STUDIES ON HELMINTH PARASITES FROM THE COAST OF FLORIDA. IV. DIGENETIC TREMATODES OF MARINE FISHES OF TAMPA, BOCA CIEGA BAYS, AND THE GULF OF MEXICO. 3 *

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Unless otherwise cited, all measurements are in millimeters.

Family BUCEPHALIDAE Poche, 1907

1. *Rhipidocotyle transversale* Chandler, 1935
(Figs. 1 to 2)

Host: *Strongylura timucu* (Walbaum) sp. inq.; needlefish; new host record?; family Belonidae
Incidence of Infection: In 1 of 3 hosts
Number: One
Location: Mid-intestine
Locality: Bayboro Harbor, Tampa Bay, Florida; new locality record

Discussion: The identity of the host reported above is in question. There appear to be two common species of *Strongylura* in Bayboro Harbor. The hosts collected in this study were the finer scaled of the two forms and in addition possessed scaled cheeks. The identification is consistent with common usage as by Kilby (1955) and Longley & Hildebrand (1941). Hopkins (1954) reported *R. transversale* from *Strongylura marina.* Since the identity of *S. marina, S. notata* and *S. timucu* is somewhat confusing, we cannot be absolutely sure of Hopkin's report as well as our own. So far as the literature is concerned, this report of *R. transversale*

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is apparently the first from *Strongylura timucu* and also represents a new locality record. According to Manter (1947), Linton's (1940) *Prosorhynchus gracilescens* from Woods Hole is *R. transversale,* a species whose known distribution now includes Massachusetts, Virginia, Florida, Louisiana and Texas.

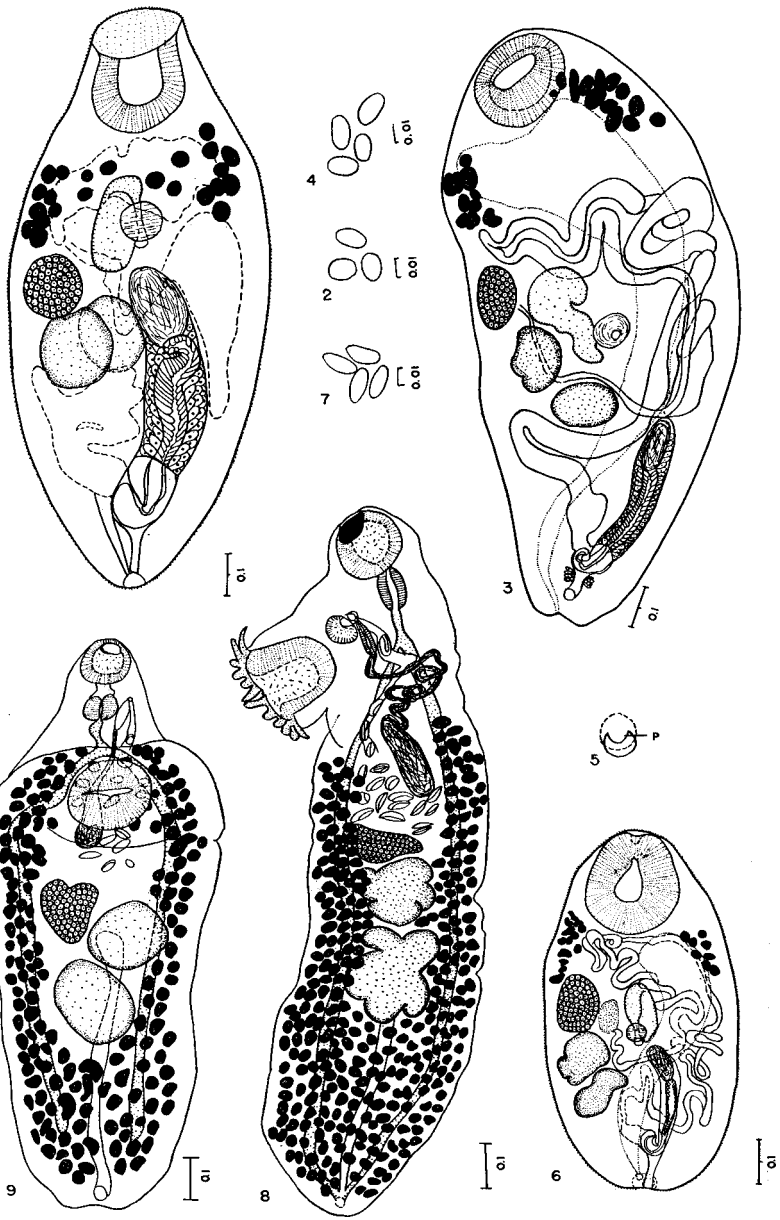
2. *Bucephaloides bennetti* Hopkins & Sparks, 1958
(Figs. 3 to 5)

Host: *Paralichthys albiguttus* Jordan & Gilbert; gulf fluke; new host record; family Pleuronectidae
Incidence of Infection: In 2 of 2 hosts
Numbers: 2, 42
Location: Pyloric ceca
Locality: Tarpon Key, Boca Ciega Bay, Florida; new locality record

Discussion: Manter (1954a.: p. 2) and Hopkins & Sparks (1958) indicated that *Bucephalopsis bennetti* Melugin, 1940, was a *nomen nudum.* The species was described in a thesis by Melugin and later given a name in abstract but no description included. Hopkins & Sparks (1958) retained the specific name *bennetti* for this species of Melugin. Hopkins (1954) named the genus *Bucephaloides* for all species previously in *Bucephalopsis* and retained the latter genus for *B. haimeanus* La Caze-Duthiers, a larval form. *Bucephaloides bennetti* was originally described from *Paralichthys lethostigmus* a species which appears to morphologically differ from *Paralichthys albiguttus* only in finray count. Hopkins and Sparks (1958) apparently did not describe the "lip" (fig. 5) of *B: bennetti.* Manter and Van Cleave (1951) described a closely related species, *B. labiatus* from a flounder, *Paralichthys californicus,* as possessing such a lip-like structure associated with the mouth. It is of some interest to note that the "lip" associated with the mouth has only been reported in *Bucephaloides* spp. from flounders of the genus *Paralichthys* even though sometimes widely separated geographically.

3. *Bucephaloides caecorum* Hopkins, 1956
(Figs. 6 to 7)

Host: *Bairdiella chysurus* (Lacepede); silver-perch; family Sciaenidae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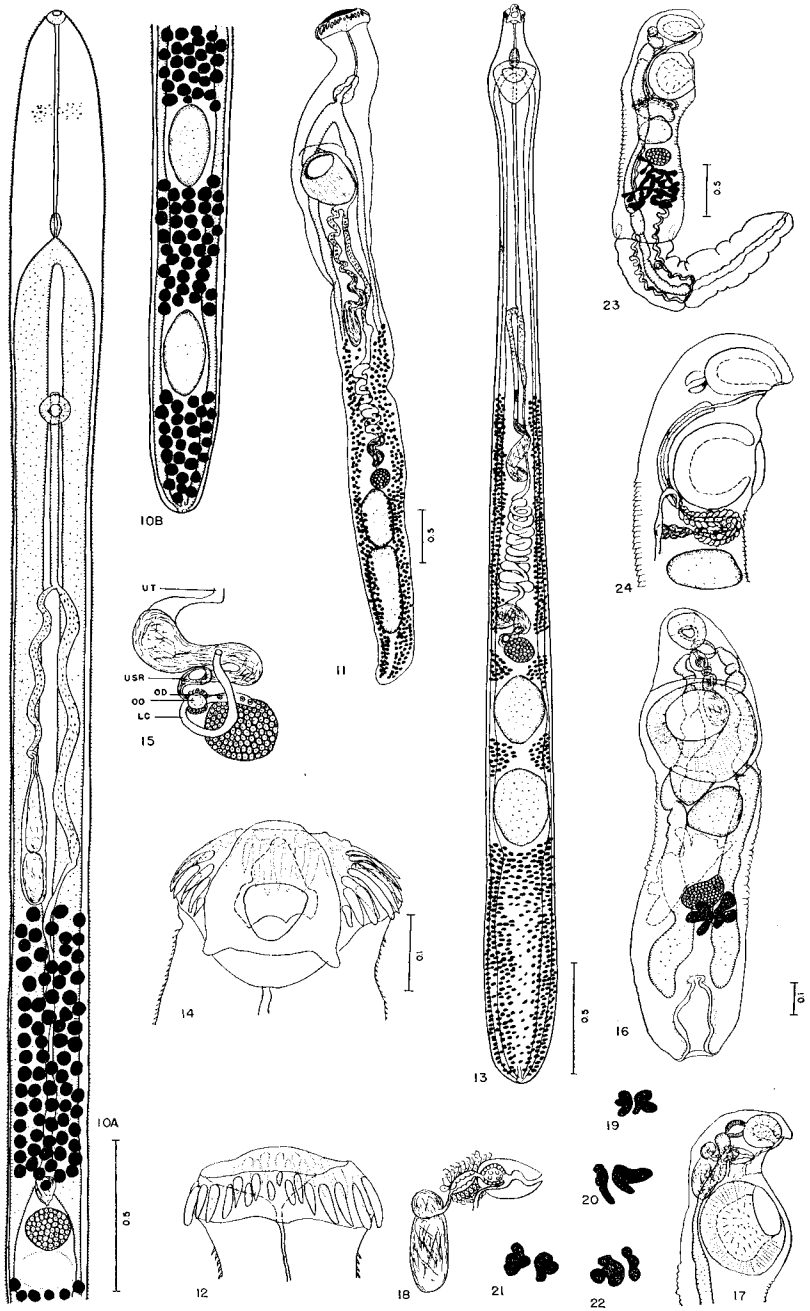
Incidence of Infection: In 1 of 9 hosts
Number: One
Location: Pyloric cecum
Locality: Tarpon Key, Boca Ciega Bay, Florida; new locality record

Discussion: *Bucephaloides caecorum* has been reported from *Cynoscion nebulosus* and *Bairdiella chrysurus* by Hopkins (1956). Sparks (1958) records the parasite from the same hosts and *Micropogon undulatus* in Grand Isle, Louisiana. *Bucephaloides caecorum* is possibly an accidental parasite of *B. chrysurus* judging from the number of hosts found negative combined with the finding of only one worm. *Bucephaloides caecorum* is similar to *B. bennetti*, a form from which it may be instantly separated by the fact that the uterus of the latter does not extend so far anteriorly, the oral sucker is proportionately smaller, and an oral "lip" is present.

EXPLANATION OF FIGURES

Unless otherwise stated, all figures were drawn with the aid of a camera lucida. Scale has value indicated in millimeters. Abbreviations used: LC, Laurer's canal; OD, oviduct; OO, ootype; P, papilla or "lip"; USR, uterine seminal receptacle; UT, uterus.

Figure 1. *Rhipidocotyle transversale* Chandler, 1935, ventral view.
Figure 2. Same, eggs.
Figure 3. *Bucephaloides bennetti* Hopkins & Sparks, 1958, ventral view.
Figure 4. Same, eggs.
Figure 5. Same, mouth showing lip, pharynx dotted in.
Figure 6. *Bucephaloides caecorum* Hopkins, 1956, ventral view.
Figure 7. Same, eggs.
Figure 8. *Opecoeloides fimbriatus* (Linton, 1934), ventro-lateral view.
Figure 9. *Pseudopecoelus manteri* (this paper), ventral view.
Figure 10A & B. *Tormopsolus filiformis* (this paper), scale drawing from camera lucida drawing of a twisted specimen, ventral view.
Figure 11. *Stephanostomum imparaspine* (Linton, 1905) Manter, 1940, ventral view.
Figure 12. Same, ventral view of oral sucker and spines.
Figure 13. *Manteria brachyderus* (Manter, 1940) Caballero, 1950, scale drawing from camera lucida drawing of a twisted specimen, ventral view.
Figure 14. Same, ventral view of oral sucker and spines.
Figure 15. Same, mehlis complex.
Figure 16. *Lecithochirium microstomum* Chandler, 1935, ventral view.
Figure 17. Same, sketch of lateral view of anterior end of body.
Figure 18. Same, sketch of terminal genitalia.
Figure 19 to 22. Same showing variation in vitelline shape.
Figure 23. *Dinurus tornatus* (Rudolphi, 1899) Looss, 1907, lateral view.
Figure 24. Same, enlarged sketch of anterior end of body showing anterior extent of cuticular denticulations and posterior extent of hermaphroditic duct.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This report of *B. caecorum* from Florida represents a new locality record.

Family Opecoelidae Ozaki, 1925

4. *Opecoeloides fimbriatus* (Linton, 1934) Sogandares & Hutton (in press)
(Fig. 18)

Host: *Bairdiella chrysurus* (Lacepede); silver-perch; family Sciaenidae
Incidence of Infection: In 1 of 9 hosts
Number: One
Location: Pyloric cecum
Locality: Tarpon Key, Boca Ciega Bay, Florida

Discussion: Sogandares & Hutton (in press) have reported what they believe to be the metacercaria of *O. fimbriatus* encysted in the cephalothoracic cavity of the shrimp, *Penaeus duorarum* Burkenroad. Since this report, we have found a single adult of *O. fimbriatus* in a pyloric cecum of *Bairdiella chrysurus.*

The specimen of *O. fimbriatus* pictured in Figure 7 has a contracted anterior and posterior body. Aside from the fact that a uroproct is formed, the specimen is believed to be conspecific with the holotype of *O. fimbriatus* (USNM Helm. Coll. No. 8266) which we have examined. The acetabular papillae in the holotype of *O. fimbriatus* are somewhat retracted.

Linton (1905) pictures a specimen of *O. fimbriatus* (Fig. 178) from Beaufort, North Carolina. Hopkins (1941) reported both *O. fimbriatus* and *O. vitellosus* in *Bairdiella chrysurus* from the same locality. Sparks (1958) examined *Bairdiella chrysurus* in Grand Isle, Louisiana, but did not report *O. fimbriatus* from that area. Precluding the chance that *O. polynemi* Von Wicklen, 1946, is not a synonym of *O. fimbriatus,* this report appears to be the northernmost record of the species in the Gulf of Mexico.

5. *Pseudopecoelus manteri* n. sp.
(Fig. 9)

Host: *Bairdiella chrysurus* (Lacepede); silver-perch; family Sciaenidae
Incidence of Infection: In 4 of 9 hosts
Number: 1, 1, 1, 1

Location: Pyloric ceca
Locality: Tarpon Key, Boca Ciega Bay, Florida
Holotype: U. S. Nat. Mus. Helm. Coll. No. 39002

Diagnosis (Based on 4 specimens): *Pseudopecoelus;* body elongate, plump, broadly rounded posteriorly, conical anterior to acetabulum, 0.94 to 1.44 long by 0.42 to 0.56 wide. Cuticle unspined. Oral sucker terminal, 0.06 to 0.08 long by 0.10 to 0.12 wide. Acetabulum in anterior ⅓ body, short pedunculate, unornamented, 0.18 to 0.20 long by 0.16 to 0.22 wide. Sucker ratio 1:0.9 to 1.1. Prepharynx from ¼ length to approximately same length as pharynx. Pharynx 0.05 to 0.07 long by 0.06 to 0.07 wide. Esophagus approximately same length of pharynx. Cecal bifurcation immediately preacetabular; ceca ending blindly ⅔ distance between posterior testis and posterior end of body. Genital pore sinistral and level with anterior border of pharynx. Testes 2, intercecal, roundish, oblique, almost in contact with each other, anterior testis equatorial, sinistral to midline of body, 0.14 to 0.18 long by 0.16 to 0.18 wide; posterior testis dextral or median, 0.14 to 0.22 long by 0.12 to 0.20 wide. Seminal vesicle from slightly posterior to acetabulum to enter a prostatic vesicle which is approximately same length of pharynx and connects with a very short cirrus which opens through genital pore. Ovary either with a single anterior notch or smooth, roundish to subtriangular in shape, to the right and level with anterior testis; 0.06 to 0.14 long by 0.10 to 0.12 wide. Seminal receptacle absent. Vitellaria medianly coalescing anterior and dorsal to acetabulum, extending posteriorly on each side of the body, overlapping ceca dorsally and ventrally to fill posttesticular space dorsally and ventrally. Uterus preovarian, extending from ovary to genital pore. Eggs collapsed, 48 to 60 microns long by 28 to 36 microns wide. Excretory pore terminal or subterminal, depending upon contraction of posterior end of body. Excretory vesicle tubular, extending from excretory pore to posterior level of ovary.

The name *manteri* is in honor of Professor Harold Winfred Manter, Department of Zoology, University of Nebraska, in recognition of his extensive contributions to the field of helminthology.

Discussion: This species is identified as *P. umbrinae* Manter & Van Cleave, 1951 and *P. gibbonsiae* Manter & Van Cleave, 1951 in Manter's (1954b: p. 6) key. Both species are from the coast of

California. *Pseudopecoelus manteri* differs from *P. umbrinae* by possessing smaller testes, an ovary which is never 3 to 4 lobed, and longer prostatic vesicle. *Pseudopecoelus manteri* differs from *P. gibbonsiae* by possessing a seminal vesicle which extends only slightly posterior to acetabulum, oblique testes, and genital pore at anterior border of pharynx, as compared with seminal vesicle extending far beyond acetabulum, almost to ovary, tandem testes and genital pore at mid-pharyngeal level. *Pseudopecoelus manteri* differs from all other species of *Pseudopecoelus* by possessing vitellaria which extend anterior to acetabulum as compared with vitellaria posterior to acetabulum.

Pseudopecoelus manteri in this collection was found associated with *Bucephaloides caecorum* Hopkins, 1956 and *Tergestia pectinata* (Linton, 1905) Manter, 1940.

Family ACANTHOCOLPIDAE Lühe, 1906

6. *Tormopsolus filiformis* n. sp.
(Figs. 10A, 10B)

Host: *Rachycentron canadus* (Linn.); cobia; family Rachycentronidae
Incidence of Infection: In 1 of 1 host
Number: 5
Location: Rectum
Locality: Gulf of Mexico, 8 miles offshore from John's Pass, Madeira Beach, Florida
Holotype: U.S.N.M. Helm. Coll. No. 39003

Diagnosis (based on 5 specimens): *Tormopsolus*; body filiform, mainly cylindrical, 4.85 to 5.65 long by 0.20 to 0.36 wide at acetabulum. Cuticle spined to level of testes. Diffuse "eye-spots" present at mid-pharyngeal level. Forebody 0.90 to 1.30 long. Oral sucker terminal, 0.04 long by 0.05 to 0.06 wide. Acetabulum in anterior ¼ body, 0.09 by 0.09 to 0.10 wide. Prepharynx half length of forebody. Pharynx 0.07 to 0.08 long by 0.04 to 0.05 wide. Esophagus absent. Ceca extending from cecal bifurcation, one on each side of body to end at posterior end of body in a uroproct. Genital pore median, immediately pre-acetabular, followed by a long unspined muscular hermaphroditic duct which extends intercecally from genital pore, dorsal to acetabulum, to end approximately in anterior ⅓ body. Testes 2, intercecal, in tandem in posterior ¼

body; anterior testis 0.12 to 0.28 long by 0.16 to 0.18 wide; posterior testis 0.30 to 0.32 long by 0.16 wide. Cirrus sac mainly intercecal, dextral, extending from about equator of body to enter hermaphroditic duct; containing a heavily spined cirrus which is slightly longer than the bipartate internal seminal vesicle. Ovary intercecal, in posterior ⅓ body, 0.12 to 0.14 long by 0.12 to 0.14 wide. Vitellaria completely surrounding body ventrally and dorsally from posterior tip of cirrus sac, interrupted at level of ovary and each testis, to end at posterior end of body. Uterus extending intercecally from ovary to a heavily spined metraterm which is about same size of cirrus sac and connects with posterior portion of the hermaphroditic duct and cirrus sac junction. *Receptaculum seminis uterinum* present. Anterior extent of excretory vesicle not observed.

The name *filiformis* is from the latin *filum* (= hair)-*forma* (= form) for the hair-like appearance of the body of this species.

Discussion: Prior to our description of *T. filiformis* there were three species in the genus *Tormopsolus* Poche, 1926. These species are *T. osculatus* (Looss, 1901) Poche, 1926; *T. orientalis* Yamaguti, 1934 and *T. lintoni* Caballero, 1952. *Tormopsolus filiformis* differs from these species by possessing a hermaphroditic duct which extends far posterior to the acetabulum (almost ⅓ distance from acetabulum to the anteriormost reach of the vitellaria) as compared with at most, hermaphroditic duct extending only a short distance posterior to acetabulum. *Tormopsolus filiformis* further differs from *T. osculatus* and *T. orientalis* by possessing a much longer forebody (proportionately twice as long) and longer prepharynx; and from *T. lintoni* by possessing an ovary which is separated from the anterior testis by a band of vitellaria.

7. *Stephanostomum imparaspine* (Linton, 1905) Manter, 1940
(Figs. 11 to 12)

Host: *Rachycentron canadus* (Linn.); cobia; family Rachycentronidae
Incidence of Infection: In 1 of 1 hosts
Numbers: 5
Location: Rectum
Locality: Gulf of Mexico, 8 miles offshore from John's Pass, Madeira Beach, Florida; new locality record.

Discussion: Linton (1905) described *Distomum imparaspine* from *Rachycentron canadus* in Beaufort, North Carolina. To our knowledge, the species has not since been reported in the literature until Manter (1940) placed *D. imparaspine* in the genus *Stephanostomum.*

Our specimens possessed from 33 to 34 oral spines. *S. imparaspine* resembles *S. hispidum* but differs in the number of crown spines (33 to 34 as compared with 40 to 42), and ovary always in contact with anterior testis as compared with ovary separated from anterior testis by a band of vitelline follicles.

It has been the current practice of ichthyologists to use the name Rachycentridae for the type genus *Rachycentron.* The name should be Rachycentronidae as here used.

8. *Manteria brachyderus* (Manter, 1940) Caballero, 1950
(Figs. 13 to 15)

Host: *Oligoplites saurus* (Bloch & Schneider); family Carangidae
Incidence of Infection: In 1 of 3 hosts
Numbers: 2
Location: Rectum
Locality: Bayboro Harbor, Tampa Bay, Florida; new locality record

Discussion: Manter (1940) originally placed this species in the genus *Dihemistephanus.* Caballero (1950) erected the genus *Manteria* for this species of Manter. Yamaguti (1953) placed the species in the genus *Dihemistephanus* and considered Caballero's (1950) *Manteria,* a sub-genus. *Manteria brachyderus* cannot be included in *Dihemistephanus* because *D. lydiae,* genotype, possesses a seminal receptacle. We have in our possession, 2 specimens of *D. lydiae* collected by Professor Manter from *Mola mola* in New Zealand and the seminal receptacle is definitely present. The presence of the seminal receptacle in *D. lydiae* would probably place it in the Deropristinae Cable & Hunnienen, 1942 of the Lepocreadiidae. The structure of the oral sucker, ventrally interrupted spines and an anterior acetabulum would place Manter's (1940) *Dihemistephanus brachyderus* in a genus all its own as proposed by Caballero (1950). For the present time, we prefer to retain *Manteria* Caballero, 1950. Our specimens possessed 30 and 32 oral spines respectively. Ather Siddiqui (personal communication), Purdue Uni-

versity, has studied specimens of *M. brachyderus* collected by Professor Raymond Cable, of the same institution, in Puerto Rico. He states that his immature specimens possess about 35, and mature specimens 41 to 47 oral spines. Professor Manter made a paratype of *M. brachyderus* available for our study. His specimen had 50 oral spines. We also have in our possession a specimen of *M. brachyderus* collected by Miss Margarita Bravo-Hollis, Instituto Nacional de Biologia (Mexico), in the Mexican Pacific. The oral spines have been lost, but the specimen is otherwise in good condition. Based on the material available for our study, we hesitate to name a new species for the Atlantic *Manteria* only on the basis of numbers of oral spines.

Caballero (1950) considers Linton's (1940) record of *Stephanostomum* sp. from Woods Hole, Massachusetts to be the same species as *M. brachyderus.* This record is the first from the Gulf of Mexico.

Family HEMIURIDAE Lühe, 1901

9. *Lecithochirium microstomum* Chandler, 1935
(Figs. 16 to 22)

Host: *Coryphaena equisetis* ? Linn.; small dolphin; new host record; family Coryphaenidae
Incidence of Infection: In 1 of 3 hosts
Numbers: 6
Location: Stomach
Locality: Gulf of Mexico, 15 mi. west of Pass-a-Grille, Florida

Discussion: The specific identity of the host was not definitely established. The worms were dropped into cold A.F.A. fixative and the ecsoma of all specimens was retracted. Manter (1947) has pointed out that Chandler's (1935) figure of *L. microstomum* does not show a membrane surrounding the posterior end of the cirrus sac. Figure 18 is a sketch of the appearance of the terminal genitalia in our specimens. Figures 19 to 22 show observed variation of vitelline shape in our material.

Lecithochirium microstomum is known from the stomachs of many unrelated fishes in the American Atlantic and Tropical American Pacific. This report is the first from a fish of the genus *Coryphaena.*

10. *Dinurus tornatus* (Rudolphi, 1899) Looss, 1907
(Figs. 23 to 24)

Host: *Coryphaena equisetis* ? Linn.; small dolphin; family Coryphaenidae
Incidence of Infection: In 3 of 3 hosts
Numbers: Not counted
Location: Stomach
Locality: Gulf of Mexico, 15 miles west of Pass-a-Grille, Florida

Discussion: The specific identity of the host is in question. All three hosts were collected from a single school of small dolphins.

Manter (1947) reported *D. tornatus* from *Coryphaena hippurus* in Tortugas, Florida, and Linton (1905) from *Coryphaena hippurus* and *C. equisetis* in Beaufort, North Carolina. Ward (1954) reported "*D. tornatus*" from the Miami, Florida area. She followed Dawes (1947) in considering *D. longisinus* Looss, 1907, a synonym of *D. tornatus*. The species Ward (1954) pictures (Fig. 3) may be *D. longisinus* because the hermaphroditic duct extends to the middle of the acetabulum. Dawes (1947) considers *Dinurus barbatus* (Cohn, 1903) Looss, 1907, *D. breviductus* Looss, 1907, *D. longisinus* Looss, 1907, synonyms of *D. tornatus* (Rudolphi, 1899) Looss, 1907. One of us (F.S.) has *Dinurus* spp. collected from *Coryphaena hippurus* in the Gulf of Panama and in Bimini, B.W.I., and in addition has been privileged to study Professor Manter's series of *Dinurus* spp. from *Coryphaena hippurus* collected in Tortugas, Florida and the Tropical American Pacific. *Dinurus tornatus* may be easily separated from *D. longisinus* because the cuticle in the former species is denticulated to the acetabulum (Figs. 23 to 24) and the hermaphroditic duct extends almost to or beyond the posterior border of the acetabulum, as compared with cuticular denticulations extending to the oral sucker and hermaphroditic duct extending to about the middle of the acetabulum in *D. longisinus*. These differences appear to be constant in several hundred specimens which one of us (F.S.) has been able to observe. The fact that most *Dinurus* spp. may live together in a single host is not evidence enough for synonymy of the species as presented by Dawes (1947). There are numerous examples to indicate that closely related species and genera may cohabit in the same host. The finding of closely related species living together in one host

would imply a strong degree of host specificity accompanying evolution. Manter (1957) shows how the accacoelid trematodes of *Mola mola* are a good example of such evolution. There is no definite contrary evidence to show that hermaphroditism is the rule in the Digenea. There is some evidence that cross fertilization occurs, and it may be more common than we at present suspect or assume. The differences of the cuticular denticulations of *Dinurus tornatus* and *D. longisinus* could possibly be a recognition character preventing interspecific mating if cross fertilization occurs in this group of trematodes. Thus in trematodes in which weak recognition characters preventing interspecific matings would exist, hybrids would be expected to result. *Pseudocreadium myohelicatum* (Bravo & Manter, 1957) seems to be just such a hybrid example (*Pseudocreadium scaphosomum* Manter, 1940 X *Pseudocreadium spinosum* Manter, 1940). Such a hybridization may perhaps occur when two trematode species normally occur in separate host species and sometimes are accidentally in one host species together. Recognition characters preventing interspecific matings in these instances would possibly be weaker than when both species normally occur together in one host species as is the case in the *Dinurus* spp. in *Coryphaena* spp., in the *monorchiids* from *Haemulon* spp., and in the accacoelids from *Mola mola.* Price (1953) believed hybridization between *Faciola hepatica* and *F. gigantica* existed in cattle in the Southeastern United States. If trematode hybrids exist these would probably be confused with intergradation between two closely related species by most observers. Such may be the case in some *Dinurus* spp. confused as synonyms by some investigators.

Summary

1. Two new trematodes are named and described. These species are: *Pseudopecoelus manteri* (family Opecoelidae) from *Bairdiella chrysurus* in Boca Ciega Bay, Florida, and *Tormopsolus filiformis* (family Acanthocolpidae) from *Rachycentron canadus* in the Gulf of Mexico.

2. New host records are as follows: *Rhipidocotyle transversale* Chandler, 1935 (family Bucephalidae) in *Strongylura timucu*?; *Bucephaloides bennetti* Hopkins & Sparks, 1958 (family Bucephalidae) in *Paralichthys albiguttus;* and *Lecithochirium microstomum* Chandler, 1935 in *Coryphaena equisetis*?.

3. New locality records are: From Tampa and/or Boca Ciega Bays, *Rhipidocotyle transversale* Chandler 1935; *Bucephaloides bennetti* Hopkins & Sparks, 1958; and *Bucephaloides caecorum* Hopkins, 1956 (family Bucephalidae) *Manteria brachyderus* (Manter, 1940) Caballero, 1950 (family Acanthocolpidae); from the Gulf of Mexico, *Stephanostomum imparaspine* (Linton, 1905) Manter, 1940 (family Acanthocolpidae).
4. Information pertaining to the exact location and numbers of each trematode species within its respective host(s) is given when possible.

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