 420 (340). Sucker width ratio 1:1.3 to 1.6 (1:1.4). Prepharynx absent; pharynx 120 to 200 (128) by 100 to 170 (128); ceca large, thin-walled, subequal in length. Testes 160 to 490 by 100 to 290, ovoid, smooth, near posterior margin of acetabulum, ventral to ceca. Seminal vesicle median, 140 to 320 (211) by 80 to 140 (110). Short, naked duct joins seminal vesicle to prostatic vesicle and prostatic vesicle to sinus sac; each segment about 66 long. Prostatic vesicle about 140 in diameter, globular, surrounded by prostate cells lying free in parenchyma. Sinus sac 200 by 80, median, slightly posterior to intestinal bifurcation; hermaphroditic duct thick-walled. Ovary consisting of several irregular lobes, 260 to 540 (360) by 150 to 710 (473), median, in posterior ¼ of body. Seminal receptacle and Laurer's canal not observed. Vitellarium large, with rosettelike mass of 12 to 16 lobes, posteroventral to ovary, maximum dimensions 240 to 860 (403) by 250 to 770 (420); postvitelline space up to 680 long. Uterus preovarian, coils more or less filling hindbody; single limb ascending dorsal to acetabulum; metraterm about 320 by 50, delimited from uterus by a sphincter. Eggs amber, 27 to 36 (29) by 19 to 22 (20).

Type host: *Antimora rostrata* Günther 1878 (Eretmophoridae), (24 to 106).

Habitat: Intestine.

Type specimens: USNM Helm. Coll. Nos. 74095 (holotype), 74096 (paratype).

PSEUDOLECITHASTER

PULMOVERMINAE SANDARS, 1961 ~~n.subfam.~~

Subfamily diagnosis : Hemiuridae : Body elongate with short ecsoma (tail). Cuticle with or without spines. Intestinal caeca extend almost to posterior extremity of body. Acetabulum near anterior extremity. Testes post-acetabular. Seminal vesicle tubular with heavy muscular walls, may extend from hindbody into forebody. Ductus hermaphroditicus enclosed in a pouch. Cirrus pouch absent. Ovary post-acetabular. Vitellaria in two compact, lobed masses, immediately post-ovarian. Uterus extending almost to posterior extremity of body. Excretory arms united anteriorly. Parasites in lungs of sea-snakes.

The Pulmoverminae may be distinguished from the Sterrhurinae, the Dinurinae, the Hemiurinae and the Dissosaccinae by the position of the long seminal vesicle which may extend from the hindbody into the forebody. It is also different from the Sterrhurinae and the Dinurinae in having compact vitellaria, and from the Hemiurinae because of the presence of an hermaphroditic pouch which is not "strongly muscular" as it is in the Dissosaccinae.

Genera : **Pulmovermis** Coil and Kuntz, 1960

Hydrophitrema Sandars, 1960

On 18th August 1960, a description of a digenetic trematode, *Pulmovermis cyanovitellosus* Coil and Kuntz, from the lungs of a sea-snake, *Laticauda semifasciata* (Reinwardt, 1837), from Yeh Yu, was published. On 20th August 1960, a description of a similar worm, *Hydrophitrema gigantica* Sandars, from a sea-snake, *Hydrophis elegans* (Gray, 1842), from Moreton Bay, South Queensland, appeared. It seemed that these two genera might by synonymous, but a comparison of the type specimens showed that they may be accepted as two distinct genera, closely related, and neither fitting into any of the present subfamilies of the Hemiuridae Lühe, 1901. A new subfamily, Pulmoverminae, is therefore proposed to receive them.

COMPARISON

Pulmovermis and *Hydrophitrema* are both elongate worms in which the acetabulum is close to the oral sucker, there is no oesophagus, and the vesicula seminalis is large with heavily muscular walls ; the rest of the reproductive organs lie in the same relative positions in both.

Pulmovermis and *Hydrophitrema* are distinguished by the following features :—

(a) The body shapes are different, *Pulmovermis* being much smaller and more slender than *Hydrophitrema* : the body length of *Hydrophitrema* (170–260 mm) is more than ten times that of *Pulmovermis* (up to 17 mm).

(b) The acetabulum in *Pulmovermis* is approximately one-ninth of the total body length from the anterior end, whereas in *Hydrophitrema* it is approximately one quarter ; in *Pulmovermis* it appears to be pedunculate, and the sides of the anterior part of the body curve ventrally, which, together with a distinctly ventrally directed oral sucker, gives a very characteristic appearance ; there is no evidence of any acetabular stalk in *Hydrophitrema*, and no ventral flexing of the anterior end of the body.

(c) The testes in *Pulmovermis* lie in tandem within the posterior half of the body and are well removed from the acetabulum ; in

- OVER -

Hydrophitrema the testes are obliquely tandem in the anterior half of the body and only a short distance behind the acetabulum.

(d) The ovary in *Pulmovermis* lies near the mid-line in the posterior quarter of the body, whereas in *Hydrophitrema* it is laterally placed and in the anterior half of the body.

(e) The vesicula seminalis of *Hydrophitrema* has a very much heavier muscular wall than in *Pulmovermis*, its length relative to the body length is much shorter (in *Hydrophitrema* 1 : 47 ; in *Pulmovermis* 1 : 2), and it extends anteriorly to the acetabulum ; in *Pulmovermis* the vesicula seminalis does not extend further forward than the level of the acetabulum.

The major features on which generic differentiation is based are : the relative positions of the acetabulum, testes and ovary ; the comparative lengths of the vesiculae seminales relative to the body lengths, and position of their anterior ends relative to the acetabulum.

Discussion

The erection of a new subfamily to receive *Pulmovermis* and *Hydrophitrema* seems necessary, as it is impossible to place either in any existing subfamily of the Hemiuridae.

Coil and Kuntz (1960) imply that they place *Pulmovermis* in the Hysterolecithinae, and state that it is "most similar to *Hysterolecitha* Linton, 1910". Although listing a number of differences from other genera in the Hysterolecithinae, they have apparently overlooked that one of the features of the Hysterolecithinae is the absence of a tail. *Pulmovermis* has a small, but quite definite, tail.

Sandars placed *Hydrophitrema* in the Derogenetinae, considering no tail to be present. If the decision that it has a small tail is correct, then it is not a member of the Derogenetinae.

The key by Yamaguti (1958) to the subfamilies of the Hemiuridae Lühe, 1901, is inadequate, as there is no provision for genera with a seminal vesicle which has a heavy muscular wall and may extend from the hindbody into the forebody. It can be modified by an additional alternative in couplet 6 (p. 261) to read "Seminal vesicle with heavy muscular wall, may extend from hindbody to forebody ; vitellaria compact . . . . . Pulmoverminae".

Pulmoverminae Sandars, 1961

type genus : *Pulmovermis* Coil and Kuntz, 1960

organ and host infected : lung of sea snakes .

diagnosis : Hemiuridae ; characterized by short ecsoma, elongate body with acetabulum in anterior quarter ; intestinal caeca running length of body, pharynx present, oesophagus absent, acetabulum powerful, larger than oral sucker, acetabular peduncle may be present. Seminal vesicle heavy-walled, tubular, uniform in diameter, coiled or folded, passing from anterior testis dorsal or lateral to acetabulum, ending at hermaphroditic sac. Its course may extend up to half the body length. Genital pore at level of caecal bifurcation, no cirrus pouch, hermaphroditic sac present (Fig 2). Ovary posttesticular, immediately anterior to vitellaria, which are generally paired but occasionally partially fused, lobate to rounded, in posterior half of body. Eggs numerous, filling uterus in heavy coils extending nearly to end of body.

Key to subfamilies found in Yamaguti (1958), are emended by Sandars (1961) to include Pulmoverminae.

FROM: VERCAMMEN-GRANDJEAN AND HEYNEMAN (1964)

OTHER GENERA: HYDROPHITREMA SANDARS, 1960

Pulmovermis, n. gen. Coil & Kuntz, 196

DIAGNOSIS: with the characters of the family Hemiuridae Lühe, 1901. Body cylindrical, aspinose, with small ecsoma. Oral sucker subterminal. Prepharynx absent. Esophagus absent or very short. Ceca bifurcate at pharynx and extend to posterior extremity of body. Acetabulum larger than, and located close to, oral sucker. Testes in tandem in posterior half of worm. Seminal vesicle tubular and with a heavy muscular wall extending in a convoluted fashion from the testes to the acetabulum. Ductus hermaphroditicus enclosed by a muscular layer. Genital pore just behind pharynx. Ovary in posterior quarter of body posterior to testes. Vitelline gland just posterior to ovary, divided into seven unequal lobes. Uterus with many eggs extending to posterior region. Excretory rami with a commissure dorsal to oral sucker. Parasites in lungs of marine snakes.

most similar to the genus *Hysterolecitha* Linton, 1910. The trematodes studied here are different from existing genera by: 1) a very elongate body shape; 2) testes in tandem in the posterior half of the body; 3) absence of an esophagus; 4) the placement of the acetabulum in close proximity to the oral sucker.

Type species: P. cyanovitellosus Coil & Kuntz, 1960

Pulmovermis Coil and Kuntz, 1960

type species: *P. cyanovitellosus* Coil and Kuntz, 1960

organ and host infected: lung of sea snakes of the family Laticaudidae

diagnosis: Pulmoverminae; body narrowly elongate or tubular (mean ratio of body length to body width behind acetabulum—19·5), acetabulum well-developed, generally pedunculated. Testes arranged in tandem, anteriormost adjacent to beginning of seminal vesicle or somewhat posteriorly, usually with space between them but may be contiguous, elongate muscular seminal vesicle loosely convoluted or in open coils between hermaphroditic pouch and anterior testes.

FROM: VERCAMMEN-GRANJEAN AND HEYNEMAN (1964)

Pulmovermis cyanovitellosus, n. sp. (Figs. 1, 3, and 5)

Coil & Kuntz, 1960

DIAGNOSIS: with the characters of the genus. Large, elongate distomes, with a cylindrical body. Ecsoma present, but excretory pore subterminal. Body length up to 17 mm. (in alcohol) and width at level of acetabulum up to 1.2. Eggs present in specimens as short as 5 mm. Cuticle without spines, but papillated. Oral sucker subterminal, 0.29-0.53 long. Prepharynx absent. Pharynx 0.20-0.30 long. Esophagus absent. Ceca extend to posterior extremity. Gut with villis-like folds and projections. Acetabulum larger than oral sucker, 0.44-0.73 long, located 0.49-0.63 from oral sucker. Testes smooth elongate, in posterior half of body, in tandem, frequently in contact, more often separated, 0.58-0.97 long. Seminal vesicle long, tubular with heavy, muscular wall, up to 0.034 thick. Ovary subspherical in posterior quarter of body 0.38-0.58 wide. Vitellaria just posterior to ovary, divided into seven unequal lobes, 0.53-0.90 long, appear blue in alcoholic specimens in tungsten lamp light. Uterus extensive with numerous eggs, extending almost to posterior end. Eggs 0.017-0.023 by 0.010-0.012. Genital pore just posterior to pharynx. Ductus hermaphroditicus enclosed in muscular pouch open at proximal end, extensible for a short distance.

HOST: *Laticauda semifasciata* (sea snake).

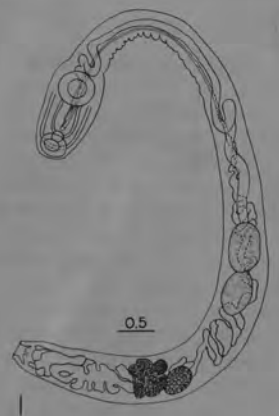
HABITAT: Lungs.

LOCALITY: Yeh Yu.

SPECIMENS: Holotype and paratypes in the Helminthological Collection of the U.S.N.M., No. 39413.

Yamaguti (1933) reported two species from the sea snake *Laticauda laticauda* (*Harmotrema laticaudae* and *Oesophagicola laticaudae*).

It is of some interest to note the host-parasite relationships of the families of trematodes represented here. Hemiurids are generally found in the stomachs or gall bladders of marine fishes. The presence of several worms, in the lungs, in a number of individuals canont be considered accidental as might be the case if the worms were found in the intestine. It seems certain that this hemiurid was acquired through the reptile's long association with marine life. On the other hand representatives of the Acanthostomidae are found in both fishes and reptiles found associated with freshwater hosts. It would seem likely then that the parasite described here (*Ateuchocephala marinus*) is acquired in terrestrial or freshwater habitats. The third family represented here is the Acanthocolpidae; a group which is generally found in marine fishes. However, the presence here of only two barely mature worms in the sea snake's intestine proves nothing conclusive. It is very possible the reptile might have eaten well-developed metacercariae a few days before the examination.



1

3

PULMOVERMIS

Hemiuridae

Qadriana n. gen. Fatima Mujib Bilquees, 1971

Generic Diagnosis.—Hemiuridae, Lecithasterinae. Medium sized trematode, body fusiform, without tail. No cuticular denticulations. Oral sucker surmounted by preoral lobe, followed by ovoid pharynx. Esophagus indistinct, ceca reaching to posterior extremity. Acetabulum larger than oral sucker, slightly subequatorial. Testes immediately posterolateral to acetabulum, one behind the other. Pars prostatica well differentiated. Seminal vesicle pyriform, posterolateral to hermaphroditic pouch. Hermaphroditic pouch convoluted. Genital opening ventral to oral sucker. Ovary in posterior third of the body, slightly submedian. Vitellaria of several tubes, posterior to ovary. Uterine coils mostly extracaecal in postacetabular region reaching near to posterior extremity and intercaecal in preacetabular zone. Eggs elongated without polar filaments. Parasitic in the stomach of marine fish.

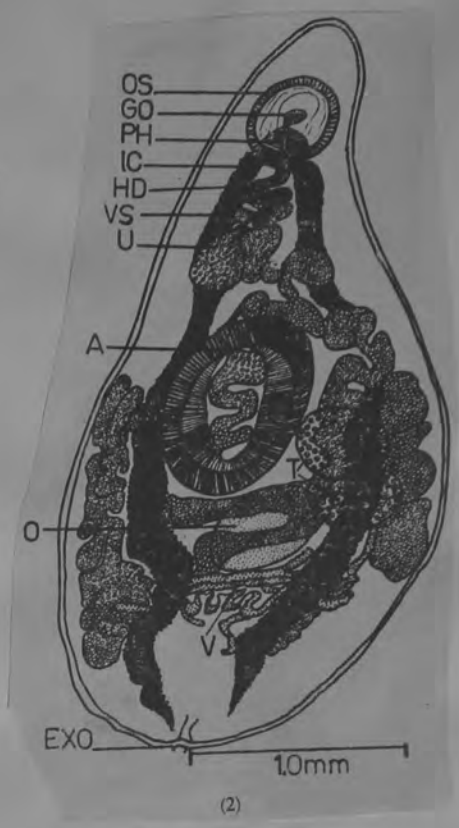
Remarks.—The new genus *Qadriana* differs from the previously described genera of the subfamily Lecithasterinae in having asymmetrical testes, ovary posttesticular, vitellaria tubular; postovarian, seminal vesicle saccular and a different arrangement of the uterine coils. In the genus *Macradena* ovary and vitellaria are pretesticular and the vitellaria consist of claviform lobes; in *Aphanurus* is single, compact. In the genus *Macradena* vitellaria is divided into a number of claviform lobes; while in *Mitrostoma* vitellaria consists of two compact lobes and the seminal vesicle is tubular. In *Opisthadina* the seminal vesicle is saccular but the vitellaria consist of two compact masses. In the genera *Mardvilkoviaster* and *Lecithaster* the vitellaria is divided into several rounded lobes.[6] The new genus is also different from the three recently erected genera of the subfamily[3] in the shape and relative size of the body, seminal vesicle and the structure of vitellaria.

Qadriana fusiformis, ~~n. sp.~~ Fatima Mujib Bilqees, 1971

Host.—*Sciaena glauca* (Day). Habitat stomach, Number a single specimen; 23 host examined.

Description.—Body length 3.53, width 2.14. Preoral lobe well-marked, oral sucker large measuring 0.39×0.37. Pharynx rounded 0.15×0.17. Esophagus absent. Ceca long, narrow posteriorly, terminating blindly near the posterior extremity, thin-walled with irregular outline, and filled with a brownish black material. Acetabulum almost equatorial, larger than oral sucker, rounded measuring 0.9×0.85 in size. Testes posterolateral to acetabulum, asymmetrical, one behind the other measuring 0.28×0.31 and 0.3×0.34. Seminal vesicle pyriform, situated in anterior one quarter of body, at considerable distance from acetabulum, posterolateral to hermaphroditic pouch, 0.32 long; 0.19 wide. Pars prostatica long. Hermaphroditic pouch convoluted opening ventral to oral sucker.

Ovary submedian, slightly towards left, larger than testes measuring 0.4×0.37 in size. Seminal receptacle and Laurer's canal not obvious. Vitellaria composed of several tubes, postovarian in position. Uterus coiled occupying extracaecal field behind acetabulum but intercaecal in the preacetabular region. Eggs elongated, without polar filaments measuring 0.017 to 0.018×0.010 to 0.011. Excretory arms not clearly visible in the anterior region.



(2)

Fig. 2.—*Qadriana fusiformis*.

QADRIANA

LOOSE LEAF
ORGANIZER

SCHEDULE

OD TIME								
URSE ON. TRUCTOR								
URSE E. TRUCTOR								
URSE ED. TRUCTOR								
URSE U. TRUCTOR								
URSE I. TRUCTOR								
URSE T. TRUCTOR								

NAME _____

ADDRESS _____

SCHOOL _____ TELEPHONE _____

Subfamily QUADRIFOLIOVARIINAE Yamaguti 1965, emended

SUBFAMILY DIAGNOSIS: Hemiuridae. Body subcylindrical, long, smooth, slender toward extremities. Preoral lobe more or less prominent. Oral sucker subterminal; pharynx well developed; esophagus short, muscular or not; ceca terminating at or near posterior extremity or united posteriorly. Acetabulum near anterior extremity, with paired, sublateral, muscular, adhesive flaps immediately behind or extending longitudinally on one side only in acetabular region; these flaps are separate anteriorly or united by a transverse lobe crossing acetabulum. Testes ventral, tandem or diagonal, contiguous or not, in midregion of body. Seminal vesicle winding or convoluted in front of testes in type genus, but may be divided or not; pars prostatica straight or sinuous, extending forward from seminal vesicle toward acetabulum, reaching to this sucker or to near level of posterior end of body flange; ejaculatory duct usually very long, but shorter and lined with cuticular villi in *Holacanthitrema*. Hermaphroditic duct short, or long and winding, muscular, narrow, or relatively wide, enclosed in globular or pyriform hermaphroditic sac. Genital pore at varying distances posterior to intestinal bifurcation. Ovary posttesticular, distinctly 4-lobed or unlobed, compact, ventral, pre- or postequatorial. Seminal receptacle large, usually anterodorsal to ovary. Laurer's canal not observed. Vitellaria divided into two (a preovarian and a postovarian) groups of digitiform lobes in type genus, but may consist of one group of seven lobes. Uterus first descending to posterior extremity, then ascending, occupying most or all available space of hindbody; eggs small, embryonated. Excretory arms united anteriorly. Gastrointestinal parasites of marine teleosts.

Yam., 1970.

QUADRIFOLIOVARIINAE ~~n. subf.~~ YAMAGUTI, 1965

SUBFAMILY DIAGNOSIS: Hemiuridae. Body long, slender, smooth. Preoral lobe prominent. Oral sucker and pharynx well developed; ceca terminating near posterior extremity. Acetabulum anterior, with a pair of muscular accessory adhesive flaps immediately behind. Testes tandem, ventral, in midregion of body. Seminal vesicle winding, prostatic cells well developed, both between acetabulum and anterior testis. Ductus hermaphroditicus enclosed in hermaphroditic pouch. Genital pore postbifurcal. Ovary distinctly lobed, ventral, posttesticular; seminal receptacle present. Laurer's canal? Vitellaria consisting of two groups of digitiform lobes. Uterus first descending ventrally to near posterior extremity, then ascending dorsally. Excretory vesicle terminal, bifurcating into wide lateral arms united anteriorly.

Quadrifoliovarium ~~n. gen.~~ YAMAGUTI, 1965

GENERIC DIAGNOSIS: Hemiuridae, Quadrifoliovariinae. Body slender, tapered at both extremities. Oral sucker subterminal, directly followed by muscular pharynx; esophagus short, muscular; ceca terminating blindly near posterior extremity. Acetabulum transversely elongate, in anterior third of body; postacetabular muscular flaps constricted near anterior end. Testes directly tandem, in equatorial zone. Vas deferens swollen proximally immediately in front of anterior testis, but tapered and convoluted as it proceeds anteriorly; pars prostatica surrounded by compact layer of prostate cells, immediately anterior to winding tubular seminal vesicle; ejaculatory duct narrow, straight, running alongside terminal portion of uterus. Ductus hermaphroditicus slender, unarmed, muscular, extremely long when fully everted; hermaphroditic pouch elliptical to oval, thin-walled. Genital pore midventral, shortly postbifurcal. Ovary four-lobed, in anterior part of posterior half of body. Receptaculum seminis voluminous, immediately anterodorsal to ovary. Vitellaria divided into two (an anterior and a posterior) groups of digitiform lobes, largely overlapping ovary. Uterus extending backward and then forward dorsal to ovary and testes; metraterm not differentiated; eggs elliptical, small, embryonated. Excretory vesicle divided near posterior extremity into two wide lateral arms running forward and uniting dorsal to oral sucker or pharynx. Gastro-intestinal parasites of marine teleosts.

TYPE SPECIES: *Q. pritchardi* n. sp., in *Naso unicornis;* Hawaii.

(A posteriorly mutilated specimen of this species, collected by Dr. H. L. Ching, stained with carmine and mounted in balsam was kindly submitted to me by Mrs. Mary Hanson Pritchard, together with her sketches and description; for these I am greatly indebted, because this slide showed the anterior union of the excretory arms and the structure of the terminal genitalia more clearly than my own specimens stained with Heidenhain's hematoxylin. This is why I prefer to dedicate the species in question to our esteemed fellow taxonomist, Mrs. Pritchard.)

DISCUSSION. From the internal anatomy of the genitalia it seems certain that this genus is related to Lecithasterinae Odhner, 1905. On the other hand it bears a certain resemblance to Accacoeliidae Looss, 1912, in which however, the excretory stems are located dorsally and ventrally in the hindbody but laterally in the forebody and not united anteriorly. The paired postacetabular flaps should be regarded as an accessory adhesive organ without great taxonomic importance. I prefer, therefore, to propose a new subfamily Quadrifoliovariinae and place it near Lecithasterinae Odhner, 1905 and Trifoliovariinae Yamaguti, 1958.

6. ***Quadrifoliovarium pritchardi*** ~~n. gen. n. sp.~~ YAMAGUTI, 1965

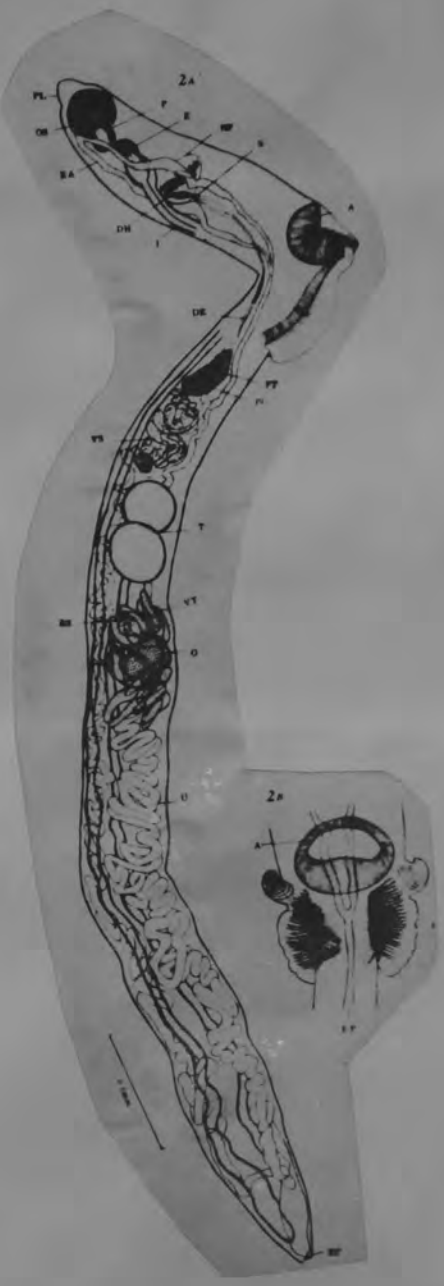
Fig. 2 *A–B*

HABITAT: Stomach and pyloric ceca of *Naso unicornis* (local name "kala"); Hawaii.

HOLOTYPE: U. S. Nat. Mus. Helm. Coll., S.Y. No. 24.

DESCRIPTION (based on 17 whole mounts): Body elongate, cylindrical, smooth, 3.0–9.0 mm long by 0.2–0.6 mm wide, tapered at each extreme end. Mouth opening ventrosubterminally. Oral sucker 0.11–0.28 × 0.15–0.29 mm, surmounted by rounded conical preoral lobe 40–90 μ thick, directly followed by well-developed pharynx 0.06–0.15 mm long by 0.08–0.15 mm wide; esophagus 80–220 μ long, provided with well-developed longitudinal muscle fibers. Ceca comparatively wide, terminating at different levels near posterior extremity. Acetabulum wider than long, 0.23–0.42 mm in transverse diameter, situated in posterior half of anterior third of body, with a pair of muscular, auricular ventrolateral lobes immediately behind; each of these lobes is constricted near its anterior end, 0.27–0.73 mm long, widest at middle of elliptical posterior portion; each lobe consists almost exclusively of dorsoventral muscle fibers, but some fibers which are located close to the point where the lobe is attached to the body are continued into the body parenchyma, so that the postacetabular lateral area of the body shows a dense marginal layer of strong transverse muscles.

Testes rounded, 0.1–0.26 × 0.11–0.3 mm, directly tandem in ventral part of midregion of body. Seminal vesicle saccular, up to 0.13 mm wide immediately in front of anterior testis, whence it tapers and passes into a much coiled tubular portion. Pars prostatica 0.12–0.35 mm long, surrounded by a dense coat of prostate cells which is well delimited from the surrounding parenchyma. Ejaculatory duct following pars prostatica long and narrow, uniting with uterus at base of hermaphroditic pouch. Hermaphroditic duct muscular, smooth, convoluted in hermaphroditic pouch, up to 0.4 mm long when fully everted; hermaphroditic pouch elliptical to pyriform, 0.08–0.26 × 0.06–0.2 mm, with comparatively thin walls of mainly longitudinal muscle fibers, a little posterior to intestinal bifurcation; genital pore midventral, 0.44–0.83 mm from head end.



Ovary divided into four spherical to oval, subequal lobes, measuring 0.13–0.4 mm longitudinally as a whole, situated ventrally at posterior part of middle third of body. Seminal receptacle voluminous, inverted retort-shaped, 0.08–0.4 mm in transverse diameter, situated immediately anterodorsal to ovary with its distal end produced backward. Shell gland complex immediately posterodorsal to ovary. Vitellaria divided into two rosette-shaped groups which are united together by a longitudinal collecting duct passing between the two ventral ovarian lobes, each group consisting of six or seven digitiform lobes totaling 12 or 14; anterior group overlapping ovary and seminal receptacle; posterior group ventral to shell gland, with forwardly directed lobes overlapping ovary. Uterus descending near ventral cuticle down to cecal ends where it turns dorsad and ascends dorsal to the descending portion, ovary, seminal receptacle and testes. Anterior to the testes it runs alongside the male duct and finally joins the latter at base of hermaphroditic pouch where it is provided with a small sphincter. Uterine eggs numerous, elliptical, operculate, embryonated, 25–30 × 12–16 μ in life. Excretory vesicle cylindrical, 80 × 70 μ in lateral view in the type, with terminal pore; divided anteriorly into two wide lateral arms running forward and reaching to oral sucker or pharynx where they unite dorsally. In the young specimen 3 mm long the two lateral excretory arms are in direct contact with each other in median line behind the acetabulum.

Quadrifoliovarium pritchardae **Yamaguti, 1965**

HOST: *Naso* sp.; unicorn fish; Acanthuridae.
LOCATION: Intestine.
NUMBER: Two from one host.

The species name, originally spelled *pritchardi*, should be *pritchardae*. The species was described from *Naso unicornis* (Forskål) in Hawaii.

No Digenea were found in the following 13 species of fishes; *Abudefduf septemfasciatus* (Cuv. and Val.), a bonito, *Caranx* sp., *Chaetodon* sp., "communard," *Gerres* sp., *Lethrinus nebulosus* (Forskål), *Mylio berda* (Forskål), *Peracanthurus teuthis* Fowler, *Polyamblydon* sp., *Scatophagus argus* (Linn.), *Siganus oranim* (Bloch and Schneider), and *Sillago sihama* (Forskål). Since only one specimen of most of these fishes was examined, these negative findings are not significant. A total of 49 species of fishes were examined in New Caledonia.

214. *Quadrifoliovarium pritchardae* Yamaguti, 1965*
(Fig. 214)

HABITAT: Stomach and pyloric ceca of *Naso unicornis* (local name "kala"); Hawaii.

HOLOTYPE: U. S. Nat. Mus. Helm. Coll., No. 63523.

DESCRIPTION (based on 17 whole mounts): Body elongate, cylindrical, smooth, 3.0-9.0 mm long by 0.2-0.6 mm wide, tapered at each extreme end. Mouth opening ventrosubterminally. Oral sucker 0.11-0.28 X 0.15-0.29 mm, surmounted by rounded conical preoral lobe 40-90 μ thick, directly followed by well developed pharynx 0.06-0.15 mm long by 0.08-0.15 mm wide; esophagus 80-220 μ long, provided with well-developed longitudinal muscle fibers. Ceca comparatively wide, terminating at different levels near posterior extremity. Acetabulum wider than long, 0.23-0.42 mm in transverse diameter, situated in posterior half of anterior third of body, with a pair of muscular, auricular, ventrolateral lobes immediately behind; each of these lobes is constricted near its anterior end, 0.27-0.73 mm long, widest at middle of elliptical posterior portion; each lobe consists almost exclusively of dorsoventral muscle fibers, but some fibers which are located close to the point where the lobe is attached to the body are continued into the body parenchyma, so that the post-acetabular lateral area of the body shows a dense marginal layer of strong transverse muscles.

Testes rounded, 0.1-0.26 X 0.11-0.3 mm, directly tandem in ventral part of midregion of body. Seminal vesicle saccular, up to 0.13 mm wide immediately in front of anterior testis, whence it tapers and passes into a much coiled tubular portion. Pars prostatica 0.12-0.35 mm long, surrounded by a dense coat of prostate cells which is well delimited from the surrounding parenchyma. Ejaculatory duct following pars prostatica, long and narrow, uniting with uterus at base of hermaphroditic pouch. Hermaphroditic duct muscular, smooth, convoluted in hermaphroditic pouch, up to 0.4 mm long when fully everted; hermaphroditic pouch elliptical to pyriform, 0.08-0.26 X 0.06-0.2 mm, with comparatively thin walls of mainly longitudinal muscle fibers, a little posterior to intestinal bifurcation; genital pore midventral, 0.44-0.83 mm from head end.

Ovary divided into four spherical to oval, subequal lobes, measuring 0.13-0.4 mm longitudinally as a whole, situated ventrally at posterior part of middle third of body. Seminal receptacle voluminous, inverted retort-shaped, 0.08-0.4 mm in transverse diameter, situated immediately anterodorsal to ovary with its distal end

* Original specific name *pritchardi* emended in accordance with ICZN Article 31.

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produced backward. Shell gland complex immediately posterodorsal to ovary. Vitellaria divided into two rosette-shaped groups which are united together by a longitudinal collecting duct passing between two ventral lobes; each group consisting of six or seven digitiform lobes totaling 12 or 14; anterior group overlapping ovary and seminal receptacle; posterior group ventral to shell gland, with forwardly directed lobes overlapping ovary. Uterus descending near ventral cuticle down to cecal ends where it turns dorsad and ascends dorsal to the descending portion, ovary, seminal receptacle, and testes. Anterior to the testes it runs alongside the male duct and finally joins the latter at the base of the hermaphroditic pouch where it is provided with a small sphincter. Uterine eggs numerous, elliptical, operculate, embryonated, 25-30 X 12-16 μ in life. Excretory vesicle cylindrical, 80 X 70 μ in lateral view in the type, with terminal pore, divided anteriorly into two wide lateral arms running forward and reaching to oral sucker or pharynx where they unite dorsally. In the young specimen 3 mm long the two lateral excretory arms are united in median line behind the acetabulum.

DISCUSSION: From the internal anatomy of the genitalia it seems certain that this genus is related to Lecithasterinae Odhner, 1905. On the other hand it bears a certain resemblance to Accacoeliidae Looss, 1912 in which, however, the excretory stems are located dorsally and ventrally in the hindbody but laterally in the forebody and are not united anteriorly. The paired postacetabular flaps should be regarded as an accessory adhesive organ.

Yam., 1970.

QUADRIFOLIOVARIUM

SATURNIUS Manter, 1969

Generic diagnosis of Saturnius — Hemiuridae. Lecithasterinae. Body small; with circular flanges, one at level of oral sucker, the other just posterior to acetabulum. Intestinal caeca ending blindly. Hindbody divided internally into four segmentlike parts by partitions formed by compact fibers. Testes tandem, in separate compartments. Seminal vesicle saccular; pars prostatica short; sinus sac pyriform. Ovary and single vitellarium in 4th, or posterior segment; seminal receptacle lacking; uterus largely divided into segments by partitions. Stem of excretory vesicle short; arms uniting dorsal to pharynx. Type species: *S. segmentatus*.

Discussion — This peculiar, very small hemiurid is most nearly related to *Bunocotyle* Odhner, 1928, the single species of which, *B. cingulata* Odhner, 1928, is found in *Perca fluviatilis* L. and *Acerina cernua* (L.) in streams connecting with the Baltic Sea. Another related genus is *Pseudobunocotyle* Yamaguti, 1965, from *Chanos chanos* (Forskål), a marine fish, in Hawaii. Both of these genera have the ridges near the oral sucker and acetabulum, and rounded, tandem gonads. However, both lack the internal pseudosegmentation. *Bunocotyle* has caeca uniting posteriorly; *Pseudobunocotyle* has two vitelline masses and a seminal receptacle.

Chabaud & Biguet (1955) described the life cycle of *B. cingulata* which matures progenetically in a copepod, *Poppella quernei* Richard. The molluscan host was *Hydrobia stagnalis* Bastes. The habitat was a brackish water pond in eastern France. Thus, although the fish hosts have been freshwater species, the genus evidently has marine affinities.

Chanos, the host of *Pseudobunocotyle*, is not closely related to *Mugil* but both fishes are plant feeders capable of living in fresh water and both are widely distributed. The occurrence of *Bunocotyle* in European waters so far removed from the Pacific and Indo-Pacific is not explainable at the present time.

The presence of fibrous septa at definite intervals along the body is unique among trematodes. It may be associated with the relatively large eggs and thin-walled, nonmuscular uterus. All specimens show the eggs separated into saclike compartments appearing like eggs in proglottids of a tapeworm. At least some of the fibers of the septa are apparently attached to the body wall laterally, some extend transversely, some bend ventrally, and most are dorsoventral. Contraction of these fibers would probably enlarge that part of the uterus lying dorsal to them and permit eggs to move forward. The intestinal caeca penetrate between fibers, becoming constricted at that point. Totomounts show no evidence of the presence of the partitions externally, hence they could hardly function in body movements.

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Saturnius Manter, 1969, emended

Diagnosis: Hemiuridae, Bunocotylinae. Body small, about 1 mm or less, aspinose but with minute corregations or papillae, possessing muscular flanges at or near levels of oral sucker and acetabulum. Acetabulum usually larger than oral sucker. Prepharynx lacking. Esophagus approximately length of pharynx. Caeca terminating blindly. Forebody and hindbody both divided internally into segment-like partitions by means of compact fibrous septa; testes occupying separate segments immediately anterior to large posterior segment possessing ovary and single compact vitellarium. Cells in compact masses and also single large cells distributed throughout body. Seminal vesicle saccate or sinuous. Prostatic cells surrounding prostatic vesicle or duct. Sinus sac containing male duct, metraterm, eversible hermaphroditic duct, and small cells. Seminal receptacle lacking. Genital pore median, usually at level of septa near middle of forebody. Excretory vesicle Y-shaped with short posterior muscular portion; arms branching from thin-walled stem and uniting dorsally approximately at pharyngeal level. Parasitic in stomach of mullet. Type species: *Saturnius segmentatus*.

From OVERSTREET, 1977

Remarks on Saturnius Manter, 1969, by Overstreet (1977)

Discussion. Unique for species of *Saturnius* are the septa in both the forebody and hindbody and possibly the specialized cells in the pseudosegments. Even though similar to species of *Bunocotyle* Odhner, 1928, because they possess a single vitellarium, species of *Saturnius* differ from them by having a sinus sac and lacking posteriorly united caeca. Other species of bunocotylines with flanges encircling the body near the oral sucker and posterior margin of the acetabulum include those of *Theletrum* Linton, 1910, and *Pseudobunocotyla* Yamaguti, 1965. In addition to lacking septa, they differ from species of *Saturnius* by having two compact vitelline masses and apparently a seminal receptacle.

The shape of the oral sucker constitutes the easiest single character to separate species of *Saturnius*. Conspicuous muscular papillae adorn the sucker's equator of *S. segmentatus*. One to three small ridges occur around the sucker of living S. *maurepasi;* but fixed ones usually just reveal a muscular thickening at the equator. The ventral portion of the sucker is less than the dorsal, but not nearly as much as in that of *S. mugilis,* which lacks any ridges but possesses a muscular thickening at the basal portion. The sucker-shape for *S. papernai* resembles a thick-sided cup with a flared anterior border.

Several other differentiating characteristics exist, but are harder to determine or observe. Relative lengths of segments differ (Figs. 5 to 8). The most robust species, *S. papernai,* has a relatively short posterior major segment. Of the others, *S. maurepasi* has a relatively longer segment located just anterior to the one containing the forward testis than the other species. At least some fixed specimens of *S. mugilis* do not possess the septum at the level of the genital pore. The structure of the prostatic complex and shape of the seminal vesicle also differ in the four species (Figs. 9 to 12), but often each individual does not provide a good example; additional specimens of *S. segmentatus* and *S. mugilis* will probably portray better examples than I illustrated. Most meristic features such as sucker-width ratio and egg-size overlap among some of the species and are not as useful as sucker-shape to quickly differentiate species.

These and other undescribed forms probably have been overlooked because of their site. Even though I saw a few specimens in the lumen of the pyloric stomach, the grinding "gizzard", of mullet in Mississippi and Sinai, many more occurred embedded between the stomach lining and the layer of glandular cells (Figs. 13 and 14). The lack of an inflammatory response indicates a well-adapted host-parasite relationship. I assume because of the sperm packed in the terminal genitalia of Manter's specimens and the everted hermaphroditic ducts in Yamaguti's, in addition to the low number of specimens described by both authors, that the worms had undergone stress and were not in their normal histozoic site.

Flanges serve the species well, at least for locomotion, by allowing individuals to hold a portion of their bodies in place within tissue while other portions move. In addition to the active oral suckers, the septal and other muscles permit rolling or spiralling, although worms sometimes quickly become inactive after being placed in saline. The functions of the cellular bodies and large single cells within the segments are presently unknown, but presumably they respond to a worm's histozoic life, its migration, or its problems resulting from segmentation.

Species of *Saturnius* have evolved differently than assumed for most trematodes. Noble and Noble (1971:572) and others state, and I believe correctly, that parasites usually develop slower than their hosts. In the case of *Saturnius,* all species infect *Mugil cephalus.* I carefully examined for species of *Saturnius* in a few specimens of most Mediterranean and Red Sea mullets other than *M. cephalus* without success. The worms apparently evolved in spite of the host's integrity, although other mugilid hosts may exist. The reason for such a process

-OVER-

may be simple: geographic isolation and different molluscan hosts. Typically, adult *M. cephalus* remain near shore except when spawning. Presently, any discussion on how, when, and from where the parasites obtained their present status constitutes unnecessary speculation. The point remains that isolation in different intermediate hosts could have resulted in, at least, the four well-differentiated and geographically isolated species. If this report stimulates examination of mullet from different localities, some encountered worms probably will be new species and different forms.

Of the four species, *S. segmentatus* most closely resembles species of *Bunocotyle* because it has muscular oral papillae. Based on the relatively short posterior partition, the relatively large prostatic vesicle, and the cup-shaped oral sucker, *S. papernai* is the least related of the species to *S. segmentatus*.

From OVERSTREET, 1977

Saturnius segmentatus ~~n.gen., n.sp.~~ MANTER, 1969
(Fig. 1-5)

Host — *Mugil cephalus* L.; Mugilidae; mullet. *Habitat* — stomach. *Locality*: — Wynnum, Queensland, Australia. *Number* — 8 specimens in 1; 1 in another; 5 hosts examined. *Holotype* — USNM Helminth. Coll. No. 71219.

Description (based on 9 specimens; measurements on 5) — Small, elongate, smooth bodied hemiurids, without ecsoma. Forebody tapering anteriorly, hindbody of almost uniform width; anterior end more or less pointed; posterior end truncate; six papillae arranged around posterior end (Fig. 2). Length 661–866; width 148–159. Preoral lobe well developed. Oral sucker 62–65 wide; acetabulum 93–101 wide. Sucker ratio 1:1.44 to 1.6. Forebody 171–205 long, or about ¼–⅓ body length. Two flanges or ridges encircling body, one at posterior edge of mouth; another (more conspicuous) just posterior to acetabulum. Lateral edges of body at level of posterior flange elevated to a nipple-shaped tip and provided with concentric muscles (Fig. 3). A pair of very large cells (up to 30 in diameter) directly beneath the postacetabular ridge, one on each side lateral to caecum (Fig. 3).

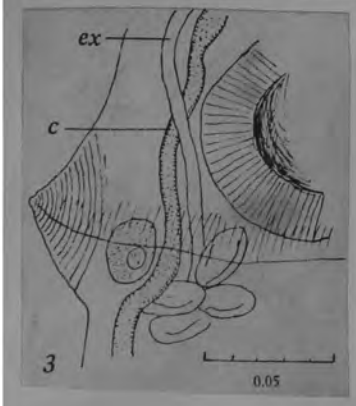
Pharynx 31–36 long × 33 wide; oesophagus almost as long as pharynx; precaecal sacs present; caeca extending to near posterior end of body, ending blindly. Hindbody divided internally by four, transverse, fibrous, septalike partitions resulting in four tandem segments of increasing size; largest (posterior) segment 250–319 long or more than ½ total body length and about same length as, or longer than, preceding three segments together. Partitions consisting of numerous thick fibers mostly dorso-ventral but becoming transverse near dorsal surface (Fig. 4). Intestinal caeca constricted when passing through partitions. Uterus with eggs accumulated in each segment; uterus presumably continuous probably by way of a thin dorsal passage at least when septal fibers contract.

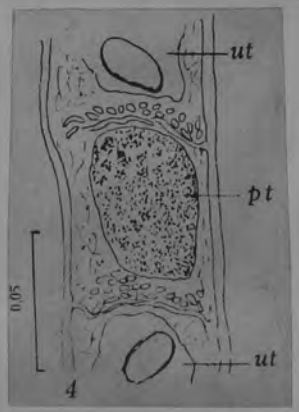
Testes smooth, tandem, in separate segments; anterior testis between 2nd and 3rd partitions; posterior testis between 3rd and 4th partitions. Seminal vesicle at anterior edge of acetabulum, saccular, recurved or bent once; prostatic cells few. Sinus sac pyriform (Fig. 5); with small spherical basal sac containing sperm cells, and thick-walled genital sinus about half length of sac. Genital pore a transverse slit near level of caecal bifurcation.

Ovary globular, immediately posterior to 4th partition; seminal receptacle lacking; sperm cells in early coils of uterus. Vitellarium single, immediately postovarian, larger than ovary. Uterus divided by body septa into five sacs probably connected dorsally. Eggs large relative to body size, 26–28 × 12–13.

Excretory vesicle with short stem; arms uniting dorsal to pharynx.

The name *Saturnius* is from Saturn (because of the body rings or flanges); and *segmentatus* suggested by the segmented appearance of the hindbody.





Saturnius segmentatus Manter, 1969
Figs. 1, 5, and 9

Synonym: *Saturnius segmentatus* Manter, 1969.
Host: *Mugil cephalus.*
Site: "Stomach."
Locality: Wynnum, Queensland, Australia.

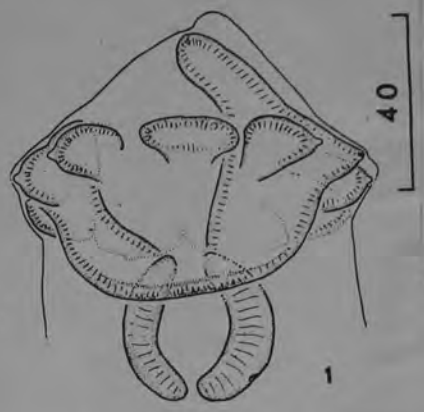


Fig. 1. Cephalic region of *Saturnius segmentatus*, lateral view showing shape of oral sucker and location of muscular papillae.

1

5 864μ long

Specimens examined: Holotype, USNM Helm. Coll. Nº 71219; paratypes, Univ. Nebraska State Museum, Manter Lab. Nos. A53a and A58a, 4 specimens. (Figs. 1 a 8.)

Remarks: From examining type material of *S. segmentatus,* I noted several characteristics that should be added to the original description. Located about the circumference at approximately the equatorial level of the oral sucker appear 10 muscular papillae (Fig. 1). Considerable solid muscle also occurs at the base of the sucker. Additional septa exist. One major one transverses the forebody and forms the "precaecal sacs" (Fig. 5). Less prominent, but probably just as functional are a few fibers extending from the oral sucker to margins of the forebody and others transversing near the posterior end. The latter fibers form a septum compartmentalizing the thick-walled posterior portion of the excretory vesicle and bar the uterus from reaching the posterior tip of the body. Cells similar to the large previously-described single cells (Manter, 1969) reaching up to 35 μ near the flange at the acetabular level also occur throughout the worm. Additionally, clumps of smaller cells situate at the peripheries of the partitions, and similar appearing ones associate with the terminal genitalia, the pharynx, and posterior portion of the excretory vesicle.

A prostatic vesicle apparently exists (Fig. 9), but is not the spherical basal sac in the "sinus sac" as asserted by Yamaguti (1971:284). Confirmation should come from material lacking sperm in the distal portions of the terminal genitalia. I consider a prostatic vesicle that swollen portion of the male duct containing large, lightly staining, anucleate, membrane-bound bodies. These bodies protrude into or completely occupy the enlarged area. When elongated, the vesicle can be called a prostatic duct or tube.

FROM OVERSTREET, 1977

9

Saturnius maurepasi ~~sp. nov.~~ OVERSTREET, 1977
Figs. 2, 3, 10 and 13

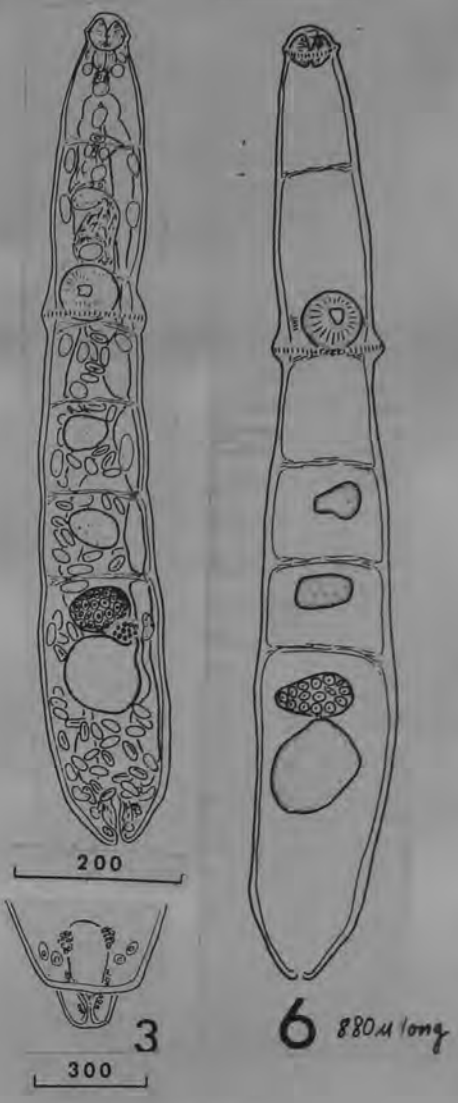
Description (based on 37 mounted and few living specimens): Body elongate, gradually tapering anteriorly, 497 to 1,085 long by 77 to 139 wide at acetabular flange; width 11 to 22% of body length with percentage greater for small worms and lower for large worms; rounded posterior end truncated, constricted ventral portion slightly shallower, with solid muscular thickening at margin of equatorial level occasionally forming minute ridge dorsally and laterally, 29 to 42 long by 33 to 48 wide; in living worm sucker active and variable in shape, muscular equatorial ridge usually conspicuous and often acting as edge of sucker's base, anterior border also acting as ridge, third ridge midway laterally in living worm and forming tail, without terminal papillae, occasionally partially withdrawn and appearing as ecsoma (Fig. 3). Preoral dorsal lip wide, poorly developed. Flange at level of oral sucker continuous around body, considerably less prominent ventrally. Oral sucker subterminal, circular in outline, between two others. Acetabulum 46 to 75 long by 49 to 77 wide. Sucker-width ratio 1:1.3 to 1.8. Forebody 25 to 34% of body length. Pseudosegments as illustrated (Figs. 2 and 6), although additional muscle fibers forming less prominent partitions; fibers in anterior of worm extending from anterior end of pharynx directly to margin of forebody and also to oral sucker; fibers in posterior of worm extending transversely near slightly protruding initiation of rounded posterior end and also diagonally; anterior major septum 13 to 20% of body length from anterior end; second major septum near anterior of acetabulum; third major partition, or segment, relatively short, occupying acetabular region with flange; fourth segment 8 to 12% of body length from flange; fifth and sixth segments roughly the same lengths as previous segment, 6 to 12 and 7 to 12% of body length, respectively; seventh, and final, major segment including posterior minor segment 173 to 373 or 30 to 37% of body length. Cellular masses present in all major segments, usually elongate, as short as 11 near pharynx to as long as 52 near midbody; large single cells also in all or most segments, usually elongated, 6 to 20 long. Material forming coalesced strings and masses extruded from pore located near lateral bulge at posterior end of body of living worm.

Pharynx 22 to 32 long by 19 to 33 wide. Esophagus thick walled, slightly longer or shorter than pharynx depending on state of contraction at fixation, surrounded by gland cells. Caeca terminating near minor septum at posterior end of body. "Precaecal sacs" of Manter not resulting from septum but by few muscular fibers, epithelium same as that of more posterior caeca. (Figs. 9-12.)

Testes smooth or irregular, in fifth and sixth major segments, usually tandem and median but occasionally slightly diagonal, ventral or nearly so; anterior testis 28 to 55 long by 30 to 62 wide; posterior testis 29 to 58 by 38 to 71. Sinus sac thick walled; containing thick-walled, finely-corregated, muscular, partially eversible hermaphroditic duct, also metraterm, short and occasionally swollen male duct, and roundish cells. Seminal vesicle thick-walled, elongate, sinuous, usually extending to anterior level of acetabulum. Sperm 50 to 55 long. Prostatic cells relatively large, usually forming compact layer dorsal and lateral to relatively moderately-sized prostatic vesicle but occasionally surrounding entire complex. Genital atrium shallow; pore median, at or near level of major anterior septum.

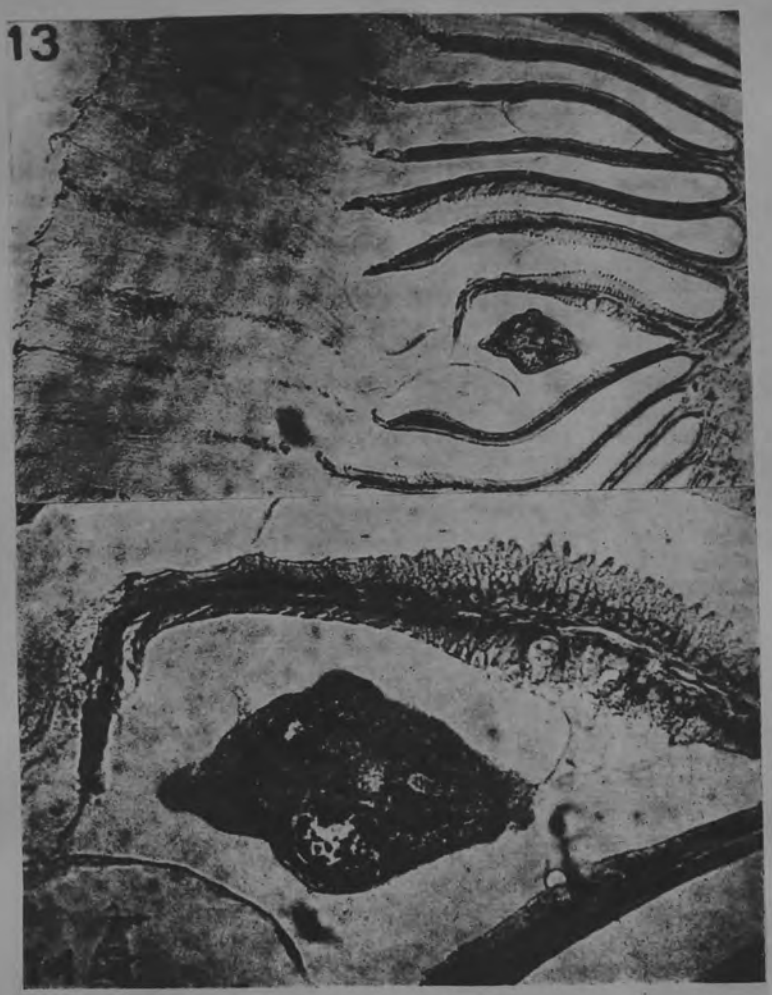
Ovary in last major segment, ventral or nearly so, smooth to irregular, wider than long, 26 to 70 long by 39 to 91 wide. Mehlis' gland conspicuous. Vitellarium smooth to irregular, 11 to 19% of body length from worm's posterior end, more voluminous than ovary, 57 to 106 long by 44 to 94 wide, contiguous with or slightly separated from ovary. Uterus filling most of partitions, extending posterior to vitellarium but not into small posterior partition, passing ventral to prostatic complex. Eggs from anterior of worm 17 to 26 long by 10 to 16 wide, 24 to 30 by 12 to 16 in three living worms.

Excretory vesicle consisting of posterior muscular sac within small posteriormost segment and anterior thin-walled, narrow extension winding anteriorly to septum at level of acetabular flange at which point two arms branching and then at or near pharyngeal level uniting dorsally; subspherical material noticeable in some living material; pore terminal.



Type host: *Mugil cephalus*.
Sites: Primarily under lining of pyloric stomach, rarely in lumen.
Locality: Mississippi Sound and adjacent water.
Holotype: British Museum (Natural History) Reg. Nº 1975.9.29.1.
Paratypes: Reg. Nº 1975.9.29.2-3; USNM Helm. Coll. Nº 73270 (2 specimens); University of Nebraska State Museum, Manter Lab. Nº 20247 (2 specimens).

Remarks. The genitive masculine name *maurepasi* honors the short-lived Fort Maurepas, the first French colony on the Gulf of Mexico, which Pierre Le Moyne d'Iberville established in 1699 at the type locality of the digenean, now known as Ocean Springs, Mississippi.



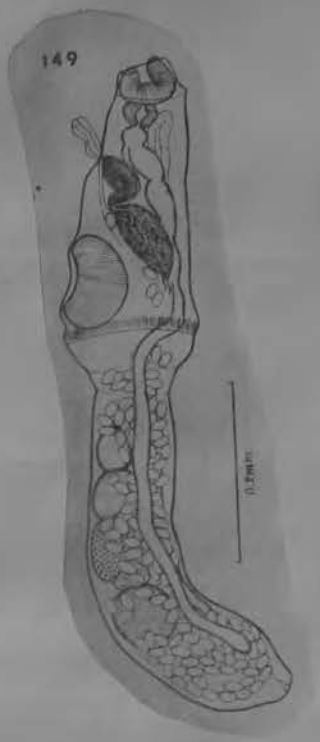
Figs. 13-14. 13. Section of cephalic region of *Saturnius maurepasi* underlying lining of pyloric stomach. Note slight alteration of adjacent glandular cell layer and lack of inflammatory reaction. 14. High magnification of previous photograph.

Subfamily BUNOCOTYLINAE Dollfus, 1950

SATURNIUS MUGILIS (YAMAGUTI, 1970) OVERSTREET, 1977

SYN. 149. *Bunocotyle mugilis* ~~n. sp.~~ YAMAGUTI, 1970

(Fig. 149)



HABITAT: Stomach of *Mugil cephalus* (local name "ama'ama"); Hawaii.

HOLOTYPE: U. S. Nat. Mus. Helm. Coll., No. 63747.

DESCRIPTION (based on six whole mounts): Body subcylindrical, 0.4-0.75 mm long, 0.08-0.15 mm wide at level of postacetabular ridge which projects all round the body in form of a belt of lamellar muscles. Oral collar encircling oral sucker laterally and dorsally but not ventrally. Mouth ventroterminal. Oral sucker 35-50 × 42-70 μ, muscular; pharynx comparatively large, 23-35 × 21-37 μ; esophagus 23-35 μ long; ceca wide in forebody, apparently united behind vitelline gland. Acetabulum 80-90 μ in diameter, at posterior end of anterior third of body or at its junction with middle third. Postacetabular ridge 0.13-0.15 mm in transverse diameter, at anterior end of middle third of body.

Testes oval, 35-70 × 46-58 μ, directly tandem, close to ventral cuticle in middle third of body. Seminal vesicle elliptical, large, 65-95 × 28-42 μ, provided with well developed spiral muscle fibers, overlapping acetabulum posteriorly. The narrow duct arising from the anterior end of the seminal vesicle describes a sigmoid curve and leads into the ejaculatory duct which is enclosed in a conspicuous bulb of circular and longitudinal muscle fibers. This ejaculatory bulb, 48 × 28 μ in the type, joins the metraterm to form an eversible hermaphroditic duct. When everted, the hermaphroditic duct is smooth, cylindrical, 42-51 μ long by 14-21 μ wide. There is no prostatic complex as observed by Odhner (1928) in *Bunocotyle cingulata*. It seems certain that Odhner interpreted the ejaculatory bulb as pars prostatica. Genital pore wide, median, ventral to intestinal bifurcation.

Ovary oval, 35-58 × 46-70 μ, situated ventrally at anterior end of posterior third of body. Seminal receptacle large, posterodorsal to ovary. Vitellaria represented by a large, single, compact mass 70-116 μ long by 46-86 μ wide, may be contiguous to ovary anteriorly. Uterine coils occupying all available space of hindbody, leaving posterior tip of body free; metraterm ventral to seminal vesicle and ejaculatory bulb. Eggs elliptical, 21-25 × 11-15 μ in life. Excretory pore terminal; arms united anteriorly dorsal to esophagus.

DISCUSSION: This species differs from the only known species of the genus, *Bunocotyle cingulata* Odhner, 1928 from *Perca fluviatilis* of Greenland, in the eggs being distinctly smaller. The difference in the host species is also worth noting.

Yam., 1970

— OVER —

OVERSTREET, 1977

Saturnius mugilis (Yamaguti, 1970) ~~comb. n.~~
Figs. 8 and 12

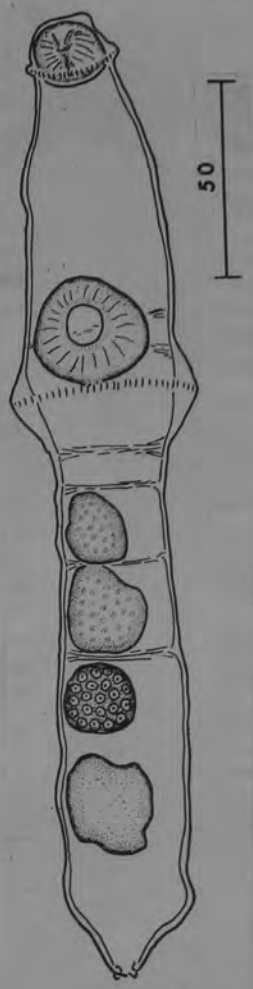
Synonym: *Bunocotyle mugilis* Yamaguti, 1970.
Host: *Mugil cephalus*.
Site: "Stomach."
Locality: Hawaii.
Specimens examined: Holotype and one paratype, USNM Helm. Coll. Nº 63747.

Remarks: Examination of two specimens showed a few differences and suspected differences from the original description. The paratype revealed that the flange around the oral sucker also projects ventrally, but only minimally. The metraterm, rather than joining an "ejaculatory bulb" anteriorly near the genital pore, enters the sinus sac near its base (Fig. 12).

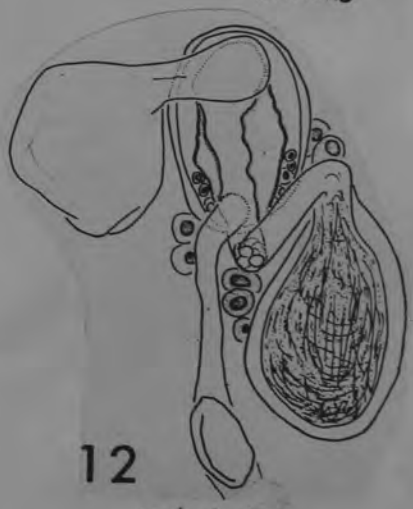
Apparently the harsh fixation of the specimens precludes easy differentiation of some organs. The caeca seem to end blindly rather than unite behind the vitellarium, a definite seminal receptacle was not apparent, and a prostatic vesicle could be present. Because the latter structure occurs in the other species, what appears to be it is indicated in Fig. 12. The presence of all the above structures should be confirmed using additional specimens.

The individuals also possessed segmentation as in other species; however, that septum occurring in other species near the genital pore was either absent or obscured in observed specimens of *S. mugilis*. The ventral portion of the oral sucker is much shorter than the dorsal portion as illustrated by Yamaguti (1970); also, extensive muscularization at the base of the sucker suggests an ability for the sucker to exhibit forceful movements as in other species.

Even though additional specimens of *Bunocotyle mugilis* should be examined for the anterior septum, prostatic vesicle, and seminal receptacle, the obvious partitioning of the hindbody and other characters corresponding to the other three species of *Saturnius* reveal that it belongs in *Saturnius* as a new combination.



8 6964 long
two terminal papillae may be artifacts



12
ventral view
♀ duct everted

Saturnius papernai ~~sp. nov.~~ OVERSTREET, 1977
Figs. 4, 7 and 11

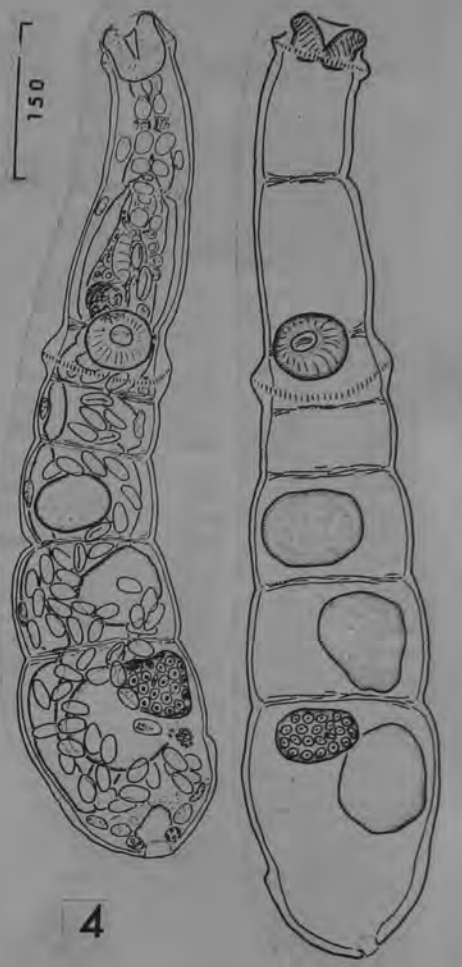
Description (based on 28 mounted specimens): Body elongate, usually tapering anteriorly, 635 to 1,021 long by 93 to 190 wide at flange near acetabular level and 113 to 202 wide at posterior segment; posterior end obtuse, without papillae. Preoral lip poorly developed, consisting of slight fleshy lobe dorsally. Anterior flange continuous around worm, less prominent ventrally. Oral sucker 38 to 64 long by 51 to 87 wide, cup-shaped with thick anterior rim flared laterally when not withdrawn; flared rim causing additional collar anterior to flange; anterior portion of sucker protrusible. Acetabulum 48 to 78 long by 51 to 90 wide. Sucker-width ratio 1:0.8 to 1.3. Forebody 28 to 35% of body length. Pseudosegments as illustrated (Figs. 4 and 7), although additional fibers forming less prominent partitions in anterior of worm extending from posterior end of pharynx to oral sucker and posterior base of flange (fibers also extending from base of flange to oral sucker and from sucker to margin of forebody) and others in posterior of worm extending transversely near slight protrusion of insertion of rounded obtuse portion; anterior major septum 13 to 21% of body length from anterior end; second major partition, or segment, either longer or shorter than first depending on body's state of contraction at fixation, almost always at acetabular level, 15 to 20% of body length; third major segment with septum near base of flange, 6 to 9% of body length, additional fibers extending between that base and acetabulum; fourth major segment about same length as previous one; fifth and sixth major segments approximately same length, 9 to 14% and 11 to 16% of body length, respectively; last major segment including posterior minor segment 173 to 273 long or 23 to 31% of body length. Cells similar to those in other species ocurring in addition to larger cellular masses in most segments, 7 to 19 long.

Pharynx 30 to 48 long by 29 to 42 wide. Esophagus muscular, thick walled, either slightly longer or shorter than pharynx depending on state of contraction at fixation, surrounded by gland cells. "Precaecal sacs" representing partitioning by anterior major septum; epithelium in lumen same as in remainder of caeca. Caeca terminating near posterior end of body.

Testes smooth or irregular in fifth and sixth major segments, almost always diagonal but often one ventral and other dorsal; anterior testis 41 to 90 long by 44 to 99 wide; posterior testis 52 to 99 by 45 to 116. Sinus sac thick walled, containing muscular, partially eversible hermaphroditic duct, metraterm, short male duct, and roundish cells. Seminal vesicle thick walled, clavate, bending dorsad near anterior border of acetabulum. Prostatic cells large, surrounding approximately 1/2 of sinus sac and seminal vesicle and all in between; prostatic vesicle relatively large, occasionally larger than seminal vesicle. Genital atrium shallow; pore median, conspicuous at or near level of major anterior septum.

Ovary in last major segment, irregular in shape, ventral, dextral to sinistral, 46 to 87 long by 44 to 107 wide. Mehlis' gland conspicuous. Vitellarium smooth to irregular, located 7 to 15% of body length from posterior end but anterior to caecal tips, contiguous with and larger than ovary, 67 to 145 long by 58 to 138 wide, medial cells often partially refractory to hematoxylin stain. Uterus filling most of partitions, extending posterior to vitellarium, passing ventral to prostatic complex. Eggs from anterior of worm 20 to 32 long by 10 to 17 wide.

Excretory vesicle consisting of posterior muscular sac with thin-walled narrow extension winding anteriorly to septum near forward border of anterior testis at which point two arms branching and then at or near pharyngeal level uniting dorsally; arms typically harboring variable-sized subspherical bodies in fixed material; posterior muscular sac partially extrusible and it, several cellular masses, other cells associated with sac, and occasionally part of thin-walled extension confined by septum to posterior end of body; pore large, terminal but often directed dorsally.



4

7 921μ long

11

—OVER—

Type host: *Mugil cephalus*.
Sites: Primarily under lining of pyloric stomach, rarely in lumen.
Locality: Bardawil Lagoon, northwestern Sinai.
Holotype: British Museum (Natural History) Reg. Nº 1975.9.29.4.
Paratypes: Reg. Nº 1975.9.29.5; USNM Helm. Coll. Nº 73271 (2 specimens); University of Nebraska State Museum, Manter Lab. Nº 20248 (2 specimens).

Remarks: The species is named after Ilan Paperna of The Heinz Steinitz Marine Biology Laboratory of The Hebrew University of Jerusalem, Elat, Israel, for his contributions to parasitology.

SATURNIUS

Tangiopsis Skrjabin et Guschanskaja, 1955

Generic diagnosis. — Hemiuridae, Halipeginae: Body small, tapered toward extremities, unarmed. Acetabulum large, equatorial. Oral sucker subterminal, esophagus short, ceca united posteriorly and forming an arch at level of testes. Testes very large, oblique, postacetabular. Seminal vesicle turned back on itself in front of acetabulum. Pars prostatica enclosed in sac, hermaphroditic duct swollen, genital atrium opening immediately behind pharynx. Ovary much smaller than testes, post-testicular. Receptaculum seminis oval, dorsal to ovary, giving off Laurer's canal at its anterior end. Vitellaria in two compact masses, at posterior extremity. Uterus filled with sperm, uterine eggs few, without filament, containing oculate miracidia. Excretory vesicle Y-shaped, arms united dorsal to pharynx.

Genotype: *T. chinensis* (Tang, 1951) Skrjabin et Guschanskaja, 1955 (Pl. 105, Fig. 1280), in *Rhinogobius giurinus*: Fukien. Cercaria develops in *Melania joretiana*, *Paludomus* (*Hemimitra*) *tangi*. — Tang (1951).

H.W. Manter

Peking Natural History Bulletin 19 (2-3): 217-223, 1950-51 北京博物雜誌 19 卷 2-3 期

福建省蠕蟲之研究報告

3. 對於吸蟲 Genarchopsis chinensis n. sp. 新種之形態及生活史研究。

唐仲璋

選種吸蟲 Genarchopsis chinensis 係由一種淡水魚 Rhinogobius giurinus 之胃中取得。文中對於成蟲及其各期幼蟲之構造皆作詳細之描述。對於本蟲之生活史之大部已完成，但是否需要第二中間宿主，及確定寄主如何受染須待日後之証明。

CONTRIBUTION TO THE KNOWLEDGE OF THE HELMINTH FAUNA OF FUKIEN*

Part 3. Notes on *Genarchopsis chinensis* n. sp., its life history and morphology

C. C. TANG

Life history studies on Hemiurid trematodes are few. Only some accidental observations on the larval stages developing in copepods, *Acartia*, were recorded by early investigators (Pratt 1898; Lebour 1923, 1935). Dollfus (1923) described a cystophorous cercaria, *Cercaria calliostomae*, and expressed the opinion that it is the larva of a species of *Hemiurus*. A more recent work is that of Hunninen and Cable (1941, 1943) on *Lecithaster confusus*; their study is to the best of the writer's knowledge the only one giving complete accounts of the life history. The knowledge regarding the biology of this group of trematodes is extremely scanty in view of the great assemblage of species under Hemiuridae, involving six subfamilies.

In 1943, when the writer was in Shao-wu, Northwestern Fukien, he found a species of Hemiurid trematode in the stomach of a fish, *Rhinogobius giurinus* Rutter (Gobiidae) taken from the Fu-tung stream. The worm was later connected with a cystophorous cercaria from the same stream on both ecological and experimental grounds. The study remained incomplete, but since for several years the writer has had no chance to return to Shao-wu, it is thought desirable to make a brief communication on those phases of the cycle which are already known.

A detailed morphological study of the adult worm indicates that it belongs to an undescribed species of the genus *Genarchopsis*, to which the name *Genarchopsis chinensis* is proposed.

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*Contribution from the Institute of Zoology and Botany, Fukien Academy, and the Department of Biology, Fukien Christian University, Foochow.

Description of *Genarchopsis chinensis* n. sp.

This small trematode measures 1.088—1.36 mm in total length and 0.544 mm in width (Fig. 1). While fully mature worms are flat, the immature and less mature ones are somewhat cylindrical in general shape. The maximum breadth is on the level of the acetabulum. The body becomes narrower toward both ends. The oral and ventral suckers are both muscular. The former measures 0.107—0.111 mm in diameter, while the latter measures 0.15—0.156 mm. The acetabulum is situated in the middle of the body. The cuticle is unarmed and smooth.

The mouth is directly connected with the pharynx, which is globose in shape. A short esophagus follows the pharynx. It divides into two intestinal crura, which unite posteriorly to form a ring-like intestine. The loop of the ring does not extend to the hind end of the body but only to the level of the testes, lying on their dorsal side.

The excretory bladder is a small triangular vesicle. It is connected with a long median unpaired stem, which divides behind the acetabulum. The paired limbs run anteriorward uniting on the dorsal side of the pharynx.

Posterior to the ventral sucker, are two large testes. The anterior testis measures 0.149 by 0.107 mm, while the posterior one measures 0.171 by 0.128 mm in diameter. From their anterior aspect two long vasa efferentia arise, running forward and uniting in front of the acetabulum, where they are connected with the vesicula seminalis. A real cirrus pouch is not present. The seminal vesicle, which describes two turns, and the pars prostatica lie free in the parenchyma. The prostatic gland with the ductus ejaculatorius is connected with the uterus to form a short and swollen sinus, which is often found to be everted outwardly from the orifice. The genital atrium is situated in the center of an elevation composed of radial muscle fibers. The prostate cells are few.

The globular ovary measures 0.043 mm in diameter. It is situated posteriorly to the testes. The curved oviduct arises from its lateral side, running posteriorward and is joined first by a receptaculum seminis and then by the common vitelline duct. The seminal receptacle is an oval sac lying on the dorsal side of the ovary. From its anterior side arises Laurer's canal, which opens on the dorsal surface of the body. The seminal receptacle in the living worm is full of actively moving spermatozoa. The oviduct, after being joined by the vitelline duct, turns forward to the ootype surrounded by a cluster of translucent unicellular shell-glands. The uterus contains a small number of eggs. After a sinuous course leading from one side of the body to the other it terminates at the sinus, and then opens through the genital atrium at the mid-ventral region posterior to the pharynx. The whole uterus is filled with spermatozoa, mingling with the eggs and crowded to its full capacity, a phenomenon unique in trematodes. The vitelline glands are in the form of two compact bodies connected by transverse vitelline ducts which join to form a common reservoir leading to the oviduct near the

junction of the seminal receptacle. The vitelline follicles on each side measure 0.04 to 0.05 mm in the longer axis and 0.025 mm in the shorter axis.

The egg is thin-shelled, oval in shape. In the proximal portion of the uterus each egg contains a centrally situated egg cell and several yolk cells, while in the more distal portion it contains a fully developed miracidium with black eye-spots. The eggs measure 0.047—0.062 mm in length and 0.022—0.03 mm in width. They are operculated and possess no filament (Fig. 3).

The genus *Genarchopsis* was erected by Ozaki in 1925, with *G. goppo* from *Mogurnda obscura* as type species. Yamaguti (1938) described *G. anguillae* from *Anguilla japonica*. The present species differs from both of them in the absece of an egg filament, the much smaller size of the ovary and in the presence of a seminal receptacle. The modification of the whole uterus as a receptaculum seminis uterinum is also a unique character.

Description of the larval stages

The cercaria.- The cercaria of *Genarchopsis chinensis* was obtained from *Paludomus* (*Hemimitra*) *tangi* Chen, a snail from the same stream where adult *Genarchopsis* occur. It belongs to the cystophorous type of cercaria. The body proper is elongated in shape, tapering somewhat anteriorly. It measures 0.38—0.60 mm. in length (average 0.468 mm) and 0.12—0.20 mm in its greatest width (average 0.168 mm). The tail of the cercaria including both the cystic bulb and the slender tubular portion reaches 2.83 mm in length (Fig. 11).

The oral sucker is antero-ventral in position measuring 0.06—0.094 mm in diameter (average 0.07 mm). Closely connected with the oral sucker is the pharynx which is 0.021—0.031 mm in transverse section (average 0.03 mm). Behind the pharynx is the short esophagus. It bifurcates into two intestinal crura, which unite posteriorly, forming an intestinal ring. The muscular acetabulum is somewhat larger than the oral sucker, measuring 0.075—0.102 mm in diameter (average 0.089 mm). A large excretory bladder is situated in the hind part of the body with an excretory pore at the middle of its posterior border. On its anterior side the bladder is connected with a median stem, which proceeds anteriorward to about the hind border of the acetabulum and divides into two collecting tubes. They run obliquely on both sides to about one third anterior to the intestinal crura. Here each tube divides again into an anterior and a posterior branch. The anterior branch fuses with its mate from the other side forming a loop situated on the dorsal side of the esophagus. The posterior branch divides twice giving off four tubules, each with a flame cell at its tip. On the posterior aspect of the bladder is the large caudal excretory vessel, which runs through the bulbous part and the whole length of the tail, terminating at its posterior extremity. Four flame cells were found in the bulb of the tail with two on each side of the caudal excretory tube. The whole cercaria possesses twelve flame cells. The pattern can be

expressed in the following formula: $2\{(2+2)+2\}=12$. The development of the cercarial excretory system has been traced from the early germ ball stage to the mature cercaria (Figs. 5-10). The earliest sign of the excretory system in the germ ball are two lateral tubules without any flame cells at the tip. Then the tubules curve posteriorly and flickering cells soon appear. As the cercarial embryo elongates, the caudal portions of the tubules gradually fuse. The flame cells multiply and the anterior excretory loop soon develops. At the stage when the caudal appendage and the tubular tail taketheir shape, the main feature of the cercarial excretory system already becomes established (Fig. 10).

The tail of the cercaria consists of a bulbous portion and a tubular portion. The cystic bulb measures 0.334 mm in length and 0.222 mm in transverse section. The tubular portion is often 2.5 mm long. The bulb is made of hard and smooth cuticle. Beneath the cuticle, a layer of large cells with distinct nuclei were observed. The whole bulb is pyriform in shape. The body of the cercaria has been observed to be completely enveloped by this cystic bulb and also observed to emerge from its anterior opening. A conspicuous lateral appendage projects from the anterior part of the bulb. It measures 0.501 mm in length. Apparently it is a suctorial organ with a column of ten to eleven cells in the center and a hollow flap at its tip. The cells contractile and the hollow flap at the tip acts as a vacuum disk attaching to the substratum. By this appendage the cercaria can hold itself in place on the surface of a stone against the sweeping water current. The whole appendage is connected with a column of cells in the interior of the cystic bulb, enabling it to be withdrawn into the compartment.

The redia. The cercaria develops in a simple redia with a pharynx and a long gut, connected by a short esophagus. A birth pore is situated near the pharynx (Fig. 4). It possesses no muscular foot-like structures. The rediae measure 0.919—1.575 in length and 0.324—0.376 mm in width. The pharynx measures 0.036–0.072 mm by 0.027—0.054 mm. The digestive gut is a very long tube reaching almost to the posterior end of the body. It measures 0.691—1.17 mm in length and 0.05—0.07 mm in width. A minute protuberance is present at the posterior extremity of the redia. (Fig. 2)

Observations and experiments.– Observations were made on the ecology of the molluscan and fish hosts. *Rhinogobius giurinus* lives on the stream-bed among stones and gravels, where the snails, *Paludomus (Hemimitra) tangi* are numerous. The incidence of infection in this gastropod is 4.5%. Another species of gastropod, *Melania joreliana* Heude occurs in the same environment. It is also infected with this parasite. The incidence of infection is 1.7%. No other Hemiurid cercariae were found in these two species of molluscs after the dissection of large number of specimens.

Three experiments were made to feed *Rhinogobius giurinus* with longtailed cystophorous cercariae dissected out from *Paludomus (Hemimitra) tangi*. The fishes used were collected from a non-infected area. A large number of them were dissected

and found to be free from infection before the remaining lot were used for experimental purpose. On Nov. 28, 1943 three small fishes were kept in a small glass container together with numerous cystophorous cercariae. They were observed to swallow the cercariae. Two days later, they were autopsied. Only one very small immature *Genarchopsis* was found in the stomach of one fish. On Dec. 5, another similar experiment was performed with two more fishes. One fish was examined on the sixth day after the feeding. Six immature trematodes were found. Ten days after infection the other fish was examined and another developing *Genarchopsis* was recovered. On Dec. 12, three fishes were put in a glass container together with the cercariae. They were kept overnight with the cercariae. The next morning, two fishes died and were discarded. The remaining one was sacrificed ten days after the infection experiment. Four worms were found in the stomach. Only one of them was sexually mature.

DISCUSSION

The first cystophorous cercaria described was *Cercaria cystophora* Wagener 1866, discovered in *Planorbis marginatus*. This cercaria, according to Sinitsin (1905) is the larva of *Halipegus ovocaudata* (Vulpian, 1859). E.L. Miller (1936) listed fourteen other species, some of which occur in marine hosts. Rothschild (1938) described *Cercaria sinitsini* with its most elaborate different appendages. The suctorial appendage in the present species is probably identical with the appendage No. 1 of *Cercaria sinitsini*. This appendage is known under different names such as "Arrow", "Excretory projection", "Internal excretory tubule", "Delivery tube" etc. of different authors, in several allied forms of cercariae. As is shown in the development of this appendage, it has no connection whatever with the excretory system.

It is now quite evident that the group of cystophorous cercariae which have a very long caudal tubular portion is quite different from those cystophorous cercariae, which do not possess such a long tail. Several short-tailed ones were found to be the larval stages of Halipegidae Poche 1926, the life histories of which are now very well known (Krull 1935; Thomas 1939). The long-tailed cercariae probably represent a more primitive and simple type of Hemiurid cercariae because some appendages such as "Sultan's plume," "Ribbon of Sinitsin", "Phrygian cap of Sinitsin" etc. are not present. While lacking such attractive organs, the long tail itself in this group probably serves as a lure for the arthropod or piscian hosts.

Several species of long-tailed cystophorous cercariae were described by previous authors. They are *Cercaria syringicauda* Faust, 1922 (from *Melania ebenina*), *Cercaria invaginata* Faust, 1924 (from *Melania cancellata*), and *Cercaria calliostomae* Dollfus 1923 (from *Calliostoma conuloides*). Yokogawa and Wakeshima described a cystophorous cercaria, Cercaria type VIII, from *Melania libertina* in Formosa. Although their description is very brief, it undoubtedly is closely related to that of *Genarchopsis chinensis*.

The feeding experiments mentioned above prove that the cystophorous cercaria from *Paludomus (Hemimitra) tangi* and *Melania joretiana* represents the larval stage of *Genarchopsis chinensis*. They, however, do not explain the normal infection of the definitive host, since under natural conditions, Hemiurid trematodes are known to utilize copepods or other animals as their second intermediate hosts. Lebour (1923, 1935) observed the larvae of *Hemiurus communis* in *Acartia clausi*, while Hunninen and Cable (1941, 1943) in working on the life history of *Lecithaster confusus*, reported the larvae to develop also in *Acartia* sp. Some marine invertebrates like *Sagitta bipunctata* have also been observed to harbour larvae of *Derogenes varicus*. It is most likely, therefore, that a second intermediate host is required in the life cycle of *Genarchopsis chinensis*. This problem remains to be further investigated.

SUMMARY

1. A new species of fish trematode, *Genarchopsis chinensis* is described.
2. The life history of this trematode is in part elucidated.
3. The definitive host is *Rhinogobius giurinus* Rutter (Gobiidae).
4. The molluscan intermediate hosts are *Paludomus* (*Hemimitra*) *tangi* Chen and *Melania joretiana* Heude.
5. The larval stages, redia and cercaria, are described in detail.
6. Experiments by feeding cercariae to *Rhinogobius giurinus* were carried out with success.

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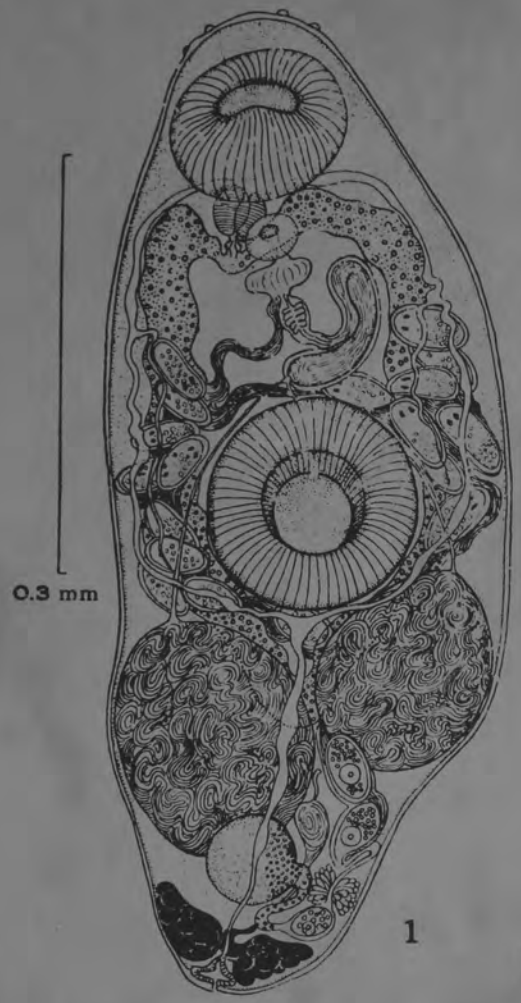
PLATE I.



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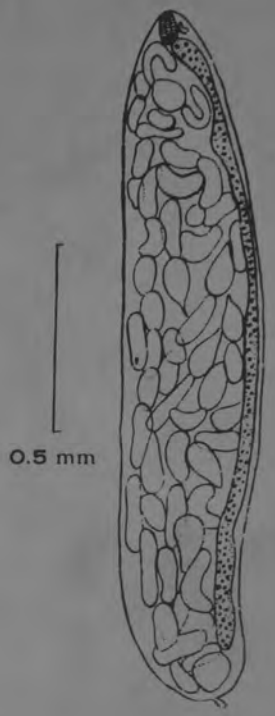

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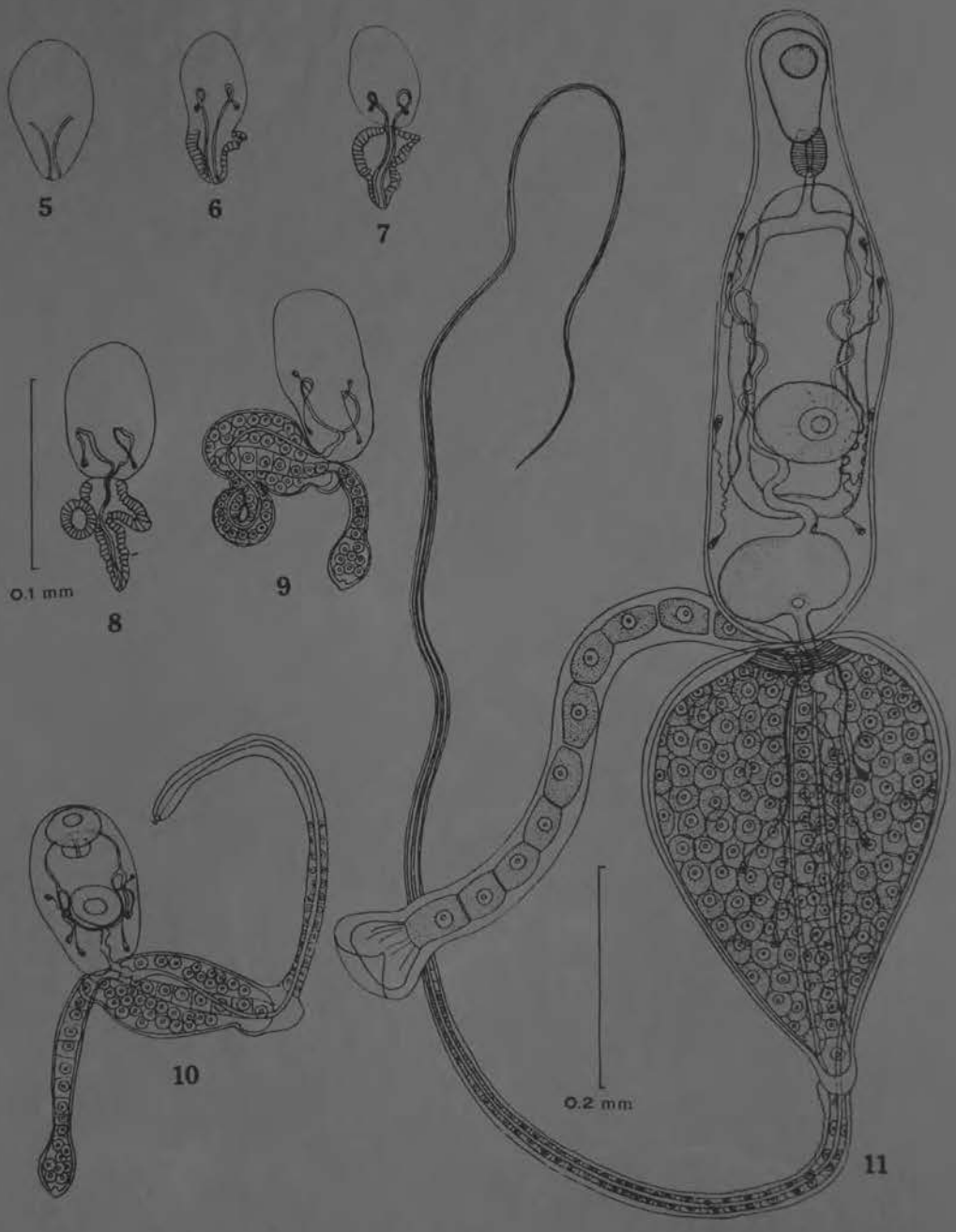
Tang: Genarchopsis chinensis



Tang: Genarchopsis chinensis


TANGIOPS

Theletrum Linton, 1910 [1])

Generic diagnosis. — Hemiuridae, ?Bunocotylinae: Body cylindrical or subcylindrical, smooth, with or without a cluster of low but distinct rounded papillae behind acetabulum. At the level of the anterior end of the acetabulum is a circular ridge running all round the body. Oral sucker subterminal, surmounted by paired preoral lobes; pharynx subglobular; esophagus very short but longer than pharynx; ceca terminating at posterior extremity. Acetabulum about one third of body

[1]) Emended on the basis of my own examination of Linton's type specimen deposited in the Animal Disease and Parasite Research Branch, A. R. C., Beltsville, Md. Pending further confirmation of my observation I would place this genus with some hesitancy in the Bunocotylinae.

length from anterior extremity, larger than oral sucker. Testes diagonal, some distance behind acetabulum. Seminal vesicle tubular, pre-acetabular. Prostatic complex free in parenchyma. Ductus ejaculatorius and metraterm opening into genital atrium. Cirrus pouch could not be made out with certainty. Genital pore near intestinal bifurcation. Ovary posttesticular, may be near posterior extremity. Receptaculum seminis present. Vitellaria postovarian, single, though a transverse groove was seen at the middle of the right side. 3 in number, 2 side by side and one median and posterior according to Linton. Uterus reaching back of vitellaria; eggs without filament. Excretory arms uniting dorsal to oral sucker or pharynx. Gastrointestinal parasites of marine fishes.

Genotype: *T. fusiforme* Linton, 1910 (Pl. 25, Fig. 324), in *Pomacanthus arcuatus*, Florida; also in *Pomacanthus arcuatus* and *P. paru*, Cuba.

Other species:

T. gravidum Manter, 1940 in *Abudefduf saxatilis*; Mexico.

T. lissosomum Manter, 1940, in unidentified angel fish; Mexico.

GENERIC DIAGNOSIS OF THELETRUM LINTON, 1910

Elongate, cylindrical hemiurids, without ecsoma; body smooth or with ventral papillae, without denticulations, posterior end broadly rounded or truncate. Acetabulum anterior to midbody. Intestinal ceca extending to posterior end of body. Genital pore near intestinal bifurcation. Sinus sac cylindrical or pyriform; seminal vesicle tubular, preacetabular; testes diagonal, separated from one another and from the ovary by the uterus. Ovary posttesticular; seminal receptacle present; vitellaria postovarian, 3 in number, 2 side by side and one median and posterior. Eggs without filaments. Excretory pore ventral, excretory crura uniting near oral sucker. Type species: *T. fustiforme* Linton, 1910.

This genus is to be classified in the subfamily Derogeninae.

T. lissosomum is very clearly distinct from *T. fustiforme*. Among the differences are: sucker ratio 2:3 rather than 1:2, more anterior ovary, smaller sinus sac, larger prostatic gland, less coiled and smaller seminal vesicle.

Although the two species occur in different oceans, both occur in angelfishes.

From: Allan Hancock Pacific Expeditions, Vol. 2, No. 14

Theletrum frontilatum **sp. n.**
(Figs. 14–15) Manter, 1969

HOSTS AND LOCALITIES: *Siganus rivulatus* (Forskål); Siganidae; type host; Moreton Bay, Queensland, Australia; type locality. *Siganus* sp.; New Caledonia.

LOCATION: Stomach.

NUMBER: Eight in Australian host; one in New Caledonian host.

HOLOTYPE: USNM Helm. Coll. No. 63328.

DESCRIPTION (measurements on 5 specimens): Length 2.489–5.719; width near acetabulum 0.627–1.653. Forebody wide, little tapered, broadly rounded; hindbody tapering to pointed posterior end. Preoral lobe well developed. Oral sucker 0.301–0.502 wide; acetabulum 0.536–0.874 wide; sucker ratio 1:1.62–2. Forebody 0.855–1.995, about one-third body length; anterior part of forebody with diagonal, almost transverse muscles on each side of oral sucker to level of intestinal bifurcation. Pharynx 0.107–0.147 long by 0.134–0.167 wide; esophagus about same length as pharynx; ceca not far apart, not quite reaching posterior end of body. Genital pore median, about midway between suckers.

Testes ovoid, smooth, symmetrical (or rarely slightly diagonal), just posterior to acetabulum, separated by uterine coils. Seminal vesicle free, tubular, coiled, its posterior end reaching or slightly overlapping acetabulum. Pars prostatica tubular, relatively wide but without vesicular cells, surrounded by conspicuous prostatic cells. Sinus sac (Fig. 15) subglobular, slightly longer than wide, 0.096–0.208 long by 0.088–0.192 wide, with muscular wall; genital sinus a straight tube; gland cells between sinus and sinus sac; short genital atrium present.

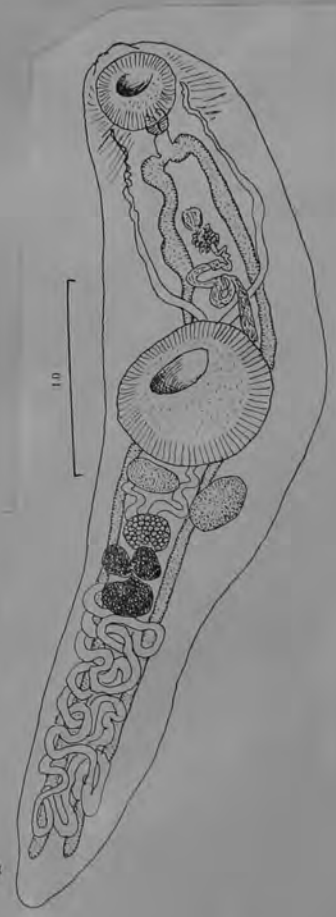
Ovary median, not far posterior to testes, globular, smooth. Vitellaria immediately postovarian; consisting of three lobes: an anterior pair side by side and a single median, larger posterior lobe; anterior lobes sometimes sublobed. Uterus much coiled posterior to ovary, extending to near posterior end of body, few coils between ovary and testes. Eggs usually 24–25 by 12–13 μ; rarely down to about 20 by 11 μ.

Excretory vesicle forking at anterior edge of acetabulum; arms ending blindly at each side of oral sucker.

The name *frontilatum* is from *frons* = fore part, and *latum* = wide, and refers to the wide forebody.

DISCUSSION: Other species in the genus *Theletrum* Linton, 1910 are: *T. fustiforme* Linton, 1910; *T. gravidum* Manter, 1940; *T. lissosomum* Manter, 1940; and *T. magnasaccum* Sogandares and Sogandares, 1961. *T. frontilatum* differs from all of these in body shape (very broad forebody and tapering hindbody) and in location of testes close to the acetabulum. The crura of the excretory vesicle clearly end blindly opposite the oral sucker, whereas they are described as uniting dorsal to the pharynx in both *T. gravidum* and *T. lissosomum*. A restudy of specimens of both these species confirms the union of the crura in *T. lissosomum*. In *T. gravidum*, the crura at least meet dorsal to the pharynx but actual union is not clear. Thus, this character seems to vary within the genus. All species of *Theletrum* possess a muscular knob-like structure at the extreme anterior tip of the body although it is not well indicated in descriptions. *T. frontilatum* has in addition conspicuous diagonal muscles near the anterior end.

Of the four previously named species, two are in the Caribbean region, two from the tropical American Pacific.



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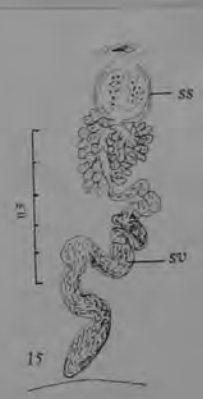


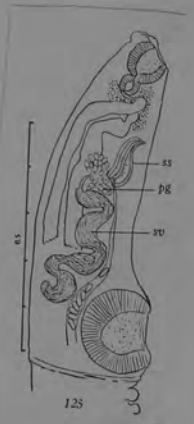
172. THELETRUM FUSTIFORME Linton, 1910
Fig. 125

HOST: *Pomacanthus aureus* (Bloch), black angelfish; in 2 of 14 hosts examined.
LOCATION: Stomach.

Discussion: Linton collected this trematode from *Pomacanthus arcuatus* (Linn.). Vigueras (1940) reported it from Cuba from *P. arcuatus* and *P. paru* (Bloch). The *P. arcuatus* of Linton and Vigueras is probably the same species which D. Longley decided was *P. aureus*.

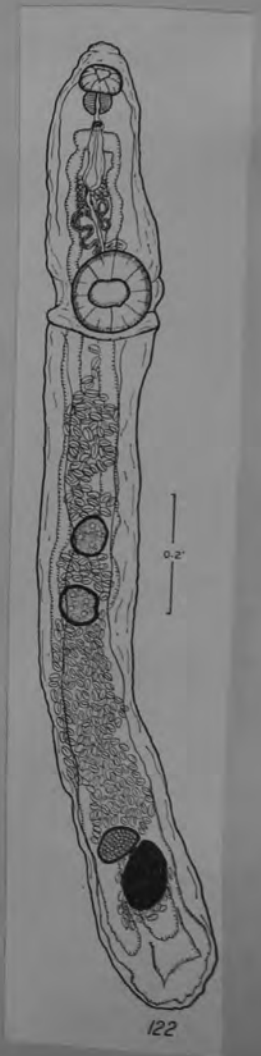
A few points should be added to Linton's description. There is a circular, muscular elevation forming a ring around the body at the posterior edge of the acetabulum. It suggests the ventral fold of *Opisthadena*. The preoral lip or lobe is well developed. There are conspicuous gland cells in the esophageal region. In my specimens, the esophagus is about the same length as the pharynx. The seminal vesicle is a long coiled tube, slightly overlapping the acetabulum; the pars prostatica is rather short, its distal half surrounded by a compact but conspicuous prostatic gland. The sinus sac is cylindrical, almost straight, with thick walls, containing a few gland cells. The vitelline gland is compact and consists of two lateral masses fused together so that it sometimes appears, in side view, as a single mass.

Two other species, *T. lissosomum* Manter, 1940 and *T. gravidum* Manter, 1940, are known in the genus. *T. fustiforme* is distinct in its ventral papillae, postacetabular ring, and its two, rather than three, vitelline lobes.



Theletrum fustiforme Linton, 1910 (FIGURE 122)
Hosts: **Acanthurus caeruleus*, **Pomacanthus arcuatus*.
Site: intestine and stomach.
Locality: Guaniquilla, Parguera, P. R.
Deposited specimen: No. 39392.

from Siddiqi + Cable, 1960



Theletrum gravidum, ~~n. sp.~~ Manter, 1940

(Plate 49, figs. 122, 123)

Host: *Abudefduf saxatilis* (Linn.)
Location: Usually in the stomach, sometimes in the intestine
Localities: Socorro and Clarion islands, Mexico
Number: Collected from 4 hosts; 2 to 5 specimens in each host

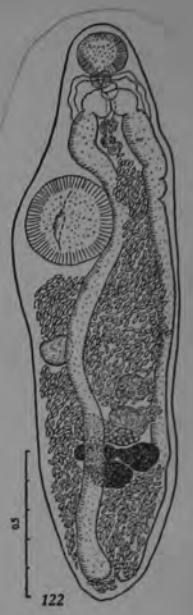
SPECIFIC DIAGNOSIS OF THELETRUM GRAVIDUM

Body smooth, cylindrical, rounded at each end, somewhat more tapering at anterior end, posterior end usually broadly rounded, 1.566 to 2.443 in length by 0.465 to 0.667 in greatest width. Forebody 0.405 to 0.547 or about ¼ to ⅕ body length. Oral sucker subspherical, 0.150 to 0.202 in diameter. Acetabulum 0.262 to 0.375 in transverse diameter, slightly longer than wide, slightly less than twice diameter of oral sucker, with longitudinal aperture. Pharynx subspherical, 0.068 to 0.076 long by 0.066 to 0.082 wide; esophagus represented by a spherical ventral diverticulum; intestinal diverticulum nearer oral sucker; ceca wide, extending to near posterior end of body but not posterior to uterus. Genital pore median, opposite esophagus. Testes rounded, diagonal, just anterior to middle of hindbody, separated by and largely covered by uterus. Seminal vesicle tubular, sharply bent once, not quite reaching acetabulum. Prostatic gland compact, subspherical, about same length as sinus sac. Short prostatic vesicle just outside sinus sac. Sinus sac more or less cylindrical, inconspicuous, opposite intestinal bifurcation. Ovary just posterior to middle of hindbody, ovoid, transversely extended. Seminal receptacle large, subspherical, partly anterior and partly dorsal to ovary. Three compact vitellaria as in other species of the genus; posterior vitellarium unlobed. Uterus voluminous with saclike coils too wide and irregular to be traced, covering most organs and reaching to tips of ceca or beyond. Eggs elongate, 24 to 29 by 10 to 12 μ, usually about 25 by 10 μ. Excretory pore subterminal and ventral; branches of vesicle uniting dorsal to esophagus.

The name *gravidum* refers to the extensive development of the uterus.

Comparisons. This species is the third to be named in the genus. It is more like *T. lissosomum* than like *T. fustiforme*. It differs from *T. lissosomum* in smaller size, in extent of the uterus, in more compact prostate gland, in unlobed posterior vitellarium, in shape of the seminal vesicle, and in slightly smaller eggs.

T. lissosomum and *T. gravidum* are both from Socorro Island, Mexico, while *T. fustiforme* is from Florida. *T. gravidum* was not collected from the Galapagos Islands.



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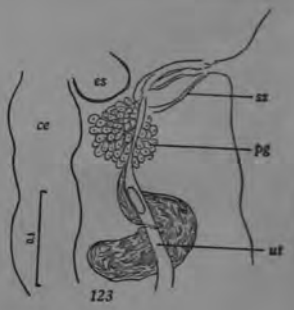

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From: Allan Hancock Pacific Expeditions, Vol.2, No. 14

Theletrum lissosomum, ~~n. sp.~~ MANTER, 1940

(Plate 48, figs. 119-121)

Host: Unidentified angelfish
Location: Stomach
Locality: Socorro Island, Mexico
Number: 7 from one fish, one from another

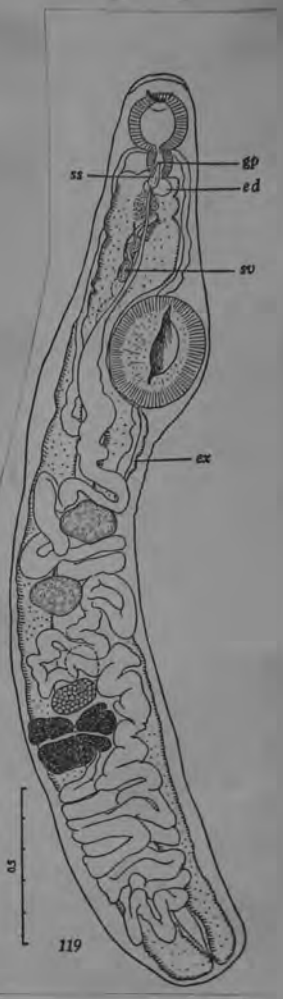
SPECIFIC DIAGNOSIS OF THELETRUM LISSOSOMUM

Body smooth, elongate, cylindrical, without ecsoma, with ventral papillae. Length 2.916 to 3.699; greatest width 0.216 to 0.499. Forebody 0.607 to 0.712 (about 1/5 body length), tapering slightly to a rounded end. Hindbody almost equally wide, posterior end bluntly rounded, almost truncate. Oral sucker subspherical, 0.180 to 0.195 in transverse diameter. Acetabulum 0.255 to 0.300 in transverse diameter, somewhat longer than wide, with longitudinal aperture. Sucker ratio approximately 2:3. Pharynx 0.085 to 0.111 in length by 0.080 to 0.099 in width; esophagus short, with small ventrally directed esophageal diverticulum; intestinal bifurcation nearer oral sucker; ceca rather wide, extending to extreme posterior end of body beyond uterine coils. Genital pore median, varying from opposite middle of pharynx to opposite intestinal bifurcation. Testes globular, oblique, ventral to ceca, about halfway between acetabulum and ovary, separated by uterus. Seminal vesicle inconspicuous, tubular, sinuous; its posterior end near anterior edge of acetabulum. Prostatic gland well developed; pars prostatica almost straight, shorter than seminal vesicle, near intestinal bifurcation. Sinus sac small, cylindrical to pyriform in shape; its tip can be projected as a small genital papilla into a very shallow genital atrium (fig. 120). Male duct and uterus entering sac separately, uniting near middle of sac to form the short, tubular genital sinus (fig. 120).

Ovary transversely extended, more or less median, about in middle of hindbody. Seminal receptacle chiefly anterior to ovary. Three compact vitellaria immediately posterior to ovary; anterior pair side by side, connected by a narrow isthmus; single, larger, bilobed posterior vitellarium directly posterior to anterior pair and more or less median. Uterus coiling backward some distance but not reaching posterior end of body; nearly straight in region of acetabulum. Eggs thin shelled, elongate, 26 to 34 by 9 to 15 μ. Excretory pore ventral, a short distance in front of posterior end of body; branches of vesicle unite dorsal to oral sucker.

The name *lissosomum* is from *lisso* (= smooth) and *somum* (= body) and refers to the absence of the ventral papillae.

Discussion. The genus Theletrum was named by Linton in 1910 for a single specimen of a trematode collected from the black angelfish, *Pomacanthus arcuatus,* from Tortugas, Florida. A few specimens have been collected there by the writer. The genus was named for the peculiar cutaneous papillae posterior to the acetabulum. These are lacking in *T. lissosomum* and are considered here as being a specific rather than a generic character. *T. lissosomum* is fundamentally similar to *T. fustiforme* especially in the reproductive systems. Linton's description and figure are incorrect in the so-called "cirrus sac," which is actually a typically hemiurid sinus sac. The 3 vitellaria and their arrangement are probably prime generic characters, although in my Florida material these vitellaria are sometimes so crowded together as to appear like one.



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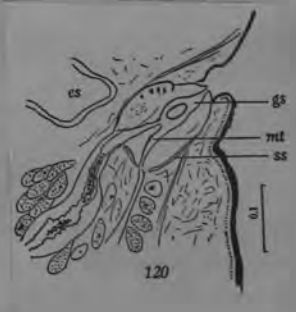

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Theletrum magnasaccum Sogandares & Sogandares, 1961

Family HEMIURIDAE
Subfamily Lecithasterinae
Theletrum **magnasaccum**, sp. nov.
(figs. 27-31)

Host.—*Abudefduf saxatilis* (Linn.); sergeant-major, family pomacentridae.

Incidence of infection.—In 1 of 1 host.

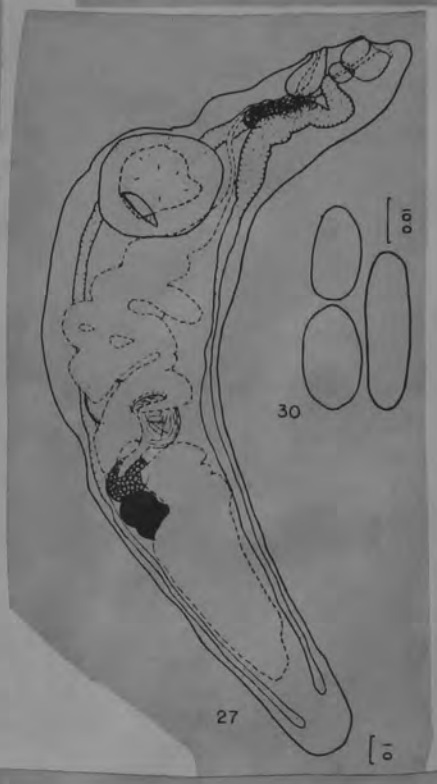
Location.—Stomach.

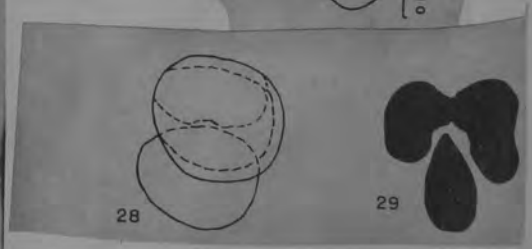
Locality.—Galeta Point, Republic of Panama. Atlantic Coast

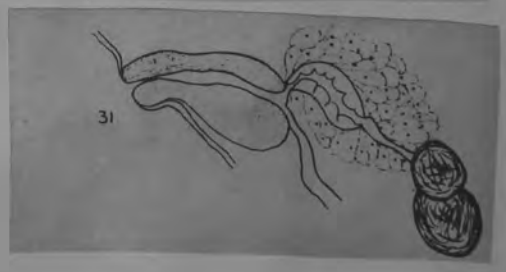
Holotype.—U. S. Nat. Mus. Helm. Coll. No. 39500.

Diagnosis (based on one specimen).—*Theletrum*: Body elongate, approximately 3.15 long by 0.59 wide at midbody. Cuticle smooth, bearing no papillae. Forebody 0.66 long. Oral sucker subterminal, 0.16 long by 0.17 wide. Preoral lip present. Acetabulum 0.44 long by 0.42 wide. Sucker ratio about 1:2.4. Prepharynx so short that it appears absent. Pharynx roundish, 0.07 long by 0.10 wide. Esophagus very short, almost appearing absent. Ceca extending, one on each side of body, to posterior end of body. Genital pore ventral, median, at level of midpharynx. Sinus sac connecting directly with genital pore, muscular, pear-shaped, 0.10 long by 0.10 at widest portion. Testes equatorial, oblique; sinistral testis anteriormost, 1/7 distance from acetabulum to posterior end of body, oval in shape, about 0.14 long by 0.19 wide; dextral testis posteriormost, about 1/3 distance from acetabulum to posterior end of body, roundish in shape, about 0.15 long by 0.17 wide. Seminal vesicle intercecal, about 1/3 distance from acetabulum to anterior end of body, bipartite; connecting with a short prostatic vesicle which is surrounded by prostate cells and is about 1/2 length of the sinus sac with which it connects (fig. 31). Ovary slightly less than 1/2 distance from acetabulum to posterior end of body, oblong in shape, about 0.12 long by 0.13 wide. Seminal receptacle conspicuous between posterior testis and dorsal aspect of ovary, spherical and larger than ovary. Vitellaria of two compact lobes (figs. 28, 29), anterior vitellarium bilobed, posterior vitellarium unlobed; immediately posterior to and in contact with ovary. Uterus with large sac-like coils which are difficult to trace, mainly intercecal, descending from ovarian complex to fill most of postovarian area, ascending to cover partially the vitellaria, seminal receptacle, ovary, and testes, intruding between ovary and posterior testis and foretestis, the sac-like coils disappearing anterior to acetabulum where uterus perforates the sinus sac adjacent to the connection with prostatic vesicle. Eggs thick-shelled, varible in shape and size (fig. 29), about 17.4 to 31.9 microns long by 11.6 to 14.0 microns wide. Excretory vesicle not observed.

Discussion.—The genus *Theletrum* Linton, 1910 resembles *Aponurus* Looss, 1907, differing mainly by possessing 2 or 3 instead of 7 or 8 prominent vitelline lobes. Studies of additional species may show that these two genera are synonymous or that *Theletrum* is a subgenus at best. At present the vitelline lobation appears to be a stable, though sometimes difficult to observe, character. Yamaguti (1958) reexamined Linton's type material of *T. fustiforme* and believed that, "the ejaculatory duct and metraterm open into a genital atrium." Yamaguti also stated, "... the cirrus pouch could not be made out with certainty." Manter (1947) studied specimens of *T. fustiforme* from the type host and locality and did not report or picture a genital atrium. Instead he stated,







"The seminal vesicle is a long coiled tube, slightly overlapping the acetabulum; the pars prostatica is rather short, its distal half surrounded by a compact but conspicuous prostatic gland. The sinus sac is cylindrical, almost straight, with thick walls, containing a few gland cells." Our study of the terminal genitalia of *T. magnasaccum* lends allied support to Manter's (1947) observations and redescription of the terminal genitalia of *T. fustiforme*. The "prostate gland" described by Manter is doubtless a prostatic vesicle surrounded by prostate cells. There are three species in *Theletrum*, *T. fustiforme* Linton, 1910 (type species), *T. lissosomum* Manter, 1940 and *T. gravidum* Manter, 1940. *T. magnasaccum* resembles *T. gravidum* and *T. lissosomum* but differs by possessing a conspicuous hermaphroditic sac, two vitelline lobes, a bipartite seminal vesicle, and other small differences which are at present difficult to evaluate due to the present shortage of material. *T. magnasaccum* differs from *T. fustiforme* by lacking the postacetabular ventral folds and papillae as described by Manter (1947), in genital pore position and by possessing a bipartite seminal vesicle which does not overlap the acetabulum.

T. magnasaccum is closely related with *T. gravidum*, from the same host genus (*Adudefduf*) in the Pacific, and probably represents its geminate species in the Atlantic.

The vitelline lobes of *T. magnasaccum* initially resembled those of *Aponurus* when viewed laterally. Careful focussing with the microscope showed that the mass is composed of two follicles (fig. 28), the anteriormost is apparently bilobed. Figure 29 shows an optical reconstruction as the vitelline lobes would presumably appear in frontal view.

One striking feature about *T. magnasaccum* is the size and shape of the eggs. Figure 30 shows three different types of eggs, from the same portion of the uterus, which we observed. Care was taken to assure that these eggs were not tilted, creating an illusion of shortness. The majority of the uterine eggs were of the narrow, elongate, sausage-shaped type.

The name *magnasaccum* is for the large sinus sac (*magna* = large) (*saccum* = sac).

Manter's and Pritchard's (1960) views regarding the higher categories of the Hemiuridae have been followed in placing *Theletrum* in the Lecithasterinae.

Theletrum **pomacentri** ~~n.sp.~~ NAHHAS + CABLE, 1964

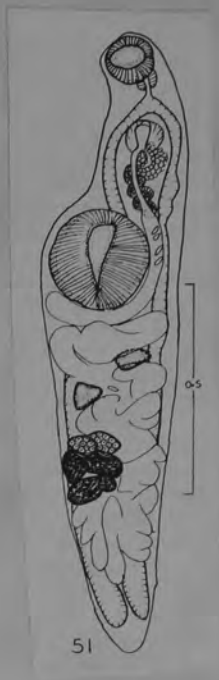
Figure 51

Host: Pomacentrus leucosticus (J).
Site: stomach.
Holotype: U.S.N.M. 60292.

Description based on a single specimen. Body non-appendiculate, tapering posteriorly, 1.54 long, 0.500 in maximum width at level of acetabulum; forebody 0.413 long, hindbody 0.865. Oral sucker 0.099 long, 0.105 wide; ventral sucker 0.262 long, 0.240 wide, with longitudinal aperture; sucker ratio 1:2.43. Prepharynx absent; pharynx spherical, 0.054 in diameter; esophagus short; ceca extending to near posterior end of body. Testes smooth, diagonal, 0.075-0.090 in diameter; seminal vesicle coiled, tubular, mostly preacetabular; prostate vesicle reniform, surrounded by poorly-developed prostate cells. Ovary bilobed, 0.060 long, 0.135 wide, posterior to, and separated from testes by coils of uterus; Mehlis' gland not evident; uterus voluminous, not reaching ends of ceca; metraterm simple, ventral to seminal vesicle, joining very short prostatic duct at base of sinus sac. Hermaphroditic duct widest anteriorly; sinus sac subglobular, 0.060 by 0.075. Genital pore midventral, posterior to intestinal bifurcation. Eggs numerous, 27-30 by 10-12 μ. Vitellaria immediately postovarian; in 3 compact masses with 2 anterior ones possibly connected by an isthmus; posterior mass slightly indented. Excretory system not observed.

Theletrum pomacentri differs from all the other species in the genus in having a bilobed ovary. It further differs from *T. fustiforme* Linton, 1910, in lacking the postacetabular fold and in having 3 rather than 2 vitelline masses; from *T. gravidum* Manter, 1940, in sucker ratio and shape and extent of seminal vesicle; from *T. lissosomum* Manter, 1940, in sucker ratio; and from *T. magnasaccum* Sogandares-Bernal and Sogandares, 1961, in shape and extent of the seminal vesicle, shape of the sinus sac and in the position of the genital pore.

The type specimen was damaged after it was studied and drawn.



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THELETRUM

Thometrema g. n.

Halipeginae. Trematódeos grandes, com cutícula lisa. Extremidade anterior mais afilada que a posterior. Ventosa oral subterminal. Acetábulo levemente pré-equatorial. Faringe e esôfago globosos. Cecos intestinais longos e estendendo-se até a extremidade posterior do corpo; são sinuosos, apresentando dilatações características ao nível de sua união com o esôfago. Poro genital situado logo atrás da faringe. Átrio genital muito longo apresentando sua região terminal globosa, sendo que às vêzes a base pode estar dilatada. Cirro e bôlsa do cirro ausentes. Vesícula seminal apresentando a forma de C às vêzes bem aberto, outras vêzes bem enrolado, com um ducto ejaculador envolvido por um conjunto bastante grande de glândulas prostáticas sôltas no parênquima. Testículos pós-equatoriais, pré-ovarianos, de contôrno circular, às vêzes elípticos, levemente oblíquos, às vêzes em zonas contíguas, às vêzes sem obliquidade, porém, geralmente com partes na mesma zona. Ovário situado na extremidade posterior do corpo, intercecal, alongado no sentido transversal. Glândula de Mehlis presente. Útero totalmente pré-ovariano, com alças bastante finas, sendo que às vêzes os ovos estão em fila única; sempre com alças intercecais, às vêzes uma ou outra passa por cima dos cecos. Vitelinos bastante ramificados com 8 a 10 ramificações em forma de um braço com mão fechada, situados bem na extremidade posterior do corpo, intercecais. Ovos elípticos com filamento bastante longo. Vesícula excretora em forma de Y, muito longa, com o ramo ímpar largo e ramos pares inconspícuos. Poro excretor terminal. Parasitos de peixes.

Espécie tipo e única — *Thometrema portoalegrensis* sp.n.

DISCUSSÃO

Thometrema g. n. deverá ser incluído na subfamília *Halipeginae* Ejsmont, 1931, a qual possui 4 outros gêneros que são *Halipegus* Looss, 1899, *Genarchella* Travassos, Artigas & Pereira, 1928, *Genocercella* Manter, 1940 e *Indoderogenes* Srivastava, 1941.

Diferencia-se do primeiro pela situação do poro genital, pelo menor número de alças uterinas, pela maior e mais característica ramificação dos vitelinos. Diferencia-se do segundo, também pela ramificação dos vitelinos e pela presença de um grande conjunto de glândulas prostáticas envolvendo o ducto ejaculador. Diferencia-se do terceiro pela localização dos testículos, que em *Thometrema* g. n. são mais equatoriais, pelo tamanho e ramificações dos vitelinos. Afasta-se do quarto gênero *Indoderogenes* Srivastava, 1911, pela configuração uterina, pela localização do acetábulo, igualmente pela ramificação dos vitelinos e pelo comprimento dos cecos intestinais.

Thometrema portoalegrensis ~~sp. n.~~ Amato, 1968

Trematódeos grandes, com cutícula lisa; medem 12,870 a 4,098 mm de comprimento por 3,696 a 2,310 mm de largura. Extremidade anterior mais fina que a posterior. Ventosa oral subterminal, com 0,546 a 0,364 mm de comprimento por 0,588 a 0,420 mm de largura. Acetábulo levemente pré-equatorial com 1,190 a 0,714 mm de comprimento por 1,232 a 0,714 mm de largura. Faringe globosa com 0,350 a 0,224 mm de comprimento por 0,308 a 0,210 mm de largura. Esôfago também globoso, sem bifurcação na maioria dos exemplares. Cecos intestinais longos chegando até a extremidade posterior do corpo, com sinuosidades espaçadas e pregueadas, estando às vêzes bastante estreitos e outras vêzes bastante largos. Poro genital situado logo atrás da faringe. Átrio genital (ducto hermafrodita) bastante longo, com 1,890 a 1,050 mm de comprimento, apresentando sua região terminal globosa medindo 0,350 a 0,210 mm de comprimento por 0,350 a 0,196 mm de largura. Cirro e bôlsa do cirro ausentes. Vesícula seminal presente com forma de C ou de vírgula, às vêzes mais enrolada, às vêzes menos enrolada medindo 2,030 a 1,330 mm de comprimento e atingindo o átrio genital através de um canal ejaculador que mede de 1,296 a 0,784 mm de comprimento, o qual se encontra envolvido por um grande conjunto de glândulas prostáticas livres no parênquima sendo que o conjunto mede de 1,260 a 0,840 mm de comprimento por 0,980 a 0,644 mm de largura. Testículos pós-equatoriais, de contôrno circular ou elíptico, sempre liso, levemente oblíquas, estando, no entanto, algumas vêzes, localizados em zonas diferentes, contíguas, às vêzes totalmente na mesma zona, porém, geralmente apenas com partes na mesma zona. Um dêles sempre localizado no campo ovariano e medindo 0,672 a 0,320 mm de comprimento por 0,910 a 0,392 mm de largura; o outro medindo 0,546 a 0,420 mm por 0,812 a 0,406 mm. Ovário localizado na extremidade posterior do corpo, intercecal geralmente alongado no sentido transversal, medindo 0,364 a 0,266 mm de comprimento por 0,546 a 0,154 mm de largura. Oötipo com alças bastantes finas e pré-ovarianas muitas delas com apenas uma fileira de ovos, na sua maioria colocadas atrás do acetábulo; apresentando um espessamento característico ao nível das primeiras voltas que funciona como espermateca, pois aí se acumulam grande número de espermatozóides. Ovos pequenos, com filamento bastante longo, medindo 0,056 a 0,042 mm de comprimento por 0,014 mm de largura e o filamento medindo 0,077 mm de comprimento. Glândula de Mehlis presente medindo de 0,322 a 0,140 mm de comprimento por 0,210 a 0,126 mm de largura. Vitelinos situados na extremidade posterior do corpo, intercecais, ramificados, apresentando de 8 a 10 ramificações em forma de um braço com a mão fechada; dêles partem dois pequenos vitelodutos, que depois se unem formando um único vitelodueto. Vesícula excretora longa, em forma de Y, com o ramo ímpar muito largo e os ramos pares inconspícuos. Poro excretor terminal.

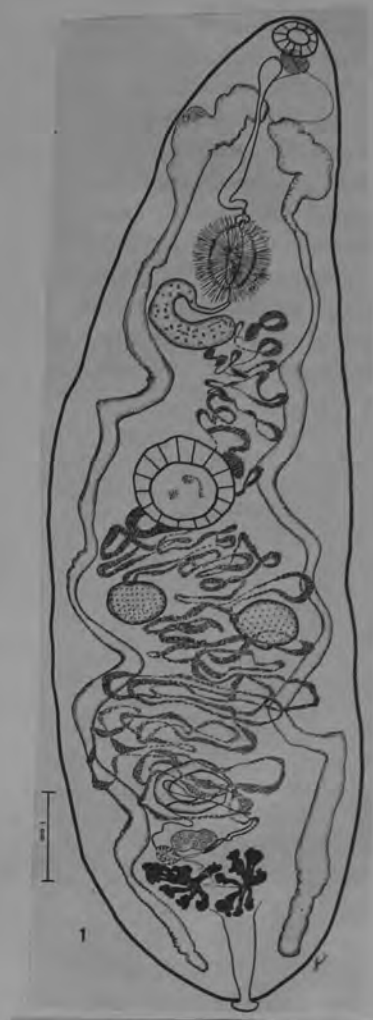
Holótipo depositado na Coleção Helmintológica da Pontifícia Universidade Católica do Rio Grande do Sul sob o n.º 29 b. *Parátipos* depositados na Col. Helm. da P.U.C.R.G.S. sob os números 29 a, 29 c, 29 d, 29 e, 29 f, 29 g, 29 h, 29 i, e na Coleção do Instituto Oswaldo Cruz sob o n.º 30.375 a-b.

Hospedeiro — *Plecostomus commersoni* (Cuv. & Val.).

Habitat — Estômago.

Proveniência — Rio Guaíba, Pôrto Alegre, Estado do Rio Grande do Sul, Brasil.

No Quadro I apresentamos as principais medidas, tôdas em milímetros, de 9 exemplares.



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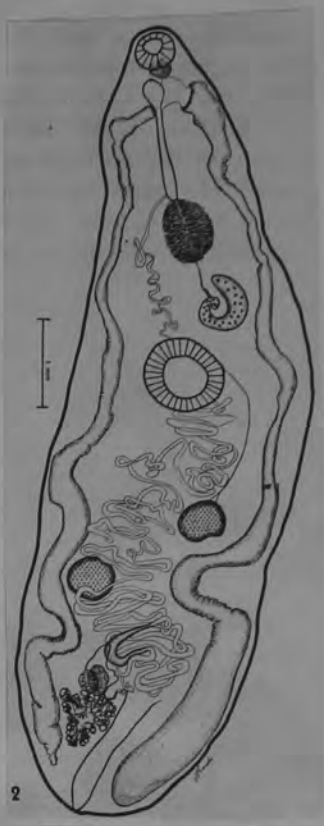
QUADRO I

Thometrema portoalegrensis sp. n.
(medidas em milímetros)

Espécime	Parát.	Tipo	Parát.	Parát.	Parát.	Parát.	Parát.	Parát.	Parát.
Col. Helm. P.U.C.R.G.S. n.º	29 a	29 b	29 c	29 d	29 e	29 f	29 g	29 h	29 i
Comprimento	12,870	10,971	9,900	9,702	9,075	8,943	8,841	7,425	4,098
Largura	3,696	3,168	3,267	3,366	2,541	2,376	2,640	2,310	2,442
Ventosa oral	0,546 X 0,588	0,420 X 0,546	0,420 X 0,532	0,462 X 0,532	0,420 X 0,434	0,364 X 0,434	0,378 X 0,490	0,392 X 0,420	0,420 X 0,434
Faringe	0,350 X 0,308	0,350 X 0,308	0,294 X 0,308	0,350 X 0,280	0,280 X 0,238	0,280 X 0,280	0,266 X 0,210	0,224 X 0,210	0,294 X 0,252
Acetábulo	1,190 X 1,232	1,092 X 1,134	0,980 X 1,050	1,050 X 1,120	0,840 X 0,840	0,798 X 0,784	0,798 X 0,798	0,714 X 0,714	0,868 X 0,868
Relação Acetábulo/Ventosa oral	1:2,1	1:2,5	1:2,3	1:2,3	1:2,0	1:2,2	1:2,1	1:1,8	1:2,0
Átrio genital — total	1,890	1,610	1,554	1,820	1,400	1,330	1,120	1,050	1,400
Átrio genital — parte globosa	0,350 X 0,280	0,280 X 0,266	0,224 X 0,266	0,280 X 0,280	0,266 X 0,238	0,210 X 0,280	0,238 X 0,196	0,210 X 0,350	0,280 X 0,280
Vesícula seminal	1,680	2,030	1,610	1,820	1,400	1,372	1,960	1,330	1,400
Ducto ejaculador	1,260	0,980	0,980	1,148	1,050	0,910	0,840	0,784	1,050
Conjunto de glândulas prostáticas	1,260 X 0,980	1,190 X 0,980	1,022 X 0,770	1,050 X 0,980	1,120 X 0,770	1,218 X 0,644	0,840 X 0,700	1,148 X 0,728	1,050 X 0,700
Testículo do campo ovariano	0,504 X 0,910	0,560 X 0,658	0,574 X 0,470	0,504 X 0,672	0,504 X 0,546	0,320 X 0,490	0,532 X 0,532	0,476 X 0,392	0,672 X 0,630
Testículo do lado oposto	0,434 X 0,812	0,476 X 0,560	0,490 X 0,658	0,490 X 0,512	0,546 X 0,504	0,434 X 0,406	0,420 X 0,616	0,392 X 0,448	0,546 X 0,588
Ovário	0,322 X 0,518	0,266 X 0,546	0,322 X 0,504	0,280 X 0,420	0,364 X 0,322	0,280 X 0,154	0,308 X 0,252	0,294 X 0,252	0,280 X 0,434
Glândula de Mehlis	0,322 X 0,168	0,294 X 0,210	0,196 X 0,182	0,210 X 0,140	0,280 X 0,210	0,154 X 0,168	0,154 X 0,126	0,140 X 0,126	0,210 X 0,168
Ovos	0,056 X 0,014	0,056 X 0,014	0,056 X 0,014	0,056 X 0,014	0,056 X 0,014	0,042 X 0,014	0,042 X 0,014	0,042 X 0,014	0,056 X 0,014



No ano de 1967, durante os trabalhos curriculares de iniciação à pesquisa que são desenvolvidos na Cadeira de Zoologia I desta Faculdade, um grupo de acadêmicos, quando autopsiava um peixe cascudo *Plecostomus commersoni* (Lac. & Val.), localizou interessantes trematódeos parasitando o estômago do [illegible] rio Guaíba, Pôrto Alegre, Rio Grande do Sul.

Já na primeira autópsia foram encontrados em grande número, sendo que posteriormente voltaram a ser encontrados em grande número pelos mesmos acadêmicos e pelo autor, que realizou 4 autópsias, tôdas positivas para o referido trematódeo. Foram retirados formando um lote de 117 exemplares, os quais em parte foram comprimidos e em parte foram conservados em formol acético sem compressão. Do material comprimido e corado com carmim cloridrico alcoólico, segundo Langeron, escolhemos 9 exemplares, sôbre os quais baseamos nossa descrição.

THOMETREMA

Trifoliovariinae ~~n. subfam.~~ YAMAGUTI, 1958

Subfamily diagnosis. — Hemiuridae: Body long, slender, smooth. Ceca terminating at posterior extremity. Acetabulum rather small, near anterior extremity. Testes wide apart from each other as well as from acetabulum, in anterior half of body. Seminal vesicle postacetabular. Pars prostatica well differentiated. Ductus hermaphroditicus enclosed in membranous sheath-like pouch. Ovary distinctly lobed, near posterior extremity. Receptaculum seminis and Laurer's canal present. Vitellaria consisting of seven elongate lobes, ventral and posterior to ovary. Uterus not extending back of ovary. Excretory arms uniting anteriorly.

Trifoliovarium Yamaguti, 1940

Generic diagnosis. — Hemiuridae, Trifoliovariinae: Body long, slender, smooth. Oral sucker terminal, funnel- or cup-shaped, directly followed by relatively large barrel-shaped pharynx. Ceca terminating at posterior extremity. Acetabulum prominent, rather small as compared with oral sucker, near anterior extremity. Testes obliquely tandem in anterior half of body far back of acetabulum. Vesicula seminalis elongate, posterior or posterodorsal to acetabulum. Pars prostatica narrow. Ductus hermaphroditicus enclosed in membranous sheath-like pouch. Genital pore on a level with pharynx or esophagus. Ovary trilobate, in posterior third of body. Receptaculum seminis and Laurer's canal present. Vitellaria divided into seven elongate lobes extending ventral and posterior to ovary. Uterus not extending back of ovarian complex. Eggs embryonated. Excretory arms uniting dorsal to oral sucker. Intestinal parasites of marine fishes.

Genotype: *T. acanthocepolae* Yamaguti, 1940 (Pl. 22, Fig. 279), in *Acanthocepola limbata;* Maisaka, Japan.

Trifoliovarium ~~n. g.~~ YAMAGUTI, 1940

GENERIC DIAGNOSIS. Hemiuridae Lühe, 1910. Body long and rather slender, unarmed. Oral sucker terminal, funnel-shaped. No prepharynx. Pharynx well developed, contiguous to oral sucker. Esophagus short. Ceca terminating near posterior extremity. Acetabulum near oral sucker. Testes obliquely tandem, between acetabulum and ovarian complex. Vesicula seminalis elongate, posterior or posterodorsal to acetabulum. Pars prostatica cylindrical, surrounded by prostate cells throughout its length. Ductus hermaphroditicus in direct continuation of metraterm, enclosed in a membranous sheath-like pouch, receiving very short ductus ejaculatorius a little in front of its posterior end, opening outside at level of pharynx or esophagus. Ovary three-lobed, in posterior third of body, dorsal to vitelline gland. Receptaculum seminis large, anterodorsal to ovary. Laurer's canal arising from receptaculum seminis and opening dorsally. Vitellaria divided into seven elongate lobes, mostly extending longitudinally between ovary and ventral body wall. Uterus winding between receptaculum seminis and acetabulum and not extending further back of ovarian complex. Metraterm well differentiated. Eggs ellipsoidal, light brown, embryonated. Excretory vesicle tubular, divided behind acetabulum into two arms uniting dorsal to oral sucker. Parasitic in marine fishes.

Genotype. *Trifoliovarium acanthocepolae.*

54. *Trifoliovarium acanthocepolae* ~~n. g., n. sp.~~ YAMAGUTI, 1940

Cepolidae

Habitat. Small intestine of *Acanthocepola limbata* (Cuv. et Valenc.).
Locality and date. Maisaka, Sizuoka Prefecture; October 24, 1936.
Type and paratypes in Yamaguti Helminthological Collection.

Body nearly cylindrical, with truncate anterior and more or less pointed posterior extremity, 5.8–7.9 × 0.34–0.46 mm. Cuticle smooth. Subcuticular musculature poorly developed. Oral sucker terminal, funnel-shaped, 0.2–0.28 × 0.21–0.36 mm, with its anterior margin attenuated and divided into two lobes, of which the ventral is broader and subdivided into two by a conspicuous median incision, while the dorsal is more prominent and may or may not be incised at the middle. Pharynx barrel-shaped or cylindrical, strongly muscular, 0.2–0.26 × 0.13–0.18 mm. Esophagus very wide, 0.18 × 0.135 mm in the type, not muscular except at posterior end. Ceca simple and wide throughout, facing backwards at right angles on each side of posterior end of esophagus and running parallel to each other near dorsal surface, terminating near posterior extremity. At the very beginning they are strongly constricted and provided with weak outer circular and strong inner longitudinal muscles continued on to posterior end of esophagus. Acetabulum prominent, 0.25–0.3 × 0.25–0.325 mm, with its center about 0.9 mm behind anterior extremity in the type.

Testes rounded, entire, 0.18–0.31 × 0.15–0.3 mm, situated ventrally one obliquely behind the other at about second quarter of body, separated from each other by a distance of 0.2–0.55 mm; the anterior usually on the left and a little smaller, immediately or some distance behind vesicula seminalis. Latter elongate, thin-walled, 0.25–0.45 × 0.09–0.13 mm, situated longitudinally behind acetabulum which it may or may not overlap at its anterior end, connected with pars prostatica by a short narrow, somewhat muscular duct. Pars prostatica cylindrical, 15–30 μ wide, up to 0.38 mm long, surrounded by prostate cells throughout its length, continued into narrower, somewhat muscular ductus ejaculatorius measuring 18 μ long by 6 μ wide in the type and opening into the ductus hermaphroditicus a little in front of its posterior end. Ductus hermaphroditicus 0.25–0.35 mm long, narrow, though somewhat swollen posteriorly, in direct continuation of metraterm, enclosed in a thin membranous sheath, opening ventrally at level of pharynx or esophagus.

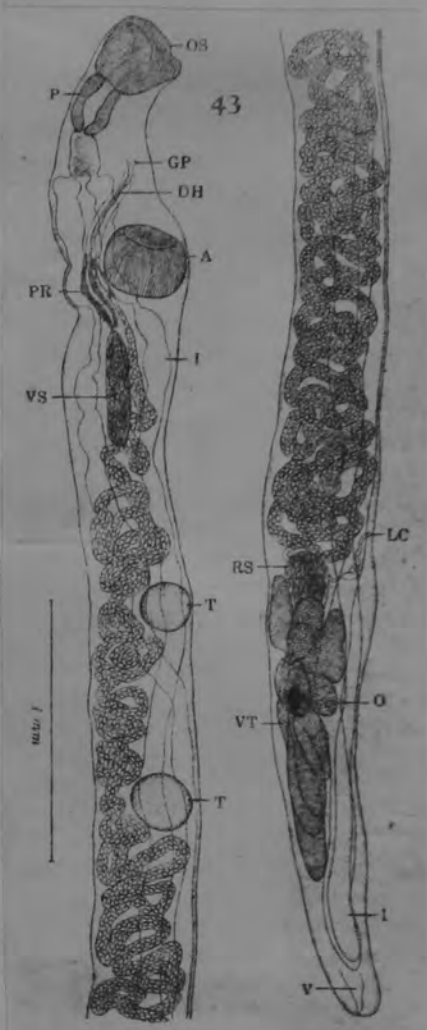


Fig. 43. *Trifoliovarium acanthocepolae* n. sp., distorted.

Ovary divided into three rounded lobes 0.1–0.19 mm in diameter, situated in median line between receptaculum seminis and vitelline gland at about middle of posterior third of body. Receptaculum seminis retort-shaped, 0.13–0.225 mm in diameter, anterodorsal to ovary, reaching to near anterior end of vitellaria or a little more anteriorly. Laurer's canal arising from dorsal side of receptaculum seminis near its anterior end, dilated at about middle, opening on middorsal surface a little in front of receptaculum seminis. Vitellaria 1.0–1.5 mm long, ventral, consisting of seven, elongate, distally swollen lobes similar in shape and arrangement to those of *Lecithaster*. Uterus winding from side to side in ventral part of body between receptaculum seminis and acetabulum leaving two testes free. Metraterm 0.1–0.27 mm long by 15–25 μ wide, constricted at its junction with uterus proper and surrounded here by a mass of gland-like cells, provided with a sphincter-like muscular thickening at its markedly attenuated distal end. Eggs ellipsoidal, light brown, embryonated, 32–39 × 17–20 μ in life.

Excretory vesicle tubular, dorsal to ovary, receptaculum seminis and uterus, forming an elongate S-shaped curve between two testes, divided immediately behind acetabulum into two lateral arms uniting dorsal to oral sucker. Excretory pore terminal. The ascending main collecting vessel opens into each lateral arm on its medial side dorsolateral to the oral sucker.

The present new genus resembles *Lecithaster* Lühe in the characters of the ovary, vitellaria, receptaculum seminis and terminal genitalia, but differs distinctly in the shape of the body, the position of the testes, the posterior extent of the uterus and the union of the excretory arms. On the other hand it bears a certain resemblance to some of the other members of the family Hemiuridae, so that it can safely be included in this family.

TRIFOLIOVARIUM

UNILACINIA Manter, 1969

Generic diagnosis of the genus Unilacinia — Hemiuridae. Lecithasterinae. Body elongate subcylindrical, asymmetrical, with unilateral flap in acetabular region. Caeca uniting near posterior end. Seminal vesicle saccular; pars prostatica and tubular prostatic vesicle postacetabular; ejaculatory duct long; sinus sac ovoid; genital pore near acetabulum. Ovary compact; seminal receptacle large; vitellaria of 7 short digitiform lobes. Excretory vesicle Y-shaped with long, bipartite stem, and arms uniting dorsal to pharynx. In acanthurid fishes. Type species: *U. asymmetrica*.

Discussion — The body flap or fold opposite the acetabulum relates this genus to *Quadrifoliovarium* Yamaguti, 1965, and to *Bilacinia* (named above), both of which also are parasites of *Naso*. It differs from both genera in its asymmetry, united caeca, saccular seminal vesicle, and shape of vitelline lobes. It differs from *Quadrifoliovatum* also in its compact ovary.

Except for the body flaps, these genera have the general characters of such genera as *Hysterolecitha* Linton, 1910; *Theletrum* Linton, 1910; and *Trifoliovarium* Yamaguti, 1940. Therefore, I feel the subfamilies Quadrifoliovariinae Yam., 1965, and Trifoliovariinae Yam., 1958, are not justified. These genera, with *Bilacinia* and *Unilacinia*, are referred to the subfamily Lecithasterinae.

Unilacinia asymmetrica ~~n.gen., n.sp.~~ MANTER, 1969
(Fig. 9–12)

Host — *Naso annulatus* (Quoy & Gaimard); Acanthuridae; unicorn fish. *Locality* — Heron Island, Queensland, Australia. *Habitat* — stomach. *Number* — numerous in both of 2 hosts examined. *Holotype and paratype* — USNM Helminth. Coll. No. 71221, 71222.

Description (based on 33 specimens with measurements on 8) — Body smooth, about uniformly wide but tapering at each end; length 1,900–2,641; greatest width (at acetabular level) 161–188; specimen 1,140 long without eggs. Long, rather narrow but conspicuous, muscular fold or flap at acetabular level on one side only, either right or left, but more often left, starting anterior to acetabulum then becoming bilobed; one lobe bluntly pointed opposite middle of acetabulum; posterior lobe rounded, extending short distance posterior to acetabulum.

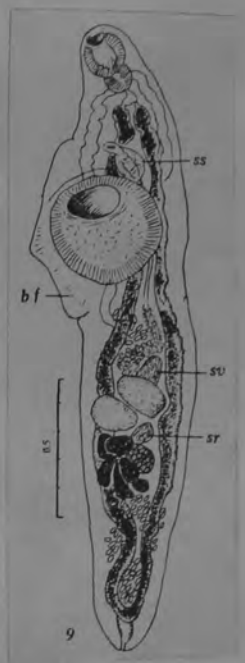
Oral sucker 161–188 wide; acetabulum 395–442 wide. Sucker ratio 1:2.17 to 2.53. Forebody 462–569 or about ¼ total body length. Pharynx 80–96 long × 102–112 wide; short oesophagus present. Caeca not widely divergent, uniting a short distance from posterior end of body.

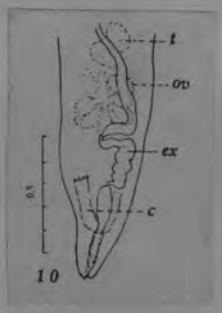
Genital pore median, conspicuous, thick-lipped, a little anterior to acetabulum. Testes smooth, wider than long, just anterior to middle of hindbody, contiguous. Seminal vesicle saccular, not divided; partly anterior and partly dorsal to anterior testis. Pars prostatica almost straight or slightly sinuous, overlapping seminal vesicle; tapering to form short tubular prostatic vesicle; ejaculatory duct dorsal to acetabulum. Sinus sac (Fig. 12) broadly ovoid, 141–178 long × 96–134 wide, extending posteriorly to anterior edge of acetabulum, containing rather wide genital sinus with folded walls, and gland cells. Short genital atrium present.

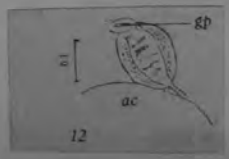
Ovary compact, wider than long, immediately post-testicular. Vitellaria consisting of 7 short digitiform lobes, partly ventral and partly posterior to ovary. Seminal receptacle large, immediately preovarian, overlapping side of posterior testis. Uterine coils rather narrow, not reaching posterior end of body by short distance, usually not extending posterior to caecal union; preovarian coils of uterus narrow. Eggs 27–37 × 14–19.

Excretory vesicle Y-shaped; arms uniting dorsal to pharynx; posterior part of stem (to about level of caecal union) cellular, becoming thin-walled and sinuous with short bulges (Fig. 10); deeply constricted at point of bifurcation (Fig. 11); bifurcating midway between seminal vesicle and acetabulum; becoming bulbous in forebody; thin-walled portion of stem often invisible.

The name *Unilacinia* is from *uni* (=one) and *lacinia* (=flap), referring to the unilateral flap on the body. The name *asymmetrica* refers to the conspicuous asymmetry of the body.







UNILACINIA