Additional Hemiurid Trematodes from Hawaiian Fishes *

H. W. MANTER AND MARY HANSON Pritchard

This paper is based on specimens collected by Dr. Hilda L. Ching during August, 1959, at the Waikiki Aquarium and at the Coconut Island Marine Laboratory of the University of Hawaii. Host identifications were confirmed by Dr. William A. Gosline. The authors recently reported 7 species of hemiurids from Hawaii (Manter & Pritchard, 1960). The present collection includes 10 additional species, 6 of which are new; the other 4 constitute new records for Hawaii.

All egg measurements are in microns and all other measurements are in millimeters.

Subfamily Aphanurinae Skrj. & Guschanskaia, 1954

(Synonym: Ahemiurinae Chauhan, 1954)

The Aphanurinae are characterized by cuticular plications, no ecosoma, and one or two compact vitellaria. Genera: Aphanurus Lühe, 1901; Ahemiurus Chauhan, 1954; Myosaccicum Montgomery, 1957; and the new genus named herein. We follow Yamaguti (1958) in considering Chuanhururus Skrj. & Gusch., 1954 as a synonym of Aphanurus.

Duosphincter zancli, n. gen., n. sp. (Figs. 1-2)

Host: Zanclus canescens (L.), kihikihi or moorish idol (Zanclidae); 27 specimens from 8 of 23 hosts.

Location: Stomach


Description (based on 27 specimens): Body, without ecosoma, 0.871 to 1.354 long by 0.201 to 0.281 wide (width about same along entire length), anterior end rounded, posterior end slightly more pointed; both forebody and hindbody bent dorsally from acetabulum. Cuticular thin, horizontal plications encircle body along its entire length. Preoral lobe small. Oral sucker rounded, 0.141 to 0.181 wide by 0.101 to 0.168 long; mouth ventral, pyriform with pointed anterior end, surrounded by well-developed sphincter. Acetabulum ½ body length from anterior end, somewhat protuberant, 0.160 to 0.181 wide by 0.121 to 0.176 long; aperture triangular with one point directed posteriorly, also surrounded by well-developed sphincter. Sucker ratio 1:1 to 1:2. Pharynx 0.032 to 0.050 long by 0.058 to 0.069 wide; esophagus short, 0.019 to 0.024 in diameter; ceca slender at origin, then widening and extending to near posterior end of body.

Testes diagonal with either right or left testis anterior, rounded, 0.070 to 0.120 long by 0.090 to 0.120 wide, contiguous or close together. Seminal vesicle tubular but not slender, winding (4 or 5 turns) dorsally between mid-acetabulum and level of genital pore. Pars prostatica narrow and straight extending ventrally or posteroventrally into sinus sac; prostatic cells surround pars prostatica and terminal part of seminal vesicle while smaller gland cells surround both pars prostatica and metraterm as they enter sinus sac (Fig. 2); pars prostatica joins metraterm at base of sinus sac to form short hemaphroditic duct. Sinus sac small, tubular, enclosing hemaphroditic duct, partially protrusible. Genital pore median or slightly submedian, at level of bifurcation or immediately posterior to bifurcation.

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Ovary to left, rounded, 0.048 to 0.120 long by 0.096 to 0.160 wide, overlapped by posterior testis and anterior vitellarium. Vitellaria compact, diagonal, overlapping, 0.072 to 0.128 long by 0.086 to 0.138 wide, anterior vitellarium usually to left and usually wider. Uterus fills postacetabular spaces posterior, dorsal, and anterior to gonads. A small sphincter just outside sinus sac marks beginning of very short metraterm; metraterm not especially muscular, enters sinus sacs and joins pars prostatica. Eggs yellowish, 21 to 26 by 13 to 17.

Excretory pore subterminal, ventral; a small, papilla-like structure protrudes in 7 specimens. Excretory vesicle not fully traced, but division occurs in region of gonads and crura extend forward and unite dorsal to pharynx.

**Generic Diagnosis of Duosphincter:** Hemiuridae, Aphanurinae: Body small, without esoma; horizontal cuticular plications encircle body along its entire length; oral sucker subterminal, mouth surrounded by well-developed sphincter; ceca extending to near posterior end of body; acetabulum pre-equatorial, protruberant, aperture with well-developed sphincter; genital pore ventral to bifurcation; testes diagonal, close together, postacetabular in middle 1/2 of body; seminal vesicle tubular, winding in forebody, rarely reaching posterior to mid-acetabulum; pars prostatica short, surrounded by prostatic cells; sinus sac short, tubular, enclosing hermaphroditic duct; ovary ovoid, posttesticular, vitellaria in two ovoid masses, postovarian, diagonal to tandem; uterine fills postacetabular spaces posterior, dorsal, and anterior to gonads; metraterm short, not especially muscular but separated from uterus by small sphincter; excretory pore subterminal, ventral; excretory vesicle Y-shaped, crura joining anteriorly.

The name *Duosphincter* is from *duo* (= two) and *sphincter* (= a closing muscle) referring to the well-developed sphincter muscles present in both the oral sucker and the acetabulum.

**Discussion:** The tubular, winding shape and the preacetabular position of the seminal vesicle are peculiar to *Duosphincter*. In *Aphanurus* and *Ahemiurus* the seminal vesicle is sacular and entirely postacetabular; in *Myosaccium* it is sacular and most of it is immediately postacetabular, although it extends dorsal to the acetabulum. The sphincter muscles of the oral sucker and acetabulum are absent in the other genera. *Duosphincter* differs from *Aphanurus* in possessing two vitelline glands, a short preacetabular pars prostatica, a shorter and less muscular hermaphroditic duct, a more posterior genital pore, and plications that extend horizontally around the body rather than at an angle. It differs from *Ahemiurus* in having a short preacetabular pars prostatica, a shorter and less muscular hermaphroditic duct, and diagonal vitellaria. It differs from *Myosaccium* in the complete absence of a prostatic vesicle, the shorter sinus sac, the lack of an ejaculatory duct, larger gonads, cuticular plications over all the body, and the non-filamented eggs.

**Subfamily Dinurinae Looss, 1907**

The Dinurinae are characterized by cuticular plications, an esoma, and long, winding vitellaria. Genera: *Dinurus* Looss, 1907; *Ectenurus* Looss.
PLATE I

Fig. 1. *Dusophineter zancli* from *Zanelus canescens*, holotype; ventral view.

Fig. 2. *D. zancli* from *Z. canescens*, paratype; lateral view of terminal genital ducts.

Fig. 3. *Ectenurus lepidus* Looss, 1907, from *Decapterus pinnulatus*; ventral view.

Fig. 4. *Lecithocladium chingi* from *Naso* sp., holotype; ventral view.

Fig. 5. *L. chingi* from *Naso* sp., paratype; ventral view of terminal genital ducts (a posterior portion is displaced to the left; its actual position is dorsal to the para prostatica shown on the right).

Fig. 6. *L. chingi* from *Naso* sp., paratype; ventral view of ovary and vitellaria.

Fig. 7. *L. chingi* from *Naso* sp., paratype; ventral view of excretory vesicle in cesoma.
1907; Lecithocladium Lühe, 1901 (syn. Clupenurus Srivastava, 1935); Magnacetabulum Yam., 1934.

Manter (1947) named Parectenurus, differentiating it from Ectenurus because the seminal vesicle was not tripartite even though the paratype specimen from Synodus foetens was figured with an indistinctly tripartite seminal vesicle. The difference is largely one of degree, and we now regard Parectenurus a synonym of Ectenurus.

Yamaguti (1954, 1958) considered Parectenurus as a synonym of Magnacetabulum Yam., 1934 although Parectenurus has a well-developed sinus sac and Magnacetabulum has none. In 1953, Yamaguti described M. leiognathi which has a “ductus hermaphroditicus . . . enclosed in a very thin membranous capsule” (i.e. sinus sac). Since Magnacetabulum is entirely without a sinus sac, M. leiognathi should be transferred to Ectenurus.

The new combinations are: Ectenurus americanus (Manter, 1947) [synonyms: Parectenurus americanus Manter, 1947; Magnacetabulum americanum (Manter, 1947) Yam., 1954] and Ectenurus leiognathi (Yam., 1953) [synonym: Magnacetabulum leiognathi Yam., 1953].

Ectenurus lepidus Looss, 1907 (Fig. 3)

Hosts (both new records): Decapterus pinnaeatus (Eydoux & Souleyet), 'opelu, maekerei sand, or 'opelu-mama (Carangidae); 5 specimens from 3 hosts. Anampses cuvieri Quoy & Gaimard, 'opule or hihi (Labridae, wrasses); 1 from 1 host.

Location: Intestine


Discussion: E. lepidus has been reported principally from carangids in the Adriatic, Mediterranean, and Black seas, and at Aberdeen, Scotland, Wellington, New Zealand, and now Hawaii. Vlassenkoo (1931) found no anterodorsal papillae on his specimen from the Black Sea; Manter (1954) observed that the papillae “are inconspicuous and not always evident”; very small ones were observed on only one of the Hawaiian specimens, and that specimen was flattened with the preoral lobe bent ventrally over the oral sucker.

In most respects the Hawaiian specimens agree with specimens of E. lepidus reported from other localities. The sucker ratio is both smaller and larger than reported by Looss (1:2.4 to 2.8 as compared with 1:2.5) and it reaches the lower limit reported by Manter (1:2.8 to 3). The eggs average smaller (16 by 10) than those reported by Looss (20 by 10), but the range (13 to 19 by 8 to 11) overlaps the limits reported by Manter (18 to 21 by 9 to 10). Like the New Zealand specimens, the sinus sac is elongate but does not reach the acetabulum.

Lecithocladium chingi, n. sp. (Figs. 4-7)

Host: Acanthurus mata (Cuvier), (Acanthuridae, surgeonfishes); 2 specimens from 1 of 3 hosts. Naso brevirostris (Cuvier & Valenciennes) or N. unicornis (Forskal), kala or unicorn fish (Acanthuridae, surgeonfishes—the two species are so similar that all differentiations are uncertain); 21 specimens from 10 of 28 hosts. Type host.

Melichthys vidua (Solander), humuhumu-hi' u-kole or humuhumunui-ali (Balistidae, triggerfishes); 2 specimens from 1 of 5 hosts.

Location: Stomach

DESCRIPTION (based principally upon 10 mature specimens and 5 young specimens): Body filiform, with ecsoma; body proper 2.144 to 3.564; ecsoma 0.436 to 2.345 long, retracted no more than 0.4 and usually not at all; total length 3.150 to 5.494; width 0.503 to 0.992 at posterior end of body. Cuticular plications encircle body, sometimes less distinct posteriorly. Oral sucker 0.241 to 0.369 wide by 0.221 to 0.315 long, surrounded by short preoral lobe. Acetabulum $\frac{1}{2}$ to $\frac{1}{3}$ body length from anterior end, 0.281 to 0.375 wide by 0.255 to 0.375 long. Sucker ratio 1:1.0 to 1.3. Pharynx 0.168 to 0.288 long by 0.134 to 0.201 wide, slightly narrowed anteriorly; esophagus first rounded 0.087 to 0.107 in diameter, then directed anterodorsal or dorsal for short distance; eeca, often containing blood, arise dorsally, enlarge and extend dorsolaterally along posterior half of pharynx then turn posteriorly, tips reach almost to posterior end of ecsoma.

Testes well separated from acetabulum, rounded, almost symmetrical or somewhat diagonal, similar in size, 0.101 to 0.255 long by 0.141 to 0.235 wide. Seminal vesicle partially or wholly anterior to testes, thick walled, saecular but usually constricted near middle to give almost bipartite appearance, 0.215 to 0.369 long by 0.109 to 0.154 wide; short, narrow duct leads posteriorly from anterior end of seminal vesicle to join pars prostatica. Pars prostatica very long, extends posteriorly almost to ovary, turns anteriorly and follows a sinuous course between testes and ventral to seminal vesicle, dorsal to acetabulum, and joins sinus sac near anterior edge of acetabulum; prostatic cells large and numerous, decreasing slightly in size and number near sinus sac. Sinus sac curves slightly to genital pore, 0.436 to 0.616 long by 0.034 to 0.088 wide. Hermaphroditic duct well developed with muscular wall, free in sinus sac, slightly protruded from genital pore in some specimens; protruded tip slender and smooth followed by short, expanded portion seeming to bear minute papillae. Genital pore median, ventral to anterior half of oral sucker in all but two specimens, ventral to posterior half of oral sucker in latter.

Ovary 0.067 to 0.201 long by 0.121 to 0.255 wide, slightly reniform, ventral and more or less median. Vitellaria consisting of paired symmetrical principal masses immediately postovarian, 0.067 to 0.121 in diameter, one with 3 lobes, other with 4 lobes; lobes very long and very coiled, encircling ovary. Initial part of uterus contains sperm cells; uterine coils descend on left, enter ecsoma a little to as much as $\frac{1}{2}$ of its length, then ascend on right side dorsal to gonads and loop 2 or 3 times before following anterior part of pars prostatica to sinus sac; uterus joins pars prostatica at base of sinus sac. Eggs numerous, yellowish, 14 to 18 by 8 to 11.

Excretory pore terminal; in the ecsoma, the median stem of excretory vesicle ascends between eeca with repeated forward and backward turnings (Fig. 7); anterior to ecsoma it becomes more straight, dividing at level of gonads; ecrura diverge and continue ventrally lateral to gonads and acetabulum and forward beside oral sucker, turn backward, narrow greatly, and parallel themselves back to level of gonads where they subdivide; one branch continues almost to posterior end of body proper.

Ten immature specimens (rudimentary gonads and no eggs) had a total length of 1.474 to 3.792 and were widest at acetabular level.

COMPARISONS: The length of the pars prostatica (almost four times the length of the seminal vesicle) and its posterior extent (posterior to the seminal vesicle and almost to the ovary) distinguish L. chingi from all other species of Lecithochilium. The vitelline lobes are unusually long and sinuous,
and they extend from a pair of well developed vitelline masses. The alternately anterior and posterior course of the excretory vesicle in the cesoma is undescribed and is not figured for any other species, nor is the narrow, posterior extension of the lateral vessels.

*L. chingi* seems most similar to *L. magnacetabulum* Yam., 1934 (syn. *L. pagrosomi* Yam., 1934). The body size, egg size, location of the cesoma invagination, and proximity of seminal vesicle to acetabulum seem closer to the description of *L. pagrosomi*. The sucker ratio of *L. chingi* (1:1.0-1.3) may be smaller, but it may overlap the ratio for *L. magnacetabulum* (1:1.2-1.55). The pars prostatica of *L. magnacetabulum* may loop backward but only partially overlaps the seminal vesicle, and its total length is not longer than the seminal vesicle.

Yamaguti (1958:280) questioned the identification of *L. magnacetabulum* from New Zealand by Manter (1954), pointing out that an egg-size range of 19 to 30 by 9 to 15 is too great for a single species. Three specimens of the New Zealand material were available for restudy. The size range reported is, in fact, misleading. The normal range, or at least the range of eggs selected as typical or normal, seems to be 20 to 26 by 11 to 14. There was slightly greater variation, but the smaller eggs were clearly abnormal with extra thick shells and eggs of 26 to 27 microns had thinner shells. These three specimens were clearly a single species. This correction does not help to identify the species since the egg size is exactly between that reported for *L. magnacetabulum* and *L. pagrosomi*. The size of the acetabulum of the New Zealand specimens is more like that of *L. pagrosomi*. In view of the tendency toward instability of egg size, we still believe *L. pagrosomi* should be considered a synonym of *L. magnacetabulum*.

**SUBFAMILY LECITHTASTERINAE Odhner, 1905**

(syn. Derogenetinae Odhner, 1921)

Hemiurids without cesoma; without cuticular plications; with vitellaria unlobed, lobed, digitate, or with seven separated parts.

*Aponurus acanthuri*, n. sp. (Fig. 8)

**Host:** *Acanthurus sandvicensis* (Streets), manini or convict tang (*Acanthuridae, surgeonfishes*); 1 specimen from 56 hosts.

**Location:** Stomach


**Description:** Body elongated, more or less cylindrical, smooth, without cesoma, 1.822 long by 0.322 wide, widest immediately posterior to acetabulum and posterior to ovary; both ends rounded. Oral sucker 0.154 wide by 0.134 long; mouth ventral, surmounted by preoral lobe. Acetabulum in second 1/5

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**PLATE II**

Fig. 8. *Aponurus acanthuri* from *Acanthurus sandvicensis*, holotype; ventral view.

Fig. 9. *Genolincia lobata* from *Acanthurus sandvicensis*, holotype; ventral view.

Fig. 10. a-c. *G. lobata* from *A. sandvicensis*, 3 paratypes; views of ovary with vitellaria.

Fig. 11. *Lechthochirium microstomum* Chandler, 1935, from *Dascyllus albisella*; ventrolateral view.

Fig. 12. *L. microstomum* from *D. albisella*; ventral view with cesoma retracted.

Fig. 13. *L. microstomum* from *Chaetodon auriga*; ventral view with cesoma extended.
of body length, 0.235 wide by 0.214 long, aperture rounded. Sucker ratio 1:1.5. Pharynx 0.060 long by 0.087 wide; esophagus short; ceca relatively wide with irregular margins, extending to near posterior end of body where tips turn anteroventrally and end blindly.

Testes separated by uterus, diagonal, rounded, 0.096 to 0.107 long by 0.115 to 0.120 wide; near midbody, anterior testis 0.255 posterior to acetabulum. Seminal vesicle preacetabular, sacular, small, about 0.080 long by 0.048 wide. Pars prostatica swollen and vesicular, small, about 0.040 in diameter, surrounded by prostatic cells; pars prostatica joins uterus at base of sinusae. Sinusae globular containing only the hermaphroditic duct; genital atrium lacking. Genital pore at level of intestinal bifurcation, quite probably median.

Ovary posttesticular, median, ovoid, 0.114 long by 0.155 wide. Seminal receptacle elongated but smaller than ovary, to left of ovary. Vitellaria composed of seven rounded to oval bodies 0.048 to 0.064 long by 0.048 to 0.080 wide, arranged in two horizontal rows (4 anterior and 3 posterior) or, differently interpreted, two contiguous groups of 4 and 3 (4 right and 3 left); anterior vitellaria contiguous with ovary. Uterus narrows dorsal to acetabulum but no metraterm differentiated. Mature, uncollapsed eggs measure 21 to 24 by 12 to 14, but collapsed eggs measure 29 to 32 by 16 to 19. Excretory pore terminal; anterior extent of vesicle not determined but, judging from the distribution of refractive granules, the errum joins dorsal to the oral sucker.

Discussion: This species is more elongate than other species in the genus. It is distinctive in that uterine coils occur between the testes and also between the testes and ovary so that no two of these organs are contiguous. This condition occurs to some degree in A. synagris Yam., 1953 which differs in that the ceca do not extend posterior to the uterus, the vitellaria are not horizontally arranged, the testes are more symmetrical, and the eggs are somewhat larger.

Genolinae lobata, n. sp. (Figs. 9-10)

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

Location: Stomach


Description (based on 4 specimens): Body small, without ecesoma, 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 \( \frac{1}{4} \) 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; sinusae short, containing muscular hermaphroditic 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, excretory erura 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 Hawai'i), but the prostatic vesicle is less well developed, the sucker ratio is smaller, and the eggs are shorter.

Hysterolecitha tinker Manter & Pritchard, 1960

Host: Chaetodon fremblui Bennett (Chaetodontidae, butterfly fishes); 2 specimens from 1 of 17 hosts. New host record.

Location: Intestine

Lecithaster stellatus Looss, 1907

Synonym: Lecithaster sayori Yamaguti, 1938

Hosts (both new records): Acanthurus olivaceus (Bloch and Schneider), nā‘ena‘e (Acanthuridae, surgeonfishes); 1 specimen from 1 of 15 hosts.

A. sundencies (Streets), manini or convict tang (Acanthuridae, surgeonfishes); 3 specimens from 2 of 56 hosts.

Location: Stomach and intestine


Brief Description of Hawaiian specimens: 1.246 to 1.628 long by 0.375 wide (0.436 to 0.623 deep); oral sucker 0.114 wide by 0.094 to 0.141 long; acetabulum 0.241 wide by 0.201 to 0.275 long; sucker ratio 1:2.1; pharynx 0.063 to 0.080 long by 0.070 wide; seminal vesicle 0.121 to 0.201 long by 0.091 to 0.147 wide; eggs 13 to 16 by 8 to 11.

Discussion: These specimens agree with the descriptions of L. stellatus as given by Looss (1907) and Yamaguti (1934, 1953). The pars prostatica is less S-shaped in the Hawaiian specimens.

Yamaguti (1938) described Lecithaster sayori from the large intestine of Hyporhamphus sayori (Temm. & Schleg.) in Lake Hamana, acknowledging that “except for measurements this species is hardly distinguishable from Lecithaster stellatus Looss, 1907, but I would regard it as distinct in view of its habitat.” The larger size of the Hawaiian specimens brings the measurements of L. stellatus even closer to those of L. sayori, and the wide variety of hosts reported for L. stellatus reduces the relative importance of “habitat.” We consider L. sayori a synonym of L. stellatus.
Subfamily Lecithochirinæ Lühe, 1901

Hemiurids with esoma, non-plicated cuticula, and compact or digitate to winding vitellaria. Manter and Pritchard (1960) listed 17 genera in this subfamily. Four others should have been included: Anahemiurus Manter, 1947; Erilepturus Woolcock, 1935 (Syn. Uterovesiculurus Skrj. & Gusch., 1954); Meroderus Manter, 1940; and Tubulovesicula Yam., 1934 (Syn. Lecithurus Pigulewsky, 1938).

The above concept of the Lecithochirinæ does bring together two or less distinct groups of genera: those resembling the Dinurinae in having a postacetabular seminal vesicle and long winding vitellaria; and those more like Sterrhurus in having the seminal vesicle preacetabular or dorsal to the acetabulum and shorter vitellaria.

Yamaguti does not consider the cuticular plications as a generic character. He named (1934) three species which, although smooth-bodied, he placed in Ectenurus (E. hamati, E. paralichthidys, E. platycephali). We believe these belong in the genus Erilepturus Woolcock, 1935 as already indicated for the first two by Manter (1947). All three of these species showed a uterine swelling immediately before the union with the pars prostatica, although it was inconspicuous in E. platycephali. Skrjabin and Guschanaskaja (1954) recognized the genus Erilepturus but named Uterovesiculurus for the three species with the uterine swelling. As will be noted below, we found this character to be of inconsistent appearance within a single species (Tubulovesicula angusticauda). Uterovesiculurus is therefore considered a synonym of Erilepturus. Erilepturus platycephali (Yam., 1934) is a new combination.

Lecithochirium magnaporum Manter, 1940

Host: Dactyloptena orientalis (Cuvier & Valenciennes), lolo'ou (Dactylopteridae); 6 specimens from 1 of 3 hosts. New host and distribution record.

Location: Stomach


Brief description of Hawaiian specimens: Body 2.111 to 3.136 long (including esoma extended none to 0.503 beyond body proper) by 0.630 to 0.670 wide; oral sucker 0.177 to 0.201 wide; acetabulum 0.409 to 0.469 wide; sucker ratio 1:2 to 2.4; preacetabular pit large, round, deep, and glandular; genital pore large, transverse, ventral to anterior part of pharynx with moderately conspicuous radiating muscles; seminal vesicle tripartite (posterior parts only slightly divided); sinus sac 0.096 to 0.128 long by 0.120 to 0.147 wide, containing transversely oval, rounded, or pyriform prostatic vesicle and short, broad, muscular hermaphroditic duct with longitudinally striated wall; thin-walled, transparent cells fill available space within sinus sac; eggs 21 to 24 by 14 to 16 (collapsed eggs 19 to 24 by 10 to 14).

Discussion: Montgomery (1957) reported L. magnaporum from La Jolla, California, adding that the specimens were larger (2 to 4.18 by 0.55 to 0.69) and had a larger sucker ratio (1:2.3 to 2.4).

The Hawaiian material was compared with 21 paratypes of L. magnaporum from the Galapagos Islands and differs principally in size, the somewhat less conspicuous radiations of the genital pore, the striated hermaphroditic duct, and the larger eggs; but each difference except body size is matched in one or more of the paratypes. The Hawaiian specimens are like the La Jolla specimens in size, but both collections are otherwise so similar to L. magnaporum from the Galapagos Islands that they are considered the same species.
L. australis Manter, 1954 is a very closely related species which differs in that the sinus sac is longer than broad and the genital pore is small, rounded, and without easily observed radiating muscles.

**Lecithochirium microstomum** Chandler, 1935 (Figs. 11-13)

**HOSTS** (all new host records): *Dascyllus albisella* Gill (Pomacentridae, damselfishes); 46 specimens from 5 of 20 hosts.

*Chaetodon auriga* Forskål (Chaetodontidae, butterfly fishes); 5 specimens from 1 of 28 hosts.

*C. corallicola* Snyder (Chaetodontidae, butterfly fishes); 2 specimens from 1 of 8 hosts.

*C. miliaris* Quoy & Gaimard (Chaetodontidae, butterfly fishes); 3 specimens from 2 of 43 hosts.

*Hemitaurichthys zoster* (Bennett), (Chaetodontidae, butterfly fishes); 1 specimen from 1 host.

*Bodianus bilunulatus* (Lacépède), 'a'awa (Labridae, wrasses); 1 specimen from 1 of 7 hosts.

**LOCATION**: Stomach; stomach and intestine; intestine.


**DISCUSSION**: Published descriptions of *L. microstomum* based on collections from various hosts in the Gulf of Mexico and the tropical American Pacific have increased the size range by decreasing the lower limits, i.e. body 1.5* to 4.8 long by 0.4* to 1.0 wide, oral sucker 0.125* to 0.200 wide, acetabulum 0.363* to 0.540 wide, sucker ratio 1:2.3 to 2.9*, eggs 16 to 24 by 10 to 13. Testes are as large or larger than the oral sucker, more or less diagonal, and the anterior testis may be contiguous with the acetabulum or separated from it by one or two loops of the uterus. We believe (Manter & Pritchard, 1960) the species is characterized by a non-glandular or inconspicuously glandular preacetabular pit, vitelline lobes as long as wide or up to twice as long, a cylindrical to pyriform sinus sac containing a spherical prostatic vesicle and muscular hermaphroditic duct. The *L. microstomum* reported from *Pseudupeneus multifasciatus* in Hawaii falls within the above limits and agrees with the specific diagnosis.

These 58 specimens, like those from the Galapagos Islands, tend to be smaller (0.831 to 2.751 long by 0.281 to 0.838 wide) and have a smaller sucker ratio (usually 1:2.3 or 2.4 but two specimens each are 1:2 and 1:2.5). The smallest specimens are probably progenetic. The sinus sac seems to be the more "open" type with some muscle strands converging posterior to the prostatic vesicle and some strands continuing posteriorly into the parenchyma. The most conspicuous variation, however, is the consistently smaller size of the testes (smaller than the oral sucker), their immediately postacetabular location, and their symmetrical, or practically symmetrical, relationship. We have reviewed more than 40 specimens of *L. microstomum* from the Galapagos Islands and Tortugas, Florida, and can confirm that all possess an easily observed rounded to pyriform sinus sac, and the large majority have large, more or less diagonal testes.

Of nine specimens from *Euthynnus alleteratus* at the Galapagos Islands, two have almost symmetrical testes, and three have testes slightly smaller than the oral sucker while two others have testes about equal in size to the

*This measurement indicated by scale accompanying Sogandares-Bernal and Hutton's (1959) figure.
oral sucker. Because of these intergradations, we feel at present that the differences are subspecific.

*Lecithochirium spiravesiculatum*, n. sp. (Figs. 14-15)

**Host:** *Gymnotorhax undulatus* (Lacépède), puhilaumilo (Muraenidae, moray eels); 1 from 1 host.

**Location:** Found in dish containing both stomach and intestine.


**Description:** Body elongate, with retracted esoma, 3.303 long by 0.858 wide at level of acetabulum; both anterior and posterior ends slightly tapered and bluntly rounded. Preacetabular pit median, immediately anterior to acetabulum, non-glandular with transverse aperture. Forebody muscular, parenchyma vesicular. Oral sucker subterminal, rounded, 0.322 long. Acetabulum about 1/2 body length from anterior end, rounded, 0.583 wide by 0.603 long, aperture longitudinally elongate. Sucker ratio 1:1.7. Pharynx small, rounded, 0.101 long by 0.114 wide; esophagus inflated, thick-walled, 0.144 long by 0.160 wide; esophagus inflated in forebody but muscular and contracted in hindbody, ending blindly anterior to base of esoma.

Testes symmetrical, immediately postacetabular, small, 0.101 long by 0.197 to 0.134 wide. Seminal vesicle tripartite, conspicuous constrictions separating parts; posterior part thin-walled, 0.281 long by 0.067 wide, lying obliquely along right anterior edge of acetabulum; middle part 0.194 long by 0.074 wide with thin muscular wall 0.010 thick, lying anterodextral to posterior part; anterior part directed medially, 0.087 long by 0.054 wide with muscular wall 0.020 thick. Seminal vesicle joined to pars prostatica by thin-walled duct 0.053 long. Prostatic cells well developed; pars prostatica short. Sinus sac pyriform, very muscular and thick-walled, 0.235 long by 0.114 wide. Prostatic vesicle consisting of a short and ovoid basal portion enclosed in thickened extension of sinus sac, and a tubular and spirally coiled part which expands anteriorly to form a rounded anterior end (Fig. 15). Hermaphroditic duct muscular, about 0.152 long, slightly sigmoid, extending to genital pore. Genital pore round, small, muscular, ventral to esophagus.

Ovary rounded, 0.161 long by 0.147 wide, immediately posterior and slightly lateral to right testis. Vitellarium median to ovary, seven elongate lobes 0.168 to 0.235 long and about 1/2 as wide, joined at bases and spreading in various directions. Uterus descends to base of esoma; metraterm straight, beginning at level of anterior margin of acetabulum, entering base of sinus sac, extending alongside prostatic vesicle, and into hermaphroditic duct directly anterior to prostatic vesicle. Eggs yellowish, 18 to 21 by 10 to 16 (both collapsed and non-collapsed eggs).

Excretory vesicle sinuous, extending more or less medially to posterior edge of acetabulum where it divides; crura extend forward and seem to meet dorsal to oral sucker.

**Discussion:** *L. spiravesiculatum* can be separated from all other species of *Lecithochirium* by the coiled posterior part of the prostatic vesicle, a character easily observed even with low magnification. The thick muscular wall of the sinus sac, the enclosure of the posterior part of the prostatic vesicle with the wall of the sinus sac, and the muscular walls of the two anterior parts of the seminal vesicle are likewise unreported in the genus. These latter characters appear in a species of *Sterrhurus* from *Cirrhitus alternatus* described below.
PLATE III

Fig. 14. *Lecithochirium spiravesiculatum* from *Gymnothorax undulatus*, holotype; ventral view.

Fig. 15. *L. spiravesiculatum*, holotype; ventral view of terminal genital ducts.

Fig. 16. *Sterrurus cirrhiti* from *Cirrhitus alternatus*, holotype; ventral view.

Fig. 17. *S. cirrhiti*, holotype; ventral view of terminal genital ducts.

Fig. 18. *Tubulovesicula angusticauda* (Nicoll, 1915) Yam., 1934, from *Conger cinereus*; ventral view.

Fig. 19. *T. angusticauda* from *C. cinereus*; ventral view of terminal genital ducts showing uterine swelling.

Fig. 20. *T. angusticauda* from *C. cinereus*; ventral view of terminal genital ducts showing uterine sphincter muscle.
**Sterrhurus cirrhiti**, n. sp. (Figs. 16-17)

**HOST:** *Cirrhitus alternatus* Gill, po'o-pan or o'opu-kai (Cirrhitidae, hawk-fishes); 1 specimen from 1 of 4 hosts.

**LOCATION:** Digestive tract.


**DESCRIPTION:** Body proper 2.513 long by 0.737 wide, widest at base of esoma and only slightly narrower at level of acetabulum; anterior end tapered and rounded, posterior end rounded. Only a short, broad portion of esoma with longitudinal folds appears to be protrusible (Fig. 16); anterior portion of esoma sinnous with numerous, deep, transverse folds, connecting with thin-walled excretory vesicle near middle of hindbody. Numerous, minute, black granules seem to occur in tissues (rather than lumen) of both portions of esoma; somewhat larger granules occur in excretory vesicle. No excretory pore could be seen. Forebody muscular; parenchyma vesicular. Oral sucker subterminal, rounded, 0.221 wide by 0.191 long. Acetabulum about ¼ body length from anterior end, 0.442 wide by 0.436 long, aperture rounded. Sucker ratio 1:2. Pharynx rounded, 0.083 long by 0.087 wide, esophagus muscular, 0.072 long by 0.046 wide; ceca muscular and somewhat contracted, sinuous, ending blindly lateral to base of esoma.

Testes diagonal, separated by uterus; right testis immediately postacetabular, transversely elongated, 0.082 long by 0.149 wide; left testis rounded, 0.152 long by 0.112 wide. Seminal vesicle tripartite; posterior part sacular, 0.096 long by 0.056 wide, overlapping anterior edge of acetabulum; middle part small, about 0.040 in diameter; anterior part rounded, about 0.067 in diameter with very muscular wall 0.013 thick; a spacious, thin-walled, S-shaped duct about 0.096 long leads from vesicle to pars prostatica. Pars prostatica 0.056 long by 0.040 wide, lined with clear cells and enclosed by muscles of sinus sac. Prostatic vesicle round, 0.048 long by 0.059 wide, lined by vesicular cells. Hermaphroditic duct wide, extending to genital pore. Sinus sac rounded, 0.120 long by 0.080 wide with very muscular wall; posteriorly, muscles enclose pars prostatica and admit metraterm. Prostatic gland cells dorsal and lateral to posterior part of sinus sac, well developed. Genital pore a transverse slit ventral to pharynx.

Ovary transversely oval, 0.120 long by 0.181 wide, posterior to left testis, median edge lying on median line. Vitellaria immediately postovarian, right group with 4 lobes and left one with 3, lobes no longer than wide. Uterus descends medially a short distance behind vitellaria, ascends to right of ovary, and crosses to left diagonally between testes; metraterm begins at anterior edge of acetabulum, follows seminal vesicle ventrally to median line, and turns anteriorly. Eggs yellowish, 16 to 21 by 10 to 12.

Excretory vesicle sinnous, more or less on median line, dividing at posterior edge of acetabulum, crura extending anteriorly lateral to ceca and joining dorsal to pharynx.

**DISCUSSION:** This species is most like *S. lotellae* Manter, 1954 from the southern hake of New Zealand, resembling it particularly in the presence of a thick-walled anterior portion of the seminal vesicle and the rounded, muscular sinus sac. It differs, however, in that the oral sucker is smaller, the genital pore is somewhat more anterior, the pars prostatica is enclosed by the muscle fibers of the sinus sac, the eggs are slightly wider, the vitelline lobes are shorter, the acetabulum is slightly more anterior, and the ceca do not enter the esoma. No metraterm was mentioned for *S. lotellae*.
**Tubulovesicula angusticauda** (Nicoll, 1915) Yam., 1934 (Figs. 18-20)

**Host:** Conger cinereus Ruppell, white eel or puhi-uhau (Congridae, conger eels); 2 specimens from 1 of 42 hosts. New distribution record.

**Location:** Stomach

**Specimen deposited:** U. S. Nat. Mus. Helminth. Coll., No. 39177.

**Brief description of Hawaiian specimens:** Total length 4.891 to 6.010, width 1.065 to 1.206. Oral sucker 0.362 to 0.382 wide; acetabulum 0.610 to 0.683 wide; sucker ratio 1:1.7 to 1.8. Seminal vesicle begins immediately posterior to acetabulum; one or two bends in posterior part, but anterior half straight and narrow. Pars prostatica begins at level of anterior edge of acetabulum, surrounded by thick, uninterrupted layer of prostatic cells; joins uterus at base of sinus sac. Hermaphrodite duct large, muscular, narrowing midway and then enlarging like a funnel; posterior part of funnel bears minute papillae while anterior part has pronounced circular muscles and is homolog of genital atrium (Figs. 19-20). Vitellaria in 2 groups of 3 and 4 lobes joined by a narrow duct immediately posterior to ovary. An inconspicuous sphincter muscle occurs near anterior end of uterus; when sphincter is constricted, tube anterior to it enlarges (Fig. 19). Eggs yellowish, 34 to 43 by 18 to 24.

**Discussion:** A genital atrium is described for this species by Yamaguti and by Manter and appears to be a generic character. In all New Zealand specimens (25) of *T. angusticauda* this atrium is short and wide and possesses strong semicircular muscles along its ventral side; the wall of the sinus sac narrows at its base. The Hawaiian specimens also show the ventral muscles, but the wall of the sinus sac continues to the wide genital pore without constriction (Figs. 19-20).

The uterine swelling in front of a sphincter muscle near the sinus sac seems to be another unreported variation in *T. angusticauda*. This condition characterized the genus *Uterovesiculurus* (syn. *Erilepturus*). We find that the swelling is visible in about one third of the specimens from New Zealand. The sphincter muscle is inconspicuous at best and probably has been overlooked.

The Hawaiian specimens are like the New Zealand specimens in sucker ratio, extent of the pars prostatica, and the position of the seminal vesicle. They differ in egg size, except for the single specimen from *Conger conger* with which the egg size is very similar. As pointed out by Sogandares-Bernal (1959), egg size is a “rather variable” character in species of *Tubulovesicula*. In *T. lindbergi* (Layman, 1930) Yam., 1934, the egg size is reported as 18 to 42 by 12 to 29; in *T. angusticauda*, 26 to 46 by 18 to 29.

In addition to egg size, the Hawaiian specimens also resemble the specimen from *Conger* in New Zealand in that the male duct is straight dorsal to the acetabulum, whereas in specimens from other New Zealand hosts this tube is sinuous. These differences are not considered specific, but it is notable that the Hawaiian specimens are most similar to the specimen from the conger eel in New Zealand.

Sogandares-Bernal recognized only 4 species of *Tubulovesicula*: *T. angusticauda*; *T. lindbergi*; *T. magnacetabulum* Yam., 1939; *T. pinguis* (Linton, 1940) Manter, 1947. The latter 2 species have been reported only from the type localities; *T. magnacetabulum* from a single host in Japan, *T. pinguis* from a variety of hosts at Woods Hole. *T. lindbergi* and its numerous syno-
nymns have been reported from various hosts in the American Pacific, Japan, the Red Sea, the Atlantic off Morocco, and the American Atlantic off Panama. T. angusticauda is, so far, Pacific in distribution being reported from Australia, New Zealand, the Celebes, and Hawaii.

**SUMMARY**

Described are one new genus, *Duosphincter*, and 6 new species: *D. zancli*, *Aponurus acanthuri*, *Genolimnea lobata*, *Lecithochirium chingi*, *L. spiravesiculatum*, *Sterrliurus cirrati*.

The following synonyms are proposed: *Parectenurus* Manter, 1947, syn. of *Ectenurus*; *Uterovesiculurus* Skrj. & Gusch., 1954, syn. of *Erilepturus*; *Lecithaster sayori* Yam., 1938, syn. of *L. stellatus* Looss, 1907.

The following new combinations are proposed: *Ectenurus americanus* (Manter, 1947) for *Magnacetabulum americanum*; *Ectenurus leioagnathi* (Yam., 1953) for *M. leioagnathi*; *Erilepturus platycephaali* (Yam., 1934), for *Ectenurus platycephaali*.

New host records are reported for *Hysterolecitha tinkerii* and *Lecithochirium microstomum*.

Four species are reported for the first time from Hawaii: *Ectenurus lepidus*; *Lecithaster stellatus*; *Lecithochirium magnaporum*; *Tubulovesicula angusticauda*. New host records are reported for all except *T. angusticauda*.

**LITERATURE CITED**


