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Introduction

During the summers of 1930, 1931, and 1932, extensive collections of parasites of fishes were made at the Biological Laboratory of the Carnegie Institution of Washington at Dry Tortugas, Florida. Dr. W. H. Longley was at that time engaged in his studies of the fishes of that region, and a very considerable number and variety of fishes were made available to me for examination. Altogether, some 2039 fishes representing some 237 species of teleost fishes were examined. Several short papers (Manter, 1930; 1931; 1931a; 1932; 1933; 1933a; 1935; 1937; 1940; 1942; 1945; 1946) and one longer paper dealing with trematodes from deepwater fishes (Manter, 1934) have been published. The present paper includes all the species of digenetic trematodes which could be identified with reasonable certainty, altogether some 189 species. Species reported previously are listed with the others partly to provide as complete a list as possible and partly to make a few corrections particularly in names of hosts.

Linton (1910) reported on trematodes of the Tortugas region, and a few species were studied by Pratt (1916) and McCoy (1929, 1930). All the species reported by them are represented in my collections with the exception

* Studies from the Department of Zoology, University of Nebraska, No. 230.

of a single species, *Hysterolecitha rosea* Linton, 1910. Not included in this report are immature specimens; a few adults, of which a single specimen was obtained; and a number of Didymozoonidae preserved material of which seemed inadequate for satisfactory identification.

The fish hosts were identified by the late Dr. W. H. Longley to whom the author is also indebted for continued interest and encouragement. During one summer (1932), Dr. Leighton Williams assisted in the collection of trematodes. Dr. Waldo Schmitt also assisted in the work directly and indirectly in many ways.

The names of the hosts, identified by Dr. Longley, follow the form used in Longley and Hildebrand's (1941) Systematic Catalogue of the Fishes of Tortugas, Florida. Common names are added where possible because they often give a quicker concept of the host. Since practically all of the fishes were examined individually, it is possible to add data on the incidence of infection.

Of the 189 species reported, 44 are new. Nine new genera are named. Nine genera and 15 species are reduced to synonymy with previously named genera or species. In addition to such synonyms, 44 new combinations are proposed.

Much progress in the taxonomy of trematodes has been made since 1910. Linton's descriptions are incomplete and inadequate in some respects and therefore, a number of species named by him are redescribed and reclassified in this paper. Linton's pioneer work did give indication of the rich fauna of trematodes in the Tortugas area. My collections confirm the fact that, judging from the number of species, the group does indeed constitute a large element in the fauna and ecology of the region. Apparently, a large variety of these parasites has developed along with the great variety of fishes, molluscs, and crustaceans of the warmer seas.

It is hoped that this survey will establish Tortugas as one of the localities where the trematode fauna is relatively well known. British marine fishes have been examined for trematodes over a period of many years, and Japanese parasitologists have described many species from the waters of Japan, but the trematodes of most regions are very incompletely known. Species of these parasites are so numerous, at least in warmer oceans, that some general conclusions might be possible from the knowledge of their geographical distribution and host relationships. For example, as might be expected the trematodes of fishes of Bermuda are evidently much the same as those of fishes at Tortugas. Almost all the trematodes of Massachusetts fishes are different. Fishes of the colder seas harbor entirely different trematodes except that several of these northern species occurred in deepwater fishes at Tortugas. A marked similarity of the trematode fauna of Pacific fishes with trematodes of Tortugas has been found. Manter (1940) reported 23 species, or 28%, of his total number of species from the tropical American Pacific as occurring in both oceans. Four more species can now be added to that list (namely *Bianium plicitum, Pseudolepidapedon balistis, Pseudopecoeloides carangis,* and *Stephanostomum ditrematis)* making 27 species or 33% of the Pacific list occurring in the Atlantic. Of the 189 species at Tortugas, about 13% were collected in the

Pacific. But the deepwater species should be excluded in that comparison since such fishes were not collected in the Pacific. The percentage of the shallow water Tortugas species found in the Pacific is about 17%. The trematodes of Woods Hole, Massachusetts are still not well known as many of Linton's species need to be restudied but, so far as can be judged, surprisingly few Tortugas species occur there. Excluding three deepwater species, only 12 Tortugas species (see page 378) have been reported from that region. This is only about 6% and very much less than the percentage found in the Pacific. Furthermore, in practically every case the host at Woods Hole is the same species serving as host at Tortugas, a condition not generally true in regard to those occurring in the Pacific. Apparently, barriers within the ocean itself are more effective than the present-day land barrier between the two oceans. The explanation lies in the fact that the present land barrier has not always existed. Various groups of free-living animals furnish similar evidence but the similarity of the trematodes frequently extends to specific identity. More evidence on problems suggested by such distribution of species will result from more complete knowledge of the marine trematodes of the world. The trematodes seem to constitute a group unusually well fitted to furnish such evidence.

Type specimens of all new species described in this paper are deposited in the Helminthological Collection of the United States National Museum.

Aspidogastrea

1. LOBATOSTOMA RINGENS (Linton, 1907) Eckmann, 1932

Fig. 1

SYNONYMS: *Aspidogaster ringens* Linton, 1907; *Cotylogaster chaetodipteri* MacCallum, 1921.*

HOSTS: *Calamus calamus* (Cuv. and Val.), saucer-eye porgy; in 2 of 20 hosts examined; 5 specimens. *Calamus bajonado* (Bloch and Schneider),** grass porgy; in 1 of 15 hosts examined; 2 specimens.

LOCATION: Intestine or rectum.

Discussion: Linton (1905:367, 397) reported this species from *Micropogon undulatus* and *Trachinotus carolinus* at Beaufort, North Carolina; (1907:104) from *Iridio radiatus* at Bermuda; and (1910:82-83) from *Calamus calamus* at Tortugas. He did not report it from Woods Hole. MacCallum and MacCallum (1913) report it from *Trachinotus carolinus* but give it no locality. *Cotylogaster chaetodipteri* MacCallum, 1921 from *Chaetodipterus faber* from Key West does not seem to differ materially from *L. ringens* and is here considered a synonym.

My specimens have 18 or possibly 19 transverse, median grooves and 42 marginal loculi. Various descriptions of the species record 16, 17 or 18 transverse grooves and either 36 or 42 marginal loculi.

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* New synonymy.
** New host record.

Gasterostomata

BUCEPHALIDAE

The following list of fifteen gasterostomes is the same as that reported by Manter (1940a), except for a few changes in the names of hosts to bring them in accord with Longley and Hildebrand (1941). In all cases the gasterostomes were collected from the intestine, the ceca, or both.

2. BUCEPHALOPSIS ARCUATUS (Linton, 1900) Eckmann, 1932

HOST: *Sphyraena barracuda* (Linn.), barracuda; common.

3. BUCEPHALOPSIS LONGOVIFERUS Manter, 1940

HOST: *Sphyraena barracuda* (Linn.), barracuda; in 8 of 15 hosts examined.

4. BUCEPHALUS KATHETOSTOMAE (Manter, 1934) Manter, 1940

HOST: *Kathetostoma albigutta* Bean, stargazer; 60 fathoms; in 2 of 3 hosts examined.

5. BUCEPHALUS PRIACANTHI Manter, 1940

HOST: *Priacanthus arenatus* (Lacépède), glass-eyed snapper; in 1 of 3 hosts examined.

6. BUCEPHALUS SCORPAENAE Manter, 1940

HOST: *Scorpaena plumieri* Bloch; scorpion fish; in 3 of 3 hosts examined.

7. BUCEPHALUS VARICUS Manter, 1940

HOSTS: *Caranx bartholomaei* Cuv. & Val., yellow jack; in 1 of 2 hosts examined. *Caranx latus* Agassiz, jack; in 1 of 6 hosts examined. *Caranx ruber* (Bloch), runner; in 5 of 6 hosts examined.

8. DOLLFUSTREMA GRAVIDUM Manter, 1940

HOST: *Gymnothorax moringa* (Cuv.), moray; in 1 of 2 hosts examined.

9. PROSORHYNCHUS ATLANTICUS Manter, 1940

HOSTS: *Mycteroperca microlepis* (Goode & Bean), gag; in 1 host examined. *Mycteroperca venosa* (Linn.), yellow-fin grouper, type host (=*M. bonaci*); in 2 of 10 hosts examined.

10. PROSORHYNCHUS OZAKII Manter, 1934

HOST: *Epinephelus niveatus* (Cuv. & Val.), snowy grouper; 90 fathoms; in 1 of 3 hosts examined.

11. PROSORHYNCHUS PROMICROPSI Manter, 1940

HOST: *Promicrops itaiara* (Lichtenstein), jewfish; in 3 of 3 hosts examined.

12. RHIPIDOCOTYLE BACULUM (Linton, 1905) Eckmann, 1932

HOST: *Scomberomorus regalis* (Bloch) (?), painted mackerel; in 1 of 3 hosts examined.

13. RHIPIDOCOTYLE ADBACULUM Manter, 1940

HOST: *Scomberomorus regalis* (Bloch), painted mackerel; in 1 of 3 hosts examined.

14. RHIPIDOCOYTLE BARRACUDAE Manter, 1940

HOST: *Sphyraena barracuda* (Linn.), barracuda; in 2 of 15 hosts examined.

15. RHIPIDOCOTYLE LONGLEYI Manter, 1934

HOST: *Synagrops bellus* (Goode & Bean); 140 to 250 fathoms; in 5 of 17 hosts examined.

16. RHIPIDOCOTYLE NAGATYI Manter, 1940

HOST: *Euthynnus alletteratus* (Raf.), little tunny; in 3 of 3 hosts examined.

Discussion: Jones (1943) has given a detailed description of *"Skrjabiniella aculeatus* (Odhner, 1905)". As has been noted by Dawes (1946:195) and by Crowcroft (1947:113), Jones' attempt to establish *Skrjabiniella* as distinct from *Prosorhynchus* cannot be accepted. An anterior arc of vitelline follicles occurs in *P. squamatus* Odhner, 1905, the type of the genus *Prosorhynchus*. If this character is to be considered generic then *Skrjabiniella* is a synonym of *Prosorhynchus*, a view now generally held; and the genus *Gotonius* Ozaki, 1924 is available for the 11 species (listed by Crowcroft) with separated vitellaria. The follicles almost meet in *P. rotundus* Manter, 1940, and Yamaguti states that in *Pseudoprosorhynchus synodi* Yamaguti, 1938 the follicles were in two lateral groups in life but confluent in his mounted specimen. However, I agree with Crowcroft that the vitellaria might well be a convenient basis for separation of two genera.

Linton (1940) reported several gasterostomes from fishes of Woods Hole, Massachusetts. Most of them seem to me to be incorrectly named. *Gasterostomum arcuatum* is *Bucephalopsis arcuatus* (Linton, 1900) Eckmann, 1932; *Gasterostomum capitatum* should be *Rhipidocotyle capitatum* (Linton, 1940) n. comb.; *Prosorhynchus ovatus* should be *Bucephalopsis ovatus* (Linton, 1900) Nagaty, 1937. The species identified by Linton as *Prosorhynchus gracilescens* (in Linton, 1940, p. 30) I consider to be *Rhipidocotyle transversale* Chandler, 1935*. *Nannoenterum baculum* should be *Rhipidocotyle baculum* (Linton, 1905) Eckmann, 1932; and *Nannoenterum gorgon* should be *Bucephalus gorgon* (Linton, 1905) Eckmann, 1932. Except in the case of *"Prosorhynchus gracilescens"* no judgment is intended here regarding Linton's identifications.

Prosostomata

PARAMPHISTOMATIDAE

17. CLEPTODISCUS RETICULATUS Linton, 1910

Fig. 2

HOST: *Pomacanthus aureus* (Bloch), black angelfish; in 6 of 14 hosts examined. Since this host is listed as *P. arcuatus* in my records (see footnote on p. 263), it is probably the same species reported by Linton.

LOCATION: Intestine.

Discussion: This trematode was not studied extensively and only a few details can be added to Linton's description. Traces of pigment eye-spots

* New synonymy.

are evident. The posterior half of the esophagus is provided with circular muscles as well as gland cells. The excretory tubes end blindly just posterior to the oral sucker and do not unite. There is one pair of large lymphatic vessels unbranched and somewhat sinuous in the middle region of the body, becoming much swollen and conspicuous opposite the two suckers. No other lymphatic vessel could be seen either from toto-mounts or cross-sections. The two vessels unite dorsal to the oral sucker near the anterior end of the body but end blindly posteriorly on each side of the acetabulum. The acetabulum contains vesicular pockets of lymph.

Cleptodiscus was tentatively classified in the subfamily Schizamphistominae by Näsmark (1937).

PRONOCEPHALIDAE

18. Pleurogonius candibulus (Linton, 1910) n. comb.

SYNONYMS: *Himasomum candibulum* Linton, 1910; *Barisomum candibulum* (Linton, 1910) Price, 1931.

HOSTS: *Holacanthus ciliaris* (Linn.)** (=*Angelichthys ciliaris*), queen angelfish; in *Pomacanthus arcuatus* (Linn.), black angelfish; in 2 of 3 hosts examined.

LOCATION: Intestine.

Disussion: Mehra (1939) considered *Barisomum* a synonym of *Pleurogonius* but did not actually make the combination with the specific name. Actually, *Barisomum* is not, I believe, a synonym of *Pleurogonius* as is *Himasomum*. Mehra was following Price in considering *Himasomum* a synonym of *Barisomum* and implied the above combination.

Study of 36 specimens of *P. candibulus* leaves no doubt that the excretory crura end blindly beside the esophagus just posterior to the nerve band across the esophagus and that Linton mistook the nerve band for the excretory system. In more than half of my specimens the terminations of the crura are clearly evident. Thus, one of the confusing points in the classification of the species is clarified and the species falls readily into the genus *Pleurogonius*. Oguro (1936), however, describes the union of the excretory crura in *P. linearis* Looss, 1901 and in *P. ozakii* Oguro, 1936. Whether the excretory pore is terminal or not depends on how much the posterior edge of the body is rolled in ventrally; it is a short distance dorsal to the actual edge of the body. In other respects, Linton's description seems fairly complete and accurate. The thin, delicate, narrow body; the small, almost straight, parallel, not widely separated ceca which are practically without side branches; and the dorsal, anterior ridge readily distinguish *P. candibulus* from *Barisomum erubescens* Linton, 1910 from some of the same hosts. The differences between the two are very conspicuous even to the naked eye. Linton's figures and descriptions evidently did not emphasize some of these differences, for Price (1931), Mehra, H. R. (1932), Mehra, R. K. (1939), and Prudhoe (1944)

* I am assuming (see Longley and Hildebrand 1941: 151-152) that the field identifications of these hosts by Dr. Longley should be revised so that his *P. arcuatus* is actually *P. aureus*, and his *P. paru* is *P. arcuatus*.

** New host record.

consider the two in the same genus and the latter author states "in all probability" they are the same species. It seems to me the differences are of generic significance.

19. BARISOMUM ERUBESCENS Linton, 1910

Fig. 3

SYNONYMS: *Pleurogonius erubescens* (Linton, 1910) Prudhoe, 1944. (Mehra (1939) considered *Barisomum* a synonym of *Pleurogonius* but he did not make the combination with the specific name); *Monostomum pomacanthi* MacCallum, 1916; *Pleurogonius pomacanthi* (MacCallum, 1916) Price, 1931.*

HOSTS: *Holacanthus ciliaris* (Linn.)** (=*Angelichthys ciliaris*), queen angelfish; in 1 of 4 hosts examined. *Holacanthus isabelita* (Jordan and Rutter), angelfish; in 2 of 13 hosts examined. *Pomacanthus arcuatus* (Linn.), black angelfish; in 3 of 3 hosts examined. *Pomacanthus aureus* (Bloch), black angelfish; in 2 of 3 hosts examined. Linton (1910) recorded this species also from *Scarus croicensis*.

Discussion: The genus *Barisomum* is being retained on the basis of the thick-set, relatively wide body; the absence of a dorsal ridge; the serpentine winding or undulations of the intestinal ceca; and the large, often bulbous branches on both inner and outer sides of the ceca. Two small, papilla-like projections near the posterior end of the body could be seen in 4 of 15 specimens but they are evidently capable of complete retraction. The intestinal ceca approach each other three times, near the level of the genital pores, shortly anterior to the testes, and posterior to the testes. In most specimens these undulations were very conspicuous but in a few they were not pronounced although discernible. The cirrus sac is long and almost horizontal; the genital pores are close together and lateral to the left cecum. Eggs have a polar filament at each end. To the naked eye, these plump, flesh-colored trematodes are very different from the long, slender, more delicate *P. candibulus* sometimes found in the same angelfish. *Barisomum,* in fact, seems to be most similar to *Pyelosomum cochlear,* notably in its broad body, undulating ceca, and relatively far lateral genital pores. It differs chiefly in lacking the dorsal ridge.

The ceca of ***B. erubescens*** are usually well filled with a black material never seen in the ceca of *P. candibulus*. *Monostomum pomacanthi* MacCallum, 1916 is reported by Price (1931:3) from exactly the same hosts from which I collected *B. erubescens* (considering *P. arcuatus* as *P. aureus* and *P. paru* as *P. arcuatus*—see footnote on page 262). Its body form and wide ceca are very different from *P. candibulus*. I believe the differences in MacCallum's specimens from *B. erubescens* are due to distortion by heavy pressure in killing.

Mehra's (1939:122-125) attempts to fit *Barisomum* into the genus *Pleurogonius* are based entirely on Price's conclusion that *Himasomum* is a synonym of *Barisomum*. Thus, since *Himasomum* has the dorsal ridge and *Barisomum* does not, he reasons that this is not a generic character. His reasons become largely invalidated if *Barisomum* is a genus distinct from *Himasomum* as I have concluded. *Himasomum* does indeed appear to be a synonym of *Pleurogonius*.

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* New synonymy.

** New host record.

MEGASOLENIDAE

Genus HAPLADENA

The genus *Hapladena* was named by Linton (1910) with *Hapladena varia,* from *Acanthurus (=Teuthis) hepatus* and *A. caeruleus* at Tortugas as type species. Manter (1935) noted similarity of *H. varia* to *Megasolena estrix,* and later (1937a) considered *Deradena ovalis* a synonym of *H. varia.* The enclosure of the metraterm within the cirrus sac was noted by Linton for *D. ovalis.* Since *D. ovalis* was the type species of *Deradena,* that genus became a synonym of *Hapladena. Deradena acuta* and *D. obtusa,* however, belong in the genus *Haplosplanchnus* (Manter, 1937a). The genera *Hapladena* and *Megasolena* were placed in the subfamily Megasoleninae but the family connections were not clear. The author (1935) noted amphistome characteristics (hermaphroditic sac, lymphatic vessels) and similarities to *Maculifer* (pre-pharyngeal muscles, lymphatic vessels) and to *Opistholebes,* finally classifying the genera in the family Opistholebetidae Fukui, 1929. The correct name for this family apparently should be Gyliauchenidae since *Gyliauchen* Nicoll, 1915 (synonym *Dissotrema* Goto and Matsudaira, 1918) is the type genus. Although Ozaki (1933) was evidently the first to use the name Gyliauchenidae it was so directly implied by Goto and Matsudaira (1918) that they should probably be given authorship. Rules regarding authorship of supergeneric names are at present not clearly defined. Park (1938) added the genus *Carassotrema* to the subfamily Megasoleninae which he placed in the family Allocreadiidae. *Carassotrema* has the hermaphroditic sac and a single testis hence is very similar to *Hapladena.* Park found no lymphatic vessels in *Carassotrema.*

Since the first description of lymphatic vessels in a distome, *Petalocotyle,* by Ozaki (1934), such vessels have been found in a number of more or less allocreadid-like genera, for example: *Megasolena* Linton, 1910; *Hapladena* Linton, 1910; *Apocreadium* Manter, 1937; *Choanodera* Manter, 1940; as well as in genera with more or less posterior acetabulum as *Gyliauchen* Nicoll, 1915; *Flagellotrema* Ozaki, 1936; *Telotrema* Ozaki, 1933; *Paragyliauchen* Yamaguti, 1934. The latter four genera are clearly related and Ozaki (1937) grouped them in the subfamily Gyliaucheninae, family Gyliauchenidae, superfamily Paramphistomatoidea. He included *Petalocotyle* in the same family, subfamily Petacotylinae. Except for the long prepharynx and spined cirrus *Petalocotyle* is similar to some Opecoelidae and its family allocation seems somewhat uncertain. Of the other genera mentioned above, *Apocreadium* and *Choanodera* are so similar to *Homalometron* (differing chiefly in their lymphatic vessels) that they should be transferred to the Homalometroninae, family Lepocreadiidae. The remaining three genera, *Megasolena, Hapladena,* and *Carassotrema,* are closely related and are peculiar in possessing an hermaphroditic sac. Since they cannot be placed in any other family without greatly extending its limits, the family Megasolenidae Skrjabin, 1942 is accepted here. It should be noted that the peculiar hemaphroditic sac is not as unique as the writer once thought. The family Haploporidae (genera *Haploporus* Looss, 1902; *Saccocoelium* Looss, 1902; *Dicrogaster* Looss, 1902; *Lecithobotrys* Looss, 1902) has a very similar hermaphroditic sac. Haploporidae, however, possess compact rather than follicular vitellaria, a uterus extending to near

the posterior end of the body, and very short ceca; they are very small trematodes, and no lymphatic vessels have been noted in them.

Ozaki (1937, 1937a) grouped *Opistholebes* Nicoll, 1915; *Heterolebes* Ozaki, 1935, and *Maculifer* Nicoll, 1915 in the family Opistholebetidae. These genera do not have lymphatic vessels. On the whole it seems to me their connection with the Paramphistomatoidea is very doubtful. They seem more like certain Lepocreadiidae such as *Pseudocreadium*.

Megasolena estrix has already been described (Manter, 1935). *Hapladena varia*, *H. ovalis*, and a new species are described below.

The following diagnosis of the genus *Hapladena* is proposed: Elongate, plump-bodied distomes; spined anteriorly. Prepharynx bulb lacking. Genital pore closely anterior to acetabulum; single testis; hermaphroditic sac; external and internal seminal vesicle. Ovary pretesticular; seminal receptacle present; Laurer's canal present; vitellaria follicular. Two pairs of longitudinal, unbranched lymphatic vessels. Excretory vesicle I-shaped. Type species: *H. varia* Linton, 1910.

The excretory vesicle in *Hapladena* extends to the posterior end of the ovary where it receives two collecting tubules (Fig. 4). It is not Y-shaped as in *Megasolena* and that character should be excluded as a charateristic of the family Megasolenidae.

20. HAPLADENA VARIA Linton, 1910

Fig. 4

HOSTS: *Acanthurus coeruleus* Bloch and Schneider, blue tang; in 2 of 12 specimens examined; 2 specimens. *Acanthurus hepatus* (Linn.), tang; in 1 of 6 hosts examined; 1 immature specimen.

LOCATION: Intestine.

Discussion: Linton (1910:65-66) described this species from these same hosts at Tortugas. From my limited material, not much can be added to Linton's description beyond the generic characters mentioned above. There is a distinct prepharynx; the pharynx is apparently unmodified; the esophagus is long, forking near the posterior edge of the acetabulum. The "cirrus sac" of Linton is the characteristic hermaphroditic sac. Two pairs of lymphatic vessels extend the length of the body. The excretory vesicle extends dorsal to the testis as far as the ovary where it receives two collecting tubules which are moderately well developed but which cannot be considered a part of the vesicle itself. Mehlis' gland, lying immediately anterior to the ovary, is large and contains two types of gland cells. My measurements of eggs were 51 to 54 by 31 to 34 μ instead of 42 by 24 μ reported by Linton. Characteristic of *H. varia* is the equal or subequal size of the suckers. In my immature specimens, the oral sucker is distinctly larger than the acetabulum.

It has been noted that Linton's *"Deradena ovalis"* was considered (Manter, 1937a) a synonym of *H. varia*. Further study of specimens leads to the conclusion that it is actually a second species of *Hapladena*. The synonmy of the genus *Deradena* with *Haplosplanchnus* is not affected.

21. **Hapladena ovalis** (Linton, 1910) n. comb.

Figs. 5, 6

SYNONYM: *Deradena ovalis* Linton, 1910.

HOSTS: *Sparisoma pachycephalum* Longley, 1941* (=*S. flavescens* (Bloch and Schneider), in part), parrotfish; present in 4 of 20 hosts examined. *Pseudoscarus coelestinus* (Cuv. & Val)* (=*P. plumbaeus* Bean), loro; present in 2 of 4 hosts examined.

LOCATION: Intestine.

Description: These are rather large, plump, reddish worms; specimens from *Sparisoma* mature at about 4.827 mm and reach 5.467 mm in length; width 1.357 to 2.025 mm. Mature specimens from *Pseudoscarus* were 3.172 to 3.358 by 0.787 to 1.174 mm. The skin appears unspined in most specimens but some have a few spines as far back as the level of the ovary. These spines are easily lost. Oral sucker 0.480 to 0.495 mm; acetabulum 0.652 to 0.750 mm in diameter; sucker ratio 1:1.34 to 1.5. Very short prepharynx; pharynx 0.300 to 0.375 by 0.187 to 0.225 mm; esophagus longer than prepharynx; bifurcation usually dorsal to acetabulum, sometimes near its posterior border; ceca extending to near posterior end of body, in one specimen apparently filled with blood from the host. A cluster of large gland cells on each side of the esophagus. Two pairs large lymphatic vessels present. Excretory vesicle a straight tube to the posterior edge of ovary where it receives two collecting tubes as in *H. varia*. Genital pore median immediately anterior to acetabulum. The single, elongate testis lies in posterior third of body. Hermaphroditic sac curving along right edge of acetabulum to a point from middle to posterior edge of acetabulum; containing a long, muscular, almost straight metraterm and sinus which together extend along its entire length; a tubular, internal seminal vesicle along about half its length; a short prostatic vesicle; and numerous gland cells (Fig. 6). The seminal vesicle narrows to a small tube which bends backward and soon expands into the short prostatic vesicle which leads to a short tube opening into the metraterm in the posterior half of the hermaphroditic sac. Immediately anterior to this point the sinus wall has rod like scales or papillae for a short distance. The external seminal vesicle is a sinuous tube extending almost to the ovary. Ovary ovoid, immediately pretesticular, about in midbody. Mehlis' gland very large, at anterior border of ovary; Laurer's canal well developed; seminal receptacle anterior to Mehlis' gland; uterus may also contain sperm cells; uterus coiled between ovary and acetabulum, muscular along its entire length, enters posterior end of hermaphroditic sac; eggs 53 to 58 by 32 to 34 μ; vitellaria from level of posterior half of acetabulum to near posterior end of body, follicles large, tending to be elongate and arranged in clusters or clumps, continuous dorsally across the body; dorsal, lateral and ventral to the ceca.

Discussion. Linton reported this species as *Deradena ovalis* from two species of parrotfishes at Tortugas, *Scarus caeruleus,* and *S. croicensis* (?). My three specimens from *Pseudoscarus coelestinus* were slightly smaller, the posttesticular distance was relatively slightly longer and the eggs slightly

* New host record.

wider, but these differences were so small that another species does not seem indicated.

22. **Hapladena leptotelea** n. sp.

Figs. 7, 8

HOST: *Pomacanthus aureus* (Bloch), black angelfish; 2 specimens in 1 of 14 hosts examined.

LOCATION: Intestine.

Description: Length 2.260 to 2.360 mm; greatest width, near acetabulum, 0.554 to 0.714 mm. Body apparently smooth, with thick cuticula; rounded anteriorly, tapering in posterior half almost to a point at posterior end. Oral sucker spherical or subspherical, 0.184 to 0.252 mm in diameter; acetabulum about ¼ body length from anterior end, slightly longer than wide, with longitudinal aperture; 0.336 to 0.402 mm in transverse diameter; sucker ratio about 1:1.6. Prepharynx short and wide; pharynx large, 0.190 to 0.235 mm long by 0.180 to 0.184 mm wide; esophagus about same length as pharynx; bifurcation dorsal to acetabulum; ceca wide, not reaching posterior end of body by some distance as if the tapered body were too narrow to accommodate them. Two pairs of lymphatic vessels are conspicuous in the anterior half of the body but obscured posteriorly by vitellaria. The excretory vesicle can be traced forward to the testes and probably forks near the ovary. Genital pore to the right of midline at midpharynx level. Testis single, in midbody region, irregular in shape, not longer than wide. Hermaphroditic sac large, almost as wide as long, filling most of forebody to the right of pharynx which is pushed to the left, extending along right side of acetabulum but not reaching to midacetabular level. The long, almost straight, external seminal vesicle extends from near the ovary to right of the acetabulum. Within the base of the sac the internal seminal vesicle is first a swollen diagonal tube, then a narrow coiled tube which leads to the short prostatic vesicle. The latter opens into the metraterm at the base of a large spherical portion of the genital sinus provided with rounded scales or papillae (Fig. 8); from this characteristic rounded portion a short muscular tube leads to the genital pore. The ovary is unlobed, wider than long, immediately anterior to the testis. Eggs were not developed in either specimen. Mehlis' gland anterior to the ovary; seminal receptacle not clearly observed; uterus much coiled between ovary and acetabulum, filled with sperm cells; metraterm within hermaphroditic sac, short and straight near entrance to sinus; exact entrance of uterus into sinus sac not observed. Vitellaria follicular from level of posterior edge of acetabulum to within short distance of, but not reaching, posterior end of body; continuous dorsally and also ventrally except for region of the gonads.

Discussion: This third species in the genus *Hapladena* differs from both *H. varia* and *H. ovalis* in its posteriorly tapered and pointed body; its wider hermaphroditic sac with expanded, scaled region of the genital sinus; the longitudinal aperture of the acetabulum; slighty shorter ceca; and more anterior genital pore. It differs from *H. varia* in sucker ratio. Although no trace of spines could be seen in the two specimens of *H. leptotelea,* spines may have been lost, as easily happens in *H. ovalis.* The peculiar scaled region of the genital sinus occurs but is not inflated in *H. ovalis.*

The smaller specimen had pigment flecks on each side of the pharynx indicating that the cercaria was oculate.

The name *leptotelea* is from *lepto*=slender and *tele*=end, and refers to the slender posterior half of the body.

23. MEGASOLENA ESTRIX Linton, 1910

HOSTS: *Kyphosus incisor* (Cuv. & Val.), yellow chub; in 2 of 5 hosts examined.
Kyphosus sectatrix (Linn.), white chub; in 2 of 5 hosts examined.

OPISTHOLEBETIDAE

24. **Opistholebes adcotylophorus** n. sp.

Figs. 9, 10

HOST: *Diodon holocanthus* Linn., balloonfish or porcupine fish; 2 specimens in 1 or 2 hosts examined.

LOCATION: Intestine.

Description: Body almost circular in outline; largest specimen 1.35 mm long by 1.147 mm wide; other specimen 0.9 mm long by 1.04 mm wide. Cuticula unspined, rugose. Oral sucker longer than wide, 0.225 by 0.187 mm, acetabulum near posterior end of body, wider than long; 0.405 mm wide, embedded in body; aperture a transverse inconspicuous slit. A disc-like, glandular and muscular portion of the body extends posterior to the acetabulum. Oral sucker with conspicuous post-oral ring; prepharynx wide and very short; pharynx 0.133 mm long, 0.136 mm wide; esophagus lacking; ceca immediately divergent then curving backward to end with tips dorsal to outer edges of the testes. The excretory pore is dorsal, far forward, almost immediately posterior to opening of Laurer's canal. Excretory vesicle a very short tube.

Genital pore median, approximately halfway between the suckers, some distance posterior to intestinal bifurcation. Testes symmetrical, on each side immediately anterior to acetabulum, wider than long, almost meeting medianly. Cirrus sac clavate extending from genital pore backward to overlap the left side of the ovary; posterior half straight and longitudinal; anterior half sharply curved backward then ventrally and somewhat forward to the genital pore; containing a large seminal vesicle, a long pars prostatica, elongate prostatic vesicle and a long cirrus (Fig. 10). Ovary to the right, immediately anterior to right testis; seminal receptacle and Laurer's canal present; uterus largely in left half of body between left cecum, the left testis and the cirrus sac, extending anterior to cirrus sac and anterior to genital pore. Eggs 68 to 71 by 42 to 44 μ. Vitelline follicles filling sides of body densely from region of pharynx to posterior edge of acetabulum, surrounding the ceca and extending median to them. Scattered pigment spots in parenchyma anterior to ovarian level. Lymphatic vessels absent.

Discussion: The genus *Opistholebes* and its relatives have been extensively studied by Ozaki (1937, 1937a). Other species are *O. amplicoelus* Nicoll, 1915; *O. cotylophorus* Ozaki, 1935; and *O. elongatus* Ozaki, 1937. As indicated by its name, *O. adcotylophorus* is most similar to *O. cotylophorus* which occurs in the same species of host, *Diodon holocanthus,* in Japan. It differs

in the curved shape of the cirrus sac which is associated with a more posterior genital pore and with a more anterior extent of the uterus. The ceca are more divergent, the acetabulum relatively larger and the eggs somewhat narrower.

Ozaki's (1937) study of pigment spots shows that the hollow cells thought once (Manter, 1935) to be lymphatic vessels are actually these spots. The author agrees with Ozaki that *Opistholebes* can be placed in a family, Opistholebetidae, distinct from the Gyliauchenidae. The post-oral ring is remarkbly similar to that found in *Megasolena* but the two genera are otherwise very different. *Heterolebes* and *Maculifer,* as Ozaki showed, are relatives of *Opistholebes*. It now seems fairly clear that the posterior location of the acetabulum in *Opistholebes* is rather incidental and does not indicate relationship to the Paramphistomatidae. Study of *Opistholebes* suggests the genus *Pseudocreadium* Layman, 1930 (=*Hypocreadium* Ozaki, 1936). Similar features are: wide body; widely curved ceca; symmetrical testes; similar vitellaria; and far anterior position of the excretory pore. *Pseudocreadium* is classified in the family Lepocreadiidae. The author is inclined to consider the Opistholebetidae a related family. Cable and Hunninen (1942) consider the gyliauchenids as related to Lepocreadiidae. Finally, as indicated earlier in this paper, two other genera of distomes with lymphatic vessels *(Apocreadium* and *Choanodera)* are related to the subfamily Homalometroninae of the Lepocreadiidae.

LEPOCREADIIDAE

25. LEPOCREADIUM TRULLA (Linton, 1907) Linton, 1910

Fig. 11

SYNONYM: *Distomum trulla* Linton, 1907.

HOST: *Ocyurus chrysurus* (Bloch), yellowtail; in 16 of 47 hosts examined.

LOCATION: Intestine.

Discussion: This species differs from *L. album* (Stossich, 1890) Stoss., 1904 in smaller size, more truncated posterior end, oblique and more posterior testes, lobed ovary, and smaller eggs. It differs from *L. pegorchis* (Stossich, 1901) Stoss., 1904 in body shape, smaller size and more anterior testes.

Minute flagellated protozoa live in the ceca of this trematode (Manter, 1930:339).

L. trulla was first reported by Linton (1907) from *Ocyurus chrysurus* at Bermuda. Linton later (1910) reports it from the same host and (one specimen) from *Calamus calamus* at Tortugas. The latter host record probably represents an accidental infection.

26. LEPOCREADIUM BIMARINUM Manter, 1940

HOST: *Lachnolaimus maximus* (Walbaum), hogfish; present in 2 of 7 hosts examined.

LOCATION: Intestine.

Discussion: This species was reported by Manter (1940) who also collected it from *Pimelometopon pulcher* (Ayres) and *Bodianus diplotaenia* (Gill) on the west coast of Mexico.

27. **Pseudocreadium anandrum** n. sp.

Figs. 12, 13

HOST: *Calamus calamus* (Cuv. & Val.), saucer-eye porgy; many specimens in 1 of 14 hosts examined.

LOCATION: Ceca.

Description (measurements on 10 specimens): Small, spiny distomes, almost circular in outline, rounded at each end; length 0.330 to 0.427 mm, width 0.300 to 0.382 mm, widest at midbody. Oral sucker subterminal, usually somewhat wider than long, 0.070 to 0.090 mm in transverse diameter. Acetabulum round, near or slightly anterior to midbody, size subequal with oral sucker, 0.068 to 0.090 mm in diameter; sucker ratio 1:0.83 to 1.1; in three specimens the ratio was 1:1. Prepharynx short; pharynx lying diagonally, 0.037 to 0.053 mm long by 0.031 to 0.042 mm wide; esophagus short; ceca rather wide, bowing outward then backward, ending blindly. Genital pore slightly to the left, opposite anterior portion of acetabulum. Testes apparently lacking in all except one specimen where rudimentary traces of testes were believed observed (Fig. 13); one was partly dorsal to the acetabulum, the other, slightly more posterior, was dorsal to the left cecum. Cirrus sac lying diagonally or almost horizontally along anterior border of acetabulum which it overlaps dorsally, about same length as diameter of acetabulum, containing a muscular cirrus, a large pars prostatica, and a rudimentary, empty seminal vesicle. External seminal vesicle small, empty; no sperm cells observed in any specimen. Ovary with few large lobes, about midway between acetabulum and posterior end, submedian or slightly to the right. Seminal receptacle not observed but probably obscured by eggs or vitellaria, perhaps greatly reduced because of lack of sperm cells. Vitellaria profusely developed, extending from oral sucker to near posterior end of body, dorsal to other organs, meeting medianly anterior and posterior to acetabulum, sometimes forming a continuous layer dorsal to all organs including the acetabulum, usually leaving a central space in acetabular region. Uterus extending posterior to ovary, sometimes almost to posterior end of body; metraterm very weakly developed, not seen in all specimens; eggs relatively large, 53 to 59 by 28 to 33μ. Excretory pore dorsal but close to posterior end of body; excretory vesicle with muscular terminal region, consisting of a broad sac extending to the ovary.

Discussion: This odd, minute, spiny trematode differs from all other species of *Pseudocreadium* in its small size, in the location of the genital pore as far posterior as the acetabulum itself, and in the degeneration of the male gonads. It might be considered a new genus but the atrophy of the male organs is perhaps an abnormality, and the character of the cirrus sac, the extent of the uterus, the lobed ovary, and other characters agree with *Pseudocreadium*. It is perhaps most similar to *P. symmetrorchis* (Ozaki, 1936) but differs, in addition to the points mentioned above, in distribution of vitellaria and in its lobed ovary.

The atrophy of male organs had caused all ten specimens of this trematode to become functionally females. The empty and rudimentary seminal vesicles suggests that sperm cells had never been produced, yet all eggs seemed normal and well developed. Such a lack of male organs has been noted in

Helicometra execta Linton, 1910 (Manter, 1933) in which about half the individuals lack testes.

The genus *Pseudocreadium* was recently revised by the author (Manter, 1946). Since then, I have noted that the genus *Trigonotrema* Goto & Ozaki, 1929 is almost certainly a related genus. It is like *Pseudocreadium* in location of genital pore, character of cirrus sac and external seminal vesicle, symmetrical testes, intertesticular multilobed ovary, and other characters. *Trigonotrema* is described as without spines but these may have been lost. It is certainly not related to the Heterophyidae or Reniferidae as was suggested. It is distinguished from *Pseudocreadium* by body shape and lack of vitellaria in the anterior half of the body.

The name *anandrum* is from *an* = without; and *andro* = male and refers to the reduction of the testes.

28. DERMADENA LACTOPHRYSI Manter, 1946

SYNONYM: *Distomum lamelliforme* Linton, 1907, in part.

HOSTS: *Lactophrys tricornis* (Linn.), trunkfish; in 7 of 25 hosts examined. *Lactophrys trigonus* (Linn.), trunkfish; in 9 of 11 hosts examined. *Lactophrys triqueter* (Linn.), trunkfish; in 2 of 4 hosts examined.

LOCATION: Intestine.

29. Opechona gracilis (Linton, 1910) n. comb.

SYNONYM: *Prodistomum gracile* Linton, 1910; nec *Opechona gracilis* (Manter, 1931) Ward and Fillingham, 1934.

HOST: *Harengula macrophthalma* (Ranzani), sardine; in 2 of 33 hosts examined.

Description (based on Linton's measurements and one additional specimen): Length 1.265 to 1.400 mm; width 0.270 to 0.300 mm. Body spined. Oral sucker 0.090 mm in diameter, subcircular; acetabulum 0.090 mm in diameter; sucker ratio about 1:1. Prepharynx not visible, if present very short; pharynx about 0.05 mm in diameter; esophagus long with short glandular portion; in a 1.265 mm specimen, the total length of the esophagus was 0.285 mm and the glandular portion 0.085 mm. Genital pore slightly to the left at level of anterior edge of acetabulum. Testes tandem in posterior third or fourth of body, rounded, smooth, close together. Cirrus sac extending posterior to acetabulum by about diameter of acetabulum; external seminal vesicle elongate, about as long as cirrus sac, reaching somewhat more than halfway to the ovary. Internal seminal vesicle inconspicuous. Ovary unlobed, submedian, pretesticular; seminal receptacle and yolk reservoir between ovary and anterior testis. Vitellaria from posterior edge of acetabulum to posterior end of body. Eggs 61 to 64 by 37 to 47 μ. Excretory vesicle reaching to the acetabulum.

Comparisons: Species of *Opechona* in which the vitellaria have a similar extent are *O. bacillaris*, *O. orientalis*, *O. pharyngodactyla*, and *O. scombri*. *O. gracilis* differs from *O. bacillaris* in unlobed ovary, longer esophagus, subequal suckers, and much smaller eggs. *O. orientalis* has a long prepharynx, and lobed ovary. *O. pharyngodactyla* has a long prepharynx, different pharynx

and shorter esophagus. *O. scombri* seems to be most similar but is smaller, wider, has a different sucker ratio and a longer excretory vesicle.

Discussion: Several specimens of this trematode were collected but all except one were accidentally dried before they could be studied. There is no doubt, however, that the species is a typical *Opechona* species. Linton erroneously mistook the acetabulum for a "genital sucker". The name thus becomes *Opechona gracilis* (Linton, 1910) and the genus *Prodistomum* Linton, 1910 falls as a synonym of *Opechona* Looss, 1907. *Opechona gracilis* (Manter, 1931) must be renamed in accordance with Article 35 of the International Rules of Zoological Nomenclature. The name *Opechona menidiae* n. nom. is proposed. Its synonyms are *Pharyngora gracilis* Manter, 1931 and *Opechona gracilis* (Manter, 1931) Ward and Fillingham, 1934.

30. **Apocreadium balistis** n. sp.

Figs. 14, 15

HOST: *Balistes vetula* Linn., queen triggerfish; in 1 of 7 hosts examined; 1 specimen. LOCATION: Intestine.

Description: Body narrow and elongate; only slightly flattened; 3.731 mm by 0.620 mm; almost equally wide along most of length except that each end is slightly tapered. Spines occur near the anterior end as far back as the posterior end of pharynx and a few could be seen near the acetabulum; otherwise the body appeared smooth. Suckers round; oral sucker 0.255 mm in diameter; acetabulum 0.350 mm; sucker ratio 1:1.33. Forebody 0.944 mm. Prepharynx 0.102 mm long; pharynx 0.136 mm long by 0.127 mm wide; esophagus very short; intestinal bifurcation midway between suckers; ceca rather wide anterior to acetabulum, then narrow, ending near together near posterior end of body. Genital pore median, very close to the anterior border of acetabulum. Testes two, tandem, intercecal, in contact, just anterior to middle of hindbody, ovoidal, slightly longer than wide, each with a peculiar equatorial ridge. Posttesticular region markedly longer than forebody, 1.401 mm long. Seminal vesicle a simple elongate sac, overlapping acetabulum, largely between ovary and acetabulum, 0.255 by 0.110 mm. A simple, non-muscular, non-glandular tube about 0.219 mm long leads from the seminal vesicle to the genital atrium. Genital atrium tubular, non-muscular, about 0.219 mm long, surrounded by a few gland cells; cirrus and cirrus sac lacking. Ovary globular, midway between anterior testis and acetabulum, slightly to the right; seminal receptacle elongate, preovarian; Mehlis' gland to left of ovary and extending almost to anterior testis; uterus short with a few eggs; metraterm not observed. Vitelline follicles from level of posterior edge of ovary to posterior end of body; extracecal until posterior to testes where they fill most of the body. Eggs 73 to 78 by 49 μ. Excretory pore near posterior end; excretory vesicle extending to posterior testis. Collecting tubules seen only incompletely. Two pairs of lymphatic vessels (Fig. 15) extending from near anterior end of body at least a short distance posterior to acetabulum.

Discussion: This species, at first thought to be a species of *Homalometron,* is placed in the genus *Apocreadium* Manter, 1937 because of its lymphatic

vessels. As noted above (p. 264) these vessels constitute the chief difference between *Homalometron* and *Apocreadium*. Two species of *Apocreadium* have been described. *A. mexicanum* Manter, 1937 and *A. longisinosum* Manter, 1937, both from the Pacific. *A. balistis* is different in body shape which is little flattened, in the unbranched lymphatic vessels, and in lacking specialized circular muscles in the pharynx. The terminal genital ducts are almost exactly as in *A. longisinosum*.

It might be noted that a former student of mine, Marjorie Raecke, has reported (Proc. Nebraska Academy of Sciences, May, 1944) the occurrence of *Pseudolepidapedon balistis* Manter, 1940 from a triggerfish found at Bermuda. This species occurs in triggerfishes in the Pacific. It was not found at Tortugas but probably occurs there.

31. **Homalometron elongatum** n. sp.

Fig. 16

HOST: *Gerres cinereum* (Walbaum), Florida mojarra; in 12 of 15 hosts examined.
LOCATION: Intestine.

Description (measurements on 7 selected individuals): Body flattened, elongate, bluntly pointed at each end; size 1.900 to 3.116 by 0.382 to 0.611 mm; anterior portion of body spined. Oral sucker subterminal, round or slightly wider than long, 0.187 to 0.260 mm in diameter. Acetabulum from 1/2 to 1/5 body length from anterior end; slightly smaller than oral sucker; 0.161 to 0.240 mm in diameter; sucker ratio approximately 1:0.9. Prepharynx wide, usually about same length as pharynx, its walls extending beyond the anterior edge of the pharynx which seems to be surrounded by the base of the prepharynx. Pharynx longer than wide; 0.102 to 0.136 mm long by 0.077 to 0.112 mm wide. Esophagus muscular, as long as or longer than pharynx according to contraction; intestinal bifurcation about 2/3 the distance between oral sucker and acetabulum. Ceca extending to near posterior end of body. Testes large, tending to be longer than wide, smooth, tandem, near together or slightly separated, posterior to midbody, intercecal. Posttesticular space usually slightly longer than forebody. Seminal vesicle an ovoid sac near left posterior border of acetabulum. Cirrus and cirrus sac lacking. Genital pore submedian, immediately anterior to acetabulum. Ovary globular, median or to the right, midway between acetabulum and anterior testis and well separated from both. Seminal receptacle flask-shaped, entering oviduct near posterior border of ovary but largely anterior to ovary. Laurer's canal present. Vitelline follicles large, from a short distance posterior to acetabulum (anterior to ovary) to posterior end of body, confluent posterior to testes and almost so anterior to testes; dorsal, ventral and lateral to ceca. Uterus extending a short distance posterior to ovary but not as far as anterior testis, chiefly preovarian. Eggs large, thin-shelled, 74 to 90 by 42 to 54 μ.

Discussion: This species differs from *H. pallidum* Stafford, 1904 in body shape, sucker ratio, egg size, and thin-walled excretory vesicle. It differs from *H. pearsei* (Hunter & Bangham, 1932) in more posterior intestinal bifurcation, greater distance between ovary and testes, and slightly different sucker ratio. *H. armatum* (MacCallum, 1895) is not very fully described but apparently its acetabulum is only 1/2 the size of the oral sucker.

32. **Crassicutis marina** n. sp.

Fig. 17

HOSTS: *Eucinostomus lefroyi* (Goode), Florida mojarra, type host; in 4 of 7 hosts examined. *Gerres cinereus* (Walbaum), gray mojarra; in 3 of 15 hosts examined.

LOCATION: Intestine.

Description: Size 1.500 to 2.800 by 0.730 to 1.190 mm. A specimen 1.305 mm long was immature. Body rather thick; tapering only slightly and approximately equally at each end; cuticula unspined, thick, wrinkled and rugose, almost lobed in places. Oral sucker subterminal; 0.195 to 0.340 mm in diameter; acetabulum about 1/3 body length from anterior end; 0.280 to 0.510 mm in diameter; sucker ratio 2:3. Short prepharynx; pharynx 0.102 to 0.187 mm long by 0.088 to 0.146 mm wide; esophagus short; bifurcation usually somewhat nearer to acetabulum than to oral sucker; ceca rather broad, extending to near posterior end of body. Genital pore inconspicuous, median, closely anterior to acetabulum. Testes two; smooth; rounded to somewhat elongate; tandem; close together, posterior to midbody; intercecal. Posttesticular space 0.255 to 0.536 mm. Seminal vesicle small, sac-like, at left posterior border of acetabulum; a narrow ejaculatory duct connects the seminal vesicle with a short inconspicuous genital atrium near the genital pore; cirrus, cirrus sac and prostate gland lacking. Ovary globular, smooth, slightly to the right, pretesticular. Seminal receptacle large, flask-shaped, between ovary and acetabulum. Laurer's canal present, opening dorsally near posterior edge of acetabulum. Uterus pretesticular, to left of and anterior to ovary; metraterm lacking. Vitelline follicles large, close together, filling most of body from posterior half of oral sucker to posterior end of body; dorsal, ventral and lateral to ceca; confluent at pharynx level and posterior to testes. Yolk reservoir between ovary and anterior testis. Eggs large, few, thin-shelled, 84 to 100 by 50 to 63 μ. Excretory pore at posterior end of body; excretory vesicle thin-walled, short, extending anteriorly to posterior testis.

Discussion: The decision to place this species in the genus *Crassicutis* involves the conclusion that this genus is to be separated from *Homalometron* on the basis of absence of body spines, very thick cuticula, and perhaps also, the anteriorly confluent vitellaria. The only other species in *Crassicutis* is *C. cichlasomae* Manter, 1936 from a fresh-water Yucatan fish. *C. marina* differs in body size and shape, location and shape of testes, location of excretory pore, and egg size.

Crassicutis is one of the relatively few trematode genera found in both freshwater and marine fishes. It is of interest to note that the closely related genus *Homalometron (=Anallocreadium)* also occurs in both freshwater and marine hosts.

33. **Opisthoporus epinepheli** n. gen., n. sp.

Figs. 18, 19

HOST: *Epinephelus morio* (Cuv. & Val.), red grouper; in 1 of 33 hosts examined; 2 specimens.

LOCATION: Intestine.

Description (based on two specimens): Small Homalometroninae; little tapering and rounded at each end, posterior end broader; size 0.909 (type) to 1.003 mm by 0.410 (type) to 0.416 mm. Body spined almost to posterior end. Oral sucker subterminal, 0.139 mm in diameter. Acetabulum 1/3 body length from anterior end; 0.102 mm in diameter. Forebody containing pigment granules. Very short prepharynx; pharynx large, 0.087 mm long by 0.102 mm wide; short, muscular esophagus; intestinal bifurcation approximately midway between suckers; ceca rather wide, ending blindly not far from posterior end of body. Testes two, tandem, intercecal, close together, in posterior third of body, wider than long, slightly irregular in contour, anterior testis larger than the posterior. Genital pore median, ventral, immediately *posterior* to acetabulum. Short genital sinus; short weak cirrus; cirrus sac lacking; prostatic vesicle (of thin-walled cells) anterior to genital pore, dorsal to acetabulum; prostatic gland lacking; seminal vesicle tubular, coiled, free in parenchyma, extending halfway from pore to ovary. Ovary globular, slightly to the right, immediately pretesticular, approximately 1/3 body length from posterior end of body. Seminal receptacle of medium size, more or less spherical, near left posterior border of ovary, overlapping anterior testis dorsally. Laurer's canal coiled, opening dorsally to left of midline posterior to seminal receptacle. Vitelline follicles from near intestinal bifurcation to posterior end of body; largely lateral, partly dorsal and ventral to ceca; confluent posterior to testes and to end of ceca; vitelline reservoir ventral to seminal receptacle. Uterus between ovary and acetabulum, extending slightly anterior to genital pore and dorsal to acetabulum, entering the genital atrium, like the cirrus, from the anterior side. Eggs thin-shelled, 54 to 60 by 29 to 35 μ. Excretory vesicle a long tube extending anteriorly to level of pharynx.

Generic Diagnosis of Opisthoporus: Small, spined Homalometroninae; genital pore posterior to acetabulum; excretory vesicle extending anterior to acetabulum; seminal receptacle posterior to ovary; prostatic vesicle present. Type species: *O. epinepheli.*

The name *Opisthoporus* is from *opistho* = posterior and *poros* = pore. The name *epinepheli* is for the host.

Discussion: The membrane around the prostatic vesicle is not interpreted as a cirrus sac, and the tubular seminal vesicle has only its own membrane. The terminal genital ducts are thus very similar to those of the genera *Homalometron* and *Crassicutis*. The unusual, even remarkable, location of the genital pore is not considered to be of more than generic significance. Its secondary nature is indicated by the extension of both male and female ducts anterior to it. The genus differs from *Homalometron* and *Crassicutis* also in its long excretory vesicle and smaller, more posterior seminal receptacle.

This trematode is the one previously noted in an abstract (Manter, 1941)* and included by Cable and Hunninen (1942:308) in the subfamily Homalometroninae.

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* Jour. Parasit., Suppl. **27**:26, 1941.

34. Opisthoporus mycteropercae n. sp.

Figs. 20, 21

HOST: *Mycteroperca venenosa* (Linn.), yellow-fin grouper; in 2 of 10 hosts examined.

LOCATION: Intestine.

Description (based on two specimens): Body elongated, spined, 2.122 to 2.265 mm by 0.517 to 0.697 mm, tapering only slightly toward each end. Pigment flecks in forebody. Oral sucker 0.172 to 0.187 mm in transverse diameter; acetabulum between 1/3 and 1/2 body length from anterior end, 0.142 to 0.160 mm in diameter. Sucker ratio about 1:0.85. Prepharynx about 1/2 length of pharynx; pharynx 0.161 mm long by 0.102 mm wide in the 2.122 mm (type) specimen but 0.167 by 0.145 mm in the other specimen. Esophagus about same length as prepharynx, bifurcation approximately midway between suckers; ceca ending blindly a short distance from the posterior end of body. Genital pore median or submedian just posterior to acetabulum. Testes two, tandem, in posterior third of body; posterior testis subtriangular, larger than anterior testis. Cirrus short, muscular; cirrus sac lacking; prostatic vesicle tubular, relatively long, extending some distance posterior to acetabulum (Fig. 21); seminal vesicle a coiled tube extending almost to the ovary. Ovary subglobular, pretesticular; vitelline reservoir and seminal receptacle postovarian; vitelline follicles from a level halfway between acetabulum and intestinal bifurcation to posterior end of body, meeting medianly anterior to acetabulum and posterior to testes; dorsal, ventral and lateral to ceca. Uterus preovarian; eggs 58 to 61 by 32 to 33 μ. Excretory vesicle ending just posterior to intestinal bifurcation, not reaching to pharynx.

Comparisons. This species differs from *Opisthoporus epinepheli* chiefly in that (1) the vitellaria extend across the body anterior to the acetabulum, (2) the prostatic vesicle is much longer, extending well posterior to the acetbulum, and (3) the excretory vesicle ends posterior to the intestinal bifurcation. Other slight differences are: larger and more elongate body, more posterior acetabulum, longer prepharynx, and more pointed posterior end of the body.

Linton (1910) figures a trematode (his fig. 77) from *Mycteroperca venenosa* at Tortugas. Although Linton with hesitation identified it as *"Lepocreadium levenseni"*, he failed to see the male, terminal organs. It seems probable that Linton's fig. 77 is actually *Opisthoporus mycteropercae*, and that it is different from his fig. 75. Certainly it is not *"Lepocreadium levenseni"*.

35. Lepidapedon levenseni (Linton, 1907) n. comb.

Fig. 22

SYNONYMS: *Distomum levenseni* Linton, 1907, in part (Linton's Fig. 81); *Lepocreadium levenseni* (Linton, 1907) Linton, 1910, in part (not illustrated by Linton); *Aephnidiogenes levenseni* (Linton, 1907) Nicoll, 1915, nec: Linton's fig. 80 (1907), nec: Linton's figs. 75-77 (1910).

HOST: *Epinephelus morio* (Cuv. & Val.), red grouper; in 2 of 32 hosts examined.

LOCATION: Intestine and cecum.

The status of this species in the literature is rather confused. Linton (1907) named it for a trematode he secured from *"Epinephelus maculosus"* and *E. striatus* at Bermuda. His figures clearly show he was dealing with two species. The following description is based on two specimens from *Epinephelus morio* at Tortugas and which agree with Linton's (1907) fig. 81.

Description: Body elongate, spined; 2.660 by 0.510 to 0.578 mm. Oral sucker 0.150 to 0.166 mm in diameter; acetabulum about 1/4 body length from anterior end, 0.108 to 0.148 mm in diameter; sucker ratio 1:0.72 to 0.89. Very short prepharynx; pharynx 0.090 to 0.092 mm long by 0.070 to 0.100 mm. wide; esophagus as long or longer than pharynx; bifurcation about midway between suckers; narrow ceca extending to near posterior end of body. Genital pore slightly to the left at anterior border of acetabulum. Testes smooth or slightly irregular in contour, tandem or slightly oblique, slightly separated, in posterior half of hindbody. Cirrus sac elongate, clavate, extending posterior to acetabulum, containing cirrus, pars prostatica, and internal seminal vesicle; external seminal vesicle and gland cells enclosed in an ovoid sac, not reaching halfway to ovary in mature specimens. Ovary oval in outline, pretesticular, separated from anterior testis by the large, flask-shaped seminal receptacle. Vitellaria from level of posterior end of external seminal vesicle to posterior end of body, confluent posterior to testes. Uterus preovarian. Eggs 66 to 74 by 34 to 40 μ. Excretory vesicle extending anteriorly to intestinal bifurcation.

Discussion: This species clearly belong in the genus *Lepidapedon*. The genus *Aephnidiogenes* Nicoll, 1915 (with *A. barbatus* as type species) in which Nicoll placed it differs in that the uterus extends posterior to the ovary. If Yamaguti's (1934) emended description of *Aephnidiogenes* is correct, that genus is very similar to *Lepocreadium* except for the extent of the uterus, and the subfamily Aephnidiogenetinae Yamaguti, 1934 seems to me unjustified.

Linton (1910) reported this species from Tortugas as *Lepocreadium levenseni* (Linton), and his specimens from *Epinephelus striatus,* although not figured or well described, probably were this species. However, Linton also included specimens of trematodes from *E. morio* and *Mycteroperca venenosa* (his figures 75-77) which represent two species belonging in an entirely different genus. Linton himself was doubtful regarding their status since he could find neither genital pore nor cirrus sac. They seem to agree well with the genus *Opisthoporus*.

36. LEPIDAPEDON ELONGATUM (Lebour, 1908) Nicoll, 1915

HOSTS: *Coelorhynchus carminatus* (Goode), 200 fath.; in 1 of 35 hosts examined. *Epigonus occidentalis* Goode & Bean, 250 fath.; in 1 of 7 hosts examined. *Laemonema barbatulum* Goode & Bean, 140-190 fath.; in 1 of 13 hosts examined. *Urophycis chesteri* (Goode & Bean), 367 fath.; in 1 of 6 hosts examined.

LOCATION: Intestine.

37. LEPIDAPEDON LEBOURI Manter, 1934

HOST: Macrouridae, unidentified; 205-285 fath.; in 1 of 5 hosts examined.

LOCATION: Intestine.

38. LEPIDAPEDON NICOLLI Manter, 1934

HOST: *Epinephelus niveatus* (Cuv. & Val.); 90 fath.; in 1 of 3 hosts examined.
LOCATION: Intestine.

39. LEPIDAPEDON RACHION (Cobbold, 1858) Stafford, 1904

HOST: *Coelorhynchus carminatus* (Goode); 200-315 fath.; in 7 of 35 hosts examined.
LOCATION: Intestine.

40. **Myzoxenus lachnolaimi** n. sp.

Figs. 23-26

HOST: *Lachnolaimus maximus* (Walbaum), hogfish; present in 5 of 7 hosts examined.
LOCATION: Intestine.

Description (based on 10 specimens; measurements on 3 favorable and typical specimens): Body elongate, rather thick and robust; about equally tapered toward each end; forebody with fine spines which may be lost; length 2.320 to 2.440 mm; width 0.640 to 0.800 mm. Oral sucker 0.246 to 0.272 mm in transverse diameter; acetabulum just anterior to midbody, circular, 0.467 to 0.520 mm in diameter; sucker ratio 1:1.8 to 2. Acetabulum with two lateral lips or jaws which can be pulled apart or closed together (Figs. 24-25). These lips are provided with an inner surface of thick cuticula armed with scales, and with three sets of muscles the most conspicuous of which are more or less longitudinal, curved, thick bands (Figs. 24-25). Prepharynx short; large subspherical pharynx 0.190 to 0.240 mm long by 0.187 to 0.204 mm wide; anterior third of pharynx with conspicuous circular muscles; short esophagus; bifurcation a short distance anterior to acetabulum; ceca large, extending to near posterior end of body. Genital pore median or slightly to the right at midpharynx level. Two testes tandem in posterior third of body; smooth; usually but not always wider than long; posttesticular space shorter than forebody. Cirrus sac well developed, cylindrical, 0.240 to 0.290 mm long, not quite reaching acetabulum, slightly wider anteriorly, with very thick walls of longitudinal muscles, containing a short cylindrical cirrus, a spherical prostatic vesicle, and, in its posterior two-thirds, a narrow, straight, internal seminal vesicle; basal portion of this tube provided with circular muscles; few or no prostatic cells within the sac (Fig. 26). External seminal vesicle a long tube which posterior to the acetabulum becomes coiled, reaching almost to the ovary. Numerous gland cells, apparently associated with the seminal vesicle and probably representing the prostatic gland, just posterior to the acetabulum and dorsal to the uterus. Ovary smooth, ovoid, wider than long, to the right just anterior to the testes; seminal receptacle flask-shaped, to left of ovary just anterior to testes; Laurer's canal present; uterus coiled between anterior testis and acetabulum; metraterm long, extending from genital pore to near posterior edge of the acetabulum, surrounded by a conspicuous bulb of circular muscles near the genital pore, opening close to the left of the male pore into a very small slit-like external opening; eggs 49 to 55 by 25 to 30 μ. Vitelline follicles dorsal, ventral, and lateral to ceca from shortly posterior to the acetabulum to posterior end of body, confluent posterior to testes. Excretory vesicle extending to the anterior testis where it connects with a collecting tube on each side; the latter forks at once to form a pair of tubes extending anteriorly.

Discussion: Only one other species, *M. vitellosus* Manter, 1934, has been named in this genus. *M. lachnolaimi* differs from it in a number of respects, particularly: much less extensive vitellaria, more anterior genital pore, larger pharynx, smaller eggs, and shape of cirrus sac. The peculiar, lateral, muscular lips of the acetabulum are characteristic of the genus *Myzoxenus*. The genus *Labrifer* Yamaguti, 1936 has similar lips which are, however, anterior and posterior rather than lateral. The two genera show impressive similarities in structure of the cirrus sac, prostatic cells at base of the acetabulum (although undescribed these cells occur in *M. vitellosus)*, reproductive organs, and excretory system. *Labrifer* is without body spines but these may have been lost as in a number of my specimens of *M. lachnolaimi*. Even if *Labrifer* is actually devoid of body spines, the lepocreadid-like external seminal vesicle and the similarity of the spined genus *Myzoxenus* seem sufficient to recommend its transfer from the Allocreadiidae to the Lepocreadiidae.

The genus *Gnathomyzon* Crowcroft, 1945 from *Pseudolabrus tetricus* from Tasmania clearly appears to be a synonym of *Myzoxenus*. In fact, *G. insolens* possesses only slight differences from *M. lachnolaimi* and it is from a related host. The new combination, *Myzoxenus insolens* (Crowcroft, 1945), is proposed. The genus thus has two species at Tortugas, Florida and one from Tasmania. Three of the four hosts recorded for the three species are Labridae.

41. MYZOXENUS VITELLOSUS Manter, 1934

HOSTS: *Calamus calamus* (Cuv. & Val.), saucer-eye porgy; in 2 of 20 hosts examined. *Decodon puellaris* (Poey), Cuban hogfish; 50-60 fath.; in 1 of 2 hosts examined.

LOCATION: Intestine.

42. BIANIUM PLICITUM (Linton, 1928) Stunkard, 1931

Figs. 27, 28

SYNONYMS: *Distomum* sp. of Linton, 1898 and 1905; *Psilostomum plicitum* Linton, 1928; *Bianium concavum* Stunkard, 1930; *Bianium adplicatum* Manter, 1940.*

HOSTS: *Spheroides spengleri* (Bloch), puffer; in 11 of 22 hosts examined. *Sphoeroides* species (probably *S. dorsalis* Longley), puffer; in 1 of 6 hosts examined. *Monacanthus hispidus* (Linn.),** filefish; in 1 of 71 hosts examined.

LOCATION: Intestine.

Discussion: The genus *Bianium* was named by Stunkard in 1930 for a *Distomum* species of Linton (1898) named *B. concavum* by Stunkard. In 1931, Stunkard found that this trematode is the same as *Psilostomum plicitum* Linton, 1928. *B. plicitum* is common in *Sphoeroides maculatus* at Woods Hole and has been reported there also from *Lagocephalus laevigatus,* and at Beaufort, North Carolina, from *S. maculatus, Siphostoma fuscum,* and *Cynoscion regalis*. If the above synonymy is correct *B. plicitum* also occurs in puffers at Tortugas, Florida and in related hosts in the American Pacific. The parasite is normally a parasite of "puffers" but can occur rarely in a few other fishes or even in birds (Linton, 1928) where it is probably a temporary, acci-

* New synonymy.
** New host record.

dental resident. *Diploporus* Ozaki, 1928 is congeneric with *Bianium* but the name *Diploporus* is preoccupied by *Diploporus* v. Buch, 1845 (an echinoderm). Four species of *Bianium* have been named: *B. hemistomum* (Ozaki, 1928) n. comb., synonym: *Diploporus hemistoma* Ozaki, 1928; *B. cryptostomum* (Ozaki, 1928) n. comb., synonym: *Diploporus cryptosoma* Ozaki, 1928; *B. plicitum* (Linton, 1928) Stunkard, 1930 and *B. adplicatum* Manter, 1940.

A comparative study was made of 19 specimens of *B. adplicatum;* 25 specimens of *Bianium* from Tortugas; 13 specimens of *B. plicitum* from *S. maculatus* from Woods Hole (supplied by Dr. Raymond Cable), and 4 specimens from *S. maculatus* from Beaufort, North Carolina (supplied by Dr. A. S. Pearse). The writer also observed two specimens of *Bianium hemistoma* collected by Yamaguti.

There are interesting variations in the American specimens of *Bianium,* and, for a time, the Tortugas material was thought to be a separate species of smaller size. Specimens from all four of the American localities agree in possessing a pharynx with anterior border bearing 8 lobes (Fig. 28). Eggs are thin-shelled and, in balsam mounts, almost always collapsed, a condition tending to increase variation of measurements and more particularly to reduce the width of eggs. No reliable differences in egg size appear to exist among the American specimens, judging from eggs in the uterus of balsam mounts. Linton (1940) reports egg size of 60 by 40 μ to 70 by 50 μ. Tortugas specimens have eggs 51 to 70 by 24 to 42 μ, usually 61 to 68 by 36 to 42 μ. One uncollapsed, apparently typical egg measured 68 by 42μ. Eggs of Pacific specimens seem to be somewhat smaller (51 to 61 by 29 to 36 μ), but sizes overlap those from Atlantic waters. Thus, neither pharyngeal lobes nor egg size seems to offer reliable specific differences.

Interesting variations also occurred in body size and sucker ratio. Specimens from Woods Hole and from the Pacific are definitely larger than those at Tortugas. Tortugas mature specimens collected from 11 different hosts (of 3 species) during three different summers ranged from 0.825 to 1.250 mm in length. The Pacific specimens were 1.58 to 2.43 mm; Linton reports 1.40 to 3.12 mm for Woods Hole material and Stunkard states the smallest mature specimen to be 1. mm. These differences are sufficient to appear very distinct to the naked eye when a series of Tortugas specimens are compared with specimens from Woods Hole or the Pacific. But the four specimens from *S. maculatus* at Beaufort are of both sizes. They measure: 1.177; 1.290; 1.620; and 2.062 mm in length; that is, two are in the neighborhood of 2 mm while two are near the 1 mm size of the Tortugas specimens. While it is possible that two species could be represented here, the tendency for the two size groups to approach each other and the fact that Woods Hole specimens can mature at 1 mm suggest that no sharp distinction can be made. At the same time, there is no doubt that *Bianium* averages considerably smaller in *S. spengleri* at Tortugas and only occasionally becomes as large as the smaller specimens from puffers in other localities. Perhaps it constitutes a variety correlated with certain host species.

The suckers are subequal or equal in size. However, in specimens from

Woods Hole and from the Pacific the oral sucker is usually slightly larger than the acetabulum, but in the (smaller) Tortugas specimens the acetabulum is usually slightly larger than the oral sucker. Equal or subequal suckers can be found in specimens from all localities. More specifically, the sucker ratio for Woods Hole and Pacific specimens is usually about 1.1:1, sometimes 1:1; for Tortugas specimens it is usually about 1:1.1, sometimes 1:1. The two small-sized Beaufort specimens (in the same collection with specimens with larger oral suckers) also had this 1.1:1 ratio. I am led to believe that there is some slight correlation between body length and sucker ratio and that larger specimens possess relatively larger oral suckers. Such changes in sucker ratio are known among trematodes although it is usually the acetabulum that grows more rapidly. The change in *Bianium* is slight. A 0.517 mm immature Tortugas specimen has suckers almost exactly equal.

The anterior extent of the vitellaria also shows some tendency toward local distinctiveness but with overlapping variations. In the Woods Hole and Beaufort specimens, the vitellaria extend anteriorly either to midacetabular level or, more commonly, to the anterior edge of the acetabulum. In the Tortugas and Pacific specimens, the vitellaria may extend forward to the middle of the acetabulum but usually reach only to its posterior edge. Since the midacetabular level of the vitellaria can occur in any of the localities, the character cannot be urged as specific.

The variations and tendencies exhibited by *Bianium* collections raise perplexing problems of specificity. Although a series of 10 or 12 specimens might be identified as originating from Woods Hole, or from Tortugas, or from the Pacific, all varying characters overlap. The Pacific material is, in some respects, more like that from Beaufort or Woods Hole than it is like the Tortugas type although it resembles the latter in distribution of vitellaria.

Bianium hemistomum from Japan is distinct in its longer prepharynx, posteriorly convergent folds of the skin, longer posttesticular space, and reduced lobing of the pharynx. *B. cryptostomum* is more like *B. plicitum* but the intestinal bifurcation is well anterior to the acetabulum.

It might be noted that the genus *Diplocreadium* Park, 1939 is like *Bianium* except that anal openings are described as absent.

43. **Multitestis chaetodoni** n. sp.
Fig. 29

SYNONYM: *Distomum* sp. of Linton, 1907, p. 115.

HOSTS: *Chaetodon ocellatus* Bloch, butterfly fish, in 4 of 10 hosts examined. *Chaetodon capistratus* Linn., butterfly fish in 1 of 2 hosts examined.

LOCATION: Intestine and ceca.

LOCALITIES: Tortugas, Florida; Bermuda.

Description: Body rather thin, broadly rounded at each end, about equally wide along most of its length, spined anteriorly to a little beyond the acetabulum. Size 0.931 to 1.312 by 0.340 to 0.637 mm. Oral sucker often pulled back slightly into anterior end of body, 0.080 to 0.100 mm in diameter; acetabulum about 1/4 body length from anterior end, 0.080 to 0.130 mm

in diameter; suckers subequal in size. Pigment flecks near dorsal surface in pharyngeal region; forebody glandular. Prepharynx very short; pharynx 0.051 to 0.068 mm long by 0.042 to 0.052 mm wide; esophagus approximately same length as pharynx; bifurcation midway between suckers; ceca extending to near posterior end. Genital pore to the left opposite anterior edge of acetabulum. Testes 11 (Linton described 9), irregularly arranged, intercecal, in posterior half of body. Cirrus sac clavate, extending diagonally to the right and posterior to the acetabulum more than halfway to the ovary, containing a basal seminal vesicle, a bipartite prostatic vesicle, and a well developed cirrus; external seminal vesicle a swollen tube. Ovary about in midbody, 4-lobed; clavate seminal receptacle anterior to ovary; uterus extending posteriorly ventral to the testes into the region of the hindmost testes; short metraterm present. Vitelline follicles extending from a little posterior to acetabulum to posterior end of body; dorsal, ventral and lateral to ceca, confluent posterior to testes. Eggs 53 to 62 by 30 to 36 μ. Excretory vesicle extending anteriorly as far as the ovary.

Discussion: M. chaetodoni differs from *M. inconstans* (Linton) in body shape, posterior extent of the cirrus sac, arrangement of the testes, and distribution of the vitellaria. It differs from *M. blennii* Manter, 1931 in more slender cirrus sac, in sucker ratio, in more anterior intestinal bifurcation and in more posterior distribution of the vitellaria.

Both *M. inconstans and M. blennii* possess the bipartite prostatic vesicle as in *M. chaetodoni.* The genus *Rhagorchis* also possesses the same type of cirrus sac, thus differing from *Multitestis* chiefly in that its uterus does not extend posterior to the ovary.

Linton's unnamed species from Bermuda (Linton, 1907:115) is evidently *M. chaetodoni.*

44. RHAGORCHIS ODHNERI Manter, 1931

SYNONYM: *Gargorchis varians* Linton, 1940.*

HOSTS: *Alutera schoepfii* (Walbaum), filefish; in both of 2 hosts examined. *Monacanthus ciliatus* (Mitchill), filefish; in 1 of 18 hosts examined.

LOCATION: Intestine.

LOCALITIES: Tortugas, Florida; Beaufort, North Carolina; Woods Hole, Massachusetts.

Discussion: A study of co-types of this species indicates that body spines had been present but lost. Specimens collected at Tortugas have spines anteriorly. *Rhagorchis* is therefore very closely related to *Multitestis* Manter 1931. It differs in that the uterus is entirely preovarian. The genus *Gargorchis* Linton, 1940 and its species, *G. varians,* are clearly synonyms of *Rhagorchis* and *R. odhneri,* respectively, and are from the same host. This trematode, with its hosts, ranges north to Beaufort and Woods Hole. The poorly described *Distomum pallens* Rud. of Linton (1898) is probably also this species.

* New synonymy.

An immature specimen from *Monacanthus* shows the testes in two clusters of 5 each, suggesting that these organs start as two and fragment into ten.

45. ENENTERUM AUREUM Linton, 1910

Figs. 30-32

HOSTS: *Kyphosus sectatrix* (Linn.) white chub; type host, present in 7 of 10 hosts examined. *Kyphosus incisor* (Cuv. & Val.), yellow chub;* in 2 of 5 hosts examined.

LOCATION: Intestine.

Linton's description is corrected and extended in the following diagnosis of this species.

Description: Body elongate, tapering at each end, pointed at posterior end; yellowish-orange color in life; size 3.847 to 10.193 by 0.870 to 1.323 mm (a 2.457 mm specimen was immature); with spined cuticula. Oral sucker funnel-shaped (fig. 31); mouth directed anteriorly and surrounded by 6 extensions or lobes of the sucker; 2 dorsal, 2 ventral, and 2 lateral; dorsal and lateral processes notched to give the appearance of a total of 10 lobes. Oral sucker 0.337 to 0.405 mm in transverse diameter (not including lobes), longer than wide. Acetabulum 1/5 to 1/7 body length from anterior end, 0.450 to 0.580 mm in transverse diameter; sucker ratio from 1:1.25 to 1.66. Muscular prepharynx when extended about the same length as pharynx; pharynx 0.225 to 0.300 mm long by 0.195 to 0.255 mm wide; esophagus lacking; ceca wide often with slightly irregular contour, uniting posterior to testes to form a rather long cecum which opens through a short rectum and anus. Anus dorsal, immediately anterior to excretory pore (Fig. 32), or rarely opening with the excretory vesicle. Testes lobed, tandem, posterior to midbody, intercecal, slightly separated by vitellaria. Cirrus sac filling preacetabular, intercecal area and reaching to mid-acetabular level, containing a tubular, convoluted seminal vesicle, very large prostatic gland and short, inconspicuous cirrus. Ovary slightly lobed, pretesticular, near midbody. Large seminal receptacle partly dorsal, partly posterior to ovary; Laurer's canal present. Mehlis' gland large, without membrane; two types of gland cells in ootype region. Uterus preovarian; metraterm a long, muscular, coiled tube just posterior to acetabulum, becoming straight dorsal to acetabulum and joining cirrus near genital pore; genital pore submedian, slightly to the left close to acetabulum. Vitelline follicles from posterior edge of acetabulum to posterior end of body; dorsal, ventral, and lateral to ceca; confluent posterior to testes. Eggs 58 to 67 by 23 to 28 μ (Linton records a width of 35 μ). Excretory pore dorsal or subdorsal, near or with anus. Excretory vesicle I-shaped; ventral to common cecum but dorsal to testes and ovary; 2 pairs lateral tubules extending length of body, more or less sinuous in anterior regions.

Discussion: Hopkins (1934) pointed out that *Enenterum* is not closely related to other papillose Allocreadiidae. It is here considered in the Lepocreadiidae in spite of its lack of eye-pigment even in young specimens. Per-

* New host record.

haps it belongs in the Opecoelidae but it has a spiny cuticula, seminal receptacle, and large prostatic gland.

The presence of a true proctodaeum lined with cuticula is unusual among trematodes. There is no doubt that the anus is functional. The intestinal ceca are lined with large glandular (often vacuolated) cells. Passageway into the rectum is regulated by sphincter-like muscle cells. The ceca contain cellular debris from the content of the intestine of the host, an herbivorous fish. Some of this material is not digested since solid cellular residue was seen in the rectum. In other words, this trematode has a complete, functional alimentary canal and carries on both ingestion and egestion of solids, apparently plant cells eaten by the host.

Comparisons: Enenterum pimelopteri Nagaty, 1942 from *Pimelopterus tahmel* from the Red Sea differs from *E. aureum* chiefly in possessing a rather long esophagus and smooth testes.

Dollfus has recently described three species of trematodes which he included in the genus *Enenterum* (Dollfus, 1946: Ann. Parasit., 21, p. 119-129, pl. I). One of these, *E. pseudaureum,* is probably a synonym of *E. pimelopteri* and differs from *E. aureum* in its smooth testes and by possessing an esophagus. *E. cadenati* Dollfus, 1946 was placed by him in a new subgenus, *Cadenatella,* on the basis of 8 oral lobes, the presence of a preacetabular accessory sucker, and a single testis. *E. (Jeancadenatia) brumpti* Dollfus, 1946 is very remarkable in possessing a median row of 14 or 15 preacetabular accessory suckers. Both of the subgenera of Dollfuss propably deserve generic rank. His material was not well preserved and he could not determine the presence or absence of an anus.

OPECOELIDAE Ozaki, 1925

SYNONYMS: Coitocaecidae Ozaki, 1929; Notoporidae Yamaguti, 1938; Sphincterostomatidae Yamaguti, 1937.*

The family Opecoelidae Ozaki, 1925 is now conceived as including most of the genera classified for many years in the family Allocreadiidae. Cable and Hunninen (1942:306) agree with Hopkins (1941:42-43) in such a restricted limitation of the Allocreadiidae. Species known to possess cotylomicrocercous cercariae apparently fall into the family Opecoelidae while the genera *Allocreadium* Looss, 1900; *Crepidostomum* Braun, 1900; *Meglagonia* Surber, 1928; *Bunodera* Railliet, 1896; and perhaps others remain in the Allocreadiidae.

Proposed Diagnosis: Body smooth; more or less elongate and usually flattened; anus or ani may be present or lacking; excretory vesicle I-shaped; testes postovarian, usually two (nine in *Helocometrina*), tandem or diagonal; cirrus sac present, lacking, or weakly developed; ovary pretesticular; uterus usually entirely preovarian, only rarely extending posterior to the ovary and never posterior to the anterior testis; seminal receptacle present or absent, usually absent; eggs large; vitelline follicles large; genital pore preacetabular,

* New synonymy.

usually to the left (submarginal and dorsal in the Notoporinae). Adults in the intestine and ceca of fishes, usually marine fishes; the cercariae known are of the cotylomicrocercous type, developing in sporocysts in snails. Type genus: *Opecoelus* Ozaki, 1925.

It must be admitted that at present adults of this family are difficult to distinguish from the Allocreadiidae. The more posterior extent of the uterus in *Allocreadium* seems to me to be significant. Allocreadiidae are more common in freshwater fishes, while the Opecoelidae are very common in marine fishes.

Divison of the Opecoelidae into subfamilies is also rather unsatisfactory. The following four subfamilies are recognized as an attempt to group together related genera.

1. OPECOELINAE Stunkard, 1931. Synonym: Coitocoecinae Poche, 1926.

Diagnosis: Opecoelidae with weakly developed cirrus sac, or without cirrus sac; genital pore ventral; acetabulum usually protrusible and often papillate; accessory sucker present or absent; ceca sometimes ending blindly but usually either uniting or opening through 1 or 2 ani or through a uroproct; seminal receptacle usually absent, sometimes present. Type genus: *Opecoelus* Ozaki, 1925.

Other genera: *Anisoporus* Ozaki, 1928; *Coitocaecum* Nicoll, 1915; *Dactylostomum* Woolcock, 1935; *Fimbriatus* Von Wicklen, 1946; *Genitocotyle* Park, 1937; *Nicolla* Wisniewski, 1934; *Opecoelina* Manter, 1934 (synonym: *Dideutosaccus* Acena, 1941*); *Opecoeloides* Odhner, 1928; *Opegaster* Ozaki, 1928; *Ozakia* Wisniewski, 1934; *Parvacreadium* Manter, 1940; *Pseudopecoelus* Von Wicklen, 1946; *Pseudopecoeloides* Yamaguti, 1940; *Sphincterostoma* Yamaguti, 1937.

The subfamily Coitocoecinae Poche, 1926 does not seem to me to be separable from the Opecoelinae because of the variety and combination of characters shown by such genera as *Dactylostomum, Opecoelina,* and *Coitocaecum.* There are few rules of nomenclature pertaining to subfamily names. I am using Opecoelinae rather than the earlier name Coitocoecinae because *Opecoelus* was the original type of the family.

This subfamily is represented by numerous species in the Pacific and is not uncommon in the American Atlantic. Considering its size, remarkably few species (apparently only fresh-water species of *Coitocaecum, C. macrostomum, C. ovatum, C. testiobliqum,* and *C. proavitum)* are reported from European waters.

Wisniewski (1934) divided the genus *Coitocaecum* into three genera based on the location of the genital pore and the character of the cirrus sac. *Nicolla* has a genital pore median and posterior to the intestinal bifurcation; and a short, ovoid cirrus sac. *Coitocaecum* has a sinistral genital pore anterior to the intestinal bifurcation and a rather long cirrus sac overlapping the acetabulum and containing an ejaculatory duct and a large seminal vesicle.

* New synonymy.

Ozakia has a genital pore located as in *Coitocaecum* but the cirrus sac is short (not crossing the intestinal cecum) containing the cirrus and a small internal seminal vesicle, while most of the seminal vesicle is external. The genus *Nicolla* is easily distinguished but *Coitocaeum* and *Ozakia* can be difficult to recognize because of the weak development of the cirrus sac; in fact, Nicoll (1915) described the type species as lacking a cirrus sac. Wisniewski states the cirrus sac may be non-muscular.

Most of the species named in the genus *Coitocaecum* fall into the genus *Ozakia*. The following new combinations, in addition to those made by Wisniewski are proposed: *Ozakia anaspidis* (Hickman, 1934); *O. glandulosa* (Yamaguti, 1934); *O. tropica* (Manter, 1940); *O. acanthogobia* (Park, 1939); *O. koreana* (Park, 1939); *O. leptoscari* (Yamaguti, 1940); *O. parva* (Crowcroft, 1945); *O. xesuri* (Yamaguti, 1940).

2. **Plagioporinae** n. subfam. This subfamily is proposed for Opecoelidae with well developed cirrus sac; with ceca ending blindly; and with ventral genital pore. Type genus: *Plagioporus* Stafford, 1904. Other genera: *Caudotestis* Yamaguti, 1934; *Hamacreadium* Linton, 1910; *Helicometra* Odhner, 1902; *Helicometrina* Linton, 1910; *Pseudoplagioporus* Yamaguti, 1938; and *Stenopera* Manter, 1933. Probably *Decemtestis* Yamaguti, 1934; *Podocotyle* Odhner, 1905; and *Pedunculacetabulum* Yamaguti, 1934 belong in this subfamily.

These genera have long been viewed as typical allocreadiids, and, in fact, their adult structure would hardly separate them from the Allocreadiidae. When more life cycles are known, the importance to be attached to the type of cercaria can be better judged. Actually, at present the evidence for accepting Opecoelidae as distinct from Allocreadiidae is far from conclusive. It depends to considerable extent on the relative importance attached to larval stages. Dawes (1946) retains the Allocreadiidae, at least for most of the genera.

3. The subfamily HORATREMATINAE Srivastava, 1942 was named for the genus *Horatrema* Srivastava, 1942. *Horatrema* seems to be related to *Notoporus*. The Horatrematinae have no or very weak cirrus sac; the ceca end blindly; the testes are oblique to symmetrical; the genital pore is ventral to left of the pharynx; minute spines occur embedded in the cuticula; there is no seminal receptacle. The presence of spines might warrant transfer of the genus *Horatrema* to the Lepocreadiidae but a seminal receptacle is lacking.

4. The subfamily NOTOPORINAE Srivastava, 1942, with submarginal, dorsal genital pore, contains *Notoporus* Yamaguti, 1938 and *Neonotoporus* Srivastava, 1942.

Opecoelinae

46. **Opegaster synodi** n. sp.

Fig. 33

HOST: *Synodus foetens* (Linn.), lizardfish; in 1 of 7 hosts examined; 2 specimens, 1 immature.

LOCATION: Intestine.

Description: The mature specimen was 1.051 mm long by 0.307 mm wide; widest at acetabular level; more or less pointed at each end. Oral sucker

0.100 mm in diameter; acetabulum 0.175 mm; sucker ratio 1:1.75. The immature specimen had a sucker ratio of 1:2.2. Acetabulum with 3 small papillae on each lip. Forebody 0.27 mm long. Prepharynx short; pharynx 0.051 mm long by 0.061 mm wide; esophagus slightly longer than pharynx; intestinal bifurcation about midway between suckers; ceca uniting near posterior end; anus ventral a short distance anterior to posterior end of body. The anus was more conspicuous on the immature specimen. Genital pore more than halfway toward the left edge of the body at level of posterior third of esophagus or barely anterior to the intestinal bifurcation. Testes tandem, close together, of slightly irregular shape with indistinct outline, just posterior to middle of hindbody. Posttesticular distance 0.255 mm. Seminal vesicle tubular, indistinct, apparently extending to very slightly beyond the acetabulum. Ovary small, subglobular, immediately pretesticular; Mehlis' gland conspicuous, bilobed, immediately preovarian. The bilobed glandular mass of Mehlis' gland is difficult to distinguish from the ovary. Vitelline reservoir overlapping ovary at one side. Eggs 50 to 54 by 30 to 32 μ. Excretory pore terminal.

Comparisons: Although only one mature specimen was available it is given a specific name for purpose of future reference. *O. synodi* surprisingly, is most similar to *O. beliyai* Pande, 1937 from *Gobius giuris* in India. Agreement includes such details as size and shape of the body; sucker ratio; rather long esophagus; location of genital pore; number of papillae on the acetabulum. The chief difference is egg size (70 by 37 to 40 μ in *O. beliyai* as compared with 50 to 54 by 30 to 32 μ). The ovary has a slightly different shape and the vitelline follicles extend slightly anterior to the genital pore in *O. beliyai.*

The occurrence of a species of *Opegaster* in the Atlantic is of some interest because all of the other 16 species of *Opegaster* and all of the 12 species of the closely related genus *Opecoelus* are reported only from the Pacific, chiefly in the region of Japan and India.

Genus OPECOELOIDES

The genus *Opecoeloides* was named by Odhner (1928) for *Distomum furcatum* Bremser in Rudolphi, 1819. Odhner compared it with *Opecoelus* Ozaki, 1925 from which it differs (1) in possessing an accessory sucker between the acetabulum and genital pore; (2) in lack of cirrus sac; and (3) in that the ceca enter the excretory vesicle rather than opening to the outside. Acetabular papillae or processes occur as in *Opecoelus.* The presence of an accessory sucker occurs also in the genus *Anisoporus* Ozaki, 1928 and in the genus *Genitocotyle* Park, 1937. *Genitocotyle* lacks acetabular papillae and the ceca end blindly. *Pseudopecoeloides* Yamaguti, 1940 has a protuberant acetabulum and a uroproct but lacks both the accessory sucker and acetabular papillae. *Anisoporus* differs from *Opecoeloides* only in that the ceca open through a single anus rather than into the excretory vesicle. Manter (1940) has questioned the validity of basing a genus on this single character which is sometimes difficult to determine.

Much of the confusion in this group of trematodes has arisen from a misinterpretation of the accessory sucker which has several times been reported as

a genital sucker surrounding a male genital pore. The true nature of the sucker was described as early as 1900 by Lühe. Von Wicklen (1946), after a study of the type specimen of *Distomum vitellosum* Linton, 1900, revised the group. She recognized the following genera: *Opecoeloides* Odhner, 1928, with *O. furcatus* (Bremser, 1819) as type species; *Pseudopecoeloides* Yamaguti, 1940, with *P. tenuis* Yamaguti, 1940 as type species; *Opecoelus* Ozaki, 1925, with *O. sphaericus* Ozaki, 1925 as type species; *Pseudopecoelus* Von Wicklen, 1946 with *P. vulgaris* (Manter, 1934) as type species; *Anisoporus* Ozaki, 1928 with *A. cobraeformis* Ozaki, 1928 as type species; and *Fimbriatus* Von Wicklen, 1946, with *F. fimbriatus* (Linton, 1934) as type species.

Opegaster Ozaki, 1928 is very closely related to *Opecoelus* except that the seminal vesicle does not extend posterior to the acetabulum, and the vitellaria reach anterior to the acetabulum. *Genitocotyle* Park, 1937 is apparently like *Pseudopecoelus* except that an accessory sucker is present.

The number and form of acetabular papillae are probably good specific characters in this group. Linton assumed them to be highly variable and did not attempt to differentiate species upon them. Odhner (1928) showed they may be extended or retracted in *Opecoeloides furcatus* but always discernible at least in sections. Several species which I have studied suggest that these papillae can be recognized without great difficulty even when contracted and that their number within a species is either constant or varying only by one or two.

The following species of *Opecoeloides* are known: *O. furcatus* (Bremser, 1819); *O. vitellosus* (Linton, 1900) Von Wicklen, 1946; *O. eucinostomi* (Manter, 1940) Von Wicklen, 1946; *O. polynemi* Von Wicklen, 1946. *Anisoporus thyrinopsi* Manter, 1940 may belong in the genus *Opecoeloides* since only one specimen was studied and the anus evidently was not conspicuous.

47. **Opecoeloides brachyteleus** n. sp.

Fig. 34

HOST: *Mulloidichthys martinicus* (Cuv. & Val.), yellow goatfish; in 3 of 10 hosts.
LOCATION: Intestine.

Description (based on 5 specimens): Length 0.975 to 2.250 mm, width 0.165 to 0.360 mm, greatest width in posterior half of body. Posterior end abruptly pointed. In the 1.035 mm type specimen: oral sucker 0.093 mm wide, slightly longer than wide; acetabulum 0.136 mm wide, wider than long; sucker ratio 1:1.46. Other specimens did not show ventral view of both suckers. Acetabulum on a distinct body stalk; papillate with 4 anterior and 3 posterior papillae. Forebody 0.225 to 0.487 mm, about 1/4 or a little less of body length. Accessory sucker close in front of acetabular stalk, with distinct border, 51 to 71 μ in diameter. Prepharynx short; pharynx large, longer than wide, 0.102 to 0.153 mm long by 0.071 to 0.133 mm wide; esophagus about same length as pharynx; ceca rather wide; uroproct present. Genital pore closely in front of accessory sucker. Testes very large, close together, wider than long, slightly overlapping ceca, in posterior third or fourth of body; posttesticular space unusually short, 0.102 to 0.255 mm in length or approximately

half the length of the forebody. Genital atrium with a few circular muscles; cirrus a short muscular tube; cirrus sac lacking; seminal vesicle a coiled tube reaching halfway or more to the ovary. Ovary unlobed, immediately pretesticular, slightly to the left; uterus preovarian; metraterm not observed; eggs 43 to 53 by 26 to 29 μ; vitellaria from about the base of the seminal vesicle to posterior end of body; dense and continuous; dorsal, lateral, and ventral to ceca; overlapping testes. Gland cells resembling vitellaria but without yolk granules, extending to acetabulum.

Discussion: This species differs from *O. vitellosus* in number of papillae, longer pharynx, smaller eggs, more conspicuous accessory sucker, and more posterior genital pore. It differs from *O. eucinostomi* in its continuous vitellaria and in the posterior extent of the seminal vesicle. *O. furcatus* has lobed testes and a much larger accessory sucker. If *Anisoporus thyrinopsi* should be found to possess a uroproct rather than an anus it would belong in the genus *Opecoeloides* and be very similar to *O. brachyteleus,* differing in more narrow hindbody, more anterior genital pore, more anterior extent of the vitellaria, 3 rather than 4 anterior papillae on the acetabulum, and longer posttesticular space.

The name *brachyteleus* is from *brachy* = short and *tele* = end, and refers to the short posttesticular region.

48. **Opecoeloides elongatus** n. sp.

Figs. 35, 36

HOST: *Pseudupeneus maculatus* (Bloch), red goatfish; in 2 of 20 hosts examined.

LOCATION: Intestine.

Description (based on 4 specimens; 2 dead and extended, 2 killed under coverglass): Length 1.260 to 2.925 mm, greatly elongate and more or less cylindrical, extended specimens about as thick as wide; width 0.165 to 0.217 mm. An extended specimen 1.260 mm long was immature; a flattened specimen of the same length contained a few eggs. Suckers, based on two flattened specimens of 1.260 and 1.500 mm: oral sucker 0.046 to 0.068 mm in diameter; acetabulum 0.078 to 0.082 mm in diameter; sucker ratio 1:1.2 to 1.7. Acetabulum with 4 anterior and 3 posterior papillae; acetabular stalk short. Forebody from 1/7 to 1/15 body length. Accessory sucker small, inconspicuous, without border, slightly to left closely anterior to acetabular stalk, slightly posterior and to left of genital pore. Prepharynx short; pharynx almost spherical, 34 to 54 μ long by 34 to 48 μ wide; esophagus longer than pharynx; intestinal bifurcation opposite acetabulum; ceca narrow; termination of ceca not observed. Genital pore slightly to the left, approximately at level of middle of esophagus. Testes elongate, unlobed, slightly separated; posttesticular space very long, twice or more the length of the forebody. Cirrus very short; cirrus sac lacking; seminal vesicle extending more than halfway between acetabulum and ovary. Ovary unlobed, separated from the anterior testis by a few vitellaria; uterus long, preovarian, with very short coils, intercecal; metraterm not observed. The distance from the acetabulum to ovary may be almost half body length. Eggs 51 to 59 by 31 to 34 μ. Vitellaria from a short distance posterior to acetabulum to posterior end of body; inter-

rupted opposite at least one of the testes, usually both; a few follicles between ovary and anterior testis; gland cells, resembling vitellaria but without yolk granules, extending to acetabular level. The excretory pore is not terminal but ventral a short distance anterior to the posterior end. It seemed to be dorsal in one specimen.

Discussion: Although this species has the same number of acetabular papillae as *O. brachyteleus* from the yellow goatfish, it is very different in a number of features: the body is much more elongate, the pharynx smaller, the accessory sucker less distinct, the posttesticular space much greater, the testes more elongate, and the vitellaria are not continuous opposite the testes. In most of these respects it differs also from the other species in the genus. *O. furcatus* is also elongate but has lobed testes and ovary and a very large accessory sucker.

The name *elongatus* is for the elongate shape of the body.

49. **Pseudopecoeloides gracilis** n. sp.

Figs. 37, 38

HOST: *Trachurops crumenophthalma* (Bloch), goggle-eye jack; in 4 of 5 hosts examined.

LOCATION: Intestine.

Description: Body elongate, rather slender, smooth, more or less pointed posteriorly, widest at acetabular level. Size (of 10 specimens measured) 1.296 to 1.989 by 0.202 to 0.352 mm. Length from 5.3 to 6.7 times the width. Forebody short, usually contracted, 0.187 to 0.240 mm or about 1/9 body length. Posttesticular space relatively long, 0.382 to 0.690 mm, from 28 to 36% of body length, usually 34 or 35% of body length. Oral sucker 0.097 to 0.122 mm in diameter; acetabulum 0.210 to 0.260 mm in diameter; sucker ratio 1:2 to 1:2.2. Acetabulum usually retracted into body, someimes protuberant; without definite papillae, sometimes with irregularly puckered edge. Pharynx length 0.060 to 0.080 mm; width 0.049 to 0.076 mm; esophagus about same length as pharynx; bifurcation near anterior edge of acetabulum; ceca enter excretory vesicle near excretory pore. Genital pore slightly to the left, opposite base of oral sucker or anterior edge of pharynx. Testes smooth, subglobular to elongate, intercecal, tandem, not contiguous but separated by at least a few vitelline follicles. In all but 1 of 27 specimens the follicles extended across the body between the testes; in the one specimen the follicles almost met. Genital atrium (Fig. 38) small, globular, thick-walled. Cirrus (Fig. 38) thick-walled, cylindrical; cirrus sac lacking; seminal vesicle sinuous, extending only a short distance posterior to acetabulum (not over 1/3 distance to the ovary). Ovary subglobular, smooth, near midbody, immediately anterior to anterior testis. Vitellaria from posterior edge of acetabulum to posterior end of body, extending between testes, usually interrupted opposite posterior testis, filling posttesticular space. Eggs 53 to 70 by 29 to 39 μ. Such a range is due largely to unusually small eggs, 53 by 29 μ in one specimen. 28 eggs measured from 9 other specimens showed no egg less than 58 μ long and most eggs were 61 to 66 μ in length. Excretory vesicle a long tube extending forward to the ovary.

Comparisons: P. gracilis differs markedly from the other two species in the genus, *P. tenuis* Yamaguti, 1940 and *P. carangis* (Yamaguti, 1938), in that the acetabulum is twice as large as the oral sucker. It is most like *P. carangis* differing in sucker ratio and in having more vitellaria between the testes. *P. gracilis* is very similar to the *"C. vitellosus"* of Linton, 1940, p. 82 and fig. 18, from the goggler, *T. crumenophthalmus* at Woods Hole, Massachusetts, except that acetabular papillae occured in Linton's material. Various species studied by the author indicate that these acetabular papillae are more constant than Linton believed but observations on living specimens are desirable.

50. **Pseudocoeloides equesi** n. sp.

Fig. 39

HOSTS: *Eques lanceolatus* (Linn.), ribbonfish, type host; in 1 of 7 hosts examined. *Eques acuminatus* (Bloch & Schneider), ribbonfish; in 3 of 9 hosts examined.

LOCATION: Intestine.

Description (based on 6 specimens): Body elongate, smooth except for a few irregularly scattered small papillae along the anterior half; about equally wide along most of its length, tapering to a rounded point at each end. Length 1.282 to 1.935 mm, width 0.225 to 0.375 mm. Oral sucker slightly wider than long, 0.126 to 0.160 mm in transverse diameter; acetabulum rather small, protrusible on a body stalk or retractile into body; 0.102 to 0.153 mm in transverse diameter, smaller than oral sucker; sucker ratio from 1:0.84 to 0.90. Anterior lip of acetabulum with 3 papillae, posterior lip with 2 papillae. Forebody from 1/4 to 1/6 body length. Pharynx large, 0.094 to 0.119 mm long by 0.088 to 0.127 mm wide, width only slightly less than length; esophagus somewhat longer than pharynx; intestinal bifurcation dorsal to acetabular stalk; ceca entering excretory vesicle near posterior end to form a uroproct.

Genital pore slightly to left of midline, opposite middle of pharynx. Testes large, smooth, tandem, contiguous, just posterior to midbody; posterior testis larger. There is a short muscular cirrus; cirrus sac lacking; seminal vesicle a coiled tube extending halfway between acetabulum and ovary. Ovary spheroid, anterior to and contiguous with anterior testis; seminal receptacle lacking; uterus preovarian; eggs 51 to 60 by 29 to 34 μ (62 by 38 μ in a living specimen); metraterm slightly longer than combined cirrus and prostatic vesicle. Vitellaria from about the base of seminal vesicle to posterior end of body, closely crowded; lateral, ventral, and dorsal to the ceca; filling posttesticular space. Excretory pore terminal.

Discussion: This species does not agree with the generic diagnosis of *Pseudopecoeloides* in that it possesses acetabular papillae. It is like *Opecoeloides* except an accessory sucker is lacking. The species is much like *P. carangis* (Yamaguti, 1938) except for the acetabular papillae. The papillae are definite in number in all 6 specimens of *P. equesi* collected. If the presence of these papillae should be considered a generic character, this species would belong to a new genus related to *Opecoeloides* and *Pseudopecoeloides*.

51. PSEUDOPECOELOIDES CARANGIS (Yamaguti, 1938) Yamaguti, 1940

SYNONYM: *Cymbephallus carangi* Yamaguti, 1938.
HOSTS: *Caranx bartholomaei* Cuv. & Val., yellow jack; in 1 of 3 hosts examined; 3 specimens. *Caranx ruber* (Bloch), runner; in 1 of 6 hosts examined; 1 specimen.
LOCATION: Intestine.

Discussion: These trematodes agree with Yamaguti's except that they are somewhat smaller and the eggs measured 46 to 48 by 27 μ rather than 57 to 63 by 30 to 42 μ. This difference is ordinarily enough to indicate different species but since other details are practically identical and since Yamaguti's measurements were made on living eggs, the above identification seems justified. The trematodes differ from *P. gracilis* in the subequal size of the suckers and more approximate testes. The specimens agree perfectly, including egg size, with the trematode reported as *Cymbephallus carangi* Yamaguti by the author from the coast of Ecuador and represent an additional species common to the two oceans.

52. **Pseudopecoelus priacanthi** (MacCallum, 1921) n. comb.
Fig. 40

SYNONYM: *Allocreadium priacanthi MacCallum*, 1921 (Fig. 39).
HOSTS: *Priacanthus arenatus* Cuv. & Val., glass-eye snapper or big-eye; one specimen in 1 of 3 hosts. *P. cruentatus* (Lacépède),* big-eye; one specimen in 1 of 3 hosts.
LOCATION: Intestine.

Discussion: MacCallum (1921) described this species as *"Allocreadium priacanthi"* from *Priacanthus arenatus* from Key West, Florida. It cannot belong in the genus *Allocreadium* because of its lack of a cirrus sac. The projecting acetabulum is a conspicuous feature. The deep, cup-shaped acetabulum bears no papillae but it is lobed by a lateral notch on each side covered by a continuous surface membrane (Fig. 40). This character was not clearly indicated by MacCallum who did imply the membraneous border in describing the acetabulum as "a beautiful filmy structure." The genital pore in both of my specimens is to the left opposite midpharynx, slightly anterior to the point described by MacCallum. The genital atrium is muscular and continues into a bulbous cirrus about the same length as the narrower prostatic vesicle surrounded by a few prostatic cells (Fig. 40). The sinuous seminal vesicle extends barely past the anterior limit of the vitellaria which end at the base of the acetabular stalk. The terminal male organs are similar to those of *P. vulgaris* (Manter, 1934) von Wicklen, 1946 and other species in the genus. The ceca end blindly.

This species is unique in the shape of the acetabulum. It differs from *P. tortugae* von Wicklen, 1946 in that the gonads are separated; the genital pore is more anterior and the eggs (about 53 by 17 μ) are smaller.

53. PSEUDOPECOELUS TORTUGAE von Wicklen, 1946

SYNONYM: *Cymbephallus fimbriatus* Linton of Manter, 1934.
HOST: *Coelorhynchus carminatus* (Goode); 200 fath.; in 1 of 5 hosts examined.
LOCATION: Intestine.

* New host record.

54. PSEUDOPECOELUS VULGARIS (Manter, 1934) von Wicklen, 1946

HOSTS: 16 species of fishes collected from depths of 50-315 fathoms. (Manter, 1934: 293).

LOCATION: Intestine.

55. Neopecoelus scorpaenae n. gen., n. sp.

Figs. 41, 42

HOSTS: *Scorpaena grandicornis* Cuv. & Val., scorpion fish; type host; 4 specimens in 2 of 4 hosts examined. *Scorpaena brasiliensis* Cuv. & Val., scorpion fish; 2 specimens in 2 of 19 hosts examined.

LOCATION: Intestine.

Description: Body smooth, 1.655 to 2.511 by 0.390 to 0.645 mm, almost uniform in width from acetabulum to posterior end, posterior end broadly rounded. Forebody 0.262 to 0.382 mm, or about 1/6 to 1/9 body length, tapering to oral sucker. Oral sucker round, 0.097 to 0.146 mm in diameter; acetabulum embedded in a fold of the ventral body-wall, without papillae, wider than long, 0.262 to 0.337 mm in transverse diameter. Sucker ratio 1:2.1 to 3, usually about 1:2.7. Short prepharynx present; pharynx 0.102 to 0.160 mm long by 0.077 to 0.122 mm wide, usually longer than wide, in one case same length as width; about the same size as the oral sucker or somewhat larger. Esophagus varying from about the same length as prepharynx to almost as long as the pharynx; bifurcation at anterior border of acetabulum; ceca narrow, each opening dorsally on one side of the excretory pore a short distance anterior to posterior end of body.

Genital pore slightly to the left at about midpharyngeal level. Testes two, subglobular, smooth, large, tandem, intercecal, slightly separated, just posterior to midbody. Cirrus a subspherical muscular structure, followed by an ovoid prostatic vesicle (Fig. 42). Cirrus sac absent. Prostatic cells free in parenchyma near prostatic vesicle and cirrus. Seminal vesicle tubular, free in parenchyma, becoming coiled or strongly sinuous posterior to acetabulum, extending dorsal to uterus almost halfway to ovary. Ovary smooth, ovoid, immediately anterior to anterior testis; seminal receptacle lacking; yolk reservoir to left of ovary; uterus preovarian, entering cirrus close to genital pore (Fig. 42). Metraterm somewhat longer than prostatic vesicle. Vitelline glands of large follicles extending in sides of body from posterior edge of acetabulum to posterior end of body, usually but not always interrupted opposite testes, not confluent between gonads, largely filling the body posterior to testes. Eggs 50 to 53 by 30 to 32 μ. Excretory pore subterminal, dorsal; extent of excretory vesicle not determined.

Generic Diagnosis of Neopecoelus: Opecoelidae with elongated, smooth body; acetabulum retractile into the body, without papillae; narrow ceca open through two ani which lie dorsally near posterior end. Testes subspherical, smooth, tandem; genital pore slightly to left of midline in pharyngeal region; cirrus subspherical; prostatic vesicle present; cirrus sac absent; seminal vesicle tubular; seminal receptacle absent; vitelline follicles extending posteriorly from acetabulum. Parasitic in the intestine of marine fishes. Type species: *N. scorpaenae.*

Comparisons: Neopecoelus is like *Pseudopecoelus* Von Wicklen, 1946 except that it possesses two ani. These ani are inconspicuous in preserved specimens but were clearly observed in living specimens. A cirrus sac or membrane is lacking in *Neopecoelus* and present but very weakly developed in *Pseudopecoelus*. *Fimbriatus* Von Wicklen, 1946 has two ani but differs in possessing an accessory sucker and papillae on the acetabulum.

56. Neopecoelus holocentri n. sp.

Figs. 43, 44

HOST: *Holocentrus coruscus* (Poey), squirrelfish; 4 specimens in 1 of 10 hosts examined.

LOCATION: Intestine.

Description: Body smooth; 1.020 to 1.890 mm long by 0.487 to 0.615 mm wide; about equally wide along most of body length; ends more or less rounded. Oral sucker wider than long, with transverse aperture; 0.116 to 0.165 mm in transverse diameter. Acetabulum about 1/4 body length from anterior end, slightly wider than long, 0.232 to 0.307 mm in transverse diameter, not invaginated into body. Sucker ratio about 1:2. Prepharynx absent or very short; pharynx very large, wider than long, 0.094 to 0.136 mm long by 0.110 to 0.161 mm wide. Esophagus muscular, somewhat shorter than pharynx; intestinal bifurcation at anterior border of acetabulum; ceca rather wide, each opening through an anus. Ani fairly conspicuous, a short distance anterior to posterior end of body, slightly anterior to excretory pore. Genital pore at midpharynx level, slightly to left of midline. Testes two, slightly lobed, tandem or diagonal, slightly posterior to midbody. Posttesticular distance 1/4 to 1/5 body length. The cirrus (or possibly the genital atrium) is muscular and spherical; leading into it is an elongate, thin-walled prostatic vesicle followed by a tubular seminal vesicle which extends dorsally across the acetabulum, coils in the region posterior and to the right of the acetabulum, then extends backward almost to the ovary. Ovary usually pretesticular, trilobed although sometimes compressed by the testes; seminal receptacle lacking; uterus preovarian; metraterm thick-walled, slightly longer than prostatic vesicle. Vitellaria from posterior edge of acetabulum or, in contracted specimen, from middle of acetabulum to or near posterior end of body; they may occur posterior to ani and excretory pore. Eggs 46 to 51 by 26 to 31 μ. Excretory pore dorsal, slightly anterior to posterior end of body; excretory vesicle a short wide sac.

Discussion: This species differs from the type species, *C. scorpaenae,* in its less elongated body; relatively larger oral sucker and wider pharynx; longer esophagus; wider ceca; and lobed testes and ovary. The metraterm seems to be much better developed.

One of the four specimens collected showed diagonal rather than tandem testes, with the ovary almost opposite the anterior testis. In another specimen the ovary was distinctly between the two diagonal testes. Such a position is usually a generic character but since all other details agreed exactly with the other three specimens collected at the same time and since another speci-

men was almost intermediate, this position of the ovary is considered an abnormality.

57. Genitocotyle atlantica n. sp.

Figs. 45, 46

HOSTS: *Carapus bermudensis* (Jones); in 1 of 2 hosts examined. *Haemulon flavolineaatum* (Desmarest), french grunt; type host; in 1 of 11 hosts examined. *Malacoctenus macropus* (Poey), blenny; in 2 of 10 hosts examined. *Opisthognathus* sp., jawfish; in 4 of 5 hosts examined. *Syngnathus robertsi* (Jordan & Rutter), pipefish; in 1 of 12 hosts examined.

LOCATION: Intestine.

Description: Body elongate, tapering equally toward each end, about equally wide along most of its length; 0.892 to 1.530 mm long by 0.280 to 0.345 mm wide. A specimen 0.660 mm long was immature. Cuticula smooth. Oral sucker usually slightly longer than wide, 0.064 to 0.120 mm in transverse diameter; acetabulum wider than long, 0.096 to 0.200 mm in transverse diameter; sucker ratio about 1:1.5 (range 1.45 to 1.8). Well developed transverse muscles of the body wall at anterior and at posterior border of acetabulum. Forebody about 1/4 body length. Accessory sucker inconspicuous, just to left of intestinal bifurcation, with ovoid opening and radiating muscles, without outer membrane. Very short prepharynx, pharynx 48 to 54 μ long by 43 to 48 μ wide; esophagus more than twice length of pharynx; intestinal bifurcation a short distance anterior to acetabulum; ceca ending blindly near posterior end of body. Genital pore slightly to left of midline opposite anterior end of esophagus. Testes two, tandem, close together just posterior to midbody, wider than long, outline slightly irregular to lobed. Posttesticular distance approximately the same as or slightly more than forebody length. Genital atrium muscular and surrounded by gland cells. Cirrus in the form of a short muscular ejaculatory duct; cirrus sac lacking; seminal vesicle a sinuous tube extending posterior to acetabulum about half-way to ovary. Ovary usually distinctly bilobed, sometimes indistinctly trilobed, directly pretesticular; shell gland large, anterior to ovary; seminal receptacle present; Laurer's canal opening dorsal to ovary; uterus preovarian; eggs yellow, 52 to 58 by 26 to 30 μ; vitelline follicles chiefly lateral to ceca from level of intestinal bifurcation to posterior end, forming two inter-cecal fields posterior to testes. The excretory vesicle extends to the ovary.

Discussion: The genus *Genitocotyle* Park, 1937 is related to the genera *Opecoeloides* Odhner, 1928 and *Anisoporus* Ozaki, 1928. All three genera agree in possessing a small accessory sucker anterior to the acetabulum. *Anisoporus* has acetabular papillae and an anus; *Opecoeloides* has acetabular papillae and a uroproct; *Genitocotyle* lacks acetabular papillae and the intestinal ceca end blindly.

Only one other species of *Genitocotyle* has been described, *G. acirrata** Park, 1937 from *Holconotus rhodoterus* on the California coast. *G. atlantica*

* Park's spelling, *acirrus*, should be changed to agree with the feminine *Genitocotyle.*

differs from *G. acirrata* chiefly in being about half as large, in its more pointed posterior end, in distribution of vitellaria anterior to acetabulum, and in more anterior genital pore more distant from the accessory sucker.

58. OPECOELINA HELICOLENI Manter, 1934

HOST: *Helicolenus maderensis* Goode & Bean; 197 fath.; in 1 of 21 hosts examined.
LOCATION: Intestine.

59. OPECOELINA SCORPAENAE Manter, 1934

HOST: *Scorpaena cristulata* Goode & Bean; 250 fath.; in both of 2 hosts examined.

Plagioporinae

60. PLAGIOPORUS CRASSIGULUS (Linton, 1910) Price, 1934

Fig. 50

SYNONYM: *Lebouria crassigula* Linton, 1910.

HOSTS: *Calamus bajonado* (Bloch & Schneider),* grass porgy; in 5 of 15 hosts examined. *Calamus calamus* (Cuv. & Val.), saucer-eye porgy; type host, recorded by Linton; not found in 14 hosts examined. *Decodon puellaris* (Poey),* Cuban hogfish; in 1 of 2 hosts examined. *Diplodus holbrookii* (Bean),* spot-tail pinfish; in 1 of 16 hosts examined.

LOCATION: Intestine.

Discussion: This species is left in the genus *Plagioporus* with much uncertainty. Its thick, stout, robust body with strong suckers and large pharynx; and the body muscles radiating from the sides of the acetabulum give it an appearance quite unlike the typical, flat-bodied *Plagioporus* species. Also, the uterus extends posterior to the ovary as far back as the posterior edge of the anterior testis. These characters make it seem probable that both *P. crassigulus* and the related species *P. gastrocotylus* Manter, 1940, have affinities with *Pycnadena* Linton, 1910 and *Pycnadenoides* Yamaguti, 1938, genera considered below to belong in the family Fellodistomatidae.

P. crassigulus is unlike the fellodistomids in its extensive vitellaria, the tandem or slightly diagonal testes, the shape of the seminal vesicle, and the excretory vesicle. The excretory vesicle was not seen by Linton and in total mounts is hidden by vitellaria. It is a broad flat tube extending dorsal to the testes as far forward as the ovary. Here, as in *P. gastrocotylus,* it flattens or spreads somewhat laterally but could hardly be called Y-shaped. Thus, the excretory vesicle is not the characteristic Y- or V-shape of the Fellodistomatidae. A somewhat intermediate condition will be shown to occur in *Pycnadena* and *Pycnadenoides.*

Genus HAMACREADIUM Linton, 1910, and Related Genera

The genus *Hamacreadium* was named by Linton in 1910 with *H. mutabile* as type species. The following additional species have been named: *H. gutella* Linton, 1910; *H. consuetum* Linton, 1910; *H. oscitans* Linton, 1910; *H. lethrini* Yamaguti, 1938; *H. epinepheli* Yamaguti, 1938; *H. mehsena* Nagaty,

* New host record.

1941; *H. interruptus* Nagaty, 1941. Nagaty (1941) considers *H. epinepheli* a synonym of *H. mutabile*.

Hamacreadium seems to differ from *Podocotyle* chiefly in that the testes are diagonal rather than tandem. This character would not ordinarily be generic but it seems to separate conveniently rather numerous species. *Podocotyle atherinae* Nicoll, 1914, named with some uncertainty, has diagonal testes but Palombi (1938a:376) considered it as an abnormal specimen of *P. atomon*. *P. breviformis* Manter, 1940 from *Anisotremus* sp. in the Galapagos Islands has diagonal testes. Restudy of cotype material shows that this species can not only be transferred to *Hamacreadium* on the basis of the diagonal testes but that thereupon it agrees very well with *Hamacreadium oscitans* from related hosts at Tortugas. Thus, at least for the present, diagonal testes seem to distinguish *Hamacreadium* from *Podocotyle*. *Podocotyle* species are further distinguished by a rather elongate body, the vitellaria do not extend anterior to the acetabulum, and the ovary is trilobed. *Hamacreadium oscitans* agrees with *Podocotyle* except its testes are diagonal and its body not elongate. It could be considered in either genus depending on the relative importance given to the vitellaria or to the diagonal testes. The excretory vesicle is short in some species of *Podocotyle* but in others it extends to the ovary; in *Hamacreadium* it is longer although in *H. oscitans* it ends near the acetabulum approximately at the level of the ovary.

Podocotyle shawi McIntosh, 1939 differs from all other species in anterior extent of the vitellaria, in the very long cirrus sac reaching to the ovary, and in its spined cirrus. These characters seem sufficient to exclude it from *Podocotyle*. Its long cirrus sac suggests the genus *Peracreadium* Nicoll, 1909, but *Peracreadium* has an unlobed ovary and median genital pore. A species very similar to *P. shawi* was named *Cainocreadium skrjabini* by Layman in 1930. It possesses the tandem testes, lobed ovary, long slender cirrus sac, spined cirrus, and a genital pore displaced to the right. Layman reports the anterior part of the body with small spines. This trematode does not seem to belong in *Cainocreadium* which is unspined, with unspined cirrus, median genital pore, and shorter cirrus sac. *Podocotyle fractum* (Rud., 1819) Stoss., 1898 from *Box salpa* (as illustrated by Timon-David, 1937) has anterior vitellaria but it differs greatly from *Podocotyle* in its elongate oral sucker and very long prepharynx and probably belongs in another genus as indicated by Odhner in 1905. It may possibly be related to the genus *Petalocotyle* Ozaki, 1934 which Ozaki (1937a) places in the family Gyliauchenidae.

The similarity of *Hamacreadium* to *Plagioporus* Stafford, 1904 (= *Lebouria* Nicoll, 1909) is even more confusing. The diagnoses of *Plagioporus* by Mueller (1934) and by Dobrovolny (1939) would include *Hamacreadium mutabile* but not the *Hamacreadium* species with a median genital pore. A genus can hardly be established on the basis of marine or freshwater hosts and a number of *Plagioporus* species have been named from marine fishes. Miller's (1940) redescription of *Plagioporus serotinus* Staff., 1904, the type species, shows this species to have the genital pore well to the left, vitellaria well anterior to acetabulum, tandem testes, unlobed ovary, and small sac-like

excretory vesicle. According to this species, the genus would seem to differ from *Podocotyle* in its anterior vitellaria and unlobed ovary; and from *Hamacreadium* in its tandem testes, unlobed ovary, shorter cirrus and genital pore well to the left. However, numerous species have now been named in *Plagioporus* and some of these such as *P. cooperi* Hunter & Bangham, 1932, *P. varia* (Nicoll, 1910), *P. japonicus* Yamaguti, 1938, and *P. branchiostegi* Yamaguti, 1938 have diagonal testes and a few, such as *P. choerodonis* (Yamaguti, 1931), *P. lobata* (Yamaguti, 1934) and *P. fusiformis* Price, 1934 have a lobed ovary. It might be noted that several species should be removed from *Plagioporus*. Linton's (1940) *"Lebouria truncata"* evidently lacks both a cirrus sac and a seminal receptacle. It has many features of *Horatrema,* and evidently should not be *Plagioporus.* Miller (1940) pointed out that *Plagioporus obducta* (Nicoll, 1909) Price, 1934 based on a *Distomum* species of Linton, 1904 could not be a species of *Plagioporus* because of its median genital pore. It also seems to lack a seminal receptacle and the presence of a cirrus sac is doubtful. *Plagioporus serratus,* Miller, 1940 has a spiny cuticula which strongly suggests some other family. It seems to belong in or near the genus *Astacotrema* Warren, 1903, a genus commonly classified in the Allocreadiidae but which may belong in the Lepocreadiidae. *Plagioporus crassigulus* (Linton, 1910) Price, 1934 and *Plagioporus gastrocotylus* Manter, 1940 are thick-bodied, muscular distomes probably related to the genus *Pycnadena.* All species of *Plagioporus* have vitellaria anterior to the acetabulum except *P. lepomis* Dobrovolny, 1939 and *P. virens* Sinitsin, 1931 which are much like *Podocotyle* except for the unlobed ovary.

As a rule *Hamacreadium* has a longer excretory vesicle than does *Plagioporus* but there is considerable variation among the described species and in some cases this character is not noted. At present, the genus *Hamacreadium* seems best distinguished by its diagonal testes together with a lobed ovary. In species of *Plagioporus* with a lobed ovary, the testes are tandem. Possibly other criteria might be more valid in separation of genera but they would entail considerable rearranging of specific names.

Superficially at least *Plagioporus* bears strong resemblance to the genus *Pycnadena* Linton, 1911 (= *Didymorchis* Linton, 1910), a genus classified in the Fellodistomatidae by Stunkard and Nigrelli (1930). Price's (1934) question of *Pycnadena's* place in the Fellodistomatidae and Yamaguti's (1938) placing of *Pycnadena* and *Pycnadenoides* Yamaguti, 1938 in the family Allocreadiidae illustrate difficulties involved by the similarities of the two families. In fact, judging from arrangement of reproductive organs, *Pycnadena* might well be considered a synonym of *Plagioporus.* However, after a study of several specimens of *Pycnadena lata,* I believe the genus should be considered in the family Fellodistomatidae. One of its chief fellodistomid characters is its broad, thick, robust body very different from the characteristically flattened allocreadiids or opecoelids. The excretory vesicle, not described by Linton, is short and almost Y-shaped (Fig. 76). Its large pharynx and very wide ceca also suggest fellodistomids. It is atypical of fellodistomids in its very extensive vitellaria; in that the uterus does not extend posterior to the testes; and in that the testes may be somewhat diagonal rather than symmetrical. The seminal vesicle is not clearly bipartite although prostatic glands

are well developed. A seminal receptacle, lacking in most fellodistomids, is known in some, for example in *Discogaster* Yamaguti, 1934 and *Parantorchis* Yamaguti, 1934. *Pycnadenoides* should also be considered in the family Fellodistomatidae.

61. HAMACREADIUM CONSUETUM Linton, 1910

HOST: *Haemulon plumieri* (Lacépède), common grunt; in 5 of 34 hosts examined; only 1 specimen in a host.

LOCATION: Intestine.

Discussion: Linton reported this species from the above host and also from *Haemulon sciurus* (Shaw), the yellow grunt. It is distinguished from *H. gulella* by its more pointed posterior end, much smaller and relatively wider eggs, and the fact that the vitellaria do not extend very much median to the intestinal ceca. The genital pore is median; the testes unlobed; the excretory vesicle extends to the posterior edge of the acetabulum.

62. HAMACREADIUM GULELLA Linton, 1910

HOSTS: *Lutianus griseus* (Linn.), gray snapper; in 2 of 24 hosts examined. *Lutianus analis* (Cuv. & Val.),* muttonfish, in 1 of 8 hosts examined.

LOCATION: Intestine.

Discussion: Compared with *H. mutabile* this species is somewhat smaller, but size varies with age; the esophagus is shorter but varies with contraction; the genital pore is median; the cirrus sac is less at a diagonal angle; and the excretory vesicle reaches only to the level of the ovary. McCoy (1930) found differences in the cercariae of the two species. He reported adults from *L. griseus, L. apodus,* and *Ocyurus chrysurus*. Since *H. mutabile* may also sometimes have a median pore, identification may require knowledge of the extent of the excretory vesicle, a character usually evident only in sections. A few specimens sectioned suggest that in *H. mutabile* the cirrus sac curves around to become median whereas in *H. gulella* it extends straight to a median pore. Thus, the position of the genital pore together with the shape of the cirrus sac is probably diagnostic.

63. HAMACREADIUM MUTABILE Linton, 1910

Linton reported adults of this species from *Lutianus griseus* (Linn.), gray snapper; *Lutianus apodus* (Walbaum), schoolmaster; and *Anisotremus virginicus* (Linn.), porkfish. McCoy (1929, 1930) discovered the life cycle and found the adult developed in *L. griseus* and in *Ocyurus chrysurus* (Bloch), yellowtail but not in several fishes other than Lutianidae which were exposed. My collections are from *L. griseus,* in 13 of 23 hosts examined; *L. apodus,* in 4 of 19 hosts examined; and in addition from *Lutianus jocu* (Bloch & Schneider)*, a dog snapper; in 1 host examined; *L. analis* (Cuv. & Val.)*, muttonfish; in 3 of 8 hosts examined; and *L. synagris* (Linn.)*, Lane snapper; in 1 host examined. The species has been reported from related hosts in the Pacific (Manter, 1940) and in the Red Sea (Nagaty, 1941). Nagaty considers *H. epinepheli* Yamaguti, 1934 a synonym.

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* New host record.

The name *mutabile* is even more appropriate than Linton realized. The genital pore apparently can vary in position from its usual location to the left of middle to be median or to the right. In some specimens it is only slightly sinistral. Nagaty found that in 34 specimens the pore was to the left in 21, median in 9, and to the right in 4. The testes are usually somewhat lobed or irregular in outline but may be smooth. The ovary shows from 3 to 11 lobes. In my specimens the vitellaria are more or less confluent anterior to the acetabulum but Nagaty found such may not always be the case.

64. HAMACREADIUM OSCITANS Linton, 1910

Synonym: Podocotyle breviformis Manter, 1940.*

This species was reported by Linton from *Haemulon plumieri* (Lacépède), common grunt; *H. sciurus* (Shaw), yellow grunt; and *Anisotremus virginicus* (Linn.), porkfish. I have collected it from these same hosts and in addition from *Haemulon carbonarium* Poey, Caesar or black grunt; in 1 of 2 hosts examined; and from *Brachygenys chrysargyreus* (Günther)**, bronze grunt; in 1 of 7 hosts examined.

This species is not common and only a few specimens were collected. It is easily recognized by its short plump body and vitellaria ending at the acetabulum. Linton did not observe the excretory vesicle which extends to the posterior border of the acetabulum. *H. oscitans* is a short-bodied species and the ovary comes to lie opposite the anterior testis and the uterus extends backward to the posterior edge of the anterior testis. The eggs are rather wide for their length. Two specimens in my collection have an unlobed ovary, and the number of lobes may vary from two to four.

65. HELICOMETRA EXECTA Linton, 1910

HOSTS: *Doratonotus megalepis* Günther; in 1 of 7 hosts examined. *Eques acuminatus* (Bloch & Schneider), ribbon fish; in 2 of 7 hosts examined. *Haemulon plumieri* (Lacépède), common grunt; in 9 of 32 hosts examined. *Haemulon sciurus* (Shaw), yellow grunt; in 2 of 24 hosts examined. *Halichoeres bivittatus* (Bloch), slippery dick; in 15 of 36 hosts examined. *Halichoeres poeyi* Steindachner; in 1 of 1 host examined. *Halichoeres radiatus* (Linn.); in both of 2 hosts examined. *Labrisomus bucciferus* Poey; in 1 of 4 hosts examined. *Labrisomus haitensis* Beebe & TeeVan; in 1 host examined. *Lachnolaimus maximus* (Walbaum), hogfish; reported by Linton. *Mycteroperca venenosa* (Linn.), yellow-fin grouper; in 1 of 10 hosts examined. *Thalassoma bifasciatum* (Bloch); in 4 of 15 hosts examined.

66. HELICOMETRA FASCIATA (Rud., 1819) Odhner, 1902

HOSTS: *Prionotus alatus* Goode & Bean; 60 fath.; in 3 of 4 hosts examnied. *Prionodes* sp.; 55 fath.; in 1 host examined. *Bellator militaris* (Goode & Bean); 50 fath.; in 3 of 9 hosts examined.

67. HELICOMETRA TORTA Linton, 1910

HOSTS: *Epinephelus morio* (Cuv. & Val.), red grouper; in 20 of 32 hosts examined. *Epinephelus striatus* (Bloch), Nassau grouper; in 4 of 6 hosts examined.

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* New synonymy, see p. 297.

** New host record.

68. STENOPERA EQUILATA Manter, 1933

HOST: *Holocentrus ascensionis* (Osbeck), squirrelfish; in both of 2 hosts examined.

69. HELICOMETRINA NIMIA Linton, 1910

HOSTS: *Apogon pseudomaculatus* Longley; cardinal fish; in 1 of 5 hosts examined. *Apogon maculatus* (Poey), cardinal fish; in both of two hosts examined. *Balistes vetula* Linn., queen triggerfish; in 2 of 7 hosts examined. *Calamus calamus* (Cuv. & Val.), saucer-eye porgy; in 0 of 20 hosts examined; reported by Linton. *Opisthognathus maxillosus* Poey, jawfish; in 1 of 2 hosts examined. *Pomacentrus leucostictus* Müller & Troschel; in 0 of 13 hosts examined; reported by Linton. *Lutianus apodus* (Walbaum), schoolmaster; in 1 of 19 hosts examined. *Lutianus griseus* (Linn.), gray snapper; in 8 of 24 hosts examined. *Lutianus synagris* (Linn.), Lane snapper; in 2 of 8 hosts examined. *Ocyurus chrysurus* (Bloch), yellowtail; in 1 of 47 hosts examined. *Scorpaena agassizii* Goode & Bean, scorpion fish; in 1 of 6 hosts examined. *Scorpaena brasiliensis* Cuv. & Val., scorpion fish; in 2 of 24 hosts examined. *Scorpaena plumieri* Bloch, scorpion fish; in all of 3 hosts examined. *Syacium papillosum* (Linn.), flounder; in 1 of 21 hosts examined.

70. HELICOMETRINA PARVA Manter, 1933

HOST: *Halichoeres bivittatus* (Bloch), slippery dick; in 1 of 36 hosts examined.

71. PODOCOTYLE PEARSEI Manter, 1934

HOST: *Urophycis chesteri* (Goode & Bean), 250-367 fath.; in 2 of 6 hosts examined.

72. EURYCREADIUM VITELLOSUM Manter, 1934

HOST: *Laemonema barbatulum* Goode & Bean, 249 fath.; in 1 of 19 hosts examined.

Discussion: This genus is considered in the Plagioporinae tentatively. Its symmetrical testes are not characteristic for the family Opecoelidae.

Horatrematinae

73. **Horatrema crassum** n. sp.

Figs. 47, 48

HOSTS: *Odontoscion dentex* (Cuv. & Val.), corvina, type host; in 1 of 2 hosts examined. *Eques acuminatus* (Bloch & Schneider), cubbyu; in 2 of 9 hosts examined. *Eques lanceolatus* (Linn.), ribbonfish; in 1 of 7 hosts examined. *Haemulon carbonarium* Poey, black grunt; in 1 of 2 hosts examined. This host may be an unnatural one as the trematode was found in the stomach.

LOCATION: Intestine.

Description: Body plump, very thin with crenulated borders posteriorly; broadly rounded at posterior end; forebody slightly tapered. Cuticula of middle third of body with minute, deeply embedded spines. Size 0.825 to 1.350 by 0.420 to 0.760 mm. Forebody 0.295 to 0.480 mm. Oral sucker 0.086 to 0.150 mm in diameter; acetabulum 0.225 to 0.375 mm in diameter; sucker ratio 1:2.5 to 3.1. Prepharynx present but very short; pharynx 0.051 to 0.076 mm long by 0.044 to 0.075 mm wide, sometimes slightly wider than long; esophagus about as long as pharynx; bifurcation approximately midway between suckers; ceca narrow, extending to near posterior end of body.

Genital pore slightly to the left, opposite middle or anterior half of pharynx. Two testes, large, smooth, extending in diagonal direction, usually oblique, sometimes symmetrical, located in the middle or in the posterior half of hind-

body. Cirrus thick-walled, cylindrical, short (Fig. 48); prostatic vesicle thick-walled, cylindrical, slightly longer than cirrus; cirrus sac lacking; seminal vesicle tubular, sinuous, not reaching beyond middle of acetabulum. Ovary ovoid, smooth, to the right, immediately anterior to the right testis; shell gland median to left of ovary; seminal receptacle absent; uterus extending forward to the left of acetabulum or dorsal to its left half; metraterm present forming an ovoid muscular bulb near the genital pore (Fig. 48). Vitellaria from mid-esophagus level to posterior end of body, confluent dorsally in the forebody; the follicles may or may not meet posterior to the testes. Eggs 49 to 58 by 27 to 34 μ. Excretory vesicle extends between the testes forward to level of ovary.

Discussion: The genus *Horatrema* was named by Srivastava in 1942 for an allocreadoid trematode from a marine fish, *Pristipoma operculare,* in the Arabian Sea. Srivastava created for it the subfamily Horatrematinae. *H. pristopomatis,* the type species, is described as lacking a cirrus and with a thin-walled cirrus sac around a small pars prostatica. The figure, however, suggests the possible interpretation that a short, thick-walled cirrus is present and a cirrus sac lacking. Srivastava compared *Horatrema* with *Cymbephallus, Parvacreadium,* and *Notoporus,* all of which have no or a very small, thin-walled cirrus sac, and lack a seminal receptacle. He separated *Horatrema* from *Cymbephallus* on the basis of (1) spiny cuticula; (2) location of genital pore; (3) "configuration of the vitellaria"; and (4) the diagonal rather than tandem testes.

H. crassum differs from *H. pristipomatis* in its thick-walled prostatic vesicle, smaller eggs, more anterior seminal vesicle, and more posterior testes.

The family Notoporidae Yamaguti, 1938 was evidently based chiefly on the dorsal location of the genital pore. Its genera, *Notoporus* Yamaguti, 1938 and *Neonotoporus* Srivastava, 1942 are apparently related to *Horatrema* and to *Pseudopecoelus.* Srivastava reduced Notoporidae to a subfamily, Notoporinae, related to Horatrematinae. Knowledge of the cercariae of *Horatrema* would be very helpful in determining family connections of the genus. It is included in the Opecoelidae on the basis of its lack of a seminal receptacle and of a cirrus sac. The cuticular spines suggest affinities to the Lepocreadiidae some genera of which (such as *Homalometron* and *Crassicutis)* lack a cirrus sac. However, the absence of a seminal receptacle seems to be more significant than the presence of inconspicuous spines.

Notoporinae

74. Neonotoporus yamagutii n. sp.

Fig. 49

HOST: *Trachurops crumenophthalma* (Bloch), goggle-eye; in 2 of 5 hosts examined.
LOCATION: Intestine.

Description (based on 2 specimens): Body smooth, elongate, widening very gradually to near posterior end then tapering abruptly almost to a point; 1.147 to 1.175 mm long; 0.285 to 0.337 mm in greatest width. Oral sucker large, widening anteriorly, wider than long, 0.142 to 0.180 mm in transverse

diameter. Acetabulum located about at midbody, subcircular, 0.112 to 0.134 mm in diameter; sucker ratio about 1:0.75 (range 0.74 to 0.78), or 4:3 Pharynx twice longer than wide; 0.063 to 0.085 by 0.034 to 0.042 mm; esophagus longer than pharynx; intestinal bifurcation about halfway between pharynx and acetabulum; ceca ending blindly near posterior end of body. Genital pore dorsal, near left edge of body at level of anterior end of acetabulum. Testes two, lobed, diagonal, close together, overlapping, halfway between acetabulum and posterior end of body. Male sac thin-walled, large, curving around the right side of the acetabulum which it partly overlaps, extending from genital pore to ovary, crossing left cecum ventrally, almost equally wide along its length; containing a large elongate prostatic vesicle surrounded by a few gland cells, an ejaculatory duct or pars prostatica (?) coiled adjacent to the prostatic vesicle, leading to the seminal vesicle which is coiled in the basal third of the sac. Since no cirrus is present, the name prostatic sac is suggested for this sac. Ovary lobed (in type specimen) or unlobed (in co-type), to right of midline, a short distance anterior to right testis; uterus chiefly between ovary and left testis, anterior to right testis; eggs few, large, 76 to 78 by 34 μ; seminal receptacle lacking; vitelline follicles from level of intestinal bifurcation to near posterior end of body, filling most of body except for regions of reproductive organs and a space near the genital pore; yolk reservoir between base of prostatic sac and ovary. Excretory vesicle passing between testes to about the level of the ovary.

Discussion: In 1938, Yamaguti named a new family, Notoporidae, for two species of trematodes, *Notoporus leignathi* and *N. trachuri.* They had some characters of the Allocreadiidae but were peculiar in possessing a dorsal genital pore, in lacking a cirrus, the prostatic vesicle opening directly into the genital pore. Thus, even an ejaculatory duct was lacking. The type species, *N. leiognathi,* had no trace of a "cirrus sac", but *N. trachuri* possessed a membraneous sac surrounding the prostatic vesicle, the pars prostatica, and the seminal vesicle. Yamaguti called this sac a cirrus sac but since a cirrus is entirely lacking the term is not appropriate .

Srivastava (1942) considered the Notoporidae only a subfamily, Notoporinae, in the family Allocreadiidae, and transferred *N. trachuri* to a new genus, *Neonotoporus,* on the basis of its prostatic sac ("cirrus sac"). I agree with these changes proposed by Srivastava, although the family should probably be Opecoelidae.

My species clearly belongs in the genus *Neonotoporus.* It differs from the only other species, *N. trachuri,* in being considerably smaller, in its relatively large pharynx and shorter esophagus, in more posterior acetabulum, in shape of body which is widest near the posterior end rather than at acetabular level, in lobed testes, and in less anterior extent of the vitellaria.

It might be noted that the Japanese host of this peculiar genus of trematodes is closely related to the host at Tortugas.

ACANTHOCOLPIDAE

Genus STEPHANOSTOMUM Looss, 1899

This genus was named by Looss in 1899 with *S. cesticillum* (Molin,

1858) as type species. In 1900, Looss renamed the genus *Stephanochasmus* because of a genus *Stephanostoma* Danielssen & Koren, 1880. Present rules of nomenclature do not invalidate a generic name becouse of slight difference in spelling and most authors in recent years have retained the original *Stephanostomum.*

In 1934, MacFarlane reported that the ceca of *Stephanostomum casum* open into the excretory vesicle, and in the same year Yamaguti named the genus *Echinostephanus* on the basis of this character. Ward (1938) considered *Echinostephanus* a synonym of *Stephanochasmus* (=*Stephanostomum).* A uroproct, often difficult to detect, is now known for a number of species otherwise clearly in the genus *Stephanostomum* and Ward's view of the synonymy of *Echinostephanus* is accepted here. Linton (1910) named the genus *Lechradena* for a species which apparently (Pratt, 1916) was *S. casum* with lost oral spines. However, the genus *Tormopsolus* Poche, 1926 is generally accepted as a *Stephanostomum*-like genus without the oral spines. It, also, was shown to have a uroproct by Yamaguti (1934), who did not in this case name a new genus for the species, *T. orientalis,* with this character.

The genus *Stephanostomum* is a large one.

75. STEPHANOSTOMUM CASUM (Linton, 1910) MacFarlane, 1936

Figs. 51-53

SYNONYMS: *Stephanochasmus casus* Linton, 1910; *Lechradena edentula* Linton, 1910.

HOSTS: *Ocyurus chrysurus* (Bloch), yellowtail; in 3 of 47 hosts examined. *Lutianus analis* (Cuv. & Val.), muttonfish; in 6 of 8 hosts examined. *Lutianus griseus* (Linn.), gray snapper; in 1 of 28 hosts examined.

Discussion: This well known species has been described in detail by Pratt (1916). Linton (1910) recorded it from the above three hosts and also from *Epinephelus striatus* (Bloch), the Nassau grouper. MacFarlane (1934) found that the ceca open into the excretory vesicle. He recorded the species from the rock cod *(Sebastodes sp.)* from Nanaimo, British Columbia. It was reported by Manter (1931) from *Micropogon undulatus* at Beaufort North Carolina, but this identification is probably incorrect. A restudy of the specimens involved indicates that the Beaufort species is *Stephanostomum tenue* (Linton, 1898) Linton, 1940 recorded from that same host at Beaufort. The number of oral spines seems to be 44 or 45 rather than the 36 characteristic of *S. casum.* Yamaguti (1934) reported *S. casum* from *Pagrosomus auratus* from the Inland Sea but describes 46 oral spines of which the aboral row was the larger. In view of the constancy of 36 oral spines in specimens at Tortugas it seems very doubtful if Yamaguti's identification was correct. It seems to me there is also some doubt regarding MacFarlane's identification of *S. casum* from the Pacific. He does not describe the number of oral spines but his figure shows an oral sucker almost as large as the acetabulum and the cirrus sac extending less than halfway between the acetabulum and the ovary. In every one of 14 specimens in my collection the acetabulum was at least 1½ times the oral sucker in diameter and the cirrus sac extended more than halfway from acetabulum to ovary. Thus, it is not certain that this species occurs other than in the Tortugas region.

The following specific diagnosis is based on the descriptions of Linton and Pratt together with a study of 14 specimens.

Body elongate, tapering anterior to acetabulum; size 2.170 to 7. mm by 0.500 to 1.200 mm. Oral sucker 0.110 to 0.280 mm, acetabulum 0.250 to 0.580 mm in diameter; sucker ratio 1:1.5 to 2. Oral spines 36, in two uninterrupted rows of 18 each. Oral row slightly larger but tips not reaching tips of aboral row. Prepharynx long; esophagus short; ceca wide; uroproct present. Testes near posterior end, fairly close together, sometimes practically touching each other; posterior testis oval and larger; anterior testis subglobular. Cirrus sac extending far posterior to acetabulum reaching from 1/2 to almost all the distance to the ovary. Vitellaria beginning at posterior edge of acetabulum extending without interruption in the lateral fields; follicles tend to insert themselves between the testes partly separating the two but never completely confluent between them. Seminal receptacle lacking. Eggs thin-shelled, light yellow, 61 to 78 by 34 to 49 μ. Type host: *Lutianus griseus;* most favorable host: *Lutianus analis.*

Some peculiar abnormal oral spines were observed on a few specimens (Figs. 51-53). The occurrence of a cluster of small spines in place of a missing large spine, and the irregular shape of some abnormally sized spines indicate that these spines may be regenerated to some extent. The specimens were adult but there was no indication as to when the abnormal spines might have been produced.

76. STEPHANOSTOMUM LINEATUM Manter, 1934

HOSTS: *Laemonema barbatulum* Goode & Bean; 140 to 197 fath.; in 1 of 19 hosts examined. *Phycis cirratus* Goode & Bean; 60 to 125 fath.; in 5 of 8 hosts examined. *Urophycis regius* (Walbaum); 60 to 200 fath.; in 4 of 8 hosts examined.

77. STEPHANOSTOMUM MICROSTEPHANUM Manter, 1934

HOST: *Epinephelus niveatus* (Cuv. & Val.); 90 fath.; in 1 of 3 hosts examined.

78. STEPHANOSTOMUM MEGACEPHALUM Manter, 1940

HOST: *Caranx latus* Agassiz, jack; in 1 of 6 hosts examined. Also reported from the Pacific coast of Mexico, Panama, and Ecuador.

79. **Stephanostomum promicropsi** n. sp.

Figs. 54, 55

HOST: *Promicrops itaiara* (Lichtenstein), jewfish; present in each of 4 hosts examined.

LOCATION: Posterior half of intestine.

Description: Body elongate, tapering anterior to acetabulum, almost equally wide along most of length, posterior end broadly rounded; length 4.250 to 7.080 mm, greatest width 0.720 to 0.977 mm. Oral sucker 0.172 to 0.285 mm in transverse diameter; oral spines larger; only one of 7 specimens had as few as 50 oral spines, one had 58, all others had 52. Acetabulum from 1/5 to 1/8 body length from anterior end; 0.390 to 0.540 mm in diameter; sucker ratio almost exactly 1:2. Prepharynx longer than pharynx but varying

with contraction of the forebody; pharynx pyriform, 0.337 by 0.270 mm in a 6.3 mm specimen; esophagus short; intestinal bifurcation shortly anterior to acetabulum; ceca often swollen as if inflated, each connected with the excretory vesicle to form a uroproct.

Genital pore median, close in front of acetabulum. Testes ovoid, elongate, smooth or slightly irregular in outline, tandem but separated by vitellaria; posterior testis close to posterior end of body and usually much more elongate than anterior testis. Cirrus sac containing a more or less coiled cirrus and a sac-like seminal vesicle, extending posterior to acetabulum usually not quite half way to the ovary; in one specimen it reached about 1/3 to the ovary and in none did it reach more than half way. Ovary globular, pretesticular, near but slightly posterior to midbody, separated from anterior testis by vitellaria; follicles dense, close together, extending almost to (or, in a few specimens all the way to) the posterior border of the acetabulum; extending to posterior end of body but interrupted ventrally on each side opposite at least one and usually both of the testes; dorsally they are continuous, covering the ceca, surrounding the gonads, confluent between the testes and between the testes and the ovary. Uterus preovarian; eggs thin-shelled, almost colorless, more blunt on one end; usually 51 to 56 by 25 to 31 μ; one measurement was as high as 58 by 49 μ; metraterm slightly shorter than the cirrus sac.

Comparisons: The most unique feature of this species is the distribution of the vitelline follicles which are continuous dorsally and cover practically the entire body posterior to the acetabulum but which are interrupted ventrally opposite the testes. *S. promicropsi* differs from species having vitellaria interrupted opposite the gonads as follows: from *S. lineatum:* anterior extent of vitellaria and posttesticular distance; from *S. pristis:* anterior extent of vitellaria; posttesticular distance, and number of oral spines; from *S. rhombispinosum:* anterior extent of vitellaria, and number of oral spines.

80. **Stephanostomum sentum** (Linton, 1910) n. comb.

Figs. 56, 57

SYNONYM: *Stephanochasmus sentus* Linton, 1910.

HOSTS: *Calamus bajonado* (Bloch & Schneider),* grass porgy; in 3 of 15 hosts examined. *Calamus calamus* (Cuv. & Val.), saucer-eye porgy; in 3 of 20 hosts examined. *Haemulon sciurus* (Shaw), yellow grunt; in 1 of 24 hosts examined. *Haemulon plumieri* (Lacépède), common grunt; in 1 of 34 hosts examined.

Discussion: This species was collected by Linton from the latter three hosts above. As in *S. casum,* there are 36 oral spines but the vitellaria reach only to the base of the cirrus sac. The gonads are all close together; the cirrus sac does not reach halfway from the acetabulum to the ovary. A uroproct is present. *S. sentum* seems to be very similar to *Stephanostomum imparispine* (Linton, 1905) Manter, 1940. Linton reported 34 spines for *S. imparispine;* his figure shows the cirrus sac reaching about 1/2 way to the ovary; and the length (9. mm) is much greater than that of *S. sentum.*

MacCallum (1917) described *"Stephanochasmus robustus"* from *Leptoce-*

* New host record.

phalus conger. He gave no data on oral spines. So far as can be determined from his description his species agrees with *S. sentum* except in size (7. mm) and may be a synonym. The host, however is quite different, and the status of the species cannot be determined without study of MacCallum's specimens.

Four specimens of a *Stephanostomum* sp. collected from *Calamus calamus* probably are not *S. sentum*. The eggs were spherical and the acetabulum was smaller.

81. **Stephanostomum coryphaenae** n. sp.

Figs. 58-60

HOST: *Coryphaena hippurus* Linn., dolphin; in all of 4 specimens examined.

LOCATION: Intestine.

Description: Body elongate, 2.028 to 3.780 mm long, 0.450 to 0.590 mm in width which is about equal along most of the body length; both ends slightly tapered. Oral sucker 0.102 to 0.152 mm in diameter; oral spines, 36, in two uninterrupted rows, spines in both rows approximately equal in size. Acetabulum 1/4 to 1/6 (usually about 1/6) body length from anterior end; 0.153 to 0.224 mm in diameter; sucker ratio 1:1.4 to 1.6. Prepharynx usually about twice as long as pharynx; pharynx 0.150 mm long by 0.127 mm wide in a 3.078 mm specimen; esophagus short but distinct; bifurcation shortly anterior to acetabulum; uroproct present. Genital pore median at anterior border of acetabulum. Testes ovoid, separated by a few vitelline follicles, posterior testis longer; posttesticular distance about same length as forebody or slightly shorter. Cirrus sac large, sinuous, curved like the letter S with an extra curve, wider in its anterior half, extending a little less than halfway between acetabulum and ovary, its narrow basal half containing a sinuous seminal vesicle, its mid-region containing a narrow prostatic tube surrounded by prostatic cells; most of its anterior half filled with the wide finely spined cirrus and with a few prostatic cells. Genital atrium short, not reaching middle of acetabulum. Ovary globular, about in midbody, separated from the anterior testis by a very few vitellaria; metraterm a muscular, narrow, sinuous, finely spined tube, considerably longer than cirrus sac. Vitellaria from level of middle of cirrus sac, continuous to near posterior end of the body, confluent between and posterior to the testes. Eggs 68 to 76 by 36 to 42 μ.

Comparisons: Species of *Stephanostomum* in which the vitellaria extend to middle of the cirrus sac are: *S. cesticillum, S. bicoronatum, S. tenue, S. hispidum,* and *S. minutum. S. hispidum* and *S. tenue* have 40 to 42 oral spines. *S. minutum* is much smaller, has eggs 47 to 36 μ, a straight cirrus sac and gonads close together. *S. bicoronatum* has 30 to 33 oral spines, a straight cirrus sac extending at least half way to the ovary, and a metraterm not longer than the cirrus sac. *S. cesticillum* also has a straight cirrus sac longer than the metraterm and its acetabulum is only slightly larger than the oral sucker. The most characteristic feature of *S. coryphaenae* is the shape of the cirrus sac which is characteristically curved even in immature specimens and wider in its anterior half. The long metraterm is also unusual.

82. STEPHANOSTOMUM DENTATUM (Linton, 1900) Manter, 1931
Fig. 61

HOSTS: *Epinephelus adsencionis* (Osbeck),* rock hind; in one host examined. *Epinephelus morio* (Cuv. & Val.),* red grouper; in 2 of 33 hosts examined. *Mycteroperca venenosa* (Linn.),* yellow-fin grouper; in 1 of 7 hosts examined.

LOCATION: Intestine.

Discussion: S. dentatum was named from *Paralichthys dentatus*, a flounder at Woods Hole. It was reported from Beaufort by Linton (1905) from 7 hosts but some of his material was not suitable for identification and up to the present the species seems to be characteristically a parasite of flounders. My Tortugas material consists of 3 specimens and a fragment lacking both tips. Eight specimens of *S. dentatum* from flounders at Beaufort, N. C. were available for comparison. Only one constant difference was noted. In *S. dentatum* from flounders the gonads were all close together and not separated by vitellaria although follicles meet dorsally at the juncture of the testes and rarely between ovary and testes. In 1 of 8 specimens the follicles barely meet between the testes. In all the Tortugas specimens follicles occurred between ovary and testes and between the testes. This difference, together with the different hosts, would suggest a different species but no other constant character could be found to establish it. The number of oral spines is 54 (or apparently 58 in one specimen); the suckers are equal or subequal with the acetabulum slightly larger (up to 1.22 times); the S-shaped cirrus sac extends about halfway to the ovary; the metraterm is slightly shorter; the vitellaria reach to the posterior border of the acetabulum. Circular muscles at the anterior portion of the pharynx were noticeable in the Tortugas specimens and present but less evident in the Beaufort material. Egg sizes overlap but the Tortugas specimens averaged slightly larger eggs. Additional material might justify a new species for the Tortugas specimens. The specimens from *E. morio* in particular seemed rather too slender to be *S. dentatum*.

Stephanostomum pagrosomi (Yamaguti, 1939) n. comb.** is very similar to *S. dentatum* differing only in slightly larger acetabulum and slightly larger eggs.

83. **Stephanostomum ditrematis** (Yamaguti, 1939) n. comb.

SYNONYMS: *Echinostephanus ditrematis* Yamaguti, 1939; *Stephanostomum longisomum* Manter, 1940***; *Stephanostomum filiforme* Linton, 1940.***

HOSTS: *Caranx latus* Agassiz, jack; in 1 of 6 hosts examined. *Caranx ruber* (Bloch), runner; in 1 of 6 hosts examined.

Discussion: Eleven specimens varied from 3.5 to 5.6 mm in length, thus being somewhat smaller than the type specimen of *S. longisomum* (7.627 mm) but about the same size as *S. ditrematis*. Most specimens had lost a part or all of the oral spines; one specimen seemed to have 36 spines; another had 38 with the midventral pair missing. Yamaguti described 36 spines but his

* New host record.
** Synonym: *Echinostephanus pagrosomi* Yamaguti, 1939.
*** New synonym.

figure indicates that perhaps 2 were missing. The vitellaria in most specimens reached very slightly anterior to the base of the cirrus sac; in one specimen they reached only to the cirrus sac; they are contiguous medianly between ovary and testes and between testes. The tips of the testes may overlap slightly but even then the vitellaria meet medianly ventral to these tips. There is usually some distance, filled with vitellaria, between ovary and testes. A uroproct is present. The species differs from *S. sentum* in more elongate body and in that the vitellaria occur between ovary and testes, as well as a usually different number of oral spines.

S. filiforme Linton, 1940, although somewhat larger (7.63 to 15. mm) is considered another synonym. Linton's smallest specimen is almost exactly the size of *S. longisomum*. Linton reported "about 44 to 48 oral spines" but added that the number was not exactly determined. *S. filiforme* was collected from *Seriola lalandi, Caranx hippos,* and *Paratractus caballus* at Woods Hole.

It will be noted that the three specific names were given independently at approximately the same dates. Although Linton's specimens were larger, size gradations occur among the species named. Sucker ratio; extent of cirrus sac; distribution of vitellaria; and egg size all agree. No differences could be found considered important enough to separate the three species. The hosts are all related except the type host, *Ditrema temmincki,* which is very different from the others. If the above synonymy is correct, a rechecking of the original host, *Ditrema,* in the Inland Sea is suggested.

ZOOGONIDAE

84. **Steganoderma parexocoeti** n. sp.

Fig. 62

HOST: *Parexocoetus mesogaster* (Bloch), flying fish; 2 specimens in 1 of 4 hosts examined.

LOCATION: Intestine.

Description (based on the type specimen): Length 2.79 mm; width 0.825 mm, greatest at acetabular level; tapering toward each end; body spined as far as level of testes. Oral sucker spherical, 0.285 mm in diameter; acetabulum about 1/3 from anterior end, slightly wider than long, 0.322 mm in transverse diameter; surrounded by rim of body wall, hence probably protuberant; sucker ratio 1:1.13. Prepharynx short; pharynx 0.210 mm long by 0.127 mm wide; esophagus short, about same length as prepharynx; ceca wide extending well past testes to a point 0.315 mm from posterior end of body. Genital pore at left edge of body, slightly dorsal. Testes almost symmetrical just posterior to midbody, elongate, smooth, ventral to ceca. Cirrus sac very large, 0.600 by 0.187 mm, extending diagonally from genital pore to the right anterior edge of acetabulum, containing a tubular but uncoiled seminal vesicle, a narrow pars prostatica, elongate prostatic vesicle, short cirrus, and numerous large prostatic cells. Ovary spherical, median, immediately posterior to acetabulum; seminal receptacle postovarian; uterus filling posterior part of body; metraterm glandular, from genital pore to left anterior edge

of acetabulum; vitelline follicles large, lateral, 9 on right, 12 on left, from mid-acetabular level to somewhat past the testes. Eggs 36 to 39 by 20 to 24 μ. Excretory vesicle not observed.

Discussion: This species is remarkably similar to *S. retroflexus* occurring in *Belone acus* in the Mediterranean. It differs in several small respects. The body shape is broader and more tapering especially posteriorly; the vitellaria extend beyond the testes; the ceca are longer; the cirrus sac is 1/3 larger; the prostatic vesicle is more narrow; and a prepharynx is present.

Yamaguti (1934) considered the genus *Lecithostaphylus* Odhner, 1911 a synonym of *Steganoderma* Stafford, 1904. Fantham (1938) recognized both genera, separating *Lecithostaphylus* on the basis of short esophagus, large pharynx, longer ceca, and more conspicuous seminal receptacle. A restudy of several specimens of *Steganoderma formosum* Stafford, 1904, type of the genus, leads me to agree with Yamaguti that *Lecithostaphylus* is a synonym of *Steganoderma.* A small seminal receptacle is definitely present posterior to the ovary, and the character of the cirrus sac and cirrus are similar to *Lecithostaphylus.* The length of the esophagus varies somewhat with body contraction, and in *Steganoderma messjatzevi* (Issaitschikow, 1928) Yamaguti, 1934, it is of median length. The author's (Manter, 1926) diagnosis is modified as follows: *Steganoderma:* Elongate, spined Zoogonidae; esophagus and ceca of varying length, the latter, however, extending past the acetabulum and not reaching the posterior end of the body; testes symmetrical at ends of ceca, or lateral or ventral to ceca; genital pore well to the left; cirrus sac with seminal vesicle, large prostatic cells, elongate prostatic vesicle and short cirrus. Ovary unlobed, immediately posterior to acetabulum; seminal receptacle present, postovarian; vitellaria lateral, postacetabular, composed of a few (up to 12 to 14 on each side), large follicles; metraterm present. Excretory vesicle I-shaped. Type species: *S. formosum* Stafford, 1904. Other species: *S. retroflexum* (Molin, 1859) n. comb., synonym: *Lecithostaphylus retroflexus; S. nitens* (Linton, 1898) n. comb., *S. messjatzevi* (Issaitschikow, 1928) Yamaguti, 1934; *S. atherinae* (Price, 1934) n. comb.; *S. spondyliosomae* (Fantham, 1938) n. comb. *S. atherinae* is a somewhat doubtful member of the genus because of its lobed ovary and numerous vitelline follicles.

Steganoderma fellis Yamaguti, 1934 and *S. sebastodis* Yamaguti, 1934 were transferred to the genus *Deretrema* by Yamaguti, 1940 on the basis of the preacetabular vitellaria.

The preacetabular location of the vitelline follicles seems to be a convenient generic character. In *Deretrema fusillum* Linton, 1910, the type species, the vitellaria are both lateral and anterior but not posterior to the acetabulum. Since in the genus *Proctophantastes* Odhner, 1911, the vitellaria are partly posterior to the acetabulum that genus is more like *Steganoderma* than like *Deretrema.* Although Price (1934) considered *Proctopantastes* a synonym of *Deretrema,* I prefer to consider it a synonym of *Steganoderma. P. abyssorum* differs from *S. formosum* in having larger suckers, shorter esophagus, and shorter longitudinal extent of the vitelline fields, but these characters seem to me specific rather than generic. *P. abyssorum* will be *Steganoderma abyssorum* (Odhner, 1911) n. comb. with the synonyms *P. abyssorum* Odhner, 1911 and *Deretrema abyssorum* (Odhner, 1911) Price, 1934.

85. **Steganoderma hemiramphi** n. sp.

Figs. 63, 64

HOST: *Hemiramphus brasiliensis* (Linn.), halfbeak; 2 specimens in 2 of 7 hosts examined.

LOCATION: Intestine.

Description (based on two specimens): Length 0.937 to 1.444 mm; width 0.292 to 0.375 mm; widest in acetabular region; spined as far back as acetabulum. In 1.444 mm specimen, oral sucker 0.170 mm in diameter, acetabulum 0.240 mm; sucker ratio 1:1.41. Acetabulum wider than long, surrounded by fold of body wall. Prepharynx present but short; pharynx 0.102 to 0.105 mm long by 0.100 mm wide; esophagus short, about same length as prepharynx; ceca extending well past testes to a point about halfway between testes and posterior end of body. Genital pore at left edge of body opposite anterior half of pharynx. Testes smooth, elongate, symmetrical or slightly diagonal, ventral to ceca, about in middle of hindbody. Cirrus sac thick-walled, slender, 0.270 mm long by 0.054 to 0.066 mm wide, extending diagonally from genital pore to anterior edge of acetabulum, containing a seminal vesicle filling most of posterior half, a straight long, pars prostatica, a subspherical prostatic vesicle, and a very short cirrus. Ovary subtriangular, unlobed, immediately posterior to acetabulum, slightly to the right; seminal receptacle posterior to ovary; vitellaria of large follicles in two lateral clusters, 9 on the right and 12 on the left, between acetabulum and testes, lateral and ventral to ceca; uterus filling body posterior to testes; metraterm short; eggs 34 to 39 by 17 to 20 μ. Excretory vesicle not observed.

Comparisons: This species is probably most similar to *S. nitens* (Linton, 1898). It differs in being 1/2 or less as large; in more anterior and more lateral genital pore; more slender cirrus sac; the vitellaria are more bunched rather than being in linear order and they do not extend posterior to the testes. It differs from *S. retroflexus* and *S. spondyliosomae* in sucker ratio and more slender cirrus sac.

86. **Steganoderma elongatum** n. sp.

Figs. 65, 66

HOST: *Strongylura timucu* (Walbaum), houndfish; in both of 2 hosts examined.

LOCATION: Intestine.

Description (based on 6 specimens): Body elongate, tapering to a rounded point at each end, and about equally wide along most of its length; length 4.130 to 5.130 mm; width 0.864 to 0.891 mm; inconspicuous spines anteriorly which may become lost; oral sucker round, 0.240 to 0.270 mm in diameter; acetabulum about 1/5 body length from anterior end, embedded in fold of the body wall, subspherical, 0.352 to 0.390 mm in transverse diameter; sucker ratio 1:1.3 to 1.6. Short prepharynx; pharynx 0.187 to 0.217 mm long by 0.142 to 0.187 mm wide; short esophagus; ceca extending more than halfway between testes and posterior end of body (for example, to a point 0.750 mm from posterior end of a 4.252 mm specimen). Genital pore near left edge of body, well beyond the left cecum, about mid-pharynx level. Testes just posterior to midbody, symmetrical, elongated, irregular in outline, wholly or

partly extracecal; cirrus sac well developed, thick-walled, extending diagonally from genital pore to anterior edge of acetabulum, 0.487 to 0.615 mm long by 0.195 to 0.210 mm wide, containing a coiled, tubular seminal vesicle, a small ovoid prostatic vesicle, and a narrow, fairly short cirrus. Ovary median, about 1/3 body length from anterior end, unlobed; seminal receptacle flask-shaped, postovarian; uterus to near posterior end of body, then coiling forward to genital pore, a narrowed, muscular region forming a metraterm between acetabulum and genital pore; vitelline follicles large, of irregular outline, extracecal, from a little anterior to ovary to anterior ends of testes or slightly beyond, never extending posterior to testes; 9 follicles on the right, 12 on the left; eggs 36 to 41 by 17 to 20 μ. Excretory vesicle not observed.

Discussion: This species is very similar to *S. nitens,* so much so that more specimens might prove it to be that species. The chief difference seems to be the posterior extent of the vitellaria which in my specimens never reach past the middle of the testes and usually end anterior to the testes. Linton has published three figures of *S. nitens* at different times and in each case the vitellaria extend posterior to the testes. Judging from Linton's figures, the genital pore of *S. elongatum* is more to the left and more anterior, and the ovary is more posterior than in *S. nitens.* Linton gives the following egg sizes for *S. nitens* 33 by 18 μ, 28 by 14 μ, and up to 36 by 18 μ, measurements which are somewhat smaller than those of *S. elongatum.* There is a tendency toward host specificity in this genus. *S. elongatum* was not found by me at Tortugas in 23 specimens of *Strongylura notata,* 10 specimens of *S. raphidoma,* nor in one specimen of *S. carribbaea.*

Fantham (1938) discussed the hosts and geographical distribution of *Steganoderma.* Since a number of additional species are now grouped in this genus, and two have been removed, a table showing a revised distribution might be of interest.

Table of Species of Steganoderma

Name	Host	Host family	Locality
S. retroflexus	*Strongylura acus*	Belonidae	Mediterranean
S. elongatum	*Strongylura timucu*	Belonidae	Tortugas, Fla.
S. nitens	*Strongylura carribbaea*	Belonidae	Woods Hole, Mass.
	Strongylura acus		Bermuda
S. hemiramphi	*Hemiramphus mesogaster*	Hemiramphidae	Tortugas, Fla.
S. parexocoeti	*Parexocoetus brasiliense*	Exocoetidae	Tortugas, Fla.
S. formosum	*Hippoglossus hippoglossus*	Hippoglossidae	Maine, Canada
	Paralichthys oblongus	Paralichthyidae	Massachusetts
S. messjatzevi	*Hippoglossoides platesoides*	Hippoglossidae	Russian Arctic
S. spondyliosomae	*Spondyliosoma blochii*	Sparidae	South Africa
S. abyssorum	*Macrourus rupestris*	Macrouridae	N. European
	Gadus aeglefinis	Gadidiae	Atlantic

Thus, five of the eight species occur in houndfishes and flying fishes which live close to the surface; two occur in flounders or halibuts which live close to the bottom of the sea.

87. Diphterostomum americanum n. sp.

Figs. 67-69

HOST: *Brachygenys chrysargyreus* (Günther), bronze grunt; 8 specimens in 1 of 6 hosts examined.

LOCATION: Intestine.

Description: Very small, rather plump distomes, covered with heavy spines as far back as acetabulum, unspined posteriorly, body widest at level of acetabulum, tapering toward each end. Length 0.510 to 0.645 mm, width 0.224 to 0.256 mm. Oral sucker circular, subterminal, 0.073 to 0.093 mm; acetabulum just posterior to midbody; wider than long; 0.170 to 0.188 mm in transverse diameter; sucker ratio about 1:2; fold of body wall tends to overlap the anterior half of acetabulum, lip-like, as in *D. brusinae;* acetabulum red in color in live specimens. No prepharynx; pharynx small, 0.034 mm long by 0.039 mm wide in a 0.517 mm specimen; esophagus short, about same length as pharynx; intestinal bifurcation nearer oral sucker than acetabulum; ceca short extending to anterior border of acetabulum, slightly swollen at tips. Genital pore near left margin of body, posterior to intestinal bifurcation, slightly nearer acetabulum than oral sucker. Testes symmetrical, lateral, far apart at posterior border of acetabulum partially overlapping it dorsally. Cirrus sac large, pyriform, extending from genital pore diagonally medianly and posteriorly to the anterior border of acetabulum; its width 1/2 to 3/4 its length, containing a bipartite seminal vesicle, a wide prostatic vesicle, prostatic gland cells, and a short cirrus armed with inconspicuous spines. Ovary globular or irregular in shape, dorsal to acetabulum, anterior to testes, more or less between the testes or directly anterior to the right testis. Seminal receptacle not observed. Vitelline gland a bilobed mass, smaller than ovary, at posterior edge of ovary. Uterus filling body posterior to acetabulum except for extreme posterior tip. Metraterm somewhat shorter than cirrus sac, with a few fine inconspicuous spines. Eggs with very thin shells, 29 to 32 by 11 to 14 μ. Excretory vesicle a simple sac.

One specimen showed many abnormal eggs varying in size from 12 by 9 to 29 by 13 μ. The small eggs had yellow thick shells while the normal eggs were colorless.

Comparisons: Four other species of *Diphterostomum* have been named: *D. brusinae* (Stoss., 1889) Stoss., 1904; *D. sargus ansularis* Wlassenko, 1931; *D. magnacetabulum* Yamaguti, 1938; and *D. spari* Yamaguti, 1938. *D. americanum* differs from all of these in that the genital pore is posterior to the intestinal bifurcation, the esophagus is shorter, and the eggs considerably smaller. It is the first species reported from America.

88. DERETREMA FUSILLUM Linton, 1910

HOSTS: *Abudefduf saxatilis* (Linn.), sergeant major; in 1 of 14 hosts examined. *Decodon puellaris* (Poey); in 1 of 2 hosts examined. *Ocyurus chrysurus* (Bloch), yellowtail; type host; in 1 of 47 hosts examined. *Priacanthus arenatus* Cuv. & Val.,* big-eye; in 1 of 3 hosts examined. *Upeneus parvus* Poey, goatfish; 50 fath., in 1 of 2 hosts examined.

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* New host record.

LOCATION: Intestine.

Discussion: Linton (1910) reported this species from *Ocyurus chrysurus, Haemulon macrostomum,* and *Abudefduf saxatilis.*

Manter (1934) classified *Deretrema* tentatively in the family Fellodistomatidae, as did McFarlane (1936). Yamaguti (1940) includes the genus in the Zoogonidae. These two related families probably should be distinguished primarily on the basis of the Y- or V-shaped excretory vesicle of the Fellodistomatidae. Fellodistomes are also usually, but not always, unspined. The two, swollen, excretory tubes evident in *D. fusillum* were interpreted by me as indicating a Y-shaped vesicle. Yamaguti's figures show that in his species two lateral collecting vessels became enlarged. The convoluted nature of these tubes in my specimens suggest this interpretation, and *Deretrema* is here included in the Zoogonidae. None of my 9 specimens have body spines but the body surface is not smooth. Fine corrugations or projections seem embedded in the cuticula and appear like rounded spines. A seminal receptacle is probably present as a small sac at or near the base of Laurer's canal. It was observed in one mounted and in one sectioned specimen; in each case, as reported by Linton, without sperm cells.

The following other species of *Deretrema,* all from the Pacific, have been named: *D. cholaeum* McFarlane, 1936; *D. fellis* (Yamaguti, 1934); *D. hoplognathi* Yamaguti, 1940; *D. plotosi* Yamaguti, 1940; and *D. sebastodis* (Yamaguti, 1938). The following diagnosis for *Deretrema* is suggested:

Deretrema: Body more or less flattened and elongate; spined or unspined; esophagus as long as pharynx or longer; ceca reaching past acetabulum; excretory vesicle I-shaped but with lateral vessels often inflated; seminal receptacle rudimentary or normal, postovarian; Laurer's canal present; testes symmetrical; ovary median, unlobed; vitelline follicles large, few (not over 12 on each side), lateral and at least partly preacetabular; genital pore on left edge of body; cirrus sac slender, not over-reaching acetabulum. Like *Brachyenteron* Manter, 1934, except the ceca extend past the acetabulum. Type species: *D. fusillum* Linton, 1910.

Genus DIPLANGUS Linton, 1910

Diagonsis: More or less plump, cylindrical distomes, unspined; acetabulum protrusible and retractile deep into the body; ceca extending past acetabulum but not reaching posterior end; genital pore submedian or slightly to the left; testes tandem or diagonal, postovarian; cirrus sac very thin-walled and delicate; seminal vesicle bipartite; prostatic vesicle inflated and conspicuous; cirrus lacking; ovary unlobed; seminal receptacle present; vitellaria lateral, or lateral and posterior, to acetabulum; uterus extending to posterior end of body; excretory vesicle I-shaped. Type species: *D. paxillus* Linton, 1910 .

Price (1934) placed this genus in the Zoogonidae, subfamily Lecithostaphylinae (= Steganoderminae). The character of its protusible acetabulum, vitellaria, rather short ceca, and excretory vesicle suggest this subfamily but

Diplangus is atypical in its unspined cuticula, delicate cirrus sac, submedian genital pore, and diagonal or tandem rather than symmetrical testes.

89. DIPLANGUS PAXILLUS Linton, 1910

Figs. 70-72

HOSTS: *Anistoremus virginicus* (Linn.),* porkfish; in 1 of 4 hosts examined. *Balistes vetula* Linn.,* queen triggerfish; in 1 of 7 hosts examined. *Brachygenys chrysargyreus* (Günther),* bronze grunt; in 1 of 7 hosts examined. *Haemulon flavolineatum* (Desmarest),* French grunt; in 2 of 11 hosts examined. *Haemulon plumieri* (Lacépède), common grunt; in 1 of 34 hosts examined. *Haemulon sciurus* (Shaw), yellow grunt; in 2 of 24 hosts examined. Linton (1910) reported this species from *Haemulon macrostomum*, *H. plumieri*, *H. sciurus*, and *Calamus calamus*. The report from *Calamus* is probably an error, the trematode from that host probably being *Proctoeces* which has superficial resemblance to *Diplangus*.

LOCATION: Intestine.

Discussion: Linton's description is fairly adequate but a few specific characters should be noted. The body is elongate and pointed posteriorly. The sucker ratio is about 1:1.5. Even when withdrawn deeply into the body, the acetabulum is anterior to midbody. The excretory vesicle is I-shaped and ends posterior to the testes; one young specimen (Fig. 71) showed a convoluted ciliated tube on each side in the anterior half of the body, and several pairs of flame cells. The testes are tandem; both parts of the seminal vesicle are large, the anterior portion larger than the prostatic vesicle; the seminal vesicle is bent at least once, usually twice. The seminal receptacle is preovarian; the vitelline follicles distinct, 7 to 13 on each side, partly lateral and partly posterior to the acetabulum.

90. **Diplangus parvus** n. sp.

Figs. 72, 73

HOSTS: *Haemulon flavolineatum* (Desmarest), French grunt; type host; in 1 of 11 hosts examined. *Haemulon carbonarium* Poey, black grunt; in 1 of 2 hosts examined.

LOCATION: Intestine or ceca.

Description (based on 3 specimens): Body cylindrical, widest about at midbody, tapering anteriorly but broadly rounded at posterior end; length 0.607 to 0.750 mm, width 0.315 to 0.345 mm. Oral sucker 0.083 to 0.100 mm in transverse diameter; acetabulum in all specimens pulled back into body to lie posterior to midbody, 0.225 to 0.240 mm in transverse diameter; sucker ratio 1:2.4 to 2.7. Prepharynx very short or lacking; pharynx 0.054 to 0.068 mm long by 0.044 to 0.054 mm wide; esophagus when contracted a little less than length of pharynx, when extended a little more than length of pharynx; ceca extending a little beyond the retracted acetabulum to level of anterior testis. Genital pore slightly to the left, opposite anterior fourth of pharynx; testes diagonal, postacetabular, in one specimen almost symmetrical; seminal vesicle bipartite, relatively small, bent once, not reaching acetabulum; prostatic vesicle ovoid, about same size as anterior portion of seminal vesicle.

* New host record.

Ovary to left of, or anterior to anterior testis; seminal receptacle anterior to ovary; vitelline follicles distinct, lateral to retracted acetabulum, 6 on the right, 6 or 7 on the left; eggs 32 to 34 by 15 to 17 μ. Excretory vesicle not observed.

Comparisons: This species differs from *D. paxillus* with which it was found in *H. flavolineatum,* in several respects. It is much smaller, wider for its length, has a rounded posterior end, much larger acetabulum, smaller seminal vesicle, diagonal testes, and fewer vitelline follicles all lateral to the acetabulum.

91. **Diplangus miolecithus** n. sp.

Fig. 74

HOSTS: *Haemulon album* Cuv. & Val., margate fish; type host; in 1 of 2 hosts examined. *Haemulon parra* (Desmarest), sailor's choice; in 1 of 9 hosts examined.

LOCATION: Intestine.

Description (based on 6 specimens): Body smooth, plump, not elongated; tapering toward each end from acetabular region; posterior end rounded; length 0.975 to 1.200 mm; width 0.322 to 0.420 mm. Oral sucker transverse diameter (observed on 2 specimens) 0.134 and 0.153 mm, compared with acetabular diameters of 0.232 and 0.240 mm; oral sucker (3 specimens) 0.132 to 0.136 mm; compared with acetabular lengths of 0.232 to 0.262 mm; sucker ratio 1:1.5 to 1.9. Acetabulum slightly anterior to midbody, protrusile. Prepharynx short; pharynx 0.085 to 0.105 mm long by 0.068 to 0.162 mm wide; esophagus about same length as prepharynx or a little longer; intestinal bifurcation near anterior border of acetabulum; ceca extending a little past testes almost to posterior end of body. Genital pore slightly to the left, opposite pharynx. Testes tandem, in posterior third of body, extracecal, on left side, ovoid; seminal vesicle dorsal to acetabulum, large, divided into two subequal parts which are usually not bent but in a straight, diagonal line; prostatic vesicle at an angle with seminal vesicle, about same size as anterior portion of seminal vesicle. Ovary ovoid, unlobed, to the right, about at same level as anterior testis; seminal receptacle preovarian; uterus filling most of body posterior to acetabulum; metraterm not observed; eggs 37 to 42 by 17 to 20 μ, usually about 39 by 19 μ. The vitellaria are very inconspicuous, barely visible in most specimens; located at level of ovary and testes, several (about 12) indistinct follicles which tend to fuse almost into tubular structures can be seen just posterior to the ovary; follicles on the left side usually not observed at all. One specimen with testes apparently lacking showed traces of follicles on that side. Appearance of the specimens suggest that the development of the uterus and the testes crowd out the vitellaria on that side. Excretory vesicle extends forward to the ovary.

The name *miolecithus* is from *mio* = less, and *lecithal* = yolk, and refers to the reduced vitellaria.

Comparisons: This species resembles *D. parvus* in body size and shape but differs in its tandem testes, sucker ratio, more posterior and more indistinct vitellaria, and its larger eggs.

92. **Brachyenteron parexocoeti** n. sp.

Fig. 75

HOST: *Parexocoetus mesogaster* (Bloch), flying fish; one specimen in 1 of 4 hosts examined.

LOCATION: Intestine.

Description (based on one specimen): Body smooth except for a few spines embedded in the cuticula at acetabular level; length 1.201 mm, width 0.456 mm; widest at acetabulum, tapering markedly toward each end; posterior end pointed. Forebody twisted so that transverse diameter of oral sucker not observed; oral sucker length 0.119 mm; acetabulum in middle of body, surrounded by folds of the body wall; 0.322 mm in length, more than twice the size of oral sucker. Short prepharynx; pharynx large, 0.122 mm long by 0.099 mm deep; esophagus 0.195 mm long; ceca very short, shorter than esophagus, reaching about to midacetabular level. Genital pore at left edge of body at midesophageal level. Testes side by side, smooth, elongated; cirrus sac about 0.323 by 0.083 mm, containing a bipartite seminal vesicle extending about half its length, an elongate prostatic vesicle and a cirrus about half the length of the prostatic portion. Ovary smooth, subspherical, immediately anterior to left testis, dorsal to acetabulum; small seminal receptacle between posterior portion of testes, distant from ovary; uterus filling most of hindbody; metraterm a little more than half length of cirrus sac; vitelline follicles large, in two lateral clusters, 11 on the left, 12 on the right, partly anterior and partly dorsal to acetabulum; eggs 34 to 36 by 17 to 20 μ. Excretory vesicle traceable forward to near the testes.

Discussion: This species is considered in the genus *Brachyenteron* on the basis of its long esophagus and very short ceca not reaching past the acetabulum. Its body spines are reduced although perhaps some had been lost, and the acetabulum is very much larger than in the other species where it is about the same size as the oral sucker. Three other species are known: *B. peristedioni* Manter, 1934; *B. acropomatis* Yamaguti, 1938; and *B. doderleiniae* Yamaguti, 1938. *B. parexocoeti* differs from all of these in its much larger acetabulum, more posterior testes, and more pointed and shorter hindbody.

93. BRACHYENTERON PERISTEDIONI Manter, 1934

HOST: *Peristedion platycephalum* Goode & Bean; 135 to 156 fath.; in 1 of 14 hosts examined.

FELLODISTOMATIDAE

94. PYCNADENA LATA (Linton, 1910) Linton, 1911

Fig. 76

SYNONYM: *Didymorchis latus* Linton, 1910.

HOST: *Calamus calamus* (Cuv. & Val.), saucer-eye porgy; in 2 of 20 hosts examined.

Discussion: The genus *Pycnadena* has been classified in the family Fellodistomatidae by Stunkard and Nigrelli (1930) and in the family Allocreadiidae by Yamaguti (1938). The excretory vesicle (Fig. 76) might be considered as I-shaped or as possessing rudimentary arms. The body is thick and muscular, the suckers strongly developed, so that its general appearance is more fellodis-

tomid than allocreadiid. The extent of the vitellaria, the character of the cirrus sac, and the limited extent of the uterus are not typical of fellodistomids. A species of *Pycnadenoides* described below is clearly related and evidently a member of the Fellodistomatidae. As noted earlier, the writer feels that *Plagioporus crassigulus* and *P. gastrocotylus* almost certainly are more closely related to *Pycnadena* than to the Opecoelidae or Allocreadiidae. They are left in the Opecoelidae tentatively pending knowledge of their life cycles.

95. **Pycnadenoides calami** n. sp.

Fig. 77

HOST: *Calamus bajonado* (Bloch & Schneider), grass porgy; in 1 of 15 hosts examined.

LOCATION: Records indicate the specimen was found on the gills, probably an abnormal location.

Description (based on a single specimen): Body thick, plump; with thick, unspined cuticula; ovoid; length 2.065 mm; greatest width near middle of body, 1.188 mm. Oral sucker 0.390 mm in transverse diameter; acetabulum embedded in body just anterior to midbody, wider than long, 0.555 mm in transverse diameter; sucker ratio 1:1.37. Transverse, somewhat muscular folds of the body wall bound the anterior and posterior borders of the acetabular aperture. Diagonal muscles radiate from the lateral edge of the acetabulum. Two small wart-like extensions of the cuticula, one anterior and left, the other posterior and on the right, did not appear to be artifacts but were probably abnormalities. Prepharynx short and wide; pharynx 0.232 mm long by 0.262 mm wide; esophagus very short; ceca voluminous curving backward to end near posterior end of body. Genital pore slightly to the left, just posterior to midpharynx. Testes two, ovoid, symmetrical, about halfway between acetabulum and posterior end of body. Cirrus sac elongate-clavate, ending dorsal to middle of acetabulum, containing a slender cirrus, a coiled tubular seminal vesicle and numerous prostatic cells. Ovary small, globular intertesticular; uterus extensively developed filling most of region between acetabulum and posterior edge of testes, extending slightly posterior to testes; overlapping ovary, testes and ceca; eggs 61 to 71 by 42 to 46 μ. Vitelline follicles from level of anterior edge of testes to near posterior end of ceca, surrounding ceca and barely contiguous posterior to testes. Seminal receptacle not observed but perhaps obscured by eggs. Excretory pore terminal; excretory vesicle indistinctly Y-shaped with short branches, the left fork smaller and branching off slightly posterior to the right fork.

Discussion: The genus *Pycnadenoides* was named by Yamaguti (1938) for *P. pagrosomi*. It differed from *Pycnadena* in that the vitellaria were postacetabular and the genital pore was more to the left. A circular muscular fold of the body surrounded the acetabulum. The excretory system was not observed. *Pycnadenoides calami* is placed in that genus on the basis of the distribution of the vitellaria and the location of the genital pore. It differs from *P. pagrosomi* in its relatively smaller acetabulum; more symmetrical testes; location of the ovary betwen the testes; more posterior extent of the uterus; and slightly smaller eggs. Th circular fold around the acetabulum is less well developed.

The similarity of this species to *P. pagrosomi,* together with its symmetrical testes, posterior extent of the uterus, rather scanty vitellaria, and shape of the excretory vesicle, strongly indicate that *Pycnadenoides* and *Pycnadena* shuold be considered in the family Fellodistomatidae rather than Allocreadiidae or Opecoelidae. The circumacetabular fold occurring in *Plagioporus gastrocotylus* and the muscular acetabular region of *P. crassigula* suggest that these species, also, do not belong in the Allocreadiidae or Opecoelidae.

96. BACCIGER HARENGULAE Yamaguti, 1938

Figs. 78-80

HOST: *Harengula macrophthalma* (Ranzani), "sardine"; in 2 of 33 hosts examined.

LOCATION: Intestine.

Discussion: Three specimens were available, one of them partly crushed. The two entire specimens were 0.390 by 0.277 mm and 0.615 by 0.450 mm in size. Very fine spines cover the body but were partly lost in one specimen. The suckers are subequal in size, the oral sucker being slightly larger or slightly smaller than the acetabulum. Details of structure agree with Yamaguti's description of *B. harengulae* except that the ceca reach to the posterior edge of the testes or slightly beyond the limit described by Yamaguti; the uterus has folds extending to midtestis level on each side lateral to the testes; and the eggs, measuring 20 to 22 by 15 to 19 μ were slightly wider for their length. All measurements, however, overlap those given by Yamaguti. The excretory vesicle, supposedly almost V-shaped, was not observed in my specimens. The species differs from *B. bacciger* (Rud.) and *B. nicolli* Palombi, 1934 in more posterior ovary and somewhat irregular shape and in the very weak development of the cirrus sac which cannot be clearly recognized as present at all.

The genus *Bacciger* usually has been classified in the family Fellodistomatidae, but Yamaguti (1938) considered it in the family Heterophyidae. Most fellodistomids are unspined and have a well developed cirrus sac, although several genera, as *Orientophorus* Srivastava, 1935; *Discogaster* Yamaguti, 1934; *Antorchis* Linton, 1911; and *Parantorchis* Yamaguti, 1934, are spined. All fellodistomids possess a cirrus sac which seems to be the chief character separating the two families.

Bacciger was named by Nicoll (1914) with *Bacciger bacciger* (Rud.) as type species. Palombi (1934) redescribed the original Mediterranean species and considered Nicoll's Atlantic material to represent a different species which he named *Bacciger nicolli.* Both Nicoll and Palombi describe a short, wide, thin-walled cirrus sac. Yamaguti (1938:71) states that *B. harengulae* is without "a distinct cirrus pouch". Assuming that at least a delicate cirrus sac is present in *Bacciger,* the genus is retained here in the Fellodistomatidae, but it has so many similarities to such a genus as *Stegopa* Linton, 1910 that the line between Fellodistomatidae and the Heterophyidae becomes rather uncertain. Perhaps the presence or absence of a cirrus sac is of less significance than the presence or absence of body spines.

97. ANTORCHIS URNA (Linton, 1910) Linton, 1911

SYNONYM: *Mesorchis urna* Linton, 1910.

HOSTS: *Holacanthus ciliaris* (Linn.),* queen angelfish; 1 immature specimen in 1 of 4 hosts examined. *Holacanthus isabelita* (Jordan & Rutter), angelfish; in 1 of 11 hosts examined. *Pomacanthus arcuatus* (Linn.), black angelfish; in 1 of 3 hosts examined. *Pomacanthus aureus* (Bloch),* black angelfish; in 6 of 23 hosts examined.

LOCATION: Intestine.

Discussion: In addition to the data given by Linton the following might be noted. The oral sucker is indistinctly bilobed dorsally as well as ventrally; the ovary may be anterior to the acetabulum; the cirrus sac is curved back, ∩-shaped; the rounded end of the cirrus sac (probably the cirrus everted into the atrium) is spined. The genus *Antorchis* Linton, 1911 is much like *Orientophorus* Srivastava, 1935 except the ovary is unlobed and the ceca are shorter. One other species, *A. lintoni* Travassos, Artigas, & Pereira, 1928 has been named.

98. **Megalomyzon robustus** n. gen., n. sp.

Figs. 81, 82

HOST: *Lachnolaimus maximus* (Walbaum), hogfish; in 1 of 8 hosts examined.

LOCATION: Stomach.

Description (based on 8 specimens with measurements of 4): Body thick, robust, and muscular; cuticula unspined; body ovoid, length 1.410 to 2.062 mm, greatest width near midbody, 0.937 to 1.237 mm, rounded at each end but slightly more tapering toward posterior end. Oral sucker very large and powerful, embedded in body, subspherical in shape, 0.547 to 0.772 mm wide by 0.547 to 0.712 mm long, mouth opening very small, ventral, bounded by conspicuous, semicircular muscles anteriorly and posteriorly. Acetabulum large but weakly muscular, much wider than long, usually indented or lobed laterally; width 0.622 to 0.795 mm, length 0.375 to 0.547. Sucker ratio, based on transverse diameters, 1:1.02 to 1.13; actually the oral sucker is larger and much more powerful than the weak, short acetabulum. Longitudinal, ventral muscles extend from the sides of the oral sucker to near the posterior edge of acetabulum. Prepharynx short; pharynx 0.195 to 0.352 mm long by 0.142 to 0.315 mm wide; esophagus lacking; ceca extend laterally, then posteriorly, ending at posterior edge of testes, slightly posterior to midbody.

Genital pore to the left, opposite anterior half of pharynx or posterior portion of oral sucker. Testes two, symmetrical, lateral, at acetabular level; right testis partly dorsal to acetabulum; ovoid, smooth. Cirrus sac ovoid, overlapping anterior third of acetabulum, containing a bipartite seminal vesicle, prostatic vesicle, prostatic cells, and a short, eversible cirrus armed with numerous spines; spines of cirrus 6 to 7 μ long by 2 to 3 μ wide at base. Genital atrium tubular, provided with a small, spherical outpocketing or atrial sac armed with minute spines (smaller than atrial spines) (Fig. 82). Ovary ovoid, smooth, immediately anterior to right testis, partly dorsal to acetabulum; seminal receptacle lacking; uterus filling most of body posterior

* New host record.

to acetabulum; metraterm lacking; vitelline follicles in two lateral clusters at level of anterior half of acetabulum, pretesticular, some follicles anterior to acetabulum and, in the type specimen, follicles of the right side were entirely so; eggs thick shelled, 31 to 34 by 15 to 19 μ. Excretory vesicle Y-shaped, branching a little posterior to acetabulum, with crura extending to near anterior end of body.

Discussion: This genus is placed in the family Fellodistomatidae on the basis of its thick, muscular body, smooth cuticula, powerful suckers, Y-shaped excretory vesicle and other characters. The spined cirrus and atrial sac, however, suggest the family Monorchidae, while the spined atrial sac suggests the genus *Genolopa* in particular. Monorchidae are smaller, weakly muscular trematodes, with spiny cuticula and well developed metraterm. A spiny genital atrium occurs in the genus *Acanthatrium* Faust, 1919 of the family Lecithodendriidae, a genus sometimes considered a synonym of *Prosthodendrium,* but that genus, among other differences, lacks a cirrus sac. *Megalomyzon* is probably most closely related to *Pseudosteringophorus* Yamaguti, 1940, a fellodistomid with an atrial outpocketing which Yamaguti called the atrial diverticulum. The latter was described as possessing "dense cuticular hairs". The gland cells surrounding it were not observed in *Megalomyzon. Pseudosteringophorus* differs in that the cirrus is unspined, the body elongate, the oral sphincter muscles are lacking, and the vitellaria entirely preacetabular.

Generic Diagnosis of Megalomyzon: Body ovoid, thick, muscular, unspined. Suckers large; oral sucker very large; semicircular muscles at anterior and posterior borders of mouth; acetabulum wider than long; intestinal ceca extend to posterior end of acetabulum; genital pore to the left; testes lateral, symmetrical at acetabular level; cirrus sac with bipartite seminal vesicle, prostatic vesicle, and spined cirrus; spined atrial sac present; ovary anterior to right testes, smooth; seminal receptacle lacking; vitellaria partly preacetabular, largely at acetabular level, consisting of two lateral clusters of follicles. Type species: *M. robustus.*

99. PROCTOECES ERYTHRAEUS Odhner, 1911

HOSTS: *Calamus bajonado* (Bloch & Schneider), grass porgy; in 2 of 15 hosts examined. *Calamus calamus* (Cuv. & Val.), saucer-eye porgy; in 2 of 14 hosts examined.

LOCATION: Posterior part of intestine. A single specimen taken from the stomach of *Mycteroperca venenosa* obviously represents an accidental infection from a food fish recently eaten. *Proctoeces* is typically an inhabitant of the intestine of porgies.

Discussion. Four species of *Proctoeces* have been named: *P. maculatus* (Looss, 1901) Odhner, 1911; *P. erythraeus* Odhner, 1911; *P. major* Yamaguti, 1934; and *P. magnorus* Manter, 1940. Odhner distinguished *P. erythraeus* from *P. maculatus* in that the acetabulum was 1/3 smaller, presumably giving a sucker ratio of about 1:1.3 instead of 1:2; smaller eggs "about 45 μ long" rather than 72 to 79 μ long; and shorter extent of vitellaria which extended only to the posterior testis. In both species the genital sinus is very long. My six specimens agree well with Odhner's diagnosis of *P. erythraeus.*

The sucker ratio was 1:1.4 to 1.6; eggs measured 46 to 53 by 19 to 24 μ; the extent of the uterus varied some but never reached past the posterior testis as it does in *P. maculatus*.

Odhner's material was from the Red Sea. Dawes (1946) considered *P. erythraeus* a synonym of *P. maculatus*.

The listing of the genera *Proctoeces* and *Tergestia* in the Monorchidae by Manter (1940) was an error. The family name Fellodistomatidae was accidentally omitted.

100. MESOLECITHA LINEARIS Linton, 1910

HOST: *Acanthurus caeruleus* Bloch & Schneider, blue tang; in 1 of 12 hosts examined.

LOCATION: Intestine.

Discussion. These specimens are all unspined and do not confirm Linton's conclusions that the cuticula was "minutely spinose" on the margins. The excretory vesicle is Y-shaped with long arms reaching to near the anterior end of the body. Therefore, the genus cannot be referred to the family Zoogonidae as thought possible by Price (1934). *Mesorchis* Linton, 1910, renamed *Antorchis* by Linton, 1911, is not a synonym of *Mesolecitha* as indicated by Price (1934:5).

Mesolecitha is in most respects very similar to the genus *Proctoeces* (family Fellodistomatidae, subfamily Haplocladinae) but has some characters of the Monorchidae. These two families are probably related and *Mesolecitha* might serve as a connecting genus. The genital pore is near the acetabulum but slightly to the left. Linton described spines on the cirrus although the "short spines" he mentions may have been in the metraterm. Rather long, slender and blunt spines, or spine-like papillae occur on the cirrus which often lies lobe-like in the genital atrium; smaller, fine spines occur for a short distance in the metraterm. The seminal vesicle is a small sac in the base of the cirrus sac and not a coiled tube as in *Proctoeces*. The spination of the cirrus and metraterm is a monorchid character, but the elongate, unspined body with tandem testes is like the Haplocladinae.

101. TERGESTIA LATICOLLIS (Rud., 1819) Odhner, 1911

Figs. 83, 84

HOSTS: *Auxis thazard* (Lacépède), frigate mackerel; Linton's record of "*T. pectinata.*" *Euthynnus alletteratus* (Raf.), little tunny; in 3 of 3 hosts examined.

LOCATION: Posterior part of intestine.

Discussion. These specimens agree with descriptions of *T. laticollis* except the eggs are slightly larger, 25 to 29 by 17 to 20 μ as compared with Odhner's measurements of 21 to 23 by 15 μ. Yamaguti (1934) reports 23 to 26 by 18 μ, and (1938) 26 to 27 by 18 μ.

The host "*Gymnosarda pelamis*" reported by Manter (1940:410) should be corrected to *Euthynnus alletteratus* (= *Gymnosarda alletterata*).

This trematode has been recorded from far flung localities: Black Sea; North Sea; Pacific Coast of Costa Rica; Japan.

102. TERGESTIA PECTINATA (Linton, 1905) Manter, 1940

Figs. 85-88

SYNONYMS: *Distomum pectinatum* Linton, 1905; *Theledera pectinata* (Linton, 1905) Linton, 1910; *Tergestia pectinata* (Linton, 1905) Hopkins, 1940.

HOSTS: *Trachurops crumenophthalmus* (Bloch), goggle-eye; in 3 of 5 hosts examined. *Priacanthus arenatus* Cuv. & Val., big-eye; in 1 of 3 hosts examined.

LOCATION: Posterior part of intestine.

Discussion. The above host records were reported by Manter (1940). Other reported hosts for this species are *Bairdiella chrysura* and *Trachinotus carolinus* at Beaufort, N. C., *Auxis thazard* at Tortugas, and *Auxis rochei* at Woods Hole, Massachusetts. The latter two records (by Linton) are, however, somewhat doubtful as in each case the sizes of the suckers indicate the species was probably *T. laticollis*. The record from *Auxis thazard* was listed as *T. laticollis* by Manter (1940).

T. pectinata differs from *T. laticollis* in that the acetabulum is about 2 to 2.5 times the oral sucker in diameter; the seminal vesicle is distinctly sinuous rather than straight; the cirrus is much folded within the cirrus sac; the eggs tend to be thinner-shelled and somewhat smaller (17 to 20 by 10 to 15 μ).

A very young specimen (Fig. 88) showed a number of flame cells.

103. **Tergestia acuta** n. sp.

Figs. 89, 90

HOST: *Caranx bartholomaei* Cuv. & Val., yellow jack; in both of 2 hosts examined.

LOCATION: Intestine.

Description (based on 11 specimens; measurements on 5 favorable specimens): Body rounded anteriorly, pointed posteriorly, widest at acetabular level; length 0.900 to 1.832 mm; width 0.315 to 0.570 mm. Six lobes on each side of neck region. Oral sucker with 14 pointed lobes; with longitudinal aperture; relatively large; 0.165 to 0.270 mm in transverse diameter; acetabulum just anterior to midbody, very large, filling almost the entire width of body; 0.292 to 0.465 mm in diameter; aperture longitudinal. Sucker ratio about 1:1.7. Pharynx 0.127 to 0.210 mm long by 0.071 to 0.119 mm wide; esophagus bifurcating at posterior edge of acetabulum; ceca largely concealed by eggs, extending to near posterior end of body. Genital pore slightly to the left and slightly anterior to acetabulum. Testes smooth, longer than wide, oblique, close together, ends usually overlapping, near posterior end of body. Cirrus sac rather wide anterior to acetabulum, then tapering to a more narrow region which extends to the posterior edge of acetabulum; seminal vesicle straight or almost straight; prostatic vesicle and cirrus as in *T. laticollis*. Ovary ovoid, smooth or slightly irregular in outline, just anterior to middle of hindbody, somewhat anterior to testes or immediately pretesticular; uterus almost filling hindbody; eggs 17 to 19 by 9 to 10 μ; vitelline follicles from posterior end of acetabulum to posterior end of anterior testis; follicles rather indistinct, in two lateral groups and confluent between ovary and acetabulum. Excretory vesicle not observed.

Discussion: This species is most easily recognized by its relatively large acetabulum and short, pointed hindbody. In relation to the oral sucker the acetabulum is larger than in *T. laticollis* but slightly smaller than in *T. pectinata;* in relation to body size it is larger than in any other species. Both suckers are relatively large. The distribution of the vitellaria differs from that of all species except *T. acanthogobii* Yamaguti, 1938. *T. acuta* differs from *T. acanthogobii* in that the acetabulum is larger in relation to body width, the oral sucker is larger, the posterior end more pointed, the cirrus sac longer, and the eggs smaller.

The name *acuta* refers to the pointed posterior end of the body.

104. BENTHOTREMA PLENUM Manter, 1934

HOST: Unidentified lizard fish; 582 fath.; 1 specimen in 1 host examined.
LOCATION: Found in body cavity; probably originally in intestine.

105. LISSOLOMA BROTULAE Manter, 1934

HOST: *Brotula barbata* (Bloch & Schneider); 79 to 140 fath.; in one host examined.

106. LOMASOMA GRACILIS (Manter, 1934) Manter, 1935

SYNONYM: *Lomaphorus gracilis* Manter, 1934.
HOST: *Peristedion miniatum* Goode; 138 to 140 fath.; in 1 of 7 hosts examined.

107. LOMASOMA MONOLENEI (Manter, 1934) Manter, 1935

SYNONYM: *Lomaphorus monolenei* Manter, 1934.
HOST: *Monolene antillarum* Norman; 79 to 140 fath.; in 5 of 49 hosts examined.

108. LOMASOMA WARDI (Manter, 1934) Manter, 1935

SYNONYM: *Lomaphorus wardi* Manter, 1934.
HOSTS: *Coelorhynchus carminatus* (Goode); 250 fath.; in 3 of 33 hosts examined.
Urophycis regius (Walbaum); 140 to 197 fath.;; in 1 of 13 hosts examined.

109. MEGENTERON CRASSUM Manter, 1934

HOST: *Diplacanthopoma brachysoma* Günther; 249 to 300 fath.; in all of 4 hosts examined.
LOCATION: Intestine.

110. STERINGOPHORUS MAGNUS Manter, 1934

HOST: Unidentified eel; 300 fath.; in both of 2 hosts examined.
LOCATION: Intestine.

111. STERINGOPHORUS PROFUNDUS Manter, 1934

HOST: *Argentina striata* Goode & Bean; 140 fath.; in 2 of 5 hosts examined.
LOCATION: Intestine.

HAPLOSPLANCHNIDAE

112. HAPLOSPLANCHNUS ACUTUS (Linton, 1910) Manter, 1937

HOSTS: *Strongylura raphidoma* (Ranzani), houndfish; in 4 of 10 hosts examined.
Linton reported this trematode from "*Tylosurus marinus,*" a species evidently

Strongylura timucu (Walbaum) (see Longley & Hildebrand, 1941: 28); and also from Bermuda in *Strongylura acus*. This trematode is also known from the Galapagos Islands and the Pacific Coast of Colombia.

113. HAPLOSPLANCHNUS ADACUTUS Manter, 1937

HOSTS: *Abudefduf marginatus* (Linn.), sergeant major; in 1 of 13 hosts examined. *Halichoeres bivittatus* (Bloch), slippery dick; in 6 of 36 hosts examined. *Halichoeres maculipinna* (Müller & Troschel); in one host examined.

LOCATION: Intestine.

114. HAPLOSPLANCHNUS BRACHYURUS Manter, 1937

HOSTS: *Cryptotomus auropunctatus* (Cuv. & Val.), parrot fish; in 2 of 15 hosts examined. *Pseudocarus guacamaia* (Cuv.), parrot fish; in 1 of 3 hosts examined. *Pseudoscarus coelestinus* (Cuv. & Val.), loro; in 1 of 4 hosts examined. *Sparisoma aurofrenatum* (Cuv. & Val.), parrot fish; in 1 of 3 hosts examined. *Sparisoma spinidens* (Guichenot), parrot fish; in one host examined. *Sparisoma viride* (Bonnaterre), parrot fish; in 2 of 4 hosts examined.

LOCATION: Intestine.

115. **Haplosplanchnus kyphosi** n. sp.

Figs. 91, 92

HOSTS: *Kyphosus sectatrix* (Linn.), white chub; type host; in 1 of 8 hosts examined. *Kyphosus incisor* (Cuv. & Val.), yellow chub; in 1 of 5 hosts examined.

LOCATION: Intestine.

Description (based on two specimens): Body elongate and slender, rounded at anterior end, tapering to a point posteriorly; unspined; length 2.700 to 3.564 mm, greatest width 0.525 to 0.712 mm, at level of acetabulum. Oral sucker subspherical, 0.420 mm in diameter or expanded (in the smaller specimen) to a diameter of 0.485 mm; acetabulum circular, 0.278 to 0.285 mm in diameter, with rounded aperture; sucker ratio 1:0.57 to 0.67 or about 3:2. Forebody about 1/3 body length. Very short prepharynx; pharynx 0.110 to 0.144 mm long by 0.105 to 0.134 mm wide; esophagus slightly shorter than pharynx; single cecum long, extending either to posterior edge of testis or halfway between testis and posterior end of body. Genital pore median about halfway between suckers. Testis single, subtriangular or elongate and irregular in shape, just posterior to midbody; posttesticular distance 0.810 to 1.390 mm, nearly as long as or longer than forebody. Cirrus or ejaculatory duct slender, inconspicuous; prostatic vesicle not observed; sinuous seminal vesicle extending not quite to midacetabular level. Ovary 3-lobed, near midbody, to the right, at right anterior edge of testis; Mehlis' gland large; seminal receptacle large, to left of ovary, just anterior to testis; uterus between Mehlis' gland and acetabulum; eggs rather wide and thick-shelled, 76 to 90 by 56 to 65 μ (Fig. 92). Vitelline follicles of varied shape, tending to become elongated, continuous in sides of body from level of esophagus to near posterior end of body, contiguous posterior to testis. Excretory pore terminal; excretory vesicle extending at least to testis, its bifurcation not observed, one branch of it extends slightly anterior to acetabulum.

Discussion: Eight species of *Haplosplanchnus* have been named: *H. pach-*

ysomus (Eysenhardt, 1829) Looss, 1902; *H. sparisomae* Manter, 1937; *H. obtusus* (Linton, 1910) Manter, 1937; *H. brachyurus* Manter, 1937; *H. pomacentri* Manter, 1937; *H. acutus* (Linton, 1910) Manter, 1937; *H. adacutus* Manter, 1937; and *H. purii* Srivastava, 1939. *H. kyphosi* is larger than most of these species and is more elongate. The type species, *H. pachysomus,* and *H. purii* have greatly reduced vitellaria limited to the region of the ovary. *H. sparisomae* is the only other species with lobed ovary and seems to be the most closely related species. It differs in body shape, sucker ratio (the acetabulum is 1.5 times the oral sucker), in extent of uterus, and in its very short posttesticular space. *H. kyphosi* is the seventh species in the genus collected at Tortugas. Two of these seven species occur in the Galapagos Islands. *H. pachysomus* has been reported from the Mediterranean and from Japan, *H. purii* from the Bay of Bengal and the Arabian Sea.

116. HAPLOSPLANCHNUS OBTUSUS (Linton, 1910) Manter, 1937

HOSTS: *Acanthurus coeruleus* Bloch & Schneider, blue tang; in 2 of 12 hosts examined. *Acanthurus hepatus* (Linn.), tang; in 0 of 6 hosts examined; recorded by Linton.

LOCATION: Intestine.

117. HAPLOSPLANCHNUS POMACENTRI Manter, 1937

HOSTS: *Pomacentrus leucostictus* Müller & Troschel, Beau Gregoire; in 18 of 31 hosts examined. *Pomacentrus xanthurus* Poey; in 3 of 13 hosts examined.

This species has been recorded from *Pomacentrus rectifraenum* from the Galapagos Islands.

118. HAPLOSPLANCHNUS SPARISOMAE Manter, 1937

HOSTS: *Sparisoma pachycephalum* Longley; in 3 of 12 hosts examined (=*S. flavescens* of Manter, 1937). *Sparisoma viride* (Bonnaterre); in 2 of 4 hosts examined.

MONORCHIDAE Odhner, 1911

119. GENOLOPA AMPULLACEA Linton, 1910

HOSTS: *Bathystoma striatum* (Cuv. & Val.); in 1 of 14 hosts examined. *Bathystoma rimator* (Jordan & Swain); in 1 of 3 hosts. *Brachygenys chrysargyreus* (Günther), bronze grunt; in 1 of 7 hosts examined. *Haemulon album* Cuv. & Val., margate fish; in 1 of 2 hosts examined. *Haemulon carbonarium* Poey, black grunt; in 1 of 2 hosts examined. *Haemulon flavolineatum* (Desmarest), french grunt in 5 of 11 hosts examined. *Haemulon macrostomum* Günther, Spanish grunt; in 1 of 6 hosts examined. *Haemulon plumieri* (Lacépède), common grunt; in 14 of 34 hosts examined. *Haemulon sciurus* (Shaw), yellow grunt; in 10 or 24 hosts examined. *Synodus foetens* (Linn.), lizardfish; in 1 of 7 hosts examined.

120. HURLEYTREMA CHAETODONI Manter, 1942

HOSTS: *Chaetodon capistratus* Linn., butterfly fish; in 1 of 2 hosts examined. *Chaetodon ocellatus,* butterfly fish; in 2 of 13 hosts examined.

121. HURLEYTREMA EUCINOSTOMI Manter, 1942

HOST: *Eucinostomus lefroyi* (Goode), mojarra; in 2 of 12 hosts examined.

122. MONORCHIS LATUS Manter, 1942

HOSTS: *Anisotremus virginicus* (Linn.), porkfish; in 2 of 4 hosts examined. *Haemulon* plumieri (Lacépède), common grunt; in 1 of 34 hosts examined.

123. PARAPROCTOTREMA BREVICAECUM Manter, 1942

HOST: *Caranx bartholomaei* Cuv. & Val., yellow jack; in 1 of 3 hosts examined.

124. POSTMONORCHIS ORTHOPRISTIS Hopkins, 1941

HOST: *Haemulon flavolineatum* (Desmarest), French grunt; in 1 of 11 hosts examined.

125. PROCTOTREMA LONGICAECUM Manter, 1940

HOST: *Anisotremus virginicus* (Linn.), porkfish; in 1 of 4 hosts examined. Also recorded from the Galapagos Islands from *Anisotremus interruptus*.

126. PROCTOTREMA TRUNCATUM (Linton, 1910) Manter, 1940

HOSTS: *Haemulon album* Cuv. & Val., margate fish; in 1 of 2 hosts examined. *Haemulon flavolineatum* (Desmarest), French grunt; in 5 of 11 hosts examined. *Haemulon plumieri* (Lacépède), common grunt; in 8 of 34 hosts examined. *Haemulon sciurus* (Shaw), yellow grunt; in 4 of 24 hosts examined.

127. PROCTOTREMA PARVUM Manter, 1942

HOST: *Haemulon flavolineatum* (Desmarest), French grunt; in 1 of 11 hosts examined.

BIVESICULIDAE

128. **Bivesicula hepsetiae** n. sp.

Fig. 93

HOST: *Hepsetia stipes* (Müller & Troschel), hardhead; present in 3 of 66 specimens examined; actual incidence doubtless much higher since these small trematodes are easily overlooked.

LOCATION: Intestine.

Description (based on 5 specimens): Body flattened, 0.586 to 0.620 mm by 0.315 to 0.399 mm, spined anteriorly; pigment granules dorsally at esophageal level. Mouth terminal; oral sucker slightly longer than wide, pharynx-like, 0.044 to 0.054 mm in transverse diameter. Esophagus up to twice length of oral sucker; pharynx lacking; ceca extending to level of anterior edge of testis about 1/3 body length from posterior end of body; genital pore median, a short distance posterior to midbody, at anterior border of testis. Testis single, somewhat variable in shape but unlobed, largely to left of midline, near posterior end of body. Cirrus sac inverted, that is, its basal end anteriormost, 0.150 to 0.195 mm long, its width about half its length, extending anterior to genital pore 2/3 or more of the distance to intestinal bifurcation; containing a spherical, internal seminal vesicle, a broad prostatic vesicle, large prostate gland, and cirrus; external seminal vesicle present. Ovary globular, pretesticular, to right of midline, opposite distal half of cirrus. Very small seminal receptacle present. Vitellaria of large follicles extending from level of intestinal bifurcation to anterior border of testis, confluent anterior to cirrus sac. Yolk reservoir large, between ovary and testis. Uterus extending to near posterior end of body, but only to posterior edge of testis or slightly

beyond; with few, large, yellowish eggs; eggs 74 to 82 by 40 to 46 μ. Excretory pore terminal; excretory vesicle V-shaped with branches extending to midesophageal level.

Discussion: The genus *Bivesicula* was named by Yamaguti in 1934. The family Bivesiculidae Yamaguti, 1938 is related to the Monorchidae. The following species of *Bivesicula* have been named: *B claviformis* Yamaguti, 1934; *B. synodi* Yamaguti, 1938; and *B. epinepheli* Yamaguti, 1938. The genus has been known hitherto only from Japanese waters.

B. hepsetiae differs from *B. epinepheli* in being approximately half as large, in that the oral sucker is markedly smaller in proportion to body width, in lack of pharynx, in longer esophagus, in anterior confluence of vitellaria, and in that the arms of the excretory vesicle do not reach the oral sucker level. It differs from *B. synodi* in that the vitellaria do not reach the level of the oral sucker, in smaller size, in possessing smaller eggs which are, however, larger in proportion to body size, and in that the uterus does not extend appreciably posterior to the testis.

B. hepsetiae is probably most similar to *B. claviformis* but differs in smaller oral sucker, more posterior testis with no eggs completely posterior to it, in less extensive vitellaria anterior to the citrus sac and in lack of pharynx.

The name *hepsetiae* is for the host.

A single specimen of a trematode also collected from *Hepsetia stipes* is probably another species of *Bivesicula*. Its eggs were all highly abnormal and since no additional specimens were available, its destription is not attempted. It is larger, has a longer esophagus, and a more posterior uterus.

GORGODERIDAE Looss, 1901

129. **Phyllodistomum carangis** n. sp.

Fig. 94

HOST: *Caranx ruber* (Bloch), runner, or jack; in 1 of 6 hosts examined; 1 specimen.
LOCATION: Recovered from washing of body cavity; original location probably the urinary bladder.

Description: Length 8.061 mm; width at level of genital pore 2.639 mm; the sides of posterior portion of the body folded over dorsally during killing; the body normally widens at about acetabular level. Body very thin, delicate and leaf-like; ventral surface covered throughout with small papillae, dorsal surface smooth. Oral sucker 0.686 mm in diameter; acetabulum 0.537 mm in diameter; sucker ratio about 1:0.8. Forebody 2.529 mm. Pharynx lacking; esophagus 0.474 mm long; intestinal ceca inconspicuous extending to about 1.9 mm. from posterior end of body. Genital pore median, midway between acetabulum and intestinal bifurcation. Testes very small, round, with no sign of lobing, diagonal, far apart, separated by uterus, 0.255 mm in diameter; posterior testis 2.09 mm from posterior end of body and 0.728 mm posterior to anterior testis. Seminal vesicle globular, 0.438 mm in transverse diameter, anterior to genital pore. Ovary 0.401 mm posterior to acetabulum, ovoid

and slightly irregular in shape, to right of median line, directly to the right of the right vitelline gland. Vitelline glands a short distance posterior to acetabulum, close together, each deeply lobed to give a tripartite, anchor-like appearance. Mehlis' gland immediately anterior to vitellaria. Uterus in slender coils, almost wholly intercecal, extending posteriorly to a point 1.456 mm from posterior end. Eggs 32 to 36 by 19 to 22 μ. Excretory pore dorsal, 0.416 mm from posterior end of body. No posterior notch of the body.

Comparisons: The genus *Phyllodistomum* is a very large one. Most species are from Amphibia or fresh-water fishes. Lewis (1935) clarified much of the developing confusion regarding the genus. *P. cavangis* seems to be most similar to *P. acceptus* Looss, 1901 from *Crenilabrus* (=*Bodianus*) from Egypt. It differs in more posterior genital pore, more anterior excretory pore, shorter esophagus, more rounded testes, more anterior acetabulum and slightly smaller eggs. It differs from *P. americanum* in being much larger, in its very much smaller and more elongate eggs, in unlobed testes, and other characters.

130. XYSTRETRUM SOLIDUM Linton, 1910

SYNONYMS: *Catoptroides magnum* MacCallum, 1917;* *Catoptroides aluterae* MacCallum, 1917;* *Xystretrum papillosum* Linton, 1910;* "Undetermined trematode" from *Balistes carolinensis* of Linton, 1907, p. 119.

HOSTS: *Balistes capriscus* Gmelin (=*Balistes carolinensis*); leatherjacket, triggerfish; in 1 of 3 hosts examined; 2 specimens. *Lactophrys triqueter* (Linn.), trunkfish; in 1 of 5 hosts examined; specimens very numerous (over 100).

LOCATION: Urinary bladder.

Discussion: If the above synonymy is correct, this species was first collected from *Balistes capriscus* in Bermuda by Linton; later from the same host from Key West by MacCallum; from *Alutera schoepfii*, the orange filefish, from Key West by MacCallum.

Linton's original description from a single, somewhat curled, specimen is not very complete. Were it not from the same host as later collections it might be considered a distinct species on the basis of sucker ratio and shape of vitellaria. I believe his specimen was not favorable to show the normal or at least the common condition of those organs.

MacCallum (1917) considered *Xystretrum* a synonym of Catoptroides and distinguished both of his species from *X. papillosum* because they lacked spines and the ventral transverse striae. He gave no figure of "*C. aluterae*" which he distinguished from "*C. magnum*" because of its smaller size and "more delicate" structure.

Through the kindness of Dr. E. W. Price and the National Museum, MacCallum's slides of these species were made available for study. There was some error in the labeling of the three slides but since only one species seems to be involved the point is not important. One slide labeled "*Distomum-Xystretrum papillosum*—urinary bladder-*Alutera schoepfii*—filefish," has four

* New synonymy.

specimens, three of them about 6 mm in length, the other about 4 mm. It is not certain that the slide labeled *Xystretrum papillosum* from *Alutera schoepfii* is the same material on which MacCallum based his species. The specimens measure 4 to 6 mm in length or larger rather than smaller than the specimens from *Balistes*. Size can apparently be ruled out as a distinction between the species since MacCallum's specimens from *Balistes* ranged from 3.5 to 5.4 mm, the published size of the species from *Alutera* was 3.4 mm and actual specimens measure above that figure. Two other slides were labeled *"Catoptroides balistes"* (a name apparently not published) from *Balistes carolinensis,* evidently MacCallum's *Catoptroides magnum;* the 15 specimens measured 3.5 to 5 mm in length.

Traces of the hair-like spines and of the ventral striae could be seen on some of MacCallum's specimens from both hosts. These peculiar, fine spines can be easily lost and the striae can be made invisible by too much pressure and over-clearing. My conclusion is that MacCallum was dealing with a single species of the genus *Xystretrum*. *Xystretrum* is related to *Catoptroides* but is characterized by: (1) continuous intestinal ceca; (2) hair-like spines; and (3) transverse, ventral striae.

It is difficult to distinguish species of *Xystretrum* because of extreme variation especially in body size, egg size, and shape of vitellaria. The thin-shelled eggs are frequently malformed in my specimens. Measurements of eggs in MacCallum's largest specimen from *Alutera* were (in microns): 46 by 27; 44 by 29; 48 by 29; 39 by 22; and 29 by 19! In another specimen the eggs were consistently 31 to 34 by 19 to 20 μ. Eggs in specimens from *Balistes* were 41 to 42 by 24 to 27 μ.

My two specimens from *Balistes* were somewhat larger (2.993 to 3.112 mm) than those from *Lactophrys* (about 1.825 to 2.628 mm) and had a much more extensive uterus. But the small size and reduced uterus of the latter might well be due to the extremely heavy infection. Linton's single specimen from *Lactophrys* was 3.5 mm. long with well developed uterus. Sucker ratio as measured from favorable specimens might be a character of specific value in this genus. This ratio is 1:1.5 in both my specimens from *Balistes* and 1:1.5 to 1.86 (usually 1.55 to 1.76) in 14 specimens from *Lactophrys*. My specimens from *Balistes* had 49 to 51 ventral striae, while the smaller specimens from *Lactophrys* had 38 to 42 striae.

131. **Xystretrum pulchrum** (Travassos, 1921) n. comb.

Fig. 95

SYNONYM: *Macia pulchra* Travassos, 1921.

HOST: *Sphoeroides splengeri* (Bloch), puffer; in 2 of 36 hosts examined; 9 specimens.

LOCATION: Urinary bladder.

Discussion: Travassos (1921) named *Macia pulchra* from the urinary bladder of a puffer, *Sphoeroides testudineus* (Linn.) from Brazil. His figure and description agree with my specimens except that he does not mention the hair-like spines or the ventral striae, but these structures might be lost or difficult to detect. The species is very similar to *X. solidum* but has a differ-

ent sucker ratio, and the posterior portion of the body does not widen so abruptly. Sucker ratios on 8 specimens were 1: 1.30; 1.37; 1.37; 1.38; 1.40; 1.43; 1.45; and 1.5. Travassos states that the average sucker measurements are 0.49 and 0.71 mm, a ratio of 1:1.46 but his figure shows a much smaller ratio. In my specimens of *X. solidum* the ratio is consistently higher although may be as small as 1:1.5. Normal eggs in a single specimen of *X. pulchrum* vary from 41 by 20 μ to 51 by 42 μ. Some of them hatch in the uterus.

Megaperidae n. nom.

In 1933, the author named a new family, Euryperidae for the genera *Eurypera* Manter, 1933 and *Thysanopharynx* Manter, 1933. The generic name *Eurypera* was preoccupied and was changed to *Megapera* (Manter, 1934). The note of correction did not actually state the name Megaperidae which would automatically replace Euryperidae. One recombination of names was also omitted: *Megapera orbicularis* (Manter, 1933) n. comb., synonym: *Eurypera orbicularis*.

This family, with its 5 species, has not yet been reported other than from Tortugas and Bermuda. Although I compared these trematodes with the Lepocreadiinae, there are some similarities to the Cryptogonimidae; for example, the symmetrical testes, lack of cirrus sac, large ceca, and general appearance of the oral sucker. However, the ani, the body spines, the shape of the pharynx, and the shape of the excretory vesicle suggests relationship to *Bianium* (of the Lepocreadiidae).

Four of the five species occur in the intestine of a trunkfish recorded (Manter, 1933) as *Lactophrys quadricornis*. The name *Lactophrys tricornis* (Linn.) is used here in accordance with Longley & Hildebrand (1941).

132. MEGAPERA GYRINA (Linton, 1907) Manter, 1934

HOST: *Lactophrys tricornis* (Linn.), trunkfish; in 4 of 28 hosts examined.
Linton records it from *L. trigonus* at Bermuda.

133. MEGAPERA ORBICULARIS (Manter, 1933) Manter, 1934

HOST: *Lactophrys tricornis* (Linn.), trunkfish; in 1 of 28 hosts examined.

134. MEGAPERA OVALIS (Manter, 1933) Manter, 1934

HOST: *Monacanthus hispidus* (Linn.), filefish; in 2 of 28 hosts examined.

135. MEGAPERA PSEUDURA (Manter, 1933) Manter, 1934

HOST: *Lactophrys tricornis* (Linn.), trunkfish; in 4 of 28 hosts examined.

136. THYSANOPHARYNX ELONGATUS Manter, 1933

HOST: *Lactophrys tricornis* (Linn.), trunkfish; in 9 of 28 hosts examined.

CRYPTOGONIMIDAE Ciurea, 1933

137. SIPHODERA VINALEDWARDSII (Linton, 1899) Linton, 1910

HOST: *Ocyurus chysurus* (Bloch), yellowtail; in 2 of 47 hosts examined.
LOCATION: Intestine.

This trematode seems to be much less common at Tortugas than at Woods Hole, Massachusetts or at Beaufort, North Carolina.

Genus METADENA Linton, 1910

Linton was correct in noting similarity between *Stegopa* and *Siphodera.* It is now well known, however, that the "genital sucker" described by Linton is an acetabulum and that his family Siphoderidae is unfounded. Following his description of *Stegopa globosa,* Linton named the genus *Metadena* with a single species, *M. crassulata.* He did not distinguish between the two genera. *M. crassulata* is considerably larger than *Stegopa* but the two agree in all important characters. Price (1940) concluded that the two genera were identical and listed *Stegopa* as a synonym of *Metadena.* Although *Stegopa* has page precedence over *Metadena,* Price's selection of *Metadena* does not violate the Rules of Nomenclature.

The genus *Siphoderina* Manter, 1934 was described as similar to *Siphodera* except that it possessed two rather than nine testes. It is thus very similar to *Metadena* and in particular to *M. crassulata.* The separation of vitelline follicles into two more or less lateral groups is certainly not generic since it appears in some specimens of *M. crassulata. Siphoderina* is here considered a synonym of *Metadena.**

The following diagnosis for *Metadena* is proposed:

Generic Diagnosis of Metadena: Oral sucker much larger than acetabulum, often retractile into anterior end of body. Acetabulum small, embedded within a depression of the body wall often more or less clearly marked by a rim. Gonotyl absent. Intestinal ceca extending posterior to testes. Testes two, symmetrical, near midbody level; seminal vesicle tubular, free in parenchyma. Ovary deeply lobed, ventral, between testes or overlapping them ventrally; vitelline follicles preovarian, dorsal, forming or tending to form a band across the body in acetabular region. Seminal receptacle present. Excretory vesicle Y-shaped with arms reaching to pharyngeal region. Type species: *Metadena crassulata* Linton, 1910. Other species: *Metadena globosa* (Linton, 1910) n. comb., synonym: *Stegopa globosa* Linton, 1910** *Metadena pagrosomi* Yamaguti, 1938; *Metadena brotulae* (Manter, 1934) n. comb., synonym: *Siphoderina brotulae* Manter, 1934; *Metadena microvata* Tubangui, 1928.

Discussion: Yamaguti (1938) classified *Metadena* in the family Heterophyidae, but Price's conclusion to include it in the family Cryptogonimidae, subfamily Cryptogoniminae, is followed here. Price (1940) separated the Cryptogonimidae from the Heterophyidae primarily on the long crura of the excretory vesicle which reach only to the ovary in the Heterophyidae. Distinction between the various subfamilies is, as Price noted, much less certain. The subfamily Siphoderinae Manter, 1934 does not seem justified, and *Siphodera* can well be included in the Cryptogoniminae.

The status of the genus *Siphoderoides* Manter, 1940 must depend on

* New synonymy.

** Price (1940) did not make the combination implied by his synonymy of the genera.

reexamination of the type specimen to determine the anterior extent of the crura of the excretory vesicle.

Srivastava (1937) named the genus *Mehracola* with type species *M. ovocaudatum* from an unnamed Indian, marine, food fish. The genus possessed several unusual features such as extracecal testes with lobed outer margins, and eggs with unipolar filament. In 1939, Srivastava named a genus *Mehrailla* with type species *M. ovocaudatum* and with the characteristics of *Mehracola*. In a footnote he stated, without comment, that *Mehracola* Sriv., 1937 was a synonym of *Mehrailla*. Since the earlier name was accompanied by a clear diagnosis and compared with related genera, it must hold priority over *Mehrailla*. *Mehrailla* is thus a synonym of *Mehracola*.* It might be pointed out that according to Article 32 of the International Rules of Zoological Nomenclature, "a generic or a specific name, once published, cannot be rejected, even by its author, because of inappropriateness." This genus was listed in the subfamily Cryptogoniminae by Price (1940:10).

138. METADENA CRASSULATA Linton, 1910
Figs. 96, 97

HOST: *Lutianus analis* (Cuv. & Val.), muttonfish; in 1 of 8 hosts examined.
LOCATION: Intestine.

Discussion: These specimens of *M. crassulata* are those referred to by Manter (1934:327) as a species of *Siphoderina*.

Six specimens measured 0.960 to 1.719 mm in length. The acetabulum is embedded in the body and the genital pore opens into the acetabular depression (Fig. 97) as in *Siphodera*. Traces of eye-spot pigment are present but sparse. A cirrus sac is lacking; a seminal receptacle present. The vitelline follicles are often continuous across the body dorsally, but may not quite meet medianly. Eggs were 16 to 18 by 9 to 10 μ. The excretory vesicle is Y-shaped, forking just posterior to the testes with crura reaching to near the anterior end of the body.

139. METADENA GLOBOSA (Linton, 1910)
Figs. 98, 99

HOST: *Lutianus griseus* (Linn.), gray snapper; 2 specimens in 1 of 23 hosts examined.
LOCATION: Intestine.

Description: This species was incompletely described by Linton. The following description is based on two specimens considered to be the species named by Linton.

Length 0.600 mm, width 0.465 to 0.487 mm; body spined, little tapering and very broadly rounded or truncated at each end. Traces of eye-spot pigment very sparse. Oral sucker short but very wide, 0.277 to 0.300 mm in diameter or well over 1/2 body width, withdrawn into anterior end of body which is thrown into rim-like circular folds; mouth directed anteriorly. Acetabulum 0.068 mm in diameter, embedded within a muscular depression with circular

* New synonymy

rim. Sucker ratio 1:0.227 to 0.245. Forebody 0.153 to 0.262 mm. Short prepharynx, pharynx 0.088 to 0.099 mm wide by 0.065 to 0.073 mm long; very short esophagus; wide ceca extend slightly beyond testes. Testes rounded; two; symmetrical, not far apart; seminal vesicle inconspicuous, not extending appreciably anterior to acetabulum. Genital pore within the acetabular depression. Ovary multilobed, lobes often appear separated, about 13 lobes in one specimen but only 7 in the other; ovary overlapping testes ventrally. Seminal receptacle between testes, sharply bent C-shaped. Vitelline follicles in a band across the body dorsally just anterior to gonads, about at acetabular level. Uterus filling most of body and extending well anterior to acetabulum on each side, lying ventral to vitellaria; eggs 14 to 15 by 8 to 9 μ.

Discussion: I have concluded that two species of *Metadena* occur in the gray snapper at Tortugas, and that Linton probably had both in his collection. One cannot be certain which of these species should be considered *M. globosa* but Linton's first measurements and his figures seem to be the species described above, while his second measurements with much larger egg size may have been the second species described below. Distinguishing characters of *M. globosa* are: diameter of oral sucker more than half body width; uterus extending anterior to acetabulum; egg size; and relatively large pharynx.

140. **Metadena adglobosa** n. sp.

Fig. 100

HOST: *Lutianus griseus* (Linn.), gray snapper; in 2 of 23 hosts examined.
LOCATION: Intestine and ceca.

Description (based on 5 specimens): Length 0.502 to 0.712 mm, width 0.315 to 0.502 mm. Body spined; granules of eye-spot pigment present to varying degrees. Oral sucker short and wide, retractile into anterior end of body; mouth anterior. Since the posterior end of the body is more or less truncate, the entire shape of the body resembles that of an urn with an anterior rim within which the oral sucker rests like a lid. Diameter of oral sucker 0.090 to 0.170 mm. Acetabulum very small and weak, withdrawn into a circular depression which opens on the ventral surface through a small, irregularly shaped opening. Acetabulum 0.029 to 0.034 mm in diameter. Sucker ratio variable, 1:0.15 to 0.40. Forebody 0.112 to 0.170 mm or about 1/4 body length. Short prepharynx present; pharynx 0.025 to 0.042 mm wide, slightly longer than wide. Ceca extending posterior to testes up to about halfway between testes and posterior end of body. Testes rounded, symmetrical, not far apart, about at midbody level; seminal vesicle coiled, extending both posterior and anterior to acetabulum, as far forward as pharynx. Ovary median, between testes and overlapping them ventrally, deeply lobed to form 3 to 7 lobes. Vitelline follicles forming a band across the body between acetabulum and gonads, dorsal to ceca; uterus filling most of body but not extending anterior to acetabulum. Genital pore within the acetabular depression. Eggs 17 to 20 by 9 to 12 μ. Excretory system not observed.

Discussion: This species is easily confused with *M. globosa* from the same host. Its body is more elongate; the oral sucker is considerably less than half body width; the ovary has fewer lobes; the uterus does not extend anterior to

the acetabulum; the seminal vesicle has coils anterior to the acetabulum; and the eggs are somewhat larger than those of *M. globosa.* Linton (1910:76) lists a specimen of *M. globosa* with eggs 20 by 13 μ. It might have been *M. adglobosa* but Linton did not mention the size of the oral sucker.

141. METADENA BROTULAE (Manter, 1934)

HOSTS: *Brotula barbata* (Bloch & Schneider); 70-140 fath.; in 1 host examined.
Lophius piscatorius Linn.; 55 fath.; in 1 of 2 hosts examined.

LOCATION: Intestine.

HEMIURIDAE

142. HEMIURUS sp. of Manter, 1934

HOST: *Peristedion imberbe* Poey; 100 fath.; in 1 of 16 hosts examined.

LOCATION: Stomach.

No further study of this specimen has been made. It is included here as a species previously recorded from Tortugas.

143. PARAHEMIURUS MERUS (Linton, 1910) Woolcock, 1935

SYNONYMS: *Hemiurus merus* Linton, 1910; *Parahemiurus parahemiurus* Vaz & Pereira, 1930; *P. platichthyi* Lloyd, 1938; *P. atherinae* Yamaguti, 1938; *P. harengulae* Yamaguti, 1938.

HOSTS: *Abudefduf saxatilis* (Linn.), sergeant major; in 1 of 13 hosts examined. *Harengula macroththalma* (Ranzani), sardine; in 16 of 33 hosts examined. *Ocyurus chrysurus* (Bloch),* yellowtail; in 2 of 47 hosts examined. *Synodus foetens* (Linn.),* lizardfish; in 1 of 7 hosts examined. *Trachurops crumenophthalma* (Bloch),* goggle-eye jack; in 1 of 5 hosts examined.

LOCATION: Stomach.

Discussion: Linton recorded this species from *"Clupanodon pseudohispanicus"* which is probably the same host recorded above as *Harengula macrophthalma.* Manter (1940:417-419) added a few details to the description of the species.

Dawes (1946:257-258) considers *Parahemiurus* a synonym of *Hemiurus,* and that the undivided seminal vesicle is inadequate as a generic distinction. The recognition of a genus on such a single character is perhaps more or less an arbitrary matter. Yet the description and figures of Looss, Odhner, and others indicate that European species including the type *H. appendiculatus,* and in Japan, *H. odhneri and H. arelisci,* all possess a distinctly bipartate seminal vesicle. Species of *Parahemiurus* have a seminal vesicle that is never bipartite and usually has a thick muscular wall. Some species of *Hemiurus* have a thick wall around the anterior portion of the seminal vesicle while the posterior portion corresponds to an external seminal vesicle, a generic character in some Lepocreadiidae. Divisions of the seminal vesicle clearly distinguish *Dinurus* and *Ectenurus* from some related genera, yet the divisions are indistinct in *Tubulovesicula* (see p. 349). Other species of *Parahemiurus* are: *P. australis* Woolcock, 1935; *P. anchoviae* Pereira & Vaz, 1930; *P.*

* New host record.

sardinae Yamaguti, 1934; *P. seriolae* Yamaguti, 1934; and *P. ecuadori* Manter, 1940.

144. Anahemiurus microcercus n. gen., n. sp.

Figs. 102, 103

HOSTS: *Calamus bajonado* (Bloch & Schneider), grass porgy; in 1 of 15 hosts examined. *Calamus calamus* (Cuv. & Val.), saucer-eye porgy; in 4 of 20 hosts examined. *Eucinostomus lefroyi* (Goode), mojarra; type host; in 2 of 12 hosts examined; numerous specimens.

LOCATION: Stomach and intestine.

Description: Body small, elongate-oval, plump, almost equally wide along most of its length; 0.375 to 0.926 by 0.150 to 0.331 mm. The 0.375 mm specimen filled with eggs. Cuticula with large, conspicuous scales not clearly arranged in rows; scales present dorsally on the forebody and ventrally on the postacetabular part of body, sparse and widely separated or absent on dorsal surface of hindbody; sometimes reduced (by loss ?) to a few scales posterior to acetabulum. Oral sucker 0.036 to 0.070 mm in diameter; forebody 0.085 to 0.187 mm or about 1/4 to 1/5 body length. Acetabulum 0.082 to 0.174 mm in diameter. Sucker ratio 1:2.16 to 2.48. Ecsoma very small, retracted or partially extended (perhaps due to pressure in killing), about 1/8 to 1/10 body length.

Genital pore ventral to oral sucker, near mouth. Testes oblique but almost symmetrical, immediately postacetabular, wider than long, often overlapping medianly. Seminal vesicle a thick-walled, muscular, ovoid sac, with posterior end almost in contact with testes, is size 0.042 to 0.116 by 0.022 to 0.062 mm, or 1/8 to 1/11 body length. Pars prostatica a long, almost straight tube extending to level of bifurcation of ceca. Genital sinus tubular, long. Ovary ovoid, wider than long, immediately behind midbody, separated from testes by uterus. Vitellaria consisting of two large, compact, unlobed masses, almost or quite meeting medianly, immediately postovarian. A small, spherical seminal receptacle surrounded by gland cells is present, but it usually appears empty while sperm cells may occur within the uterus. Uterus extending to posterior end of body. Eggs 19 to 28 by 10 to 12 μ (29 by 13 μ in a live specimen). Egg size is not correlated with body size as the largest eggs were in the smallest specimens. Excretory vesicle forking just posterior to acetabulum; the crura uniting dorsal to pharynx.

Slight differences were noted in the specimens from the two hosts. Those from *Calamus calamus* were somewhat smaller, had fewer body scales, and larger eggs.

Generic Diagnosis of Anahemiurus: Hemiuridae of small size; body with few to many conspicuous scales rather than annular denticulations. Ecsoma present but small. Genital pore opposite oral sucker. Seminal vesicle posterior to middle of acetabulum, thick-walled, ovoid and undivided; pars prostatica long, not coiled; ductus hermaphroditicus fairly long and straight. Ovary posterior to midbody, posttesticular, ovoid; vitellaria consisting of two large, compact, unlobed, postovarian masses. Seminal receptacle present but sperm cells occur in uterus. Type species: *Anahemiurus microcercus.*

The name *Anahemiurus* is from *an,* near; and *hemiurus,* referring to similarity to *Hemiurus.*

This genus is like *Parahemiurus* notably in the reproductive organs, but differs in possessing scales rather than annular denticulations. In possessing scales it is like *Dinosoma* but differs in shape of seminal vesicle, the pars prostatica, and in unlobed vitellaria.

Genera LECITHOCHIRIUM Lühe, 1901 and STERRHURUS Looss, 1907

Looss (1907) distinguished *Lecithochirium* from *Sterrhurus* on the basis of the muscular elevations on the inner surface of the oral sucker; the presence of a preacetabular pit; and highly muscular preoral lip. Species added to the two genera since 1907 tend to weaken these generic differences. It seems clear now that the oral elevations or arches constitute a specific rather than a generic character. Jones (1943:56) concluded that all of the characters proposed to separate the genera occur in varying degree and "seem to be features of no more than specific value". She did not, however, definitely reduce *Sterrhurus* to a synonym of *Lecithochirium,* but suggested that further descriptive work on the species involved was needed. Crowcroft (1946) agreed in the non-generic value of characters previously used and redefined the genera on the basis of the character of the "prostatic vesicle" or swelling of the male tube in the basal portion of the sinus sac. This vesicle can represent an expanded portion of the pars prostatica in which case it is lined with clear, rather large, thin-walled cells as is the portion outside the sinus sac; or it can represent an expanded portion of the ejaculatory duct in which case it lacks the thin-walled cells and has a wall different from that of the pars prostatica. Crowcroft applies the term "ejaculatory vesicle" to the latter, retaining the term "prostatic vesicle" for the former. According to Crowcroft, the presence of the ejaculatory vesicle characterizes the genus *Sterrhurus,* while *Lecithochirium* has the prostatic vesicle. On this basis he transferred *S. fusiformis, S. floridensis,* and *S. laevis* to the genus *Lecithochirium.* His species, *S. macrorchis* Crowcroft, 1946, like *S. magnatestis* Park, 1936, has the ejaculatory vesicle. Evidently the character of this vesicle is not always correlated with the presence of the preacetabular pit.

The manuscript for this paper was sent to the publishers before Crowcroft's paper was received. The following revision of the two genera is based chiefly on the presence or absence of a preacetabular pit. Other possible generic characters are: the loose or open nature of the sinus sac; or the character of the male vesicle within the sac. It seems clear that certain species *(S. laevis, S. profundus, S. robustus)* should be removed from either genus. The disposition of the remaining species in *Sterrhurus* and *Lecithochirium* is still not clear and the following revision is not a result of a very strong conviction. The characters mentioned above are not easily determined in some cases although they are evident in most. Thus, when the sinus sac is rudimentary, as in a *Lecithochirium* species described below, neither prostatic nor ejaculatory vesicle can be seen.

In some species of *Lecithochirium* the preacetabular pit is muscular or glandular and conspicuous; in others it is very inconspicuous and has been

overlooked rather frequently. The difficulty is increased by the fact that *Sterrhurus* specimens may show a ventral concavity of the forebody or may be so bent as to produce folds in the forebody. Also, in *Lecithochirium,* the pit may be concealed by bending or twisting of the forebody or by being overlapped by the acetabulum. The determination of the preacetabular pit depends upon observation of a rounded or oval pore-like opening with a more or less distinct outline. Crowcroft's description of "a deep transverse groove, the preacetabular pit" might have been a cuticular fold.

Most species of *Lecithochirium,* including the type, *L. rufoviride* (Rud., 1819) Lühe, 1901, have a very weakly developed sinus sac consisting of a few strands of fibers rather than a distinct, complete wall. Some species, however, such as *L. microstomum, L. muraenae,* and *L. synodi* possess a definite sinus sac inclosing the ductus hermaphroditicus and a more or less spherical vesicle (prostatic vesicle, according to Crowcroft).

The following species of *Lecithochirium* have been named: *L. acutus* Chauhan, 1935; *L. caudiporum* (Rud., 1819) Lühe, 1901; *L. conviva* Lühe, 1901; *L. dillanei* Nicoll, 1918; *L. exodicum* McFarlane, 1936; *L. gravidum* Looss, 1907; *L. japonicum* Yamaguti, 1938; *L. magnaporum* Manter, 1940; *L. medius* Acena, 1941; *L. microstomum* Chandler, 1935; *L. muraenae* Manter, 1940; *L. physcon* Lühe, 1901; *L. polynemous* Chauhan, 1935; *L. rufoviride* (Rud., 1819) Lühe, 1901; *L. synodi* Manter, 1931.

L. copulans (v. Linst., 1904) Odhner, 1906 is a synonym *of L. caudiporum* according to Looss (1907). *L. digitatum* (Looss, 1899) Lühe, 1901 is type of the genus *Plerurus* Looss, 1907.

L. physcon and *L. conviva* are inadequately described and not figured, hence cannot be critically compared with other species. *L. dillanei* from a sea snake (evidently an abnormal host) is an uncertain species; the preacetabular pit was not described. I consider *L. medius** a synonym of *L. exodicum.* Both occur in *Sebastodes* species at Friday Harbor, Washington and they agree in practically all details except the more sinistral genital pore and slightly larger eggs of *L. medius.* Incidentally, most of the *"Lecithochirium"* species listed by Acena (1941) are actually species of *Lecithocladium.*

L. polynemous and *L. acutus* are from Indian fishes. The endings of these specific names do not follow the Rules of Nomenclature; *polynemous* (listed twice by Chauhan as *"polynemus")* evidently was intended to refer to the host and should be *"polynemi"; "acutus"* should be *acutum.* Both species are very large in size; one *(L. acutum)* has a "nipple-shaped" preoral lobe; and both are described as having a seminal receptacle, which, however, is not shown in the figures. These characters suggest the genus *Ceratotrema* Jones, 1933 described as differing from *Lecithochirium* in the bifid form of the preoral lip, larger size, and three projections into the oral sucker. These elevations into the oral sucker occur in *L. rufoviride* and in *L. gravidum.* A seminal receptacle is not mentioned in most descriptions of *Lecithochirium* species. In *L. synodi* a functional seminal receptacle is probably lackng; there is a small sac-like swelling of the oviduct within Mehlis' gland but sperm cells abound in the early coils of the uterus; Laurer's canal is lacking. It seems to me that *Cera-*

* New synonymy.

totrema Jones, 1933 should be considered a synonym of *Lecithochirium* and its species becomes *L. furcolabiatum* (Jones, 1933) n. comb.

145. Lecithochirium mecosaccum n. sp.

Fig. 104

HOSTS: *Synodus foetens* (Linn.), lizard fish; in 5 of 7 hosts examined; rather numerous specimens. *Synodus poeyi* Jordan, lizard fish; in 1 host examined.

LOCATION: Stomach.

Description (measurements are from 5 specimens): Length of body alone 1.35 to 1.920 mm ecsoma retracted or extended; width of body 0.502 to 0.577 mm. Oral sucker 0.127 to 0.135 mm; acetabulum about 1/3 body length from anterior end, 0.262 to 0.270 mm; sucker ratio in all specimens 1:2. Preacetabular pit inconspicuous, non-glandular. Pharynx 0.051 to 0.060 mm long by 0.051 to 0.068 mm wide. Ceca do not enter ecsoma. Genital pore a large, transverse slit opposite base of pharynx. Testes immediately postacetabular, slightly diagonal or symmetrical. Seminal vesicle extending from anterior edge of acetabulum which it may overlap as much as anterior third; tripartite; pars prostatica short; external prostatic vesicle not observed. Sinus sac very large; straight or slightly curved; containing a large, spherical, internal ejaculatory vesicle and a long, very muscular ductus hermaphroditicus. The sinus sac measures 0.170 to 0.300 mm in length and is only slightly wider near its base due to clear vesicular spaces on each side of the ductus hermaphroditicus. The ratio of length of sinus sac to diameter of the acetabulum is 1:0.77 to 1.5. Ovary not far posterior to testes; vitelline glands with broad, often indistinct lobes much wider than long; uterus with numerous coils posterior to ovary which do not enter ecsoma (except in one specimen where the condition was probably due to pressure in killing). Eggs are 14 to 16 by 8 to 9 μ.

Comparisons: This species is to be recognized by its very broad vitelline lobes and very large sinus sac which distinguish it from *L. synodi*. The sucker ratio of 1:2 is most like *L. caudiporum, L. gravidum,* and *L. magnaporum*. It differs from *L. caudiporum* (= *L. copulans)* in much smaller eggs, in size of sinus sac, posterior extent of seminal vesicle, and development of the ejaculatory vesicle. It differs from *L. gravidum* in smaller size, shorter vitelline lobes, and in size of the sinus sac (which is only a fraction of the diameter of the acetabulum in *L. gravidum). L. magnaporum* has a very different sinus sac and longer vitelline lobes. Since the vesicle in the sinus sac is an ejaculatory vesicle rather than a prostatic vesicle, the species would be considered in the genus *Sterrhurus* if this character rather than the preacetabular pit were the criterion.

146. LECITHOCHIRIUM MICROSTOMUM Chandler, 1935

HOSTS: *Ancylopsetta dilecta* (Goode & Bean),* flounder; from 100 fathoms; in 3 of 8 hosts examined. *Promicrops itaiara* (Lichtenstein),* jewfish; in 1 of 4 hosts examined. *Tarpon atlanticus* (Cuv. & Val.),* tarpon; in 1 of 3 hosts examined.

LOCATION: Stomach.

* New host record.

Discussion: The additions to the description of *L. synodi* made below make that species very similar to *L. microstomum*. Chandler's description does not mention the sinus sac and it is rather indistinct in his figure. If his specimens actually have the incomplete or open type of sinus sac, then the above specimens and those identified by Manter (1940) from the Galapagos Islands belong to a different species.

The specimen from the tarpon was 2.4 mm long, had a sucker ratio of 1:2.5, and eggs 18 to 19 by 10 to 11 μ. It is identified as *L. microstomum* partly because the eggs are wider than those of *L. synodi* and the sinus sac is more pyriform. The specimens from the jewfish were from 1.687 to 2.437 mm long, with sucker ratio of 1:2.7, and eggs 18 to 19 by 10 to 11 μ. In these also the sinus sac was strongly pyriform with a ratio to acetabular diameter of 1:3.66, somewhat above that of *L. synodi*.

147. LECITHOCHIRIUM sp. of Manter, 1934

HOST: *Urophycis regius* (Walbaum); 200 to 220 fath.; in 1 of 8 hosts examined
LOCATION: Stomach.

This trematode is probably the same species as the one listed above as *L. microstomum*.

148. **Lecithochirium parvum** n. sp.

Figs. 105-107

HOSTS: *Epinephelus striatus* (Bloch), Nassau grouper; in 1 of 6 hosts examined. *Euthynnus alletteratus* (Rafinesque), little tunny, bonito; type host; in 1 of 3 hosts examined. *Diplectrum formosum* (Linn.), squirrel fish; in 10 of 21 hosts examined. *Polymixia lowei* Günther, barbudo; in 1 of 1 host examined; 140-197 fathoms. *Priacanthus arenatus* Cuv. & Val., big-eye; in 2 of 3 hosts examined. *Prionodes* species; in 2 of 15 hosts examined; 50 fathoms. *Priacanthus cruentatus* (Lacépède), big-eye in 2 of 3 hosts examined. *Pseudupeneus maculatus* (Bloch), red goatfish; in 2 of 20 hosts examined. *Synodus foetens* (Linn.), lizardfish; in 3 of 7 hosts examined.
LOCATION: Stomach.

Description (based on 35 specimens): Small-sized; length 0.525 to 1.215 mm; greatest width 0.150 to 0.270 mm. Ecsoma always retracted. Preacetabular pit inconspicuous, weakly muscular, usually with anterior lip better developed; non-glandular. Oral sucker 0.071 to 0.112 mm in diameter, without internal elevations; acetabulum 0.165 to 0.225 mm; sucker ratio 1:1.95 to 2.4. Forebody 0.135 to 0.225 mm or approximately the same as the diameter of the acetabulum. Pharynx subglobular 0.032 to 0.042 mm long by 0.032 to 0.049 mm wide. Ceca do not enter ecsoma. Genital pore more or less median, opposite pharynx. Testes globular, immediately postacetabular, diagonal but overlapping one another, hence sometimes almost symmetrical; seminal vesicle tripartite, the two posterior portions rarely only indistinctly separated, overlapping anterior edge of acetabulum but not reaching to middle of acetabulum. Pars prostatica short, with much reduced very inconspicuous swellings. Ductus hermaphroditicus moderately long, provided with a few gland cells. Sinus sac very much reduced, represented by a very few fibers and quite invisible in most specimens.

Ovary ovoid, posterior to midbody in largest specimens. Vitellaria of two masses of 4 and 3 lobes; lobes very short and thick rather than digitiform, shorter than wide (Fig. 107). Seminal receptacle not observed. Uterus with few postovarian coils, not entering ecsoma; metraterm beginning at acetabular level. Eggs thin-shelled, collapsed in mounted specimens, usually 12 to 15 by 7 to 8 μ, rarely 17 by 7 μ. Excretory crura uniting dorsal to oral sucker.

Comparisons: This species occurred with *L. texanum* but could be easily distinguished from that species by its small size, smaller acetabulum, shorter vitelline lobes, and almost complete absence of the sinus sac. *L. parvum* is considerably smaller than any other species of *Lecithochirium*. It is perhaps most similar to *L. caudiporum, L. gravidum,* and *L. exodicum*. It differs from *L. caudiporum* in size, in somewhat larger acetabulum, shape of eggs and much smaller eggs which are 32 by 13 μ in *L. caudiporum*. It differs from *L. gravidum* in lacking the elevations in the oral sucker, in size, and in shorter vitelline lobes. It differs from *L. exodicum* in size, in much smaller eggs, in longer ductus hermaphroditicus and lack of a conspicuous anterior prostatic swelling.

149. LECITHOCHIRIUM SYNODI Manter, 1931

Figs. 108, 109

HOST: *Synodus foetens* (Linn.), lizard fish; in 2 of 7 hosts examined; 3 specimens collected.
LOCATION: Stomach.

Discussion: This species has been reported hitherto only from the same host at Beaufort, North Carolina. This original collection consisted of numerous specimens showing marked homogeneity and clearly belonging to a single species. Collections of hemiurids from lizard fishes at Tortugas showed in contrast a most puzzling heterogeneity. It was finally decided that no less than three species of *Lecithochirium* as well as *Sterrhurus floridensis* all occurred in *Synodus foetens,* often two of them simultaneously. *L. synodi* was uncommon, two specimens being found in a single host.

An examination of 34 specimens of *L. synodi* from Beaufort showed the following constant characters useful in identifying the species. The vitelline lobes are longer than wide. In a single specimen, they seemed about the same length as width, but their elongate nature is practically always very evident. The acetabulum, usually 2.2 to 2.5 times the oral sucker in diameter, may be up to 2.8 times. The sinus sac is thick-walled, complete, subcylindrical, usually slightly wider at its base, and encloses the anterior prostatic vesicle. An external prostatic vesicle is present. The ratio of the length of the sinus sac to the transverse diameter of the acetabulum is 1:2.74 to 3.3. The preacetabular pit is highly glandular and conspicuous.

The Tortugas specimens agreed with all these characters except that the preacetabular pit, although conspicuous, was not markedly glandular.

The other species of *Lecithochirium* found in *S. foetens* were *L. parvum,* characterized by short, broad vitelline lobes and rudimentary incomplete sinus sac; and a new species described below, characterized by short, broad vitelline lobes and a very large sinus sac.

150. **Lecithochirium texanum** (Chandler, 1941) n. comb.

Fig. 110

SYNONYM: *Sterrhurus texanus* Chandler, 1941.

HOST: *Euthynnus alletteratus* (Rafinesque), little tunny, bonito; in all of 3 hosts examined.

LOCATION: Stomach.

Discussion: These specimens, characterized by the very large acetabulum and distinct sinus sac, agreed in all particulars with *Sterrhurus texanus* Chandler, 1941 except for the presence of the preactabular pit. Study of a paratype specimen kindly loaned by Dr. Chandler convinced the author that this pit occurs also in the Texas material.

Very large numbers occurred in the stomach of the bonito at Tortugas. They were associated with *Lecithochirium parvum.*

There is a strong possibility that this species may be the same one described as *Sterrhurus imocavus* by Looss from a related host in Egypt. The differences mentioned by Chandler are slight and the agreement in body form, sucker ratio, and sinus sac are conspicuous. The "spaltförmige Vertiefung" of the ventral surface was not considered a preacetabular pit by Looss. The pit is inconspicuous but with a definite pore in my material.

Linton has reported a trematode *Distomum monticellii* Linton, 1898 (= *Sterrhurus monticellii* (Linton) Linton, 1910) from a number of fishes at Woods Hole, Beaufort, Bermuda, and Tortugas. These collections almost certainly involve several species including one or more in the genus *Lecithochirium.* Probably he had both *L. branchialis* and *L. texanum.* The type collection of *Distomum monticellii* was from *Remora remora.* Linton recorded the acetabulum as over 5 times the diameter of the oral sucker. The *Sterrhurus monticellii* reported from three hosts at Beaufort by Manter (1931) is actually *Lecithochirium* and the specimens from *Pomatomus saltatrix* are probably the same as *L. branchialis.*

The following diagnosis of the genus *Sterrhurus* is an attempt to narrow its limits to some extent. It does not include details of the sinus sac.

Generic Diagnosis of Sterrhurus Looss, 1907: Body smooth; ecsoma present; preacetabular pit absent. Testes diagonal or symmetrical, preovarian. Vitellaria lobed; lobes may be short cylindrical or finger-like; seminal receptacle small or absent. Sinus sac present, short, pyriform, cylindrical, or spherical; prostatic gland short, immediately posterior to sinus sac; seminal vesicle thin-walled, not extending posterior to acetabulum. Type species: *S. musculus* Looss, 1907. Other species agreeing with the above diagnosis are: *S. brevicirrus* Nicoll, 1915 (perhaps the same as *S. musculus); S. floridensis* Manter, 1934; *S. fusiformis* (Lühe, 1901) Looss, 1907; *S. grandiporus* (Rud., 1819) Looss, 1907; *S. imocavus* Looss, 1907; *S. magnus* Yamaguti, 1938; *S. macrorchis* Crowcroft, 1946; *S. musigarei* Yamaguti, 1938; *S. preclarus* Manter, 1934.

Ten other species have been named in the genus. The following disposition for them is suggested.

1. *Sterrhurus branchialis* Stunkard & Nigrelli, 1934 was collected from the

gills of *Trichiurus lepturus*. The trematode had probably migrated to the gills from the stomach under the abnormal conditions attending the capture and death of the host. Stunkard and Nigrelli found so much variation among their specimens that "for a time it appeared that more than one species was represented", but intermediate conditions seemed to make separation of species impossible. Several specimens of the collection were kindly presented to me by Dr. Stunkard. In most of these, the forebody was bent or contracted to conceal a possible preacetabular pit, but one (Fig. 111) seemed to show such a structure. In all my specimens, the sinus sac was very broad and short, a prostatic vesicle present, and the vitelline lobes about twice as long as wide. I believe they belong in the genus *Lecithochirium* and very close to, if not identical with, *L. magnaporum*. Chandler (1935) described *L. microstomum* from *Trichiurus lepturus* in the Gulf of Mexico, but it seems to be distinct from the Atlantic material although from the same host.

Sterrhurus branchialis is probably a valid species. Its sinus sac is described and figured as pyriform rather than broad and short as in my specimens. Judging from the small variation in the vitelline lobes of *Sterrhurus* species I have studied, the specimens referred to by Stunkard and Nigrelli as possessing spherical to oval lobes probably belong to still another species. In some of my Florida collections, as will be noted later, several species of *Sterrhurus* and *Lecithochirium* were found to occur simultaneously in one host.

2. *S. gymnothoracis* Yamaguti, 1940 I believe to be a synonym of *S. fusiformis*,* a widely distributed species in morays.

3. *S. karachii* Srivastava, 1941 has unlobed vitellaria, a long pars prostatica, posterior seminal vesicle, and a "tail" too rudimentary to be recognizable as an ecsoma. It probably belongs in the genus *Derogenes* or some closely related genus.

4. *S. laevis* (Linton, 1898) Manter, 1934 should be placed in a new genus for which the name *Dissosaccus* is proposed.

Generic Diagnosis of Dissosaccus: Body smooth, ecsoma present. Parenchyma vesicular. Vitellaria unlobed, in two compact masses. Seminal vesicle thin-walled, tubular, divided into two subequal parts by a rather long narrow duct, the posterior part extending to or beyond posterior edge of acetabulum. Sinus sac complete, thick-walled; ductus hermaphroditicus short and wide; no external prostatic vesicle; prostatic gland present. A peculiar preoral pit occurs ventrally in the preoral lobe. Type species: *Dissosaccus laevis* (Linton, 1898) n. comb. Synonyms: *Distomum laeve* Linton, 1898; *Hemiurus laevis* (Linton) Looss, 1898; *Sterrhurus laevis* (Linton) Manter, 1934; nec *Sterrhurus laeve* (Linton) of Manter, 1931; *Lecithochirium laevis* (Linton) Crowcroft, 1946.

Dissosaccus differs from *Sterrhurus* chiefly in the shape and extent of the seminal vesicle, and in its unlobed vitellaria. The preoral pit is rather clearly marked and somewhat muscular. It has not been described in previous descriptions of the species.

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* New synonymy.

5. *S. magnatestis* Park, 1936 belongs in the genus *Lecithochirium* as pointed out by Lloyd (1938) and I agree with his view that it is a synonym of *L. exodicum* McFarlane, 1935.

6. *S. monolecithus* Srivastava, 1941 seems to belong in the genus *Aphanurus* since the "very rudimentary tail . . . visible only in fully extended individuals" is probably not an ecsoma but a temporary fold of the body wall. The vitelline mass is single; the pars prostatica long; and the seminal vesicle posterior to the acetabulum. the name *Aphanurus monolecithus* (Srivastava 1941) n. comb. is proposed.

7. *S. profundus* Manter, 1934 should be placed in a new genus for which the name *Lethadena* is proposed.

Generic Diagnosis of Lethadena: Cylindrical, smooth-bodied hemiurids, with ecsoma. Two unlobed, compact vitelline masses present; seminal receptacle rudimentary. Ceca and uterus extending into the ecsoma; seminal vesicle a rather thick-walled, elongate, undivided sac, not extending posterior to acetabulum; prostatic gland cells lacking; prostatic vesicle surrounded by a thick wall; sinus sac lacking; ejaculatory duct opening into a short genital atrium; genital pore close to mouth, ventral to oral sucker. Type species: *L. profunda* (Manter, 1934) n. comb. Synonym: *Sterrhurus profundus* Manter, 1934.

This genus is distinct from *Sterrhurus* in lacking a sinus sac and prostatic gland cells. The vitellaria are unlobed and the genital pore far forward. It is perhaps closer to *Glomericirrus* Yamaguti, 1937 one species of which *(G. propositus)* has unlobed vitellaria, a thick-walled seminal vesicle and greatly reduced prostatic gland. *Glomericirrus,* however, has cuticular denticulations, a cirrus sac (!), and more posterior genital pore.

The name *Lethadena* is from *letha* = forgetting, and *adena* = gland and refers to the absence of the prostatic gland.

8. *S. robustus* Manter, 1934 also should be placed in a new genus. The name *Adinosoma* is proposed for it.

Generic Diagnosis of Adinosoma: Robust, smooth-bodied hemiurids, with well-developed ecsoma; parenchyma vesicular. Vitelline lobes short and broad; seminal receptacle rudimentary. Seminal vesicle bipartite, partly dorsal to and partly posterior to the acetabulum; prostatic gland cells surrounding the prostatic vesicle; sinus sac lacking. Branches of excretory vesicle uniting dorsal to oral sucker. Type species: *A. robustum* (Manter, 1934) n. comb. Synonym: *Sterrhurus robustus* Manter, 1934..

Yamaguti (1938:117) recommended that *S. robustus* be transferred to the genus *Dinosoma.* He concluded that too much importance should not be ascribed to external structures such as scales because they may be lost after death. I cannot agree with his recommendation regarding *Sterrhurus robustus* because my specimens of this species are numerous, representing 14 different collections from 6 different hosts; they are in good condition being killed while still active; and no specimen shows any trace of spines or scales. Every one of numerous specimens of *Dinosoma rubrum* possesses conspicuous scales

Dinosoma is probably the nearest relative of *Adinosoma* differing in possessing cuticular scales. The name *Adinosoma* is from *ad* = near, and *Dinosoma*.

9. *S. texanus* Chandler, 1941 is considered above to belong in the genus *Lecithochirium*.

10. *S. vitellograndis* (Layman, 1930) Manter, 1934 was returned to the genus *Aponurus* by Yamaguti (1938:125).

151. STERRHURUS FLORIDENSIS Manter, 1934

HOSTS (List revised from Manter, 1934): *Antennarius radiosus* Garman, frogfish; in 2 of 2 hosts examined. *Antennarius scaber* (Cuvier), frogfish; in 2 of 2 hosts examined. *Bembrops gobioides* (Goode); in 1 of 20 hosts examined; 100 fath. *Brotula barbata* (Bloch & Schneider); in 1 of 1 host examined; 79-140 fath. *Cyclopsetta fimbriata* (Goode & Bean); in 8 of 8 hosts examined; 50 fath. *Echeneis naucrates* Linn., shark-sucker; in 3 of 3 hosts examined. *Lophius piscatorius* Linn., allmouth; in 1 of 1 host examined; 55 fathoms. *Ogcocephalus cubifrons* (Richardson), batfish; in 2 of 9 hosts examined. *Paralichthys* sp., flounder (type host); in 1 of 1 host examined; 40 fathoms. *Pontinus longispinus* Goode & Bean; in 1 of 18 hosts examined; 90 fathoms. *Prionodes* sp.; in 2 of 15 hosts examined; 50 fathoms. *Prionotus stearnsi* Jordan & Swain; in 1 of 3 hosts examined; 50 fathoms. *Prionotus* sp.; in 2 of 11 hosts examined. *Scorpaena brasiliense* Cuv. & Val., scorpion fish; in 1 of 4 hosts examined. *Scorpaena plumieri* Bloch, scorpion fish; in 1 of 3 hosts examined. *Syacium micrurum* Ranzani, flounder; in 9 of 14 hosts examined. *Syacium papillosum* (Linn.), flounder; in 10 of 20 hosts examined. *Synodus foetens* (Linn.), lizardfish; in 1 of 7 hosts examined. *Synodus intermedius* (Agassiz),* lizardfish; in 1 of 9 hosts examined; 40 fathoms. *Synodus* sp.,* lizardfish; in 1 of 4 hosts examined; 140-197 fathoms. *Phycis cirratus* Goode & Bean; in 5 of 8 hosts examined; 60-125 fathoms.

Nine hosts recorded in 1934 for this species are to be transferred as hosts of *Lecithochirium parvum* as listed in the description of that species. Specimens from the following hosts are considered to be *Lecithochirium* (species undetermined): *Calamus bajonado* (Bloch & Schneider), grass porgy; in 1 of 9 hosts examined. *Haemulon album* Cuv. & Val., margate fish; in 1 of 2 hosts examined. *Haemulon plumieri* (Lacépède), grunt; in 1 of 24 hosts examined. *Haemulon sciurus* (Shaw), yellow grunt; in 2 of 33 hosts examined. *Lutianus griseus* (Linn), gray snapper; in 3 of 28 hosts examined.

Specimens from the following hosts were immature and hence can not be certainly identified: *Holocentrus ascensionis* (Osbeck), *Ioglossus calliurus* Bean; *Lutianus apodus* (Walbaum); *Peristedion imberbe* Poey; *Trachurops crumenophthalma* (Bloch); *Tylosurus raphidoma* (Ranzani).

Specimens from the following hosts could not be certainly identified as *Sterrhurus* or *Lecithochirium: Bathystoma rimator* (Jordan & Swain); *Halieutichthys aculeatus* (Mitchill).

Specimens from the following hosts were lost or spoiled: *Caranx latus* Agassiz; *Chaunax pictus* Lowe; *Diplectrum bivittatum* (Cuv. & Val.); *Haemulon flavolineatum* (Desmarest); *Lonchopisthus micrognathus* (Poey); *Lutianus synagris* (Linn.); *Lutianus vivanus* (Cuv. & Val.); *Scorpaena agassizii* Goode & Bean; *Scorpaena inermis* Cuv. & Val.; *Trichopsetta ventralis* (Goode & Bean).

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* New host record.

Discussion: In 1934, I reported *Sterrhurus floridensis* from no less than 55 different fishes from various depths at Tortugas. The discovery that the preacetabular pit in *Lecithochirium* might be very indistinct led to reexamination of every specimen in this collection. After a very time-consuming review of all this material a revised host-list of 21 species is offered above. Many of the smaller specimens were decided to be *Lecithochirium parvum*. Other specimens were allocated as indicated above. Double infections were not as common as might be expected although *Synodus foetens* is apparently host to *S. floridensis* and two species of *Lecithochirium*. Several collections, notably from *Haemulon* species, seemed to be *Lecithochirium* but so much like *S. floridensis* except for the preacetabular pit that they are considered of uncertain status.

No important changes in the description of *S. floridensis* seem necessary, although the smaller sizes probably apply to *L. parvum*. *S. floridensis* is still considered distinct from *S. musculus* on the basis of egg size. While these eggs are frequently collapsed in balsam mounts, the largest uncollapsed examples I can find measure 17 by 12 μ. The 19 to 21 by 11 to 13 μ size of the eggs of *S. musculus* would be a very noticeable difference. The short lobes of the vitellaria are very constant.

Even the reduced number of hosts for *S. floridensis* leave it an unusually cosmopolitan trematode. Probably the number of truly normal hosts is much smaller. Related trematodes are known to become precociously mature in crustacean intermediate hosts and the fact that so many of the collections were represented by single specimens suggests that these were accidentally present from recently digested food. There is also a possibility that more than one species are still represented in the collections and might be recognized on the basis of some character such as size and shape of the sinus sac the variability of which is not recognized at present.

152. STERRHURUS FUSIFORMIS (Lühe, 1901) Looss, 1907

HOSTS: *Gymnothorax moringa* (Cuvier), common spotted moray; in 1 of 3 hosts examined; 8 specimens. *Gymnothorax funegris* Ranzani, black moray; in 1 of 3 hosts examined; several specimens.

LOCATION: Stomach or intestine.

Discussion: Linton (1910:62-63) reported this species from these same hosts at Tortugas. The sucker ratio in my specimens was 1:1.7 to 1.94.

This species is widely distributed being reported from the Mediterranean, the British Isles, the Pacific coast of Ecuador, and from Japan.

153. **Sterrhurus microcercus** n. sp.

Figs. 112, 113

HOST: *Fistularia tabacaria* Linn., cornet fish; in 1 of 1 host examined; 3 specimens.
LOCATION: Stomach.

Description: Body 1.387 to 1.598 mm long by 0.504 to 0.570 mm wide. Oral sucker 0.124 to 0.127 mm in diameter; acetabulum 0.234 to 0.255 mm in diameter; sucker ratio 1:1.8 to 2. Forebody 0.328 to 0.372 mm or about 1/4 body length. Ecsoma very small but distinct, partially extended, 0.124 to

0.182 mm long or about 1/10 body length, more or less pointed. Pharynx the same size in all three specimens, 0.060 mm long by 0.068 mm wide; esophagus lacking; ceca extending to near posterior end of body, never entering ecsoma. Genital pore far forward, opposite base of oral sucker. Testes diagonal, not far apart, close to posterior edge of acetabulum which one of them may overlap slightly. Seminal vesicle indistinctly tripartite; pars prostatica short; external and internal prostatic vesicles present; sinus sac more or less pyriform, well developed, rather short, mostly ventral to pharynx, not extending posterior to intestinal bifurcation. The internal prostatic vesicle is always partly, and in one case mostly, overlapping the pharynx. Ovary ovoidal, about in middle of hindbody; a seminal receptacle seems to be present but empty; vitelline masses with very broad indistinct lobes of 4 and 3 respectively, lobes much broader than long; uterus with rather long diagonal coils extending to posterior end of body but not into the ecsoma. Metraterm muscular beginning at anterior border of acetabulum, entering base of sinus sac. Eggs 15 to 17 by 9 to 10 μ.

Comparisons: This species is distinct in its very small ecsoma, its far anterior genital pore and its short sinus sac almost all of which is opposite the pharynx. In *S. floridensis,* for example, the prostatic vesicle is more posterior. *S. microcercus* seems to be most like *S. brevicirrus* Nicoll, 1915 especially in the short sinus sac, but the ecsoma is smaller; the sucker ratio is only 1:2 as compared with 1:2.7 and as a result the acetabulum occupies much less of the body width; and the eggs are 15 to 17 by 10 μ as compared with 20 to 21 by 12 μ.

154. STERRHURUS PRAECLARUS Manter, 1934

HOST: *Merluccius* sp., probably *Merluccius bilinearis* (Mitchill); 390 fath.; in 1 of 23 hosts examined.

LOCATION: Stomach.

155. **Dissosaccus laevis** (Linton, 1898) n. comb., see above

HOSTS: *Helicolenus maderensis* Goode & Bean; 197 fath.; in 1 of 21 hosts examined. *Peristedion longispathum* Goode & Bean; 200 fath.; in 1 of 32 hosts examined. *Peristedion miniatum* Goode; 140 fath.; in 2 of 11 hosts examined. *Peristedion platycephalum* Goode & Bean; 168 fath.; in 4 of 14 hosts examined.

LOCATION: Stomach.

156. **Lethadena profunda** (Manter, 1934) n. comb., see above

HOSTS: *Pronotogrammus aureorubens* Longley; 135-156 fath.; in 2 of 14 hosts examined. *Xenodermichthys capei* (Gill); 300 fath.; in 1 of 2 hosts examined.

LOCATION: Stomach.

157. DINOSOMA RUBRUM Manter, 1934

HOSTS: *Synodontid;* 60-125 fath.; in 7 of 9 hosts examined. *Urophycis regius* (Walbaum); 200-220 fath.; in 1 of 13 hosts examined.

158. **Adinosoma robustum** (Manter, 1934) n. comb., see above

HOSTS: *Chaunax pictus* Lowe; 200 fath.; in 4 of 9 hosts examined. *Chlorophthalmus*

truculentus Goode & Bean; 200 fath.; in 1 of 4 hosts examined. *Merluccius* sp. probably *M. bilinearis* (Mitchill); 190-280 fath.; in 3 of 23 hosts examined. *Paralichthys oblongus* (Mitchill); 150-250 fath.; in 3 of 7 hosts examined. *Urophycis chesteri* (Goode & Bean); 300 fath.; in 1 of 6 hosts examined. *Urophycis regius* (Walbaum); 139-220 fath.; in 3 of 13 hosts examined.

LOCATION: Stomach.

Genera ECTENURUS Looss, 1907, DINURUS Looss, 1907 and Related Genera

Compared with most of Looss' genera, the genus *Ectenurus* has been rather troublesome. Probably every species which has been added to the genus is open to question. *Ectenurus angusticauda* Nicoll, 1915 was transferred to *Tubulovesicula* by Yamaguti, 1934. Srivastava (1937a), in a preliminary abstract, states that some species named in *Ectenurus* do not belong in that genus. His *E. indicus* was not diagnosed in the abstract and hence is a *nomen nudum*. Yamaguti (1934:464) states that *Ectenurus virgula* Linton, 1910 does not belong in *Ectenurus* but states no reason for that conclusion.

Looss named *Ectenurus* as a close relative of *Dinurus* with which he stated it agreed except (1) the prostatic gland cells were limited to the anterior portion of the prostatic duct, and (2) the vitelline tubes were shorter. The latter point is probably too variable and relative to apply easily.

In *Dinurus* Looss, 1907, the vitellaria consist of sinuous tubes; the ecsoma is well developed and in addition: (1) cuticular plications are conspicuous, (2) the seminal vesicle is tripartite; (3) the excretory crura do not unite anteriorly; and (4) prostatic cells occur along practically the entire length of the pars prostatica.

Lecithocladium Lühe, 1901 is like *Dinurus* except that the seminal vesicle is sac-like and has a thick muscular wall; the oral sucker is more funnel-shaped and the pharynx more cylindrical.

Another related genus is *Magnacetabulum* Yamaguti, 1934 which is like *Dinurus* except the seminal vesicle is tubular and twisted rather than tripartite and the prostatic gland cells are apparently absent.

In 1935, Woolcock named the genus *Erilepturus* which she considered close to *Ectenurus*. It differed in that (1) the cuticula, although faintly ringed, did not possess the plications characteristic of *Ectenurus* and *Dinurus*, (2) the seminal vesicle was not distinctly tripartite, and (3) the excretory crura united anteriorly. The greater portion of the prostatic duct was free of gland cells. Also, the acetabulum was rather far posterior near the middle of the body.

Tubulovesicula Yamaguti, 1934 is much like *Erilepturus*. It lacks definite plications; the seminal vesicle is not tripartite; and the excretory crura unite. It differs only in that the long pars prostatica is surrounded by gland cells along all or nearly all its length. The seminal vesicle tends to be more tubular than sac-like and the acetabulum tends to be more anterior.

Stomachicola Yamaguti, 1934 is very large in size; lacks cuticular plications; the seminal vesicle is sac-like; prostatic gland cells occur along most or all of the prostatic duct; and the ecsoma is much longer than the body proper.

There has been considerable confusion in allocation of species among

the above genera. The presence or absence of sharp-edged cuticular plications (the "rings" of *Hemiurus)* seems to be a valid generic character visible even in pressed specimens, and, in this group at least, it seems usually to be correlated with non-uniting excretory crura (exception: *Clupenurus* Srivastava, 1935). Only in the case of a few species of *Lecithocladium* do these characters seem unreliable. Two other generic characters, I believe, might be accepted: the tripartite seminal vesicle (as in *Dinurus),* and the lack of prostatic gland cells along a large part of the prostatic duct. All the above genera possess well developed ecsoma and tubular vitellaria. The following classification is suggested.

Dinurus: Cuticular plications present; seminal vesicle tripartite; gland cells along all or most of the long pars prostatica; excretory crura do not unite. Type species: *D. tornatus* (Rud., 1819) Looss, 1907. Other species: *D. barbatus* (Cohn, 1903) Looss, 1907; *D. breviductus* Looss, 1907; *D. longisinus* Looss, 1907; *D. scombri* Yamaguti, 1934; *D. coryphaenae* Yamaguti, 1934; *D. euthynni* Yamaguti, 1934.

Ectenurus: Cuticular plications present; seminal vesicle tripartite; a long portion of the pars prostatica without gland cells; excretory crura do not unite. Type species: *E. lepidus* Looss, 1907. Other species: *E. virgulus* Linton, 1910

Magnacetabulum: Cuticular plications present; seminal vesicle tubular; prostatic gland cells lacking or rudimentary; excretory crura do not unite. Type species: *M. trachuri* Yamaguti, 1934.

Lecithocladium: Cuticular plications present; seminal vesicle sac-like with thick muscular walls; prostatic gland cells along all or most of the long prostatic duct; pharynx strong and elongate; excretory crura do not unite.* Type species: *L. excisum* (Rud., 1819) Lühe, 1901 (synonym: *L. excisiforme* Cohn, 1902). Other species: *L. cristatum* (Rud., 1819) Looss, 1907; *L. crenatum* (Molin, 1859) Looss, 1907; *L. gulosum* (Linton, 1901) Looss, 1907; *L. psenopsis* Yamaguti, 1934; *L. pagrosomi* Yamaguti, 1934; *L. glandulum* Chauhan, 1945; *L. carultum* Chauhan, 1945; *L. annulatum* Chauhan, 1945; *L. harpodontis* Srivastava, 1937; *L. brevicaudum* Srivastava, 1937. Probably not all these species belong in the genus. The last two named above lack cuticular plications and the excretory crura unite.

Erilepturus: Cuticular plications lacking; seminal vesicle not tripartite; a long region of the prostatic duct without gland cells; excretory crura unite; a seminal receptacle is present. Type species: *Erilepturus tiegsi* Woolcock, 1935. Other species: *E. hamati* (Yamaguti, 1934) n. comb. (synonym: *Ectenurus hamati* Yamaguti, 1934); *E. paralichthydis* (Yamaguti, 1934) n. comb. (synonym: *Ectenurus paralichthydis* Yamaguti, 1934); *E. lemeriensis* (Tubangui & Masilungan, 1935) n. comb. (synonym: *Ectenurus lemeriensis* Tubangui & Masilungan, 1935).

Tubulovesicula: Cuticular plications lacking; seminal vesicle tubular or indistinctly bipartite; gland cells along all or most of the prostatic duct;

* According to Looss. Yamaguti states that the crura do unite

excretory crura unite. Type species: *T. spari* Yamaguti, 1934. Other species: *T. anguillae* Yamaguti, 1934; *T. muraenesocis* Yamaguti, 1934; *T. californica* Park, 1936; *T. pseudorhombi* Yamaguti, 1938; *T. lindbergi* (Layman, 1930) Yamaguti, 1934; *T. nanaimoensis* (McFarlane, 1935) n. comb. (synonym: *Dinurus nanaimoensis* McFarlane, 1935); *T. pinguis* (Linton, 1940) n. comb. (synonym: *Dinurus pinguis* Linton, 1940). *T. angusticauda* (Nicoll, 1915) Yamaguti, 1934.

Although *Clupenurus* Srivastava, 1935 was thought probably to be a synonym of *Tubulovesicula* by Manter (1940), it differs in that more than half the long prostatic duct is without gland cells, and cuticular plications are present. *Clupenurus* should probably stand as a genus closely related to *Lecithocladium* and *Magnacetabulum*.

Stomachicola: Cuticula without denticulations or plications; seminal vesicle oval, not markedly muscular; pars prostatica glandular along all or most of its length; ecsoma much longer than body and containing most of the intestinal ceca and uterus and parts of the vitelline coils; excretory crura usually not observed, probably uniting dorsal to oral sucker (see Linton, 1910:65). Size large. Type species: *S. muraenesocis* Yamaguti, 1934. Other species: *S. secunda* Srivastava, 1939; *S. magna* (Manter, 1931) n. comb. (synonym: *Dinurus magnus* Manter, 1928); *S. rubea* (Linton, 1910) n. comb. (synonym: *Dinurus rubeus* Linton, 1910).

Related genera, easily recognized by characteristic features are *Mecoderus* Manter, 1940 and *Elytrophallus* Manter, 1940.

159. ECTENURUS VIRGULUS Linton, 1910

Fig. 114

HOSTS: *Bothus ocellatus* (Agassiz),* flounder; in 1 of 19 hosts examined. *Harengula macrophthalma* (Ranzani),* sardine; in 1 of 6 hosts examined. *Trachurops crumenophthalma* (Bloch), goggle-eye jack; in 2 of 5 hosts examined. Linton (1910) recorded this species from "*Clupanodon pseudohispanicus*" (type host) at Tortugas, and (1940) from *Trachurops crumenophthalma* at Woods Hole.

LOCATION: Stomach.

Discussion: This species differs from *E. lepidus* in that the ductus hermaphroditicus is very much longer and more slender and in that the cuticular plications are absent dorsally except for a small area immediately posterior to the acetabulum. The plications in *E. virgulus* are almost entirely limited to the ventral surface posterior to the acetabulum. In *E. virgulus,* the prostatic cells surround about 1/2 the length of the prostatic duct whereas in *E. lepidus* they are limited to about 1/3 the length of the duct.

Bothus is probably an accidental host.

The correct spelling of the specific name is *virgulus* rather than *virgula.*

160. **Parectenurus americanus** n. gen., n. sp.

Figs. 115, 116

HOSTS: *Caranx bartholomaei* Cuv. & Val., yellow jack; in 1 of 2 hosts examined; 3

* New host record.

specimens. *Synodus foetens* (Linn.), lizardfish; in 1 of 10 hosts examined; 1 specimen.

LOCATION: Stomach or gills (probably an accidental location).

Description: Length of body 1.900 to 2.070 mm, width 0.467 to 0.469 mm; total length including ecsoma 2.527 to 3.760 mm. Cuticular plications well developed ventrally posterior to acetabulum, poorly developed dorsally for a short region posterior to acetabulum; other regions of body smooth. Oral sucker 0.160 to 0.212 mm, acetabulum 0.300 to 0.348, about 1/3 body length from anterior end; sucker ratio 1:1.6 to 1.9. Pharynx subglobular, 0.090 to 0.112 mm long by 0.082 to 0.122 mm wide; short esophagus present; ceca reaching into ecsoma. Genital pore at posterior border of oral sucker. Testes almost symmetrical a slight distance posterior to acetabulum, at base of seminal vesicle. Seminal vesicle not distinctly divided into three parts, moderately thick-walled; in the form of a swollen tube bent near its middle. Prostatic duct straight, 0.410 to 0.528 mm in length, its basal 2/3 to 3/4 with scanty very inconspicuous cells, its distal 1/3 to 1/4 surrounded by conspicuous gland cells. Sinus sac 0.190 to 0.250 mm long or about 1/2 total length of prostatic duct; genital atrium short. Ovary transversely oval, immediately posttesticular. Left vitelline gland with 4, right gland with 3, elongate, coiled tubes. Seminal receptacle not observed but Mehlis' gland conspicuous; uterus extending posterior to ovary and entering slightly the ecsoma. Eggs 15 to 17 by 8 to 9 μ. Excretory crura do not unite anteriorly.

Discussion: A new genus was named for this species because it did not quite agree with the characters of any genus as outlined above. Its seminal vesicle and prostatic duct are like *Erilepturus* but it possesses distinct plications, lacks a seminal receptacle, and the excretory crura do not unite. It is like *Magnacetabulum* except that it has distinct prostatic gland cells, a more sac-like seminal vesicle, and less prominent acetabulum. It might be included in *Lecithocladium* except for the bipartite seminal vesicle, two regions of the prostatic duct, and it does not have an elongated pharynx. It differs from *Ectenurus* in that the seminal vesicle is not tripartite.

Generic Diagnosis of Parectenurus: Hemiurids with well developed ecsoma, cuticular plications and tubular vitellaria. Seminal vesicle an elongate sac, bent near its middle; most of prostatic duct with few very indistinct cells; prostatic cells conspicuous around the distal portion of the duct; excretory crura do not unite. Type species: *P. americanus.*

161. DINURUS TORNATUS (Rud., 1819) Looss, 1907

HOST: *Coryphaena hippurus* Linn., "dolphin"; in 3 of 6 hosts examined.
LOCATION: Stomach.

162. DINURUS BREVIDUCTUS Looss, 1907

HOST: *Coryphaena hippurus* Linn., "dolphin"; in 2 of 6 hosts examined.
LOCATION: Stomach.

163. DINURUS LONGISINUS Looss, 1907

SYNONYM: *Dinurus coryphaenae* Yamaguti, 1934 (new synonymy).
HOST: *Coryphaena hippurus* Linn., "dolphin"; in 2 of 6 hosts examined.
LOCATION: Stomach.

Discussion: Yamaguti (1934) distinguished his *D. coryphaenae* from *D. longisinus* on the basis of egg size (21 to 24 by 12 to 13 μ as compared with 17 to 19 by 11 to 13 μ). Measurements of eggs from balsam mounts of specimens of *D. coryphaenae* sent by Yamaguti were about 17 by 12 μ or almost exactly the size given by Looss for *D. longisinus*. I consider *D. coryphaenae* a synonym of that species.

164. DINURUS BARBATUS (Cohn, 1903) Looss, 1907

HOST: *Coryphaena hippurus* Linn., "dolphin"; in 1 of 6 hosts examined.
LOCATION: Stomach.

165. DINURUS SCOMBRI Yamaguti, 1934

Fig. 117

HOST: *Euthynnus alletteratus* (Rafinesque), little tunny, bonito; in 1 of 3 hosts examined; 1 specimen.
LOCATION: Stomach.

Discussion: This specimen agreed well with Yamaguti's description. The divisions of the seminal vesicle were not as distinct; the fourth division apparently tapers to form the prostatic duct. The posterior half of the prostatic duct is somewhat coiled and is surrounded by lightly stained gland cells; the anterior half is straight and has darkly stained prostatic gland cells. The suckers are subequal in size. The oral sucker has an anterior and posterior lip; the acetabulum a longitudinal aperture. I could not observe the union of the excretory crura, nor the presence of a seminal receptacle. The latter was probably concealed by the well developed Mehlis gland. Looss states it is often not observable.

The body length of my specimen was 2.550 mm, while the ecsoma extended 1.141 mm beyond, a total of 3.691 mm. This is somewhat smaller than Yamaguti's specimens (body 3.6 to 3.78 mm). Yamaguti's *Dinurus euthynni* from *Euthynnus pelamys* is a closely related species especially if its large size (15 mm) be discounted as a specific character.

166. STOMACHICOLA RUBEA (Linton, 1910)

SYNONYM: *Dinurus rubeus* Linton, 1910.
HOSTS: *Gymnothorax funebris* Ranzani, black moray; not found in 3 hosts examined.
Gymnothorax moringa (Cuvier), common spotted moray; not found in 3 hosts examined.
LOCATION: Stomach and intestine.

This trematode is the only trematode collected by Linton at Tortugas and not represented in my collections.

Genera LECITHOPHYLLUM and APONURUS

The genus *Lecithophyllum* Odhner, 1905 is very similar to *Aponurus* Looss, 1907 and it has been suggested (Manter, 1934) that they should perhaps be considered identical. The two differences are the larger eggs and the longer genital sinus of *Lecithophyllum*. Most species of *Aponurus* have eggs 25 to 30 μ long while eggs of *Lecithophyllum* are 55 to 63 μ long. The fact

that eggs of *A. sphaerolecithus* were 56 to 65 μ long led Odhner to believe it belonged in the genus *Lecithophyllum*. Several species of *Aponurus* have eggs up to 34 μ long and in *A. intermedius* the sizes are 36 to 38 μ. In most species of *Aponurus* the genital sinus is clearly shorter than the par prostatica although in *A. sphaerolecithus* and *A. brevicaudatus* it is of about the same length. Ordinarily, these differences would seem to be only specific but as the number of species in *Aponurus* increases it seems convenient to retain the genus and characterize *Lecithophyllum* as possessing eggs 55 to 65 μ long and a genital sinus as long or longer than the pars prostatica. Egg size of *Aponurus* would be from 22 to 23 μ. Such a concept will require transfer of *A. sphaerolecithus* to *Lecithophyllum*. Its name becomes *Lecithophyllum sphaerolecithum* (Manter, 1925) n. comb.

Lecithophyllum fuscum Yamaguti, 1938 has a very short genital sinus and eggs 33 to 45 μ long. Although its eggs approach the size of those of *Lecithophyllum*, the very short ductus hermaphhroditicus excludes it from that genus. As a large-egged species of *Aponurus* it is to be compared with *Aponurus intermedius* Manter, 1934. Such a comparison shows no differences which do not overlap and such similarities as very short, globular sinus sac; long, almost straight pars prostatica; symmetrical testes; large eggs; pointed posterior end; and considerable portion of the uterus posterior to the vitellaria. Both species occur in *Chaunax* species. *Lecithophyllum fuscum* is considered a synonym of *Aponurus intermedius*, and is an example of the wide distribution of trematodes of deep-water fishes. *Aponurus bengalensis* Srivastava, 1939 is possibly another synonym of this species.

The author (Manter, 1934) transferred *Aponurus vitellograndis* Layman, 1930 to *Sterrhurus* but Yamaguti (1938) states that the tail appendage is lacking and retains the species in *Aponurus*. It is very similar to *A. laguncula*.

The following species of *Aponurus* now occur: *A. laguncula* Looss, 1907; *A. vitellograndis* Layman, 1930; *A. intermedius* Manter, 1934; *A. brevicaudatus* Yamaguti, 1934; *A. rhinoplagusiae* Yamaguti, 1934; *A. callinymi* Yamaguti, 1938; *A. acropomatis* Yamaguti, 1938; *A. bengalensis* Srivastava, 1939; *A. breviformis* Srivastava, 1939; *A. trachinoti* Manter, 1940.

The genus *Lecithophyllum* includes *L. botryophorum* (Olsson, 1868) Odhner, 1905 and *L. sphaerolecithum* (Manter, 1925).

167. APONURUS LAGUNCULA Looss, 1907

Figs. 118-120

HOST: *Ocyurus chrysurus* (Bloch), yellowtail; 1 specimen in each of 2 hosts of 47 examined.

LOCATION: Stomach.

Discussion: One specimen (0.776 by 0.240 mm) was fully mature; the other (0.600 by 0.150 mm) had only a few eggs. Oral sucker-acetabulum diameters were 0.090 and 0.152 mm and 0.068 and 0.119 mm, or a ratio of not quite 1:2. The gonads are crowded together and more or less tandem. The sinus sac is shorter than the S-shaped pars prostatica. Eggs are 32 to 33 by 14 to 17 μ and tend to be more pointed at one end although this character

was not evident in a few eggs in which the usually narrowed end bore a rudimentary point.

This species keys to *A. laguncula* in the key of Srivastava (1939) and it agrees fairly well, for example in size, arrangement of gonads, and sucker ratio. It differs in that the pars prostatica is longer than the genital sinus. However, the side view illustrated by Looss would not reveal the curves in this tube. The egg size is slightly larger than that stated by Looss who, however, gave only one measurement (27 by 16 μ). The pointed shape of many of the eggs suggest *A. trachinoti* Manter, 1940 which is a closely related species. It may be found that *A. laguncula* and *A. trachinoti* are the same. *A. trachinoti* differs from my specimens in being slightly larger, and, at the same time, with smaller eggs; the seminal receptacle is preovarian; and the posterior end of the body is more pointed.

The *Aponurus* sp. of Linton, 1910 from *Lobotes surinamensis* at Woods Hole, Massachusetts is probably *A. laguncula.*

168. APONURUS INTERMEDIUS Manter, 1934

HOSTS: Unidentified eel; 300 fath.; in one host examined. Unidentified sole; 249 fath.; in one host. *Chaunax pictus* Lowe; 200-300 fath.; in 2 of 9 hosts examined.

LOCATION: Stomach.

169. BRACHADENA PYRIFORMIS Linton, 1910

Fig. 121

SYNONYMS: "*Distomum bothryophoron* Olsson" of Linton, 1905; *Lecithaster anisotrema* MacCallum, 1921; "*Lecithaster gibbosus* (Rudolphi)" of Linton, 1940,* in part.

HOSTS: *Bathystoma striatum* (Cuv. & Val.); in 1 of 14 hosts examined. *Brachygenys chrysargyreus* (Günther),** bronze grunt; in 1 of 7 hosts examined. *Calamus bajonado* (Bloch & Schneider),** grass porgy; in 1 of 15 hosts examined. *Chaetodon ava* Jordan,** butterfly fish; in 1 of 2 hosts examined. *Chaetodon sedentarius* Poey,** in 1 of 2 hosts examined. *Haemulon album* Cuv. & Val.,** margate fish; in 2 of 2 hosts examined. *Haemulon macrostomum* Günther, spanish grunt; in 1 of 6 hosts examined. *Haemulon parra* (Desmarest),** sailor's choice; in 7 of 13 hosts examined. *Haemulon plumieri* (Lacépède), common grunt; in 8 of 34 hosts examined. *Ogcocephalus cubifrons* (Richardson),** bat fish; in 2 of 9 hosts examined.

OTHER HOSTS, previously recorded: *Anisotremus virginicus* (Linn.), porkfish; by MacCallum (1921) from Key West, Florida. *Calamus calamus* (Cuv. & Val.), saucer-eye porgy; by Linton (1910) from Tortugas. *Micropogon undulatus* (Linn.), croaker; by Linton (1905) and Manter (1931), from Beaufort, N. C. *Orthopristis chrysopterus* (Linn.), hogfish; by Linton (1905) and Manter (1931), from Beaufort, N. C. *Paralichthys dentatus* (Linn.), flounder; by Linton (1905), from Beaufort, N. C.

LOCATION: Stomach. Usually only one or a few in a host.

Discussion: The first two synonyms listed above were reported by Manter (1931). In addition there seems little doubt that the "*Lecithaster gibbosus*

* New synonymy.
** New host record.

(Rud.)" of Linton, 1940 from *Stenotomus chrysops* (Linn.), porgy at Woods Hole, Mass. is also a synonym. Linton's drawings show the characteristic unlobed ovary, preacetabular seminal vesicle, and sucker ratio of ***B. pyriformis***. Linton was probably in error in describing a cirrus sac. Thus, the distribution of the species seems to extend to Massachusetts. The trematode is much more prevalent at Tortugas than at Beaufort or at Woods Hole.

This hemiurid is found in an unusual variety of hosts, typically porgies and grunts. *Micropogon* and *Orthopristis* are fishes of the same suborder, but *Ogcocephalus* and *Paralichtys* are quite different hosts. The latter was recorded by Linton. My specimens from *Ogcocephalus* differ in that the acetabulum is only twice the diameter of the oral sucker. This small size is approached in specimens from other hosts, hence was not considered sufficient to establish a species.

The following specific diagnosis is suggested: Body somewhat flattened, widest at level of acetabulum, tapering toward each end, 0.660 to 2. by 0.300 to 0.800 mm. Acetabulum usually 3 times, sometimes 2.5, rarely only twice the diameter of oral sucker. Genital pore opposite pharynx or intestinal bifurcation. Testes symmetrical, lateral, immediately postacetabular. Sinus sac short, muscular, cylindrical or pyriform; pars prostatica much longer than sinus sac, coiled, intercecal, preacetabular; seminal vesicle small, barely overlapping anterior border of acetabulum. Ovary about midway between acetabulum and posterior end of body, submedian, ovoidal, unlobed; vitelline lobes elongate, clavate, variously grouped, meeting immediately posterior to ovary, at least one lobe extending anterior to ovary; uterus extending to posterior end of body but chiefly preovarian; eggs yellow or brown, 30 to 40 by 17 to 20 μ.

170. **Lecithaster acutus** (Linton, 1910) n. comb.

SYNONYM: *Dichadena acuta* Linton, 1910.

HOSTS: *Acanthurus hepatus* (Linn.)* doctor fish; surgeon fish or tang; in 1 of 6 hosts examined. *Acanthurus caeruleus* Bloch & Schneider, blue tang; reported by Linton (1910).

Discussion: These small, plump trematodes clearly belong in the genus *Lecithaster*, and the genus *Dichadena* Linton, 1910 becomes a synonym of *Lecithaster* Lühe, 1901.

Linton overlooked the 4-lobed ovary. The vitellaria overlie the ovary ventrally with lobes partly anterior to the ovary. Linton probably mistook one lobe of the ovary for a testis. The two testes are nearly symmetrical and overlap the ovary and vitellaria. All the gonads lie crowded together in the short, plump hindbody. The seminal vesicle is entirely postacetabular, close to one testis; the pars prostatica is very long. The seminal receptacle is postovarian. Egg measurements from my specimens are 27 by 12 to 15 μ or slightly larger than Linton's record (24 by 15 μ). The species differs from all others in the genus in sucker ratio; the acetabulum is very large, three to four times the size of the oral sucker.

* New host record.

171. LEURODERA DECORA Linton, 1910

Figs. 122-124

HOSTS: *Anisotremus virginicus* (Linn.), porkfish in 1 of 4 hosts examined. *Brachygenys chrysargyreus* (Günther),* bronze grunt; in 1 of 7 hosts examined. *Haemulon carbonarium* Poey,* Caesar grunt; in 1 of 2 hosts examined. *Haemulon parra* (Desmarest),* sailor's choice; in 1 of 13 hosts examined. *Haemulon plumieri* (Lacépède), common grunt; in 2 of 34 hosts examined. *Haemulon sciurus* (Shaw), yellow grunt; in 1 of 23 hosts examined. *Haemulon flavolineatum* (Desmarest),* French grunt; in 1 of 11 hosts examined. Linton (1910) recorded it also from: *Acanthurus hepatus* (Linn.), tang; and *Neomaenis griseus*, gray snapper. The record from the tang is probably incorrect since some of its measurements do not agree with those of *L. decora*.

LOCATION: Stomach.

Description: Body muscular, tapering toward each end; 1.102 to 2.698 by 0.425 to 0.730 mm. Oral sucker subterminal, slightly wider than long, 0.170 to 0.240 mm in transverse diameter; acetabulum just posterior to midbody, 0.289 to 0.450 mm in diameter; sucker ratio about 1:2, the acetabulum usually slightly less than twice the size of oral sucker. A living specimen revealed 7 pairs of papillae on the oral sucker (Fig. 123). Genital pore opposite region of intestinal bifurcation, varying with body contraction. Testes smooth, ovoid, symmetrical, mostly extracecal, just posterior to acetabulum. Sinus sac large, ovoid, containing a coiled muscular sinus; seminal vesicle tubular, extending to anterior edge of acetabulum, larger posteriorly, sometimes bent once. Ovary ovoid, submedian, immediately posttesticular. Vitellaria two, usually slightly lobed, rarely smooth, tandem, directly posterior to ovary. Seminal receptacle present, mostly anterior to ovary; Mehlis' gland postovarian; uterus with lateral coils between testes and acetabulum and also anterior to acetabulum. Eggs 31 to 36 by 12 to 17 μ. Excretory vesicle forking posterior to acetabulum; each branch with a characteristic backward loop about halfway between the suckers; branches uniting dorsal to pharynx.

Discussion: This species is very similar and perhaps identical with *L. pacifica* Manter, 1940. The differences overlap in the two species. Body shape, egg size, and position of the genital pore are too variable in *L. decora* to distinguish the two species. *L. decora* tends to possess a somewhat smaller acetabulum, lobed rather than unlobed vitellaria, and the posterior vitellarium is rarely intercecal. Comparison between the two species is now based on 12 specimens of *L. decora* and about 8 of *L. pacifica*. Only one Pacific specimen had a 1:2 sucker ratio, in others the acetabulum ranged up to 2.5 times the oral sucker. One specimen of *L. decora* had unlobed vitellaria; and another had an intercecal posterior vitellarium.

Two specimens (from *Haemulon sciurus)* were infected with a microorganism, probably a microsporidian, widely distributed in the parenchyma.

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* New host record.

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.

173. DEROGENES CRASSUS Manter, 1934

HOST: *Callionymus agassizii* Goode & Bean; 90 fath.; in 1 of 39 hosts examined.
LOCATION: Probably stomach.

This species is apparently very similar to *Derogenes plenus* Stafford, 1904 which is very incompletely described. The chief difference seems to be the 1:2 sucker ratio in *D. plenus* compared with a ratio almost 1:3 in *D. crassus*.

D. crassus is reported from *Coelorhynchus* sp. from Japan by Yamaguti, 1938. Parasites of deep-water fishes probably have a wide geographical distribution.

174. DEROGENES VARICUS (Mueller, 1784) Looss, 1901

HOSTS: *Helicolenus maderensis* Goode & Bean; 296-315 fath.; in 2 of 31 hosts examined. *Merluccius* sp., probably *Merluccius bilinearis* (Mitchill); 190-280 fath.; in 2 of 23 hosts examined. *Scorpaena cristulata* Goode & Bean; 367 fath.; in 1 of 2 hosts examined. *Setarches parmatus* Goode; 250 fath.; in 1 of 2 hosts examined. *Urophycis regius* (Walbaum); 250 fath.; in 1 of 13 hosts examined.
LOCATION: Stomach.

175. GONOCERCA CRASSA Manter, 1934

HOSTS: *Ancylopsetta dilecta* (Goode & Bean); 100 fath.; in 1 of 8 hosts examined. *Brotula barbata* (Bloch & Schneider); 79-140 fath.; in one host examined. *Coelorhynchus carminatus* (Goode); 300 fath.; in 3 of 33 hosts examined. *Lophius piscatorius* Linn.; 55 fath.; in one host examined. *Merluccius* sp.,

probably *M. bilinearis* (Mitchill); 168-250 fath.; in 4 of 23 hosts examined. *Paralichthys oblongus* (Mitchill); 168 fath.; in 1 of 7 hosts examined. *Paralichthys* sp., probably *P. squamilentus* Jordan & Gilbert; 40 fath.; in one host examined. *Phycis cirratus* Goode & Bean; 90 fath.; in 2 of 8 hosts examined. *Sauridia normani* Longley; 60 fath.; in 1 of 6 hosts examined. *Setarches parmatus* Goode; 249 fath.; in 1 of 2 hosts examined. *Synodontid;* 60-125 fath.; in 2 of 9 hosts examined. *Synodus intermedius* (Agassiz); 40 fath.; in 1 of 9 hosts examined. *Urophycis regius* (Walbaum); 168-220 fath.; in 3 of 13 hosts examined.

LOCATION: Stomach.

This species has been reported from *Coelorhynchus* sp. from Japan by Yamaguti (1938).

176. GONOCERCA PHYCIDIS Manter, 1925

HOSTS: *Coelorhynchus carminatus* (Goode); 300 fath.; in 1 of 33 hosts examined. *Merluccius* sp., probably *M. bilinearis* (Mitchill); 197-367 fath.; in 3 of 23 hosts examined. *Urophycis regius* (Walbaum); 139-156 fath.; in 1 of 13 hosts examined.

LOCATION: Stomach.

177. GONOCERCELLA ATLANTICA Manter, 1940

Fig. 126

SYNONYM: *Distomum* species of Linton, 1905, p. 367, fig. 204.

HOST (for an immature specimen): *Monacanthus hispidus* (Linn.), filefish; in 1 of 71 hosts examined.

LOCATION: Intestine.

Discussion: This species was named for the *Distomum* species of Linton (1905:367) from *Trachinotus carolinus* at Beaufort, North Carolina. Measurements of my specimen (immature, but with gonads well developed) are: length 3.5 mm; width 0.766 mm; forebody 1.82 mm; oral sucker 0.467 mm; acetabulum 0.759; pharynx 0.153 mm long and 0.219 mm wide; sucker ratio 1:1.6. The diverticulum of the esophagus was indistinct in my specimen and not described by Linton. Linton records for the adult: length 5.5 mm; width 0.88 mm; oral sucker 0.5 mm; acetabulum 1. mm; pharynx 0.21 by 0.21 mm; eggs 27 by 14 μ.

The species is closely related to *G. pacifica* Manter, 1940 from a related host in the Pacific. It differs in shorter eggs (27 μ as compared with 34 μ), much more profuse prostatic gland cells, and longer and more coiled seminal vesicle.

178. PARASTERRHURUS ANURUS Manter, 1934

HOST: *Argentina striata* Goode & Bean; 98-168 fath.; in 3 of 5 hosts examined.

LOCATION: Stomach.

179. HEMIPERINA NICOLLI Manter, 1934

HOSTS: *Chaunax pictus* Lowe; 300 fath.; in 1 of 9 hosts examined. *Dibranchus atlanticus* Peters; 300 fath.; in 1 of 8 hosts examined. *Diplacanthopoma brachysoma* Günther; 249-300 fath.; in 4 of 4 hosts examined.

LOCATION: Stomach.

180. HYSTEROLECITHA ROSEA Linton, 1910
Figs. 127, 128

HOSTS: *Acanthurus bahianus* Castelnau,* ocean tang; in 1 of 6 hosts examined. *A. caeruleus* Bloch & Schneider, blue tang in 1 of 10 hosts examined. *A. hepatus* (Linn.), doctor fish; in 2 of 6 hosts examined.
LOCATION: Stomach.

The following is modified from Linton's (1910:52-53) description: Body elongate, cylindrical, without ecsoma, tapered at each end; red in life; size 2.673 to 5.5 by 0.450 to 0.920 mm; greatest width at level of acetabulum. Oral sucker subterminal; small preoral lip present. Acetabulum very large, wider than the body at other levels, about 1/3 from anterior end, about 3 times diameter of oral sucker. Pharynx contiguous to oral sucker; esophagus about the same length as pharynx; ceca extending to near posterior end of body. Genital pore median, immediately posterior to bifurcation of ceca. Testes spherical, near together but not in contact, not far posterior to acetabulum. Seminal vesicle a long, rather slender, sinuous tube, usually with two or three indistinct bends. Pars prostatica a slightly coiled tube, its distal 1/2 to 2/3 surrounded by prostatic gland cells (Fig. 128). Sinus sac pyriform, weakly developed; ductus hermaphroditicus muscular and protrusible. Ovary far posterior, about 1/4 to 1/5 from the posterior end of the body, transversely ovoid or subglobular. Vitelline gland of 7 lobes fused centrally to form a rosette-like appearance; immediately posterior to ovary; lobes rounded or somewhat longer than wide. Seminal receptacle lacking; uterine seminal receptacle present. Uterus sends a single loop a short distance posteriorly then extends forward in short transverse coils to acetabular level thence almost straight to the genital sinus. Eggs 27 to 34 by 15 to 17 μ. Excretory pore terminal; excretory vesicle forking at leve lof testes, its branches uniting dorsal to pharynx or posterior part of oral sucker.

Generic Diagnosis of Hysterolecitha: Family Hemiuridae; subfamily Lecithasterinae. Body smooth, elongated, almost cylindrical, without ecsoma. Acetabulum in anterior half of body. Genital pore near intestinal bifurcation. Excretory crura uniting anteriorly. Testes oblique; seminal vesicle tubular, preacetabular; prostatic vesicle lacking; prostatic portion of male tube separated from seminal vesicle by a non-glandular portion, as in *Aponurus*. Sinus sac small and weak, pyriform; ductus hermaphroditicus muscular. Ovary ovoid, unlobed, far posterior to testes. Seminal receptacle lacking. Intestinal ceca extending posterior to uterus. Vitelline mass of 7 or 8 distinct lobes either rounded or somewhat longer than wide, centrally fused. Eggs 22 to 34 μ in length. Type species: *Hysterolecitha rosea* Linton, 1910. Other species: *H. elongata* Manter, 1928; *H. microrchis* Yamaguti, 1934; *H. xesuri* Yamaguti, 1938; *H. lintoni* Srivastava, 1939. The *"Hysterolecitum blepsiae"* Layman, 1930 is insufficiently described.

The genus *Hysterolecitha* is considered in the subfamily Lecithasterinae on the basis of the absence of the ecsoma. *Aponurus* is a related genus but the body is less elongated, the vitellaria are of seven rounded, separate follicles; a seminal receptacle is present; and the uterus, excpt in *A. brevicaudatus,* is more extensive posterior to the ovary extending to or beyond the tips of the

* New host record

ceca. *Hysterolecithoides* Yamaguti, 1934 has a more posterior acetabulum and genital pore, a seminal receptacle, more separated vitelline lobes, symmetrical testes and the excretory crura do not unite.

181. MACRADENA PERFECTA Linton, 1910
Figs. 129-131

HOST: *Acanthurus caeruleus* Bloch & Schneider, blue tang; in 5 of 10 hosts examined.
LOCATION: Intestine.

Description: Body cylindrical, elongate, very muscular and contractile, with smooth surface, without caudal appendage, tapering toward each end, almost equally wide along most of its length; 2.550 to 7.020 by 0.450 to 0.540 mm. One 3.105 mm specimen had produced only a few eggs in the early coils of the uterus but another 2.630 mm in length contained many eggs. Oral sucker subterminal, slightly longer than wide. Acetabulum large, far forward. Linton states it is 1/5 to 1/6 body length from the anterior end but it may be only 1/10. Acetabulum slightly longer than wide, deep, usually slightly protuberant; its transverse diameter approximately twice the diameter of the oral sucker. Most specimens show a side view of the acetabulum. Sucker measurements of 7 specimens showing ventral view of both suckers were: oral sucker 0.175 to 0.277 mm, acetabulum 0.397 to 0.555 mm; sucker ratio 1:2 to 2.2. Pharynx large; esophagus very short, but, for a short distance, the ceca have the same thin-walled appearance of the esophagus. Near the acetabulum each cecum begins as a small sac-like swelling; ceca reaching to near posterior end of the body filled with dark material evidently the remains of blood of the host.

Genital pore between acetabulum and level of intestinal bifurcation. Testes subspherical or transversely oval, close together, tandem, at a varying distance from the acetabulum. In a few specimens the testes were not far from the acetabulum, in others they may lie as much as 1/3 body length posterior to the acetabulum. The genital pore opens into a cavity with thick, folded walls. This genital sinus, perhaps more of a genital atrium, extends dorsally from the pore and is surrounded by longitudinal muscle fibers which do not, however, form a very distinct wall. Thus, the sinus sac is weakly developed. The uterus and the male duct open into the sinus dorsally approximately at the level of the genital pore. No genital cone or papilla was observed although the folded walls of the sinus suggested that such a structure might be formed at times. The male duct is a simple, straight, narrow tube extending posteriorly to the acetabulum dorsal to which it becomes the pars prostatica surrounded by prostatic cells. The pars prostatica is very long, either slightly or markedly coiled, extending to approximately the level of the anterior testis. The coiled, tubular seminal vesicle lies near or overlaps the anterior testis.

Ovary consisting of four ovoid lobes, two more or less directly dorsal to the other two; lobes apparently separated but in contact. Large, ovoid seminal receptacle immediately posterior to ovary. Vitelline lobes arising between ovary and seminal receptacle, spreading out ventrally somewhat beyond both the ovary and the receptacle, branched to form many clavate or finger-like processes, an anterior set spreading from four stems, and a posterior set

spreading from three main stems (Fig. 130). Vitelline branches slightly curving but not coiled; number of branches somewhat variable, about 40 free tips counted in one specimen. Uterus extending posteriorly in short, lateral coils ventrally located, then anteriorly in dorsally located coils to level of testes where the coils become more ventral as they extend forward to the genital sinus. Eggs 22 to 27 by 12 to 14 μ. Excretory pore terminal or subterminal; excretory vesicle branching just posterior to acetabulum, branches uniting dorsal to pharynx.

Since Linton did not give a diagnosis of *Macradena,* the following is proposed: Tailless, elongate, muscular, cylindrical hemiurids. Cuticula smooth. Suckers not far apart; acetabulum deep and strong. Digestive system with large pharynx, forked esophagus with swellings at beginnings of the ceca. Testes preovarian. Genital sinus a folded muscular tube; sinus sac weakly developed; pars prostatica very long and coiled; seminal vesicle tubular and coiled. Ovary of four separate lobes; seminal receptacle present, postovarian; vitelline tubes with fairly numerous but relatively short branches arising from 4 anterior and 3 posterior stems. Excretory vesicle forking near acetabulum, branches uniting dorsal to pharynx. Type species: *M. perfecta* Linton, 1910.

Discussion: This genus appears to be related to *Hysterolecitha, Opisthadena,* and *Theletrum* judging from body form, lack of ecsoma, tubular seminal vesicle, and presence of a seminal receptacle; but it differs in its 4-partite ovary and branched vitellaria. Since the other three genera seem to belong in the subfamily Derogenitinae, *Macradena* is also included there. Its 4-partite ovary suggests the Lecithasterinae and the branched tubular vitellaria resemble more those found among the Sclerodistominae. *Macradena* is probably most like the genus *Trifoliovarium* Yamaguti, 1940 which it resembles in shape of body, arrangement of organs and also in deeply lobed ovary. It differs in its branched vitellaria, posterior extent of the uterus, and shape of the oral sucker.

182. **Macradenina acanthuri** n. gen., n. sp.

Figs. 129-133

HOST: *Acanthurus caeruleus* Bloch & Schneider, blue tang; 2 specimens in 1 of 10 hosts examined.

LOCATION: Intestine.

Description: Body elongate, cylindrical, smooth, without ecsoma. Size 2.4 to 2.8 by 0.48 to 0.58 mm. Live specimens reddish in color. Oral sucker elongate, embedded in body, length 0.202 to 0.240 mm, thickness 0.152 to 0.192 mm. Acetabulum about 1/4 body length from anterior end, with transverse aperture, 0.337 to 0.376 mm in diameter. Ratio of longitudinal diameters of suckers 1:1.66 to 1.68. Esophagus short; ceca voluminous, extending to posterior end of body, containing a black, granular material probably derived from blood of host. Pharynx slightly wider than long 0.085 to 0.088 by 0.093 to 0.102 mm.

Genital pore approximately midway betwen suckers. Testes subglobular,

slightly wider than long, tandem, close together but not in contact, postovarian, approximately midway between acetabulum and posterior end of body. Seminal vesicle tubular, loosely coiled, its posterior end near anterior testis and postovarian; pars prostatica a long, almost straight tube extending from level of ovary to base of sinus sac. Sinus sac subcylindrical, its membrane apparently incomplete posteriorly; ductus hermaphroditicus thick-walled. Ovary 4-lobed, not far posterior to acetabulum; seminal receptacle subspherical, large, postovarian. Vitellaria composed of 12 claviform unbranched tubes centered ventral to ovary. Uterus extending to near posterior end of body. Eggs 28 to 30 by 14 to 16 μ. Excretory system not observed.

Generic diagnosis of Macradenina: Hemiuridae, subfamily Lecithasterinae. Tailless hemiurids with smooth, elongate, cylindrical body. Intestinal ceca long and voluminous. Testes tandem, postovarian; seminal vesicle tubular; pars prostatica long; sinus sac cylindrical. Ovary 4-lobed; seminal receptacle postovarian; vitellaria composed of 12 claviform, unbranched lobes, ventral to ovary. Uterus filling most of hindbody. Type species: *Macradenina acanthuri.*

Discussion: The genus *Macradenina,* named for its similarity to *Macradena* Linton, 1910, differs from the latter only in that the testes are postovarian and the vitelline lobes are unbranched. Both genera are intestinal parasites of *Acanthurus* at Tortugas. Related, elongate Lecithasterinae seem to be *Trifoliovarium* Yamaguti, 1940 and perhaps *Hysterolecitha* Linton, 1910.

183. OPISTHADENA DIMIDIA Linton, 1910

Figs. 134-139

HOSTS: *Kyphosus sectatrix* (Linn.), white chub; in 8 of 10 hosts examined. *Kyphosus incisor* (Cuv. & Val.),* yellow chub; in 1 of 5 hosts examined.

LOCATION: Stomach.

Diagnosis: The following description supplements and extends the short description of Linton (1910:54-55).

Body elongate, cylindrical, smooth, without ecsoma. Anterior end bluntly pointed; posterior end broadly rounded. Size 2.800 to 8.370 by 0.450 to 1.039 mm, widest at level of acetabulum. Oral sucker subterminal, subspherical, often embedded in anterior end of body, 0.195 to 0.292 mm in transverse diameter. Preoral lip present. Various paired papillae associated with mouth (Fig. 135). One pair is at the ventro-posterior edge of the mouth (one papilla on each side of the midline), another pair lies immediately lateral to these at the lateral angles of the mouth. Three pairs of papillae occur on the preoral lobe: 1 pair ventral, 1 pair dorsal, and 1 pair lateral (Fig. 135). There are thus 5 pairs of papillae associated with the mouth opening. On the ventral wall of the oral cavity not far from the mouth occur two sessile, circular, rather conspicuous papillae, one on each side of the midline. Acetabulum large, from 1/5 to 1/9 body length from anterior end, occupying most of the body width which is greatest at this level, approximately three times the size of the oral sucker, 0.487 to 0.817 mm in transverse diameter. The

* New host record.

acetabulum is provided with a peculiar transverse fold of the body wall extending across the ventral surface slightly posterior to aperture of the sucker (Fig. 136). This thin fold is muscular with transverse and apparently dorso-ventral or diagonal muscles. When specimens are flattened in killing this flap may be inconspicuous. Sometimes it projects at the sides of the body giving the appearance described by Linton as lateral papillae.

Pharynx closely applied to oral sucker; short esophagus inflated and immediately forking to form two lateral inflated regions (Fig. 137); ceca extending to near posterior end of body.

Genital pore median, just posterior to intestinal bifurcation, about midway between acetabulum and pharynx. It leads to a short, tubular genital atrium which is well filled by the muscular, cylindrical, truncated, genital cone or papilla (Fig. 138). The atrium is followed posteriorly by a subspherical, thick-walled sinus sac. Both the male duct and the uterus enter near the base of the sac. The ductus hermaphroditicus is surrounded by gland cells; a swollen region of the duct occurs near the anterior end of the sac at base of the genital cone. Large cells in this swollen region suggest the prostatic vesicle of some hemiurids. The sinus sac extends to near the anterior edge of the acetabulum. Outside the sac at its posterior edge occurs a cluster of small gland cells. The two testes are smooth, transversely extended, tandem, close together, median, posterior to midbody, preovarian. The seminal vesicle is a broad tube folded two or three times and enclosed within a muscular, ovoid sac, which might be called the *seminal sac,* not far anterior to the testes. Pars prostatica a long, sinuous tube surrounded by conspicuous gland cells, extending from seminal sac almost to acetabulum; from here it continues forward, dorsal to the acetabulum, as a straight tube leading to the sinus sac. Ovary ovate, somewhat extended transversely, a short distance posterior to testes. Seminal receptacle flask-shaped, extending from posterior edge of the ovary anteriorly to the posterior testis. Vitelline glands two, compact, smooth, side by side, immediately posterior to ovary. Uterus extending a short distance posterior to the vitelline glands, then forward in very short, transverse coils becoming straight at the acetabulum, to the sinus sac. Eggs (Fig. 139) rather thin-shelled, yellow, elongate, broadly rounded at each end, slightly bent in the middle, variable in size, 27 to 42 by 12 to 17 μ. The terminal excretory pore is followed by a short sac-like region of the vesicle which continues into a thin-walled, tortuous tube bending about among the gonads, forking at level of the testes into two thin-walled tubes. These crura early show signs of bulbous expansions which become very pronounced anterior to the acetabulum. Here the crura send out numerous, broad, lobe-like processes (Fig. 137) which may meet but not fuse medianly. Almost the entire forebody is filled by clear, bulbous, vesicular sacs continuous with the excretory crura. Opposite the oral sucker dorsally the crura unite and send out three finger-like processes which extend to near the anterior tip of the body (Fig. 137). A pair of lateral, anteriorly directed processes also occurs (Fig. 137). From the lateral processes there arises on each side a smaller tube which coils backward to end near the forking of the vesicle.

Generic Diagnosis of Opisthadena: Family Hemiuridae; subfamily Dero-

genetinae. Body elongate; cylindrical; widest at acetabulum, smooth; without ecsoma; with ventral acetabular fold. Testes tandem, posterior to midbody. Seminal vesicle a folded tube enclosed in a muscular sac; pars prostatica long; sinus sac well developed, containing gland cells; ductus hermaphroditicus forming a muscular genital cone lying in a genital atrium. Ovary posttesticular; two compact, post-ovarian vitellaria. Seminal receptacle present. Uterus only slightly posterior to ovary. Excretory crura with numerous bulbous branches in forebody, uniting dorsal to oral sucker. Type species: *Opisthadena dimidia* Linton, 1910.

The genus *Opisthadena* is placed in the subfamily Derogenetinae because of its compact vitellaria. *Theletrum* Linton, 1910 is a related genus. *Macradena* has the long pars prostatica and a similar body shape but has tubular vitellaria. *Opisthadena* is similar in body shape but has lobed vitellaria, lacks a seminal receptacle, and has a greatly reduced pars prostatica.

184. DICTYSARCA VIRENS Linton, 1910

Figs. 140, 141

HOST: *Gymnothorax funebris* Ranzani, black moray; in 1 of 3 hosts examined; 3 specimens.

LOCATION: Air bladder.

Discussion: Linton (1910:58-59) reported the species from both the black and the spotted moray at Tortugas. Study of my specimens does not permit much addition to Linton's description. They are about the size of Linton's largest (about 10 mm long). They are large, thick trematodes beautifully colored in life by the opaque white of the gonads and the bright yellow-orange of the eggs in the uterus. Typical measurements are: length 10 mm; width 3.60 mm; forebody 1.823 mm; oral sucker 0.712 mm; acetabulum 0.787 mm; eggs 27 by 15 μ. The large vesicular, parenchymal cells noted by Linton are very conspicuous. The ceca are large and filled with a finely granular material. The testes are lateral, extracecal, more or less diagonal, not far posterior to the acetabulum. The terminal male ducts could not be well observed in my material. They seem to be as described by Linton, i.e. a short genital atrium but no sinus sac. The lobed ovary is to the left, not far from the posterior end of the body. The two large vitelline masses are multilobed, lateral and symmetrical, immediately preovarian. The uterus fills most of the body. Its early coils contain many sperm cells. Cross-sections of one of my specimens do not reveal a typical seminal receptacle, but Mehlis' gland is large and bipartite, each part enclosed in a membrane. The part receiving the yolk duct and the oviduct is more or less typical but contains two distinct kinds of gland cells. It connects by a narrow duct with the other part which is equally large and mostly filled with a fine fibrous stroma but with a tube containing sperm cells. Laurer's canal was not observed. The excretory crura unite dorsal to the pharynx.

The small eggs hatch in partially evaporated sea-water. The larva is unciliated and somewhat similar to that of *Otodistomum*. The bristle plates were not clearly seen; there were probably four but two seemed larger than the others.

Dictysarca was probably correctly assigned to the Hemiuridae by Poche (1926). It is at least a Hemiuroidea. Its subfamily connections are not clear.

185. HIRUDINELLA VENTRICOSA (Pallas, 1774) Baird, 1853

Figs. 142-144

HOST: *Coryphaena hippurus* Linn., "dolphin"; in 2 of 4 hosts examined; 1 mature and 3 immature specimens.

LOCATION: Location of the immature specimens was not recorded; the mature specimens seemed to come from the body cavity.

Discussion: The type species of *Hirudinella* is *H. clavata* (Menzies, 1791), found in the stomach of *Scomber pelamys*. Various names given to this or closely related species have resulted in a confusing synonymy and the actual number of species in the genus is very uncertain. They are giant distomes known from early times and have been classified according to external form and other characters which are clearly subject to great individual variations in such muscular worms. Their descriptions date back to a time when the worms were referred to as "insects". They have been reported as being found several times free in the sea! As the unreliability of external features became realized, students (such as Poirier, 1885; Darr, 1902; Buttel-Reepen, 1903; and Mühlschlag, 1914) stressed in great detail the histology of these trematodes which were studied chiefly from serial sections. It seems somewhat strange that the common specific characters such as sucker ratio; position of gonads; extent and character of vitellaria; and egg size have been given little consideration or are buried within pages of histological detail. Published figures are either of externals only, or of sections.

Material to aid in clearing this confusion is not available to me. The problem is a complex one. Probably too many species are still recognized although there may well be several valid ones. My material of *H. clavata* from the Pacific (Manter, 1940) shows a very elongate cylindrical body with swollen posterior end, but young specimens of *H. beebei* have the same shape as these specimens from *Coryphaena*. The identification of my specimens as *Hirudinella ventricosa* is tentative. The host record is not new.

The following observations might be noted. The mature specimen measured 22.5 by 8.5 mm. The oral sucker was 1.738 mm in diameter; the acetabulum, with rounded aperture, was 3.879 mm; the sucker ratio thus being 1:2.2. The genital pore is opposite the base of the pharynx. The esophagus extends to each side leading to the inflated, lobed swellings representing the beginnings of the ceca. The ceca are rather narrow in the forebody but posterior to the acetabulum become huge in size filling most of the body. They show transverse foldings or pleats and apparently each has a longitudinal fold or pleat extending along the middle third of the hindbody. The three gonads are close together just posterior to the acetabulum, the small ovary being directly posterior to the right testis. The vitellaria anastomose to form a network (Fig. 144) chiefly ventral and dorsal to the ceca and extend from midtestis level to about 1/3 body length from the posterior end. The uterine coils are crowded between the ceca; they extend posteriorly to about the same limit as the vitellaria. Whether the male and female ducts open together or separately

could not be observed from the serial sections made of one immature specimen. However, as Chandler suggested, this point perhaps varies with contraction of the genital pore. Eggs, so far as they could be measured from a totomount, were about 33 by 19 μ, and had fairly thin shells.

Generic characters are, I believe, proximity of ovary to testes; the inflated ceca; the vitellaria anastomosing to form a network; and the failure of both the uterus and the vitellaria to reach by some distance the posterior end of the body.

186. **Sclerodistomum sphoeroidis** n. sp.

Figs. 145-148

HOST: *Sphoeroides spengleri* (Bloch), puffer; in 6 of 36 hosts examined; 1 specimen in each of 5 hosts; 3 specimens, 2 immature, in another.

LOCATION: Body cavity.

Description: Body thick and muscular but forebody rather slender; color deep red in life; length 5.536 to 7.411 mm; greatest width 1.592 to 3.294 mm, near middle of hindbody; posterior end broadly rounded; forebody tapering. A specimen 4.117 mm long was immature. Oral sucker longer than wide, 0.387 to 0.667 mm in width by 0.438 to 0.740 mm in width; acetabulum subspherical, with small, longitudinal aperture, 0.752 to 1.372 mm in diameter. Ratio of transverse diameter of oral sucker to that of acetabulum about 1:2. Forebody about 1/4 to 1/3 body length. Pharynx 0.204 to 0.225 mm long by 0.182 to 0.262 mm wide; esophagus very short, with folded inner wall; small enlargement at beginning of each cecum; ceca fairly large but not voluminous as in *Hirudinella,* slightly sinuous, with finely corrugated wall, extending to posterior end of body, often containing a black material.

Genital pore midway between suckers, median or submedian, immediately posterior to intestinal bifurcation. Two testes, wider than long, in contact, side by side or diagonal, very closely posterior to acetabulum, often slightly overlapping posterior edge of acetabulum. Seminal vesicle a coiled tube with muscular wall and embedded in a finely fibrous stroma of the parenchyma. Anterior to the acetabulum the stroma becomes glandular but the male duct, now the pars prostatica, remains very muscular. The male duct joins the metraterm about in the middle of the genital cone (Fig. 146). Genital cone and atrium large. Ovary ovoidal or subspherical, distant from testes, about in middle of hindbody, median or to the right. Mehlis' gland compact, well developed, at the right or the left posterior edge of the ovary. Laurer's canal present, somewhat coiled, leading to a spherical enlargement within Mehlis' gland and containing sperm cells. True seminal receptacle absent. Uterus with wide, intercecal transverse coils reaching to near the posterior end of the body then forward becoming a muscular metraterm near posterior border of acetabulum. The metraterm leads through the compact stroma surrounding the seminal vesicle and joins the male duct in the genital cone. The vitellaria originate as coiled tubes, 3 on one side, 4 on the other. These tubes almost immediately fork and some of them may fork agaain as they extend laterally from the region of Mehlis' gland. Near the ceca the tubes begin to diverge and lateral to the ceca they spread anteriorly and posteriorly as much coiled

but not anastomosing tubes. They seem to number from 7 to 10 with 8 as the most common number. Anteriorly they reach almost to testicular level, posteriorly almost to the end of the body. Only a few coils occur median to the ceca. Eggs are 32 to 36 by 19 to 24 μ and possess extremely thick shells (about 4 μ, as in *S. italicum*).

The excretory system is rather unusual but similar to that described by Looss (1912) for *S. italicum*. From the terminal excretory pore a short, narrow, cellular tube leads forward, enlarges to form a wider tube, then divides into two short, narrow, still cellular branches (Fig. 148). Usually one of these branches is much shorter than the other. The longer branch ends blindly just median to one of the intestinal ceca. Cross-sections show clearly that the shorter branch opens into the inflated, thin-walled, vesicular portion of the system. The junction is surrounded by a sphincter muscle. The vesicular portion of the system is lined with flat epithelium and sends out bulbous branches some of which may extend posteriorly along the side of the median excretory tube. About midway between the ovary and testes this highly irregularly shaped vesicle forks into two crura which extend into the region of the oral sucker. In the forebody they are less branched but still possess irregular bulbous outpocketings. They unite dorsal to the oral sucker.

Discussion: Only one other species, *S. italicum,* has been described in this genus. *S. sphoeroidis* differs from it in its smaller size, more slender forebody; more anterior genital pore, testes close together rather than far apart, and smaller eggs. Similarities include such details as the very thick shells of the eggs, and the peculiar excretory system although in *S. sphoeroidis* the "differentiated paired tube" labeled *Ex*[1] in Looss's figure has at least one long arm. *S. sphoeroidis* is from the body cavity rather than from the stomach of the host.

Dollfus (1932) proposed that the Sclerodistomatinae be raised to family rank and separated from *Hirudinella,* largely on the basis of the excretory system. Considering the terminal genital ducts, the tubular vitellaria, the shell gland complex, and the similarity in body form, I am inclined to retain *Sclerodistomum* and *Hirudinella* in the Sclerodistomatinae. In both genera the excretory vesicle is voluminous either as much coiling tubes or as a bulbous inflated tube.

187. TETROCHETUS CORYPHAENAE Yamaguti, 1934

Fig. 149

HOST: *Coryphaena hippurus* Linn., "dolphin"; in 3 of 4 hosts examined.
LOCATION: Intestine.

APOROCOTYLIDAE

188. DEONTACYLIX OVALIS Linton, 1910

Fig. 150

HOSTS: *Kyphosus sectatrix* (Linn.), white chub; in 4 of 10 specimens examined.
Kyphosus incisor (Cuv. & Val.), yellow chub; in 1 of 5 hosts examined.
LOCATION: Body cavity.

Discussion: Linton's description of this species is essentially correct but

incomplete in some respects. He did not indicate the location of the parasite. Manter (1940:445) has noted its collection from the coelom of the host. All my 33 specimens were from that location and although the trematode is a typical blood fluke in its morphology, it is evidently a coelomic parasite.

The body surface is provided with rows of fine spines which are only slightly better developed laterally. There is a single testes, located about in the middle of the body. The testis is more or less H-shaped, with two longitudinal extracecal extensions the posterior ends of which reach slightly beyond the ceca; two transverse processes extend medianly and unite at the center of the testis, leaving two large spaces, one on each side of midline (Fig. 150). The testis is of the reticulate type with scattered small perforations or pores. The vas deferens extends backward in broad curves to form an S-shaped path with a conspicuous C-curve near the posterior end. A small, ovoid cirrus sac with very thin membrane is present. The lobed ovary is to the left of midline; the uterine seminal receptacle is just anterior to the point of union with the vitelline duct; the uterus is much coiled and extends anterior to the ovary; the vitelline glands lie chiefly in the area of the ceca, extra- and inter-cecal, ventral to the ceca, largely covering the testis; some follicles occur anterior to the ceca along the sides of the posterior portion of the esophagus. There is a short, relatively weak metraterm. The uterine pore is closely anterior to the male pore.

One other genus of Aporocotylidae, *Psettarium* Goto & Ozaki, 1930 (= *Plehnia* Goto & Ozaki, 1929), possesses a single, reticulated testis. *Deontacylix* differs in its preovarian coils of the uterus and in a number of smaller characteristics.

189. **Psettarium cardiocolum** n. sp.

Figs. 151, 152

HOST: *Calamus bajonado* (Bloch and Schneider), grass porgy; in 1 of 15 hosts examined.

LOCATION: Heart.

Description: Body very thin, 1.125 mm long by 0.167 mm wide. Spines in short transverse rows, ventrally around periphery of body. For a short distance near midbody and adjacent to the male pore, the spines in the rows are fused to form a single chitinous rod the pointed tip of which projects as a fine, hair-like spine. The mouth is subterminal and ventral, the long esophagus is a little less than 1/2 body length, the intestinal bifurcation being 0.450 mm from anterior end. Anterior ceca broad and rather short, 0.075 mm in length; posterior ceca 0.300 to 0.315 mm in length, extending about 1/2 way between bifurcation and posterior end of body. Male pore dorsal, near left edge of body, 0.051 mm from posterior end, at tip of papilla-like projection apparently the end of the cirrus sac. Testis single, elongate, slightly irregular in shape, outline rather indistinct, filling intercecal space from intestinal bifurcation to tips of ceca, not extending beyond ceca laterally. Testes perforated by a number of openings, hence of the reticulated type. Vas deferens swollen to function as seminal vesicle, only slightly sinuous, extending to near posterior end of body where it narrows and turns to the left to enter cirrus sac. Origin of vas deferens was not clearly seen, but probably multiple. Cirrus sac pyriform, 19 by 9 μ, partly projecting from genital pore.

Ovary, bilobed, median, without distinct membrane, about 1/4 body length from posterior end. Vitellaria consisting of small follicles from level of ovary to transverse nerve commissure 0.102 mm from anterior end; extracecal, filling median portion of body on each side of esophagus but with narrowing fields ending at nerve commissure. Oviduct extending posteriorly to about halfway between ovary and posterior end, here it receives the long unpaired vitelline duct then bends forward as a rather wide uterus to the left lobe of the ovary where it bends sharply backward toward the uterine pore; one short loop in descending arm of uterus; metraterm cylindrical, with thick walls, 27 μ long, 10 μ wide. Uterine pore a short distance (0.068 mm) anterior to male pore, about halfway between left edge and midline of the body. Mehlis' gland diffuse, from oviduct region almost to level of male pore. No fully formed eggs present. A number of egg cells and vitelline cells in basal portion of uterus did not seem to possess egg shells.

Comparisons: Two genera of Aporocotylidae possess a single reticulated testis: *Deontacylix* Linton, 1910, and *Psettarium* Goto and Ozaki, 1930 (= *Plehnia* Goto and Ozaki, 1929). Although the present species might deserve generic rank, it is placed in *Plehnia* because of the postovarian uterus in contrast to the long, preovarian coils of the uterus in *Deontacylix*. It differs from *P. japonicum* (Goto and Ozaki, 1929) in its median, bilobed ovary, more anterior Mehlis' gland, much longer esophagus, and much less extensive testis. It is more similar to *P. tropicum* Manter, 1940 but is much smaller, has a relatively much longer esophagus, longer anterior ceca, more anterior Mehlis' gland, and a distinct metraterm.

Host List

The following is an alphabetical list of fishes in which adult, digenetic trematodes were found, together with a list of the trematodes from each host. The number in parentheses indicates the number of hosts examined.

Abudefduf saxatilis (Linn.), sergeant major (13)
- *Deretrema fusillus*
- *Haplosplanchnus adacutus*
- *Parahemiurus merus*

Acanthurus bahianus Castelnau, ocean tang (6)
- *Hysterolecitha rosea*

Acanthurus coeruleus Bloch & Schneider, blue tang (12)
- *Hapladena varia*
- *Haplosplanchnus obtusus*
- *Hysterolecitha rosea*
- *Lecithaster acutus*
- *Macradena perfecta*
- *Macradenina acanthuri*
- *Mesolecitha linearis*

Acanthurus hepatus (Linn.), tang (6)
- *Hapladena varia*
- *Haplosplanchnus obtusus*
- *Hysterolecitha rosea*
- *Lecithaster acutus*

Alutera schoepfii (Walbaum), filefish (2)
- *Rhagorchis odhneri*

Ancylopsetta dilecta (Goode & Bean (8)
- *Gonocerca crassa*
- *Lecithochirium microstomum*
- *Pseudopecoelus vulgaris*

Anisotremus virginicus (Linn.), porkfish (4)
- *Brachadena pyriformis*
- *Diplangus paxillus*
- *Hamacreadium mutabile*
- *Hamacreadium oscitans*
- *Leurodera decora*
- *Monorchis latus*
- *Proctotrema longicaecum*

Antennarius radiosus Garman, frog fish (3)
- *Sterrhurus floridensis*

Antennarius scaber
(Cuv.), frog fish (2)
Sterrhurus floridensis
Apogon maculatus
(Poey), cardinal fish (2)
Helicometrina nimia
Apogon pseudomaculatus
Longley, cardinal fish (4)
Helicometrina nimia
Argentina striata Goode & Bean (5)
Parasterrhurus anurus
Steringophorus profundus
Auxis thazard (Lacépède), frigate mackerel (Linton's record)
Tergestia laticollis

Balistes capriscus
Gmelin, triggerfish (2)
Xystretrum solidum
Balistes vetula Linn.,
queen triggerfish (7)
Apocreadium balistis
Diplangus paxillus
Helicometrina nimia
Bathystoma rimator (Jordan & Swain), tomtate (3)
Genolopa ampullacea
Bathygobius soporator
(Cuv. & Val.), goby (12)
Helicometra execta (?)
Bathystoma striatum
(Cuv. & Val.) (14)
Brachadena pyriformis
Genolopa ampullacea
Bellator militaris (Goode & Bean) (23)
Helicometra fasciata
Pseudopecoelus vulgaris
Bembrops gobioides (Goode) (15)
Pseudopecoelus vulgaris
Sterrhurus floridensis
Benthodesmus atlanticus
Goode & Bean (1)
Pseudopecoelus vulgaris
Bothus ocellatus (Agassiz) (19)
Ectenurus virgulus
Brachygenys chrysargyreus
(Günther), bronze grunt (7)
Brachadena pyriformis
Diplangus paxillus
Dipherostomum americanum
Genolopa ampullacea
Hamacreadium oscitans
Leurodera decora
Brotula barbata (Bloch & Schneider) (5)
Gonocerca crassa
Lissoloma brotulae
Metadena brotulae
Pseudopecoelus vulgaris
Sterrhurus floridensis

Calamus bajonado (Bloch & Schneider), grass porgy (15)
Anahemiurus microcercus
Brachadena pyriformis
Lecithochirium sp.
Lobatostoma ringens
Plagioporus crassigula
Proctoeces erythraeus
Pycnadenoides calami
Psettarium cardiocolum
Stephanostomum sentum

Calamus calamus (Cuv. & Val.), saucer-eye porgy (20)
Anahemiurus microcercus
Brachadena pyriformis
Helicometrina nimia
Lobatostoma ringens
Myzoxenus vitellosus
Plagioporus crassigula
Proctoeces erythraeus
Pseudocreadium anandrus
Pycnadena lata
Stephanosotmum sentum
Callionymus agassizii Goode & Bean
Derogenes crassus
Caranx bartholomaei
Cuv. & Val., yellow jack (3)
Bucephalus varicus
Paraproctotrema brevicaecum
Parectenurus americanus
Pseudopecoeloides carangis
Tergestia acuta
Caranx latus Agassiz, jack (6)
Bucephalus varicus
Stephanostomum ditrematis
Stephanostomum megacephalum
Caranx ruber (Bloch), runner (6)
Bucephalus varicus
Phyllodistomum carangis
Pseudopecoeloides carangis
Stephanostomum ditrematis
Carapus bermudensis (Jones) (4)
Genitocotyle atlantica
Chaetodon aya Jordan,
butterfly fish (2)
Brachadena pyriformis
Chaetodon capistratus Linn.,
butterfly fish (5)
Hurleytrema chaetodoni
Multitestis chaetodoni
Chaetodon ocellatus Bloch,
butterfly fish (11)
Hurleytrema chaetodoni
Multitestis chaetodoni
Chaetodon sedentarius Poey (2)
Brachadena pyriformis
Chauanx pictus Lowe
(=*C. nuttingi*) (9)

Adinosoma robustum
Aponurus intermedius
Hemiperina nicolli
Chlorophthalmus truculentus Goode & Bean (10)
Adinosoma robustum
Citharichthys cornutus (Günther) (22)
Dolichoenterum sp.
Coelorhynchus carminatus (Goode) (36)
Gonocerca crassa
Gonocerca phycidis
Lepidapedon elongatum
Lepidapedon rachion
Lomasoma wardi
Pseudopecoelus tortugae
Coryphaena hippurus Linn., dolphin (7)
Dinurus breviductus
Dinurus barbatus
Dinurus longisinus
Dinurus tornatus
Hirudinella ventricosa
Stephanostomum coryphaenae
Tetrochetus coryphaenae
Cryptotomus auropunctatus (Cuv. & Val.), parrot fish (15)
Haplosplanchnus brachyurus
Cyclopsetta fimbriata (Goode Bean), flounder (8)
Sterrhurus floridensis

Decodon puellaris (Poey), Cuban hogfish (2)
Deretrema fusillum
Myzoxenus vitellosus
Plagioporus crassigula
Dibranchus atlanticus Peters (12)
Hemiperina nicolli
Diodon holocanthus Linn., porcupine fish (3)
Opistholebes adcotylophorus
Diplacanthopoma brachysoma Günther (4)
Hemiperina nicolli
Megenteron crassum
Diplectrum formosum (Linn.) (21)
Lecithochirium parvum
Diplodus holbrookii (Bean), spot-tail pinfish (8)
Plagioporus crassigula
Doratonotus megalepis Günther (7)
Helicometra execta
Echeneis naucrates Linn. (3)
Sterrhurus floridensis
Epigonus occidentalis Goode & Bean (7)
Lepidapedon elongatum
Epinephelus adsencionis (Osbeck), rock hind (1)
Stephanostomum dentatum

Epinephelus morio (Cuv. & Val.), red grouper (33)
Helicometra torta
Lepidapedon levenseni
Opisthoporus epinepheli
Stephanostomum dentatum
Epinephelus niveatus (Cuv. & Val.) (3)
Lepidapedon nicolli
Prosorhynchus ozakii
Stephanostomum microstephanum
Epinephelus striatus (Bloch), Nassau grouper (6)
Helicometra torta
Lecithochirium parvum
Eques acuminatus (Bloch & Schneider), ribbonfish (9)
Helicometra execta
Horatrema crassum
Pseudopecoeloides equesi
Eques lanceolatus (Linn.), ribbonfish (7)
Horatrema crassum
Pseudopecoeloides equesi
Eucinostomus lefroyi (Goode), mojarra (12)
Anahemiurus microcercus
Crassicutis marina
Hurleytrema eucinostomi
Euthynnus alletteratus (Rafinesque), little tunny (3)
Dinurus scombri
Lecithochirium parvum
Lecithochirium texanum
Rhipidocotyle nagatyi
Tergestia laticollis

Fistularia tabacaria Linn. (1)
Sterrhurus microcercus

Gerres cinereus (Walbaum), mojarra (15)
Crassicutis marina
Homalometron elongatum
Gymnothorax funegris Ranzani, black moray (3)
Dictysarca virens
Sterrhurus fusiformis
Stomachicola rubea
Gymnothorax moringa (Cuv.), common spotted moray (3)
Dollfustrema gravidum
Sterrhurus fusiformis
Stomachicola rubea

Haemulon album Cuv. & Val., margate fish (2)
Brachadena pyriformis

Diplangus paxillus
Genolopa ampullacea
Lecithochirium sp.
Proctotrema truncatum

Haemulon carbonarium Poey, black grunt (2)
Genolopa ampullacea
Diplangus parvus
Hamacreadium oscitans
Horatrema crassum
Leurodera decora

Haemulon flavolineatum (Desmarest), french grunt (11)
Genitocotyle atlantica
Genolopa ampullacea
Diplangus parvus
Diplangus paxillus
Leurodera decora
Postmonorchis orthopristis
Proctotrema parvum
Proctotrema truncatum

Haemulon macrostomum Günther, Spanish grunt (6)
Brachadena pyriformis
Genolopa ampullacea

Haemulon parra (Desmarest), sailor's choice (13)
Brachadena pyriformis
Leurodera decora

Haemulon plumieri (Lacépède), common grunt (34)
Brachadena pyriformis
Diplangus paxillus
Genolopa ampullacea
Hamacreadium consuetum
Hamacreadium oscitans
Helicometra execta
Lecithochirium sp.
Leurodera decora
Monorchis latus
Proctotrema truncatum
Stephanostomum sentum

Haemulon sciurus (Shaw), yellow grunt (24)
Brachadena pyriformis
Diplangus paxillus
Genolopa ampullacea
Hamacreadium consuetum
Hamacreadium oscitans
Helicometra execta
Lecithochirium sp.
Leurodera decora
Proctotrema truncatum
Stephanostomum sentum

Halichoeres bivittatus (Bloch), slippery dick (36)
Haplosplanchnus adacutus
Helicometra execta
Helicometrina parva

Halichoeres maculipinna (Müller & Troschel) (2)
Haplosplanchnus adacutus

Halichoeres poeyi Steindachner (=*H. kirschii*) (10)
Helicometra execta

Halichoeres radiatus (Linn.), puddingwife (3)
Helicometra execta

Harengula macrophthalma (Ranzani), sardine (33)
Bacciger harengulae
Diplangus paxillus
Ectenurus virgulus
Opechona gracilis
Parahermiurus merus

Helicolenus maderensis Goode & Bean (21)
Derogenes varicus
Opecoelina helicoleni
Pseudopecoelus vulgaris

Hemiramphus brasiliensis (Linn.), halfbeak (7)
Steganoderma hemiramphi

Hemianthias vivanus (Jordan & Swain) (1)
a small hemiurid; lost

Hepsetia stipes (Müller & Troschel), hardhead (66)
Bivesicula hepsetiae

Holacanthus ciliaris (Linn.), queen angelfish (4)
Antorchis urna
Barisomum erubescens

Holacanthus isabelita (Jordan & Rutter), angelfish (13)
Antorchis urna
Barisoma erubescens

Holocentrus ascensionis (Osbeck), squirrelfish (2)
Helicometra torta

Holocentrus coruscus (Poey), squirrelfish (10)
Neopecoelus holocentri

Jenkinsia lamprotaenia (Gosse), round herring (7)
trematode in one; lost

Kathetostoma albigutta Bean (3)
Bucephalus kathetostomae

Kyphosus incisor (Cuv. & Val.), yellow chub (5)
Deontacylix ovalis
Enenterum aureum
Haplosplanchnus kyphosi
Opisthadena dimidia

Kyphosus sectatrix (Linn.), white chub (13)
Deontacylix ovalis
Enenterum aureum
Haplosplanchnus kyphosi
Opisthadena dimidia

Labrosomus haitensis Beebe & Tee-Van (1)
Helicometra execta
Lachnolaimus maximus (Walbaum), hogfish (8)
Helicometra execta
Lepocreadium bimarinum
Megalomyzon robustus
Myzoxenus lachnolaimi
Lactophrys tricornis (Linn.) (28)
Dermadena lactophrysi
Megapera gyrina
Megapera orbicularis
Megapera pseudura
Thysanopharynx elongatus
Lacophrys trigonus (Linn.), trunkfish (11)
Dermadena lactophrysi
Lactophrys triqueter (Linn.), trunkfish (4)
Dermadena lactophrysi
Xystretrum solidum
Laemonema barbatulum Goode & Bean (19)
Eurycreadium vitellosum
Lepidapedon elongatum
Pseudopecoelus vulgaris
Stephanostomum lineatum
Lophius piscatorius Linn. (2)
Gonocerca crassa
Metadena brotulae
Sterrhurus floridensis
Lutianus analis (Cuv. & Val.), muttonfish (8)
Hamacreadium gulella
Hamacreadium mutabile
Metadena crassulata
Stephanostomum casum
Lutianus apodus (Walbaum), schoolmaster (19)
Hamacreadium mutabile
Helicometrina nimia
Lutianus griseus (Linn.), gray snapper (24)
Hamacreadium gulella
Hamacreadium mutibile
Helicometrina nimia
Lecithochirium sp.
Leurodera decora
Metadena adglobosa
Metadena globosa
Stephanostomum casum

Lutianus jocu (Bloch & Schneider), dog snapper (1)
Hamacreadium mutabile
Lutianus synagris (Linn.), Lane snapper (8)
Hamacreadium mutabile
Helicometrina nimia
Lutianus vivanus (Cuv. & Val.) (1)
Metadena, probably *crassulata*
Sterrhurus sp.; lost

Macrouridae (6)
Lepidapedon lebouri
Malacoctenus macropus (Poey), blenny (10)
Genitocotyle atlantica
Merluccius sp., probably *M. bilinearis* (Mitchill) (23)
Adinosoma robustum
Derogenes varicus
Gonocerca crassa
Gonocerca phycidis
Sterrhurus praeclarus
Monacanthus ciliatus (Mitchill), filefish (24)
Rhagorchis odhneri
Monacanthus hispidus (Linn.), filefish (28)
Bianium plicitum
Gonocercella atlantica
Megapera ovalis
Monolene antillarum Norman (49)
Lomasoma monolenei
Mugil curema Cuv. & Val. (13)
Haplosplanchnus sp.; unidentified
Mulloidichthys martinicus (Cuv. & Val.), yellow goatfish (10)
Opecoeloides brachyteleus
Mycteroperca microlepis (Goode & Bean) (1)
Prosorhynchus atlanticus
Mycteroperca venenosa (Linn.), yellowfin grouper (7)
Helicometra execta
Opisthoporus mycteropercae
Prosorhynchus atlanticus
Stephanostomum dentatum

Neoscopelus macrolepidotus Johnson (4)
specimen lost; probably *Pseudopecoelus vulgaris*

Ocyurus chrysurus (Bloch), yellowtail (47)
Aponurus laguncula
Deretrema fusillum
Hamacreadium mutabile
Helicometrina nimia
Lepocreadium trulla

Parahemiurus merus
Siphodera vinaledwardsi
Stephanostomum casum
Odontoscion dentex (Cuv. & Val.) (2)
Horatrema crassum
Ogcocephalus cubifrons (Richardson), batfish (9)
Brachadena pyriformis
Sterrhurus floridensis
Opisthognathus maxillosus (Poey) (2)
Helicometrina nimia
Opisthognathus sp., jawfish (2)
Genitocotyle atlantica

Paralichthys oblongus (Mitchill) (11)
Adinosoma robustum
Gonocerca crassa
Paralichthys sp., probably *P. squamilentus* Jordan & Gilbert (3)
Gonocerca crassa
Sterrhurus floridensis
Parexocoetus mesogaster (Bloch), flying fish (4)
Brachyenteron parexocoeti
Steganoderma parexocoeti
Peristedion imberbe Poey (17)
Hemiurus sp.
Pseudopecoelus vulgaris
Peristedion longispathum Goode & Bean (32)
Dissosaccus laevis
Peristedion miniatum Goode (7)
Dissosaccus laevis
Lomasoma gracilis
Pseudopecoelus vulgaris
Peristedion platycephalum Goode & Bean (14)
Brachyenteron peristedioni
Dissosaccus laevis
Pseudopecoelus vulgaris
Phycis cirratus Goode & Bean (8)
Gonocerca crassa
Stephanostomum lineatum
Sterrhurus floridensis
Polymixia lowei Günther (1)
Lecithochirium parvum
Pomacanthus arcuatus (Linn.), black angelfish (3)
Antorchis urna
Barisomum erubescens
Pleurogonius candibulus
Pomacanthus aureus (Bloch), black angelfish (14)
Antorchis urna
Barisomum erubescens
Cleptodiscus reticulatus
Hapladena leptotelea
Pleurogonius candibulus
Theletrum fustiforme

Pomacentrus leucostictus Müller & Troschel (31)
Haploplanchnus pomacentri
Helicometrina nimia
Pomacentrus xanthurus Poey (13)
Haplosplanchnus pomacentri
Pontinus longispinus Goode & Bean (20)
Pseudopecoelus vulgaris
Sterrhurus floridensis
Priacanthus arenatus Cuv. & Val., glass-eye snapper (3)
Bucephalus priacanthi
Deretrema fusillum
Lecithochirium parvum
Pseudopecoelus priacanthi
Tergestia pectinata
Priacanthus cruentatus (Lacépède), big-eye (3)
Lecithochirium parvum
Pseudopecoelus priacanthi
Prionodes sp. (19)
Helicometra fasciata
Lecithochirium parvum
Sterrhurus floridensis
Prionotus alatus Goode & Bean (4)
Helicometra fasciata
Pseudopecoelus vulgaris
Prionotus sp. (10)
Sterrhurus floridensis
Prionotus stearnsi Jordan & Swain (3)
Pseudopecoelus vulgaris
Sterrhurus floridensis
Promicrops itaiara (Lichtenstein), jewfish (4)
Lecithochirium microstomum
Prosorhynchus promicropsi
Stephanostomum promicropsi
Pronotogrammus aureorubens Longley (14)
Lethadena profunda
Pseudopecoelus vulgaris
Pseudoscarus coelestinus (Cuv. & Val.), loro (4)
Hapladena ovalis
Haplosplanchnus brachyurus
Pseudoscarus guacamaia (Cuv.) (3)
Haplosplanchnus brachyurus
Pseudupeneus maculatus (Bloch), red goatfish (13)
Lecithochirium parvum
Opecoeloides elongatus

Sauridia normani Longley (6)
Gonocerca crassa
Scarus punctulatus Cuv. & Val. (7)
One trematode; lost
Scarus croicensis Bloch (2)
Barisomum erubescens

Scomberomorus regalis (Bloch), mackerel (3)
Rhipidocotyle adbaculum
Rhipidicototyle baculum
Scorpaena agassizii Goode & Bean (6)
Helicometrina nimia
Scorpaena braziliensis Cuv. & Val., scorpion fish (24)
Helicometrina nimia
Neopecoelus scorpaenae
Sterrhurus floridensis
Scorpaena cristulata Goode & Bean (2)
Derogenes varicus
Opecoelina scorpaenae
Pseudopecoelus vulgaris
Scorpaena grandicornis Cuv. & Val., scorpion fish (4)
Neopecoelus scorpaenae
Scorpaena inermis Cuv. & Val. (2)
Sterrhurus sp.
Scorpaena plumieri Bloch (3)
Bucephalus scorpaenae
Helicometrina nimia
Sterrhurus floridensis
Setarches parmatus Goode (2)
Derogenes varicus
Gonocerca crassa
Sparisoma aurofrenatum (Cuv. & Val.) (3)
Haplosplanchnus brachyurus
Sparisoma pachycephalum Longley, parrotfish (20)
Hapladena ovalis
Haplosplanchnus sparisomae
Sparisoma spinidens (Guichenot) (1)
Haplosplanchnus brachyurus
Sparisoma viride (Bonnaterre) (4)
Haplosplanchnus brachyurus
Haplosplanchnus sparisomae
Sphoeroides sp. (7)
Bianium plicitum
Sphoeroides spengleri (Bloch), puffer (36)
Bianium plicitum
Sclerodistomum sphoeroidis
Xystretrum pulchrum
Sphyraena barracuda (Walbaum), barracuda (15)
Bucephalopsis arcuatus
Bucephalopsis longoviferus
Rhipidocotyle barracudae
Stegastes chrysurus (Cuv. & Val.) (5)
Haplosplanchnus sp.; unidentified
Stephanostomum sp.; dead
Strongylura raphidoma (Ranzani), houndfish (10)
Haplosplanchnus acutus
Strongylura timucu (Walbaum) (2)
Haplosplanchnus acutus
Steganoderma elongatum
Syacium micrurum Ranzani (14)
Sterrhurus floridensis
Syacium papillosum (Linn.) (21)
Helicometrina nimia
Sterrhurus floridensis
Synagrops bellus (Goode & Bean) (1)
Rhipidocotyle longleyi
Syngnathus robertsi (Jordan & Ritter), pipefish (12)
Genitocotyle atlantica
Syngnathus floridae (Jordan & Gilbert) (33)
one trematode; lost
Synodontid (9)
Dinosoma rubrum
Gonocera crassa
Synodus foetens (Linn.), lizardfish (7)
Genolopa ampullacea
Lecithochirium mecosaccum
Lecithochirium parvum
Lecithochirium synodi
Opegaster synodi
Parahemiurus merus
Parectenurus americanus
Sterrhurus floridensis
Synodus intermedius (Agassiz), lizardfish (9)
Gonocerca crassa
Sterrhurus floridensis
Synodus poeyi Jordan, lizardfish (1)
Lecithochirium mecosaccum
Synodus sp. (3)
Dinosoma rubrum
Sterrhurus floridensis

Tarpon atlanticus (Cuv. & Val.), tarpon (3)
Lecithochirium microstomum
Thalassoma bifasciatum (Bloch) (15)
Helicometra execta
Trachurops crumenophthalma (Bloch) (5)
Ectenurus virgulus
Neonotoporus yamagutii
Parahemiurus merus
Pseudopecoeloides gracilis
Tergestia pectinata

Unidentified eel; probably *Synaphobranchus kaupii* Johnson (1)
Aponurus intermedius
Steringophorus magnus
Unidentified lizard fish (1)
Benthotrema plenum
Upeneus parvus Poey (2)
Deretrema fusillum
Urophycis chesteri (Goode & Bean) (6)

Adinosoma robustum
Lepidapedon elongatum
Podocotyle pearsei
Urophycis regius (Walbaum) (13)
Adinosoma robustum
Derogenes varicus
Dinosoma rubrum
Gonocerca crassa
Gonocerca phycidis
Lecithochirium sp.
Lomasoma wardi
Stephanostomum lineatum

Xenodermichthys copei (Gill) (2)
(=*Aleposomus* sp. of Manter)
Lethadena profunda

The following 55 species of fishes did not contain trematodes. In most cases, it will be noted, only one or a few specimens were examined.

Aleposomus sp. (1)
Alutera scripta (Osbeck) (1)
Angyropelecus amabilis (Ogilby)* (1)
Antigonia capros Lowe (2)
Apogon pigmentarius (Poey)
cardinal fish (2)
Apogonichthys stellatus Cope (2)
Auchenopterus monophthalmus
Günther (1)
Aulostomus maculatus Val.,
trumpet fish (1)

Bathypterois quadrifilis (Günther) (2)
Blennius cristatus Linn. (11)
Blennius marmoreus Poey (5)

Cantherines pullus (Ranzani) (1)
Chilomycterus schoepfi, spiny boxfish (3)
Citharichthys arctifrons Goode (21)
Coryphopterus glaucofraenum Gill (1)

Dactylopterus volitans (Linn.) (6)
Diplectrum radiale (Cuv. & Val.) (4)
Dinematichthys cayorum (Everman &
Kendall) (3)
Diplodus holbrooki (Bean), spot-tail
pinfish (16)

Elacatinus oceanops Jordan (1)
Engyophrys sentus Ginsburg (6)

Gillellus semicinctus Gilbert,
stargazer (1)
Gnathypops aurifrons (Jordan
& Thompson) (1)

Hippichthys brachycephalus (Poey),
sea horse (3)
Hippocampus punctulatus Guichenot,
sea horse (4)
Histrio gibba (Mitchill),
sargassum fish (1)
Hollardia hollardi Poey (8)
Hypoplectrus gemma
(Goode & Bean) (2)
Hypoplectrus puella (Cuv. & Val.) (8)

Ioglossus calliurus Bean (1)

Lagodon rhomboides (Linn.),
pinfish (4)
Lepophidium cervinum
(Goode & Bean) (2)
Lutianus campechanus (Poey),
red snapper (1)

Opisthognathus aurifrons
(Jordan & Thompson) (2)

Pempheris schomburgkii
Müller & Troschel (3)
Poecilopsetta beanii (Goode) (2)
Pomacentrus planifrons Cuv. & Val. (5)
Prionotus sp. (1)
Pristipomoides macrophthalmus
(Müller & Troschel) (16)

Scarus croicensis Bloch (6)
Sole, cross-banded (17)
Sparisoma abildgaardi (Bloch),
red parrot fish (5)
Sparisoma radians (Cuv. & Val.) (16)
Sparisoma rubripinne (Cuv. & Val.) (1)
Strongylura notatus (Poey),
needlefish (22)
Syngnathus rousseau Kaup,
pipefish (4)

Trachinotus falcatus (Linn.),
pompano (1)
Trichopsetta ventralis
(Goode & Bean) (9)

Unidentified: 5 species of deep-
water fishes (1 each)

Xyrichthys psittacus (Linn.),
razorfish (1)

Yarella blackfordii (Goode & Bean (1)

* This fish was identified by Dr. Longley as "an Argyropelecid" from 582 fathoms. It is probably one of the two specimens noted by Longley & Hildebrand (1946: 16).

Discussion

The identification of 189 species of adult, digenetic trematodes from the fishes of Tortugas shows that this region is very favorable for such parasites. No other region except Japanese waters is at present known to possess such a rich trematode fauna. Few extensive studies have, of course, been made, but it seems evident that considerably fewer species exist in more northern waters. For example, Nicoll (1915) listed about 61 species from teleost fishes from waters of the British Isles and only a few species have since been added to that list, so that even if one should add the 46 deepwater species from Tortugas which presumably might have a very wide distribution, the trematode species of the marine fishes of Great Britain would number much less than those found at Tortugas. On the other hand, sampling of the tropical Pacific (Manter, 1940) suggests as great a variety there as at Tortugas. From Japanese waters, Yamaguti has reported some 229 species. The great variety of digenetic trematodes in the warmer seas is, of course, correlated with the very numerous species there of fishes, molluscs, and crustacea.

GEOGRAPHICAL DISTRIBUTION

It has been suggested in the Introduction that trematodes constitute a favorable group of animals for geographical distribution studies. Such considerations first came to my attention in connection with the deep-sea species (Manter, 1934) which proved to be almost entirely different from those of the nearby shallow waters but which did include several species well known in northern oceans. Another aspect of the distribution of these parasites was revealed by a significant similarity of species in the tropical Atlantic and tropical Pacific (Manter, 1940b) even although the two oceans are now separated by effective barriers. This similarity was associated with related but frequently not identical hosts. Trematodes of marine fishes lend themselves to such studies because of the great variety of species, because they exhibit considerable but not complete host specificity, and because they have not as yet been artificially diverted by man from their natural state.

Nicoll (1915) noted that numerous species of trematodes not found in British waters had been reported from other regions in fishes which did occur in British waters. In other words, the host fishes seemed to have a different distribution than many of the trematodes of these fishes. The same species of fish seemed to have different parasites in one locality than in another. Nicoll suggested several possible explanations such as presence or absence of intermediate hosts, abundance or rarity of the fish, and completeness or incompleteness of knowledge in the different regions. After more than 30 years the same situation seems to exist. As yet, however, no very complete studies have been made on the parasites even of a single species of fish in widely separated regions. Interesting data should be possible from a study of fishes which have a wide distribution as species.

Another phase of the geographical distribution of trematodes involves the occurrence of the same species of trematode in different fish hosts in different localities. 62 of the 189 Tortugas species have been reported or are known to occur in other regions. The following table lists those known to occur in

certain localities, namely, Beaufort, N. C.; Woods Hole, Mass.; Bermuda; British Isles; Mediterranean; Red Sea; Japan; tropical American Pacific.

Table Showing the Distribution of Trematodes of Tortugas Known from Other Localities

Species also occurring at Woods Hole, Mass. (15)
Bianium plicitum
Bucephalopsis arcuatus
Deretrema fusillum
Derogenes varicus
Dinurus tornatus
Dissosaccus laevis
Ectenurus virgulus
Hirudinella ventricosa
Lepidapedon elongatum
Rhagorchis odhneri
Rhipidocotyle baculum
Siphodera vinaledwardsii
Stephanostomum dentatum
Stephanosotmum ditrematis
Tergestia pectinata

Species also occurring at Bermuda (12)
Dermadena lactophrysi
*Dollfustrema gravidum**
Haplosplanchnus acutus
Lepidapedon levenseni
*Lepidapedon nicolli**
Lepocreadium trulla
Lobatostoma ringens
Megapera gyrina
Multitestis chaetodoni
Siphodera vinaledwardsii
*Sterrhurus fusiformis**
Xystretrum solidum

Species also occurring at Beaufort, N. C. (14)
Bianium plicitum
Brachadena pyriformis
Bucephalopsis arcuatus
Dinurus breviductus
Dinurus tornatus
Gonocercella atlantica
Lecithochirium synodi
Lobatostoma ringens
Postmonorchis orthopristis
Rhagorchis odhneri
Rhipidocotyle baculum
Siphodera vinaledwardsii
Stephanostomum dentatum
Tergestia laticollis (?)

Species also occurring in British waters (6)
Derogenes varicus
Helicometra fasciata
Lepidapedon elongatum
Lepidapedon rachion
Sterrhurus fusiformis
Tergestia laticollis

Species also occurring the Mediterranean (4)
Aponorus laguncula
Helicometra fasciata
Sterrhurus fusiformis
Tergestia laticollis

Species also occurring the Red Sea (5)
Bucephalus varicus
Dinurus longisinus
Dinurus tornatus
Hamacreadium mutabile
Proctoeces erythraeus

Species also occurring Japanese waters (13)
Bacciger harengulae
Derogenes crassus
Derogenes varicus
Dinurus longisinus
Dinurus scombri
Gonocerca crassa
Hamacreadium mutabile (?)
Parahemiurus merus
Pseudopecoeloides carangis
Stephanostomum ditrematis
Sterrhurus fusiformis
Tergestia laticollis
Tetrochetus coryphaenae

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* Not hitherto recorded. Identified from a collection made in Bermuda by Dr. F. D. Barker.

Species also occurring in the tropical American Pacific (24)*
Bianium plicitum
Bucephalus varicus
Derogenes varicus
Dinurus barbatus
Dinurus longisinus
Hamacreadium mutabile
Hamacreadium oscitans
Haplosplanchnus acutus
Haplosplanchnus pomocentri
Helicometra fasciata
Helicometra torta
Helicometrina nimia
Lecithochirium microstomum
Lepidapedon nicolli
Lepocreadium bimarinum
Parahemiurus merus
Proctotrema longicaecum
Prosorhynchus ozakii
Pseudopecoeloides carangis
Stephanostomum casum
Stephanostomum ditrematis
Stephanostomum megacephalum
Sterrhurus fusiformis
Tergestia laticollis

Conclusions based on these records of distribution are subject to certain qualifications. For example, while the trematodes of the British Isles, Japan, and Tortugas have now been rather extensively studied and those of Woods Hole and Beaufort are fairly well known, little work has been done at Bermuda. Considering the type of fishes found at Bermuda, it seems probable that the trematode fauna will be found to be very similar to that of Tortugas. The parasites of deep-water fishes, like the other animals of the deep sea, doubtless have a world wide distribution at appropriate depths. Unlike their deep-sea hosts, however, some of the trematodes apparently extend their range to shallow water in cold water regions of the sea. Another consideration is the fact that a few of the records above involve adventitious or sporadic occurrence of the host. For example, a fish from the Gulf Stream may be taken rarely at Woods Hole but should not be considered a normal part of the fauna there. Also, published identifications might be incorrect; as a matter of fact, the above list from Woods Hole and Bermuda has been revised somewhat from the records of Linton. Some interesting aspects of the subject might develop from a comparison of hosts of trematodes with a wide distribution, or from a study of the distribution of certain genera of trematodes, but our knowledge at present is perhaps too incomplete for such comparisons.

Certain conditions are more or less clear from the above table. There are a few, but only a few, species of trematodes with very wide distribution; for example, *Derogenes varicus, Tergestia laticollis,* and *Sterrhurus fusiformis.* Two outstanding conditions do seem clear: First, the distinctiveness of the Tortugas fauna as compared with more northern Atlantic waters. Thus, 15 of the 189 species occur at Woods Hole (3 of these are in deepwater at Tortugas); 14 from Beaufort; and only 6 from British waters (of which 3 are in deepwater at Tortugas). The 12 known from Bermuda are based on less knowledge and probably would be doubled or more if collections there corresponded to those made at Woods Hole. The second, and contrasting, condition is the large number of Tortugas species occurring in the tropical American Pacific. 24 of the 189 have been collected in the Pacific and 3 additional species *(Pseudolepidapedon balistis, Hirudinella beebei, Hirudinella clavata)* are known from the American Atlantic and probably occur at Tortugas. In

* Three additional species are known from the American Atlantic and probably occur at Tortugas.

spite of the fact that the trematodes of the American Pacific are little known, this number of Tortugas species there is by far larger than from any other locality even Beaufort, N. C. not many miles from Tortugas. Even the distant waters of Japan contain 13 of the Tortugas species, a number comparable at present with the number at Beaufort or at Woods Hole. As has been noted (Manter, 1940b) this distribution is associated with similarity but not identity of the fish hosts. Molluscan fauna of the "Panamanian province" shows a similarity to that of the Carribean extending to identity of species in a few cases.

HOST SPECIFICITY

Some general conclusions can be drawn from a list of 189 species of trematodes. For example, the degree of host specificity should be approximately revealed. Including host records of Linton, of the 189 species 105 (55.5%) were collected from one kind of host; 43 (22.7%) from two hosts; 14 (7.4%) from three hosts; 8 (4.2%) from five hosts; 3 (1.6%) from six hosts; 2 (1%) from nine hosts; 1 from ten hosts; 1 from twelve hosts; 2 from thirteen hosts; 1 from fourteen hosts; 1 from sixteen hosts; and 1 from twenty-one hosts. Thus, there is a marked tendency toward host specificity. Most of the two-host records, some of the three-host records, and two of the four-host records, involved a single genus of fish. Since frequently the differences between species within a genus of fish are very slight, one could hardly expect specificity of a parasite to restrict itself to a single species. Actually, 138 species (or 73%) were limited to a single host genus. It might be noted that the greatest break in the series of figures is between the number of species occurring in two hosts and those occurring in three hosts. Perhaps the one- and two-host species should be lumped together, since practically all of the latter involve closely related hosts and more collections of the former would tend to reveal some other related host. There are evidently a few species of trematodes which can live in a considerable variety of hosts. In such cases, some one or few hosts are usually more favorable ones. Some of such records are doubtless accidental and temporary infections. In some instances, most of the hosts are related; for example, 6 of the 9 hosts of *Genolopa ampullacea* are species of *Haemulon,* 2 others are related genera, leaving only one other, probably accidental, host; all 9 of the hosts of *Leurodera decora* are related fishes. Only 6 of the 189 trematodes were collected from a wide variety of hosts. Two of these *(Gonocerca crassa* and *Pseudopecoelus vulgaris)* were from deepwater hosts; three *(Brachadena pyriformis, Helicometra execta,* and *Helicometrina nimia)* were from shallow-water hosts; and one *(Sterrhurus floridensis)* was from both deep- and shallow-water fishes.

Thus, while there are exceptions, it seems evident that digenetic trematodes of marine fishes, at least in the Tortugas region, exhibit a high degree of host specificity. This specificity is not rigid as to host species; it is rather predominantly generic, and there are few exceptions to the family connections of the hosts.

However, the restriction of a trematode to a few hosts can be due to conditions other than specificity. Opportunity for infection must occur. Absence

of infected intermediate hosts in a particular locality; the restricted travels of infected individuals resulting in a very local distribution of the parasite; and the food habits of a fish preventing infection even although the fish might be susceptible are examples of possible factors. A large survey involving many examinations and collections would tend to minimize such factors, but the data can only be approximate. It might be noted that figures for trematodes from deepwater fishes only are not greatly different from the shallow-water figures. Of 48 deepwater species, 29 or 60% were found in one host species, while 4 species occurred in more than 6 hosts (up to 16).

Yamaguti has published very extensive surveys of the trematodes of fishes of Japanese waters. Digenetic trematodes of marine teleosts there show a similar and even more pronounced host specificity. From a compilation of his papers, one finds that of 229 species, 169 (73%) are reported from a single host; 32 (14%) from two hosts; 16 (7%) from three hosts; 5 (2%) from four hosts; 2 (1%) from six hosts; and 1 from eleven hosts. When these figures are compared with my data, it is seen that both agree in that species found in numerous hosts are few and that practically all the species occur in from one to three hosts. The Japanese figures differ in that a much larger percentage of the trematodes are limited to a single host. Assuming that more

British Isles

I	II	III	IV	V	others	species
28	7	7	5	4	8	59
47.4%	11.8%	11.8%	8.5%	6.7%	13.5%	

Tortugas

I	II	III	IV	V	others	species
105	43	14	7	8	11	189
55.5%	22.7%	7.4%	3.7%	4.2%	5.7%	

Japan

I	II	III	IV	V	others	species
169	32	16	5	4	3	229
73%	14%	7%	2%	2%	1.3%	

Figure 1. Table showing the host specificity of digenetic trematodes of marine teleosts from the British Isles, Tortugas, and Japan. The Roman numeral represents the number of different kinds of hosts; the Arabic number represents the number of species of trematodes; the percentage represents that of the total number of trematodes known from the region, a number given in the last square. For example, 28, or 47.4% of the 59 trematodes of Britain, occur in one host only.

collections would transfer a number of these to the two-host column, the combined one- and two-host species in Japan is still high (87%) as compared with the precentage (78%) at Tortugas. The data suggest that a greater variety of species of trematodes in one locality is associated with increased host specificity. All of these figures pertain to teleost hosts found in the respective localities. The figures would be only slighty changed by adding hosts known elsewhere. Digenetic trematodes are rare in Selachians.

In one other locality, the waters of the British Isles, the trematodes of marine fishes are well known. Nicoll's (1915) list is based on collections probably comparable to those now known from Tortugas and Japan. Although Nicoll listed trematodes from British fishes found in other regions, his list (by hosts) of trematodes from British waters is not large, including some 61 species from teleost, marine hosts. Data by Dawes (1946) indicate that this number is still approximately the same; in fact, the number of species considered as synonyms by Dawes is slightly greater than the number of new records reported since 1915, so that a list compiled from his book would total between 55 and 60, depending on the acceptance of his proposed synonyms. Considering 59 of these species as valid, and considering only the hosts occurring in British waters as was done in the cases of Tortugas and Japan, 28 (47.4%) are from one host only; 7 (11.8%) from two hosts; 7 (11.8%) from three hosts; 5 (8.5%) from four hosts; 4 (6.5%) from five hosts; and 8 (13.5%) from more than five hosts.

Comparison of the three regions is shown in more graphic form in Text

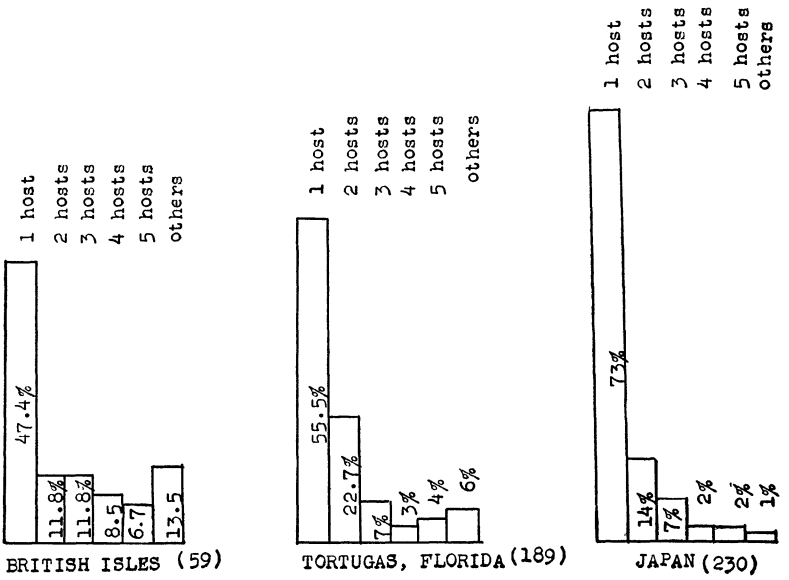

Figure 2. Graphic representation of the data given in Text Figure 1. For example, 47.4% of the 59 species of trematodes from British teleosts occur in one host only; 11.8% occur in two hosts only, etc.

Figures 1-3. Figure 3 combines the one- and two-host species and compares the sum with those having more than two hosts. It brings out even more clearly the fact that, so far as present records show, trematodes of the three localities tend to have a degree of host specificity varying with the total number of species present. While such figures can only be approximate, they seem to support the suggestion that the greater the number of species occurring in a

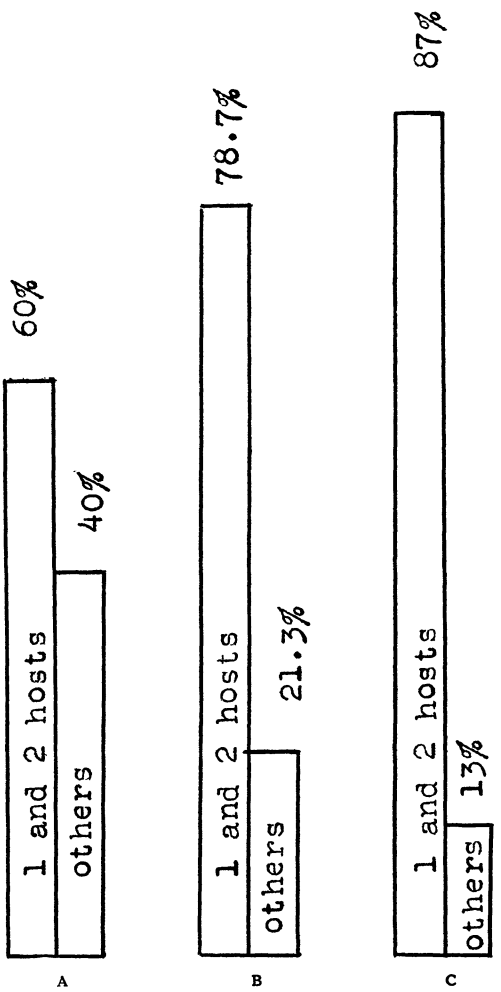

Figure 3.—Graphic representation showing host specificity of digenetic trematodes of marine teleosts. Trematodes found in either one or in two kinds of hosts are combined and compared with trematodes having three or more hosts. A. British Isles (percentages of 59 species). B. Tortugas, Florida (percentages of 189 species). C. Japan (percentages of 230 species).

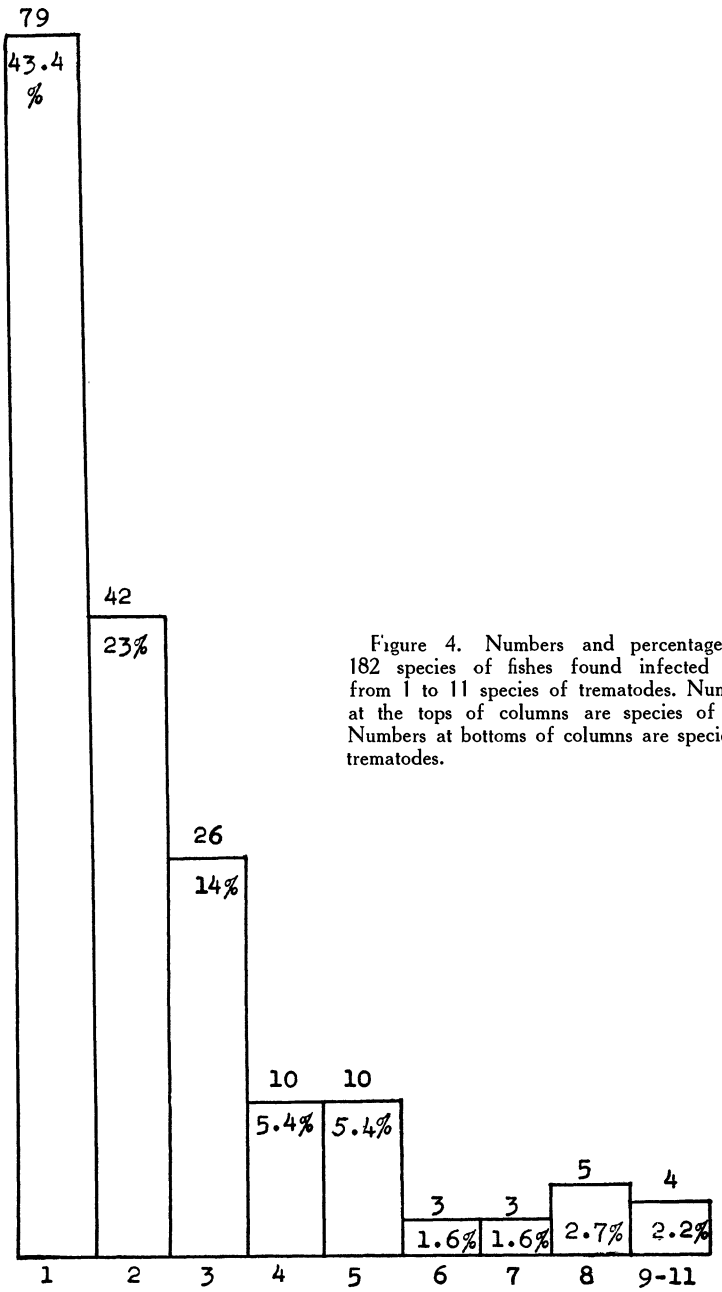

Figure 4. Numbers and percentages of 182 species of fishes found infected with from 1 to 11 species of trematodes. Numbers at the tops of columns are species of fish. Numbers at bottoms of columns are species of trematodes.

locality the higher the percentage showing host specificity. Such a phenomenon would perhaps be expected from evolutionary processes. Wherever a group has had time and opportunity to evolve into numerous (morphological) species, it also should have developed greater physiological specificity. Such specificity is evidently one manifestation of evolution. A larger number of species of hosts in a locality is probably also a factor in the situation.

The above figures pertain, in a way, to the distribution of fishes among the trematodes, or the number of hosts per parasite. The distribution of the trematodes among the fishes—that is, the number of trematodes parasitizing certain species of fishes can be shown by another series of figures. Of 237 different species of teleost fishes examined, 182 pecies, or 76.8%, contained adult trematodes. The largest number of species collected from a single species of host was 11 (from *Haemulon plumieri),* although both *Calamus calamus* and *Haemulon sciurus* yielded 10 species. Only one species of trematode was collected from 79 hosts; two species from 42 hosts; three species from 26 hosts; four species from 10 hosts; five species from 10 hosts; six species from 3 hosts; seven species from 3 hosts; eight species from 5 hosts; nine species from 1 host; ten species from 2 hosts; and eleven species from 1 host. Thus, most of the infected host species (80.4%) harbored from one to three species of trematodes. Text Figure 4 shows this distribution.

Most of the 55 species of fish found uninfected were represented by one or a few specimens; in 22 of these cases a single specimen was examined. Thus it seems certain that additional species of trematodes remain to be collected at Tortugas. Some species of fishes, however, are probably entirely free of digenetic trematodes.

Summary

1. 189 species of digenetic trematodes are reported from teleost fishes of the region of Tortugas, Florida. Among these are recognized: 44 new species, 9 new genera, 44 new combinations, 14 new synonyms, and 51 new host records.

2. The new genera are:

Adinosoma (family Hemiuridae)
Anahemiurus (family Hemiuridae)
Dissosaccus (family Hemiuridae)
Lethadena (family Hemiuridae)
Macradenina (family Hemiuridae)
Megalomyzon (family Fellodistomatidae)
Neopecoelus (family Opecoelidae)
Opisthoporus (family Opecoelidæ)
Parectenurus (family Hemiuridae)

3. The new species are:

Anahemiurus microcercus
Apocreadium balistis
Bivesicula hepsetiae
Brachyenteron parexocoeti
Crassicutis marina
Diphterostomum americanum
Diplangus miolecithus
Diplangus parvus
Genitocotyle atlantica
Hapladena leptotelea
Haplosplanchnus kyphosi
Homalometron elongatum
Horatrema crassum
Lecithochirium mecosaccum
Lecithochirium parvum
Macradenina acanthuri
Megalomyzon robustus
Metadena adglobosa
Multitestis chaetodoni
Myzoxenus lachnolaimi
Neonotoporus yamagutii
Neopecoelus holocentri

Neopecoelus scorpaenae
Opecoeloides brachyteleus
Opecoeloides elongatus
Opegaster synodi
Opistholebes adcotylophorus
Opisthoporus epinepheli
Opisthoporus mycteropercae
Parectenurus americanus
Phyllodistomum carangis
Psettarium cardiocolum
Pseudocreadium anandrum
Pseudopecoeloides equesi
Pseudopecoeloides gracilis
Pycnadenoides calami
Sclerodistomum sphoeroides
Steganoderma elongatum
Steganoderma hemiramphi
Steganoderma parexocoeti
Stephanostomum coryphaenae
Stephanostomum promicropsi
Sterrhurus microcercus
Tergestia acuta

Opechona menidiae is a new name for *Opechona gracilis* (Manter, 1931).

4. The new combinations are:

Adinosoma robustum; formerly *Sterrhurus robustus* Manter, 1934
Aphanurus monolecithus; formerly *Sterrhurus monolecithus Srivastava,* 1941
Bianium cryptostomum; formerly *Diploporus cryptostoma* Ozaki, 1928
Bianium hemistomum; formerly *Diploporus hemistomum* Ozaki, 1928
Dissosaccus laevis; formerly *Sterrhurus laevis* (Linton, 1898)
Erilepturus hamati; formerly *Ectenurus hamati* Yamaguti, 1934
Erilepturus lemeriensis; formerly *Ectenurus lemeriensis* Tubangui & Masilungan, 1935
Erilepturus paralichthydis; formerly *Ectenurus paralichthydis* Yamaguti, 1934
Hapladena ovalis; formerly *Deradena ovalis* Linton, 1910
Lecithochirium furcolabiatum; formerly *Ceratotrema furcolabiatum* Jones, 1933
Lecithochirium texanum; formerly *Sterrhurus texanus* Chandler, 1941
Lecithophyllum sphaerolecithum; formerly *Aponurus sphaerolecithus* Manter, 1925
Lecithaster acutus; formerly *Dichadena acuta* Linton, 1910
Lethadena profunda; formerly *Sterrhurus profundus* Manter, 1934
Megapera orbicularis; formerly *Eurypera orbicularis* Manter, 1933
Metadena brotulae formerly *Siphoderina brotulae* Manter, 1934
Metadena globosa; formerly *Stegopa globosa* Linton, 1910
Myzoxenus insolens; formerly *Gnathomyzon insolens* Crowcroft, 1945
Lepidapedon levenseni; formerly *Distomum levenseni* Linton, 1907, in part; *Lepocreadium levenseni* (Linton, 1907), in part; *Aephnidiogenes levenseni* (Linton. 1907) Nicoll, 1915
Opechona gracilis; formerly *Prodistomum gracile* Linton, 1910; nec *Opechona gracilis* (Manter, 1931)
Ozakia anaspidis; formerly *Coitocaecum anaspidis* Hickman, 1934
Ozakia glandulosa; formerly *Coitocaecum glandulosum* Yamaguti, 1934
Ozakia tropica; formerly *Coitocaecum tropicum* Manter, 1940
Ozakia acanthogobia ;formerly *Coitocaecum acanthogobium* Park, 1939
Ozakia koreana; formerly *Coitocaecum koreanum* Park, 1939
Ozakia leptoscari; formerly *Coitocaecum leptoscari* Yamaguti, 1940
Ozakia parva; formerly *Coitocaecum parvum* Crowcroft, 1945
Ozakia xesuri; formerly *Coitocaecum xesuri* Yamaguti, 1940
Pleurogonius candibulus; formerly *Himasomum candibulum* Linton, 1910; *Barisomum candibulum* (Linton, 1910) Price, 1931
Pseudopecoelus priacanthi; formerly *Allocreadium priacanthi* MacCallum, 1921
Rhipidocotyle capitatum; formerly *Gasterostomum capitatum* Linton, 1940
Steganoderma abyssorum; formerly *Proctophantastes abyssorum* Odhner, 1911; *Deretrema abyssorum* (Odhner, 1911) Price, 1934
Steganoderma atherinae; formerly *Lecithostaphylus atherinae* Price, 1934
Steganoderma nitens; formerly *Lecithostaphylus nitens* (Linton, 1898) Linton, 1940
Steganoderma retroflexum; formerly *Lecithostaphylus retroflexus* (Molin, 1859) Odhner, 1911
Steganoderma spondyliosomae; formerly *Lecithostaphylus spondyliosomae* Fantham, 1938

Stephanostomum ditrematis; formerly *Echinostephanus ditrematis* Yamaguti, 1939
Stephanostomum pagrosomi; formerly *Echinostephanus pagrosomi* Yamaguti, 1939
Stephanostomum sentum; formerly *Stephanochasmus sentus* Linton, 1910
Stomachicola magna; formerly *Dinurus magnus* Manter, 1938
Stomachicola rubea; formerly *Dinurus rubeus* Linton, 1910
Tubulovesicula nanaimoensis; formerly *Dinurus nanaimoensis* McFarlane, 1935
Tubulovesicula pinguis; formerly *Dinurus pinguis* Linton, 1940
Xystretrum pulchrum; formerly *Macia pulchra* Travassos, 1921

5. Nine genera are considered synonyms of previously named genera, as follows:

Ceratotrema Jones, 1933; synonym of *Lecithochirium* Lühe, 1901
Dichadena Linton, 1910; synonym of *Lecithaster* Lühe, 1901
Dideutosaccus Acena 1941; synonym of *Opecoelina* Manter, 1934
Gargorchis Linton, 1940; synonym of *Rhagorchis* Manter, 1931
Gnathomyzon Crowcroft, 1945; synonym of *Myzoxenus* Manter, 1934
Macia Travassos, 1921; synonym of *Xystretrum* Linton, 1910
Mehrailla Srivastava, 1939; synonym of *Mehracola* Srivastava, 1937
Prodistomum Linton, 1910; synonym of *Opechona* Looss, 1907
Siphoderina Manter, 1934; synonym of *Metadena* Linton, 1910

6. The following species, in addition to those involved in new combinations, are considered synonyms:

Bianium adplicatum Manter, 1940; synonym of *Bianium plicitum*
Catoproides aluterae MacCallum 1917; synonym of *Xystretrum solidum*
Catoptroides magnus MacCallum 1917; synonym of *Xystretrum solidum*
Cotylogaster chaetodipteri MacCallum, 1921; synonym of *Lobatostoma ringens*
Dinurus coryphaenae Yamaguti, 1934; synonym of *Dinurus longisinus*
"*Lecithaster gibbosus* (Rud.)" of Linton, 1940, in part; synonym of *Brachadena pyriformis*
Lecithophyllum fuscum Yamaguti, 1938; synonym of *Aponurus intermedius*
Podocotyle breviformis Manter, 1940; synonym of *Hamacreadium oscitans* Linton, 1910
Prosorhynchus gracilescens of Linton, 1940; synonym of *Rhipidocotyle transversale*
Gargorchis varians Linton, 1940; synonym of *Rhagorchis odhneri*
Stephanostomum filiforme Linton, 1940; synonym of *S. ditrematis*
Stephanostomum longisomum Manter, 1940; synonym of *S. ditrematis*
Sterrhurus gymnothoracis Yamaguti, 1940; synonym of *S. fusiformis*
Unnamed trematode from *Balistes carolinensis* of Linton, 1907; synonym of *Xystretrum solidum*
Xystretrum papillosum Linton, 1910; synonym of *X. solidum*

7. Of 237 species (approximately 2039 specimens) of teleost fishes examined, 182 species or 76.8% were parasitized by adult, digenetic trematodes. Most of the host species harbored from one to three species of trematodes; 79 (or 43.4% of the 182) had a single species of trematode. Two fishes, however, were each susceptible to ten species of trematodes; and one to eleven.

8. Of the 189 species of trematodes, 105 or 55.5% were collected from one kind of host; 43 (22.7%) from two hosts; 14 (7.4%) from three hosts; and only 12 from more than three hosts (up to 21 hosts in one case). 138 species, or 73%, were limited to a single host genus. This marked tendency toward host specificity seems to be shown to an even greater degree by trematodes of Japanese waters but to a less degree by trematodes of the region of the British Isles.

9. Present records indicate that a larger percentage of the Tortugas species

of trematodes occur in the American Pacific than occur along the New England Coast. Of the 189 species, 24 are now known from the Pacific, 15 from Woods Hole, Massachusetts. Excluding the deepwater species, the difference is even greater.

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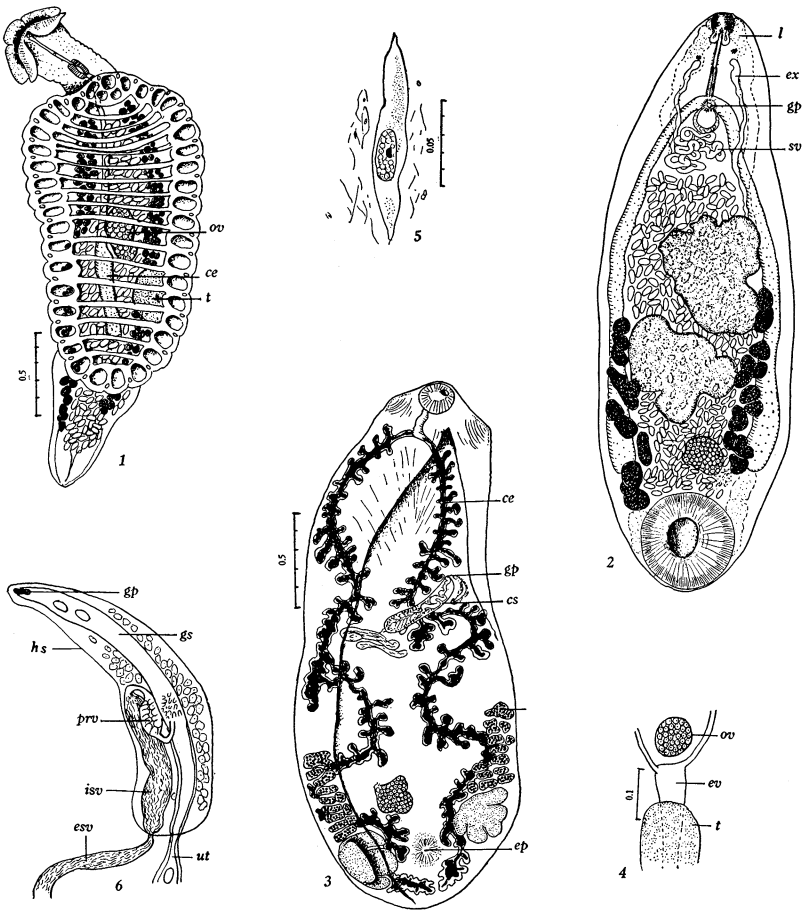
EXPLANATION OF FIGURES

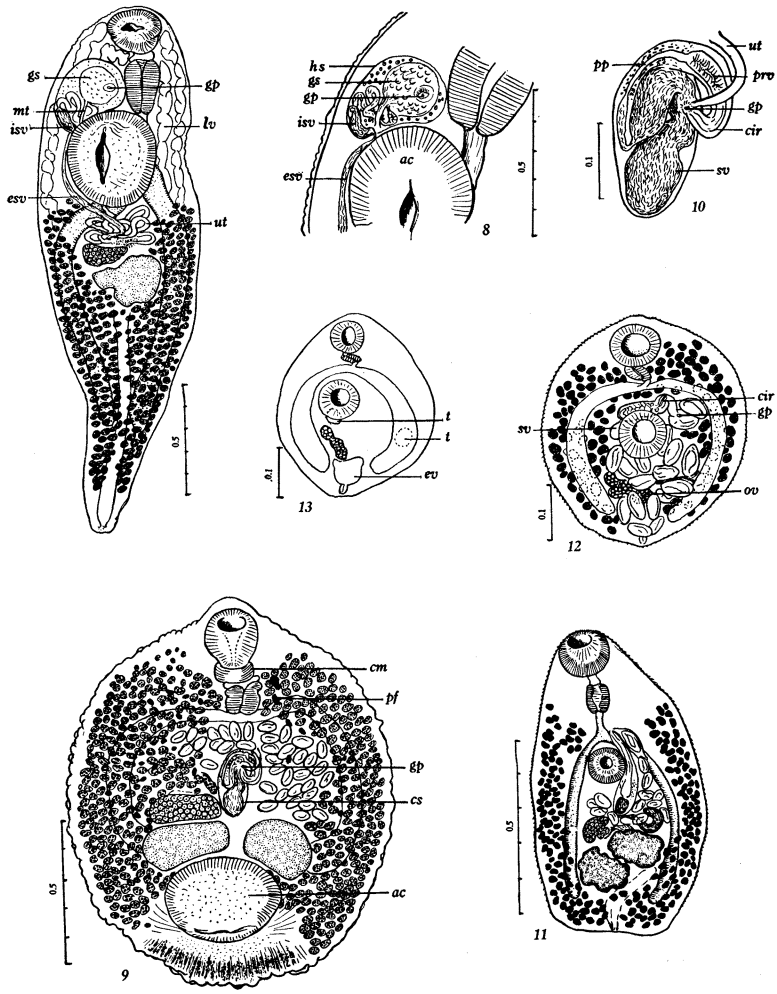
All figures are original and, except for diagrams, were drawn with the aid of a camera lucida or projection apparatus. The projected scale has its value indicated in mm in individual figures.

Abbreviations are as follows:

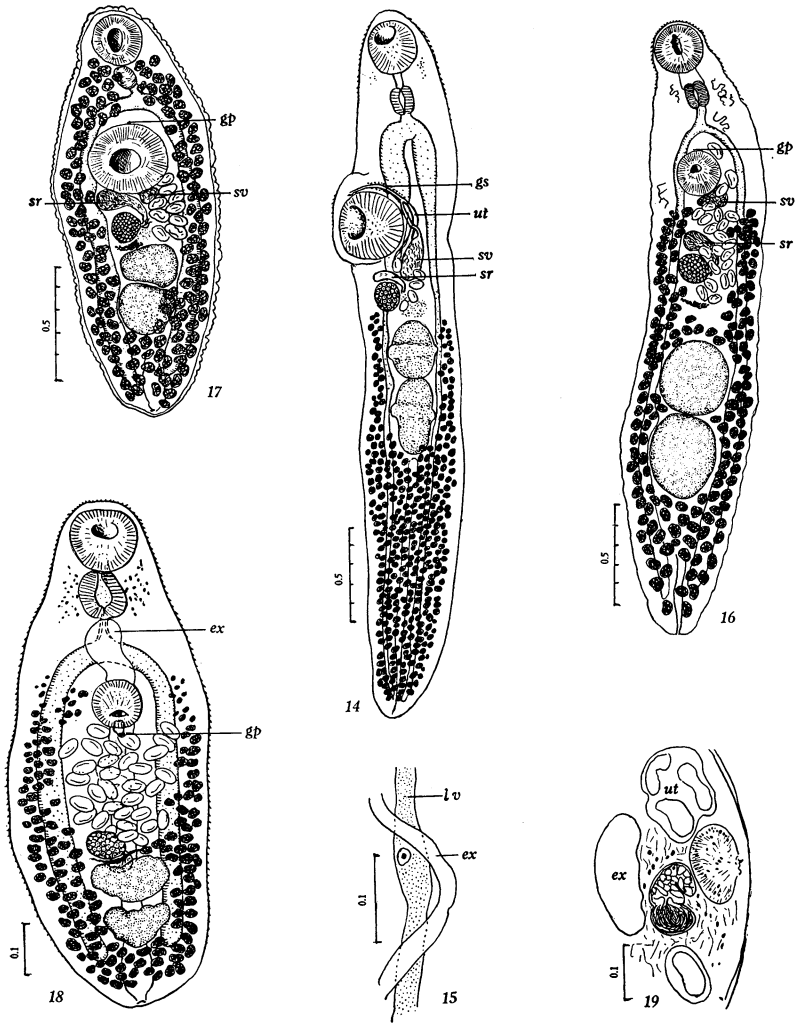
a anus
ac acetabulum
acs accessory sucker
ats atrial sac
c cuticula
ce intestinal cecum
cir cirrus
cm circular muscles
cs cirrus sac
e egg
ep excretory pore
es esophagus
esv external seminal vesicle
ev excretory vesicle
ex excretory system
fc flame cell
ga genital atrium
gc genital cone
gp genital pore
gs genital sinus
hs hermaphroditic sac
isv internal seminal vesicle
iprv internal prostatic vesicle
lc Laurer's canal
lv lymphatic vessel
m mouth
mg Mehlis' gland
mt metraterm
ov ovary
p papilla
pa preacetabular pit
pf pigment flecks
pg prostate gland
pp pars prostatica
prv prostatic vesicle
ps pseudosucker
r rectum
sr seminal receptacle
ss sinus sac
sv seminal vesicle
t testis
ut uterus
utsr uterine seminal receptacle
vd vas deferens
vt vitellaria
yd yolk duct



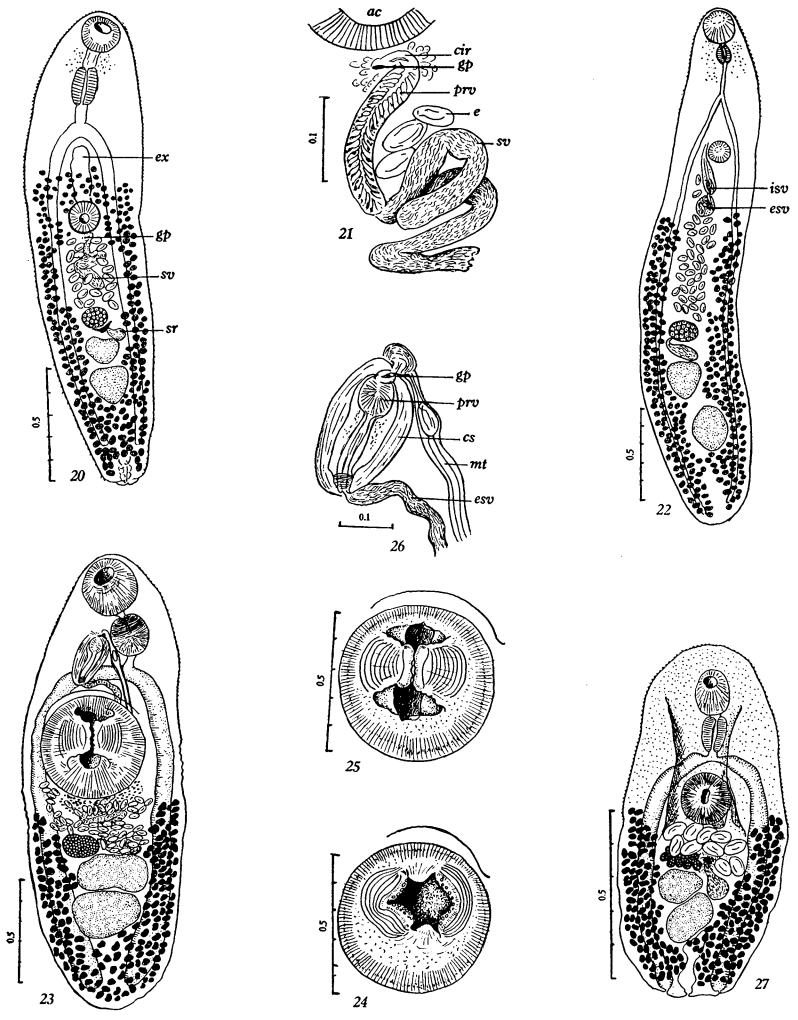
Figs. 1-6. 1. *Lobatostoma ringens* from *Calamus calamus* (ventral view); 2. *Cleptodiscus reticulatus* from *Pomacanthus aureus* (ventral view); 3. *Barisomum erubescens* from *Holacanthus ciliaris* (ventral size); 4. Portion of *Hapladena varia* from *Acanthurus caeruleus* showing excretory vesicle (ventral view); 5. Portion of lymphatic vessel of *Hapladena ovalis* from *Sparisoma pachycephalum;* 6. *Hapladena ovalis*, diagram of terminal reproductive organs.



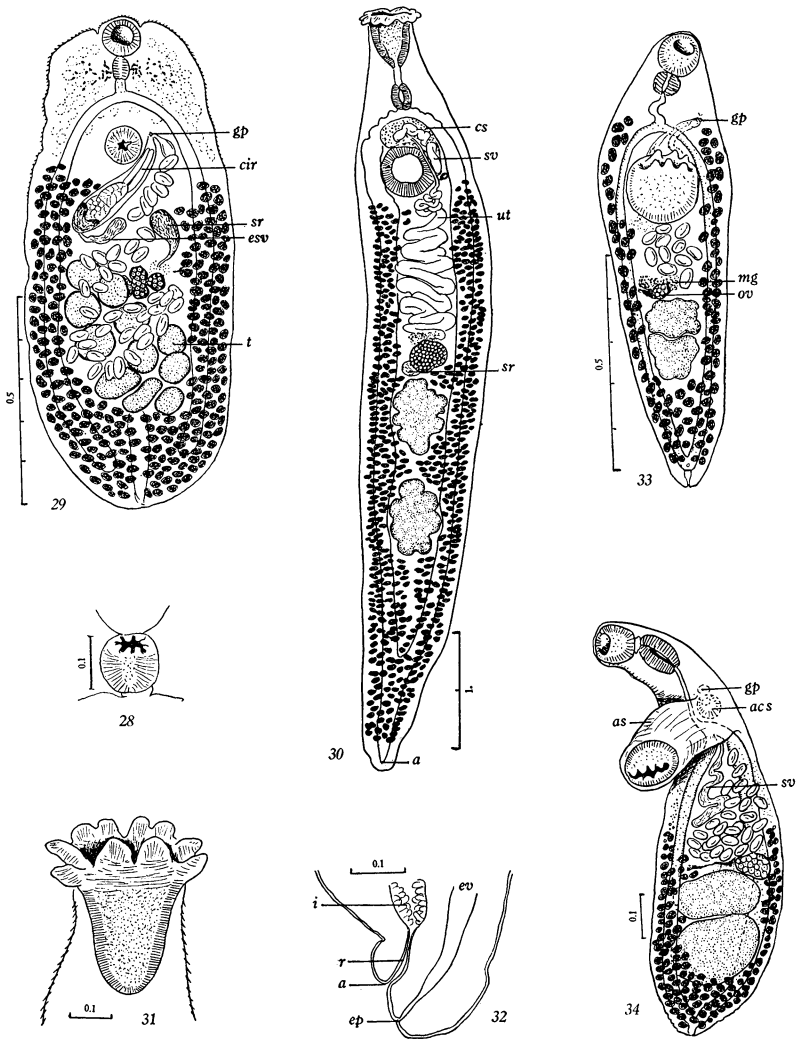
Figs. 7-13. 7. *Hapladena leptotelea* from *Pomacanthus aureus* (ventral view); 8. *H. leptotelea*, terminal reproductive organs (enlarged view); 9. *Opistholebes adcotyophorus* from *Diodon holacanthus* (ventral view); 10. *O. adcotylophorus*, terminal reproductive organs (enlarged view); 11. *Lepocreadium trulla* from *Ocyurus chrysurus* (ventral view); 12. *Pseudocreadium anandrum* from *Calamus calamus* (ventral view); 13. *P. anandrum*, immature specimen showing testes and excretory vesicle.



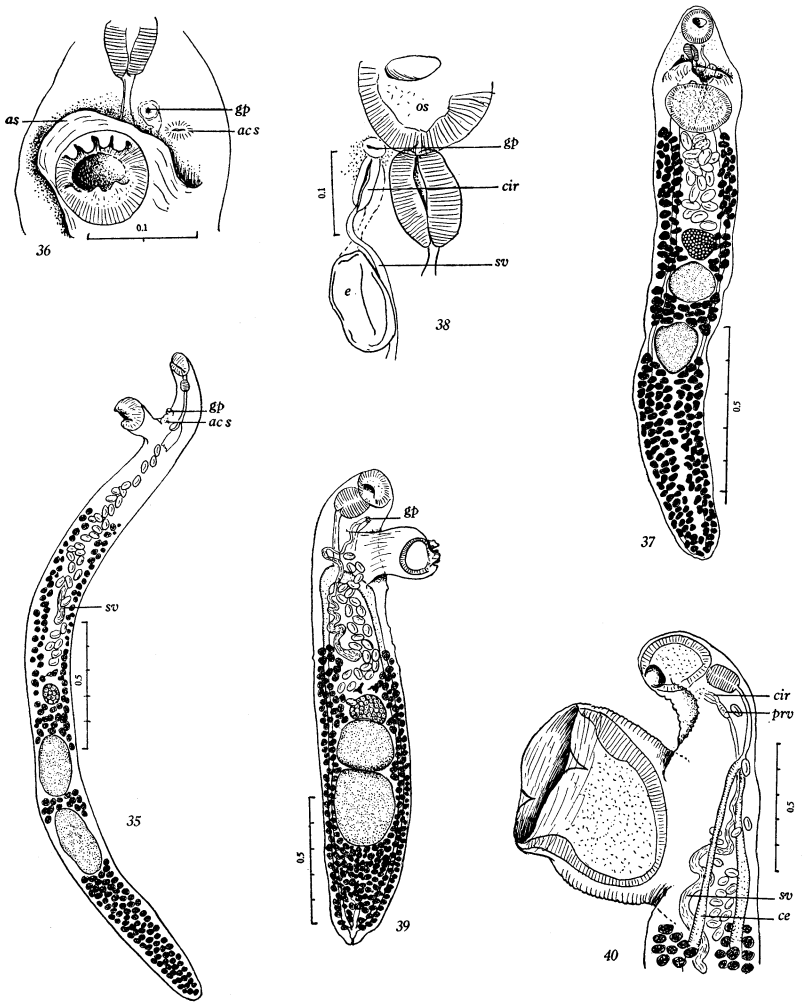
Figs. 14-19. 14. *Apocreadium balistis* from *Balistes vetula* (ventral view); 15. Lymphatic vessel and excretory vessel of *A. balistis;* 16. *Homalometron elongatum* from *Gerres cinereum* (ventral view); 17. *Crassicutis marina* from *Eucinostomus lefroyi* (ventral view); 18. *Opisthoporus epinepheli* from *Epinephelus morio* (ventral view); 19. *O. epinepheli,* sagittal section through acetabular region.



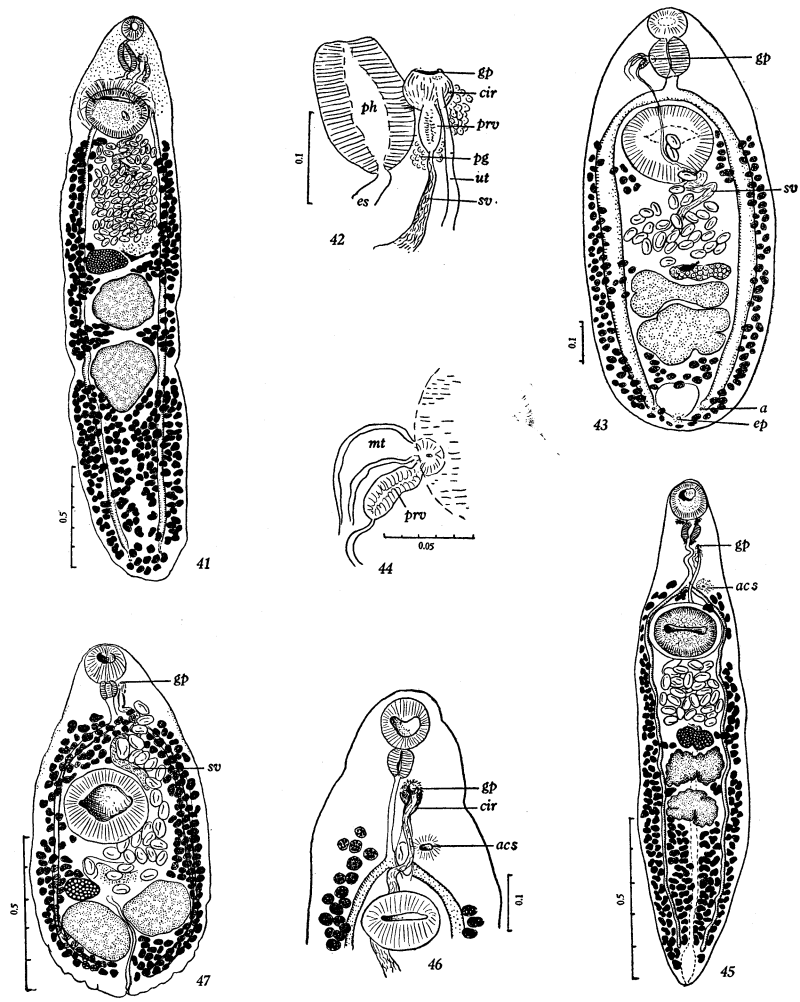
Figs. 20-27. 20. *Opisthoporus mycteropercae* from *Mycteroperca bonaci* (ventral view); 21. *O. mycteropercae*, portion showing terminal reproductive organs; 22. *Lepidapedon levenseni* from *Epinephelus morio* (dorsal view); 33. *Myzoxenus lachnolaimi* from *Lachnolaimus maximus* (ventral view); 24. *M. lachnolaimi*, acetabulum with open lips; 25. *M. lachnolaimi*, acetabulum with closed lips; 26. *M. lachnolaimi*, terminal reproductive organs (ventral view); 27. *Bianium plicitum* from *Sphoeroides spengleri* (ventral view).



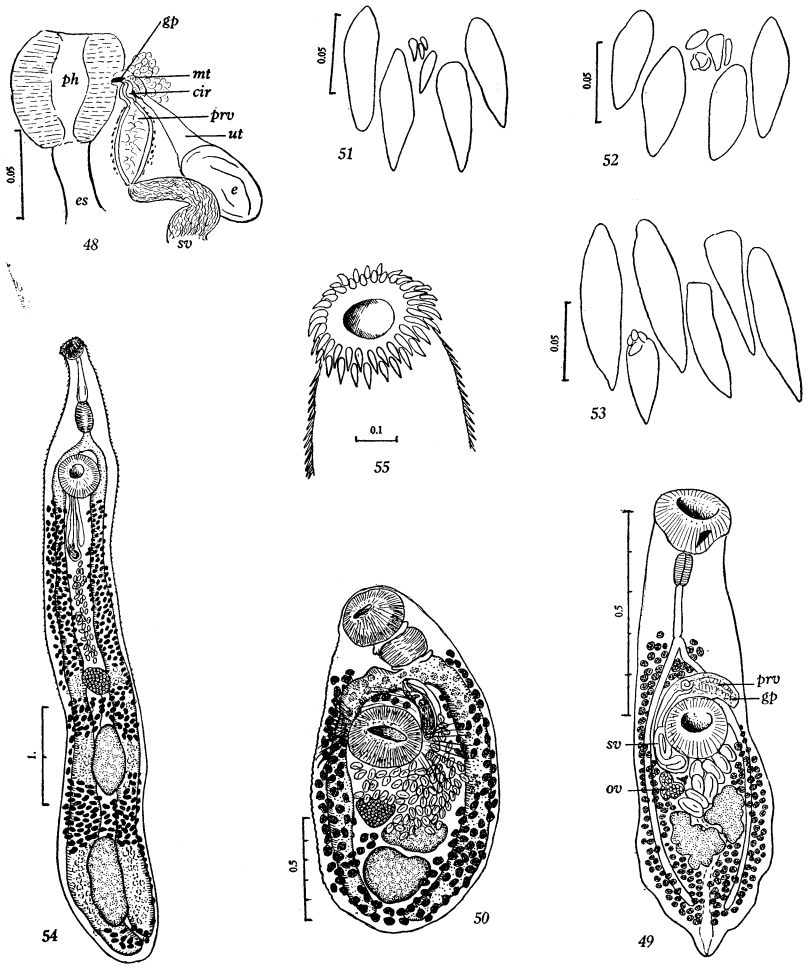
Figs. 28-34. 28. *Bianium plicitum*, pharynx showing lobed anterior edge; 29. *Multitestis chaetodoni* from *Chaetodon ocellatus* (ventral view); 30. *Enenterum aureum* from *Kyphosus incisor* (ventral view); 31. *E. aureum*, oral sucker (enlarged view); 32. *E. aureum*, sagittal section through posterior end showing rectum, anus, and excretory pore; 33. *Opegaster synodi* from *Synodus foetens* (ventral view); 34. *Opecoeloides brachyteleus* from *Mulloidichthys martinicus* (ventral view).



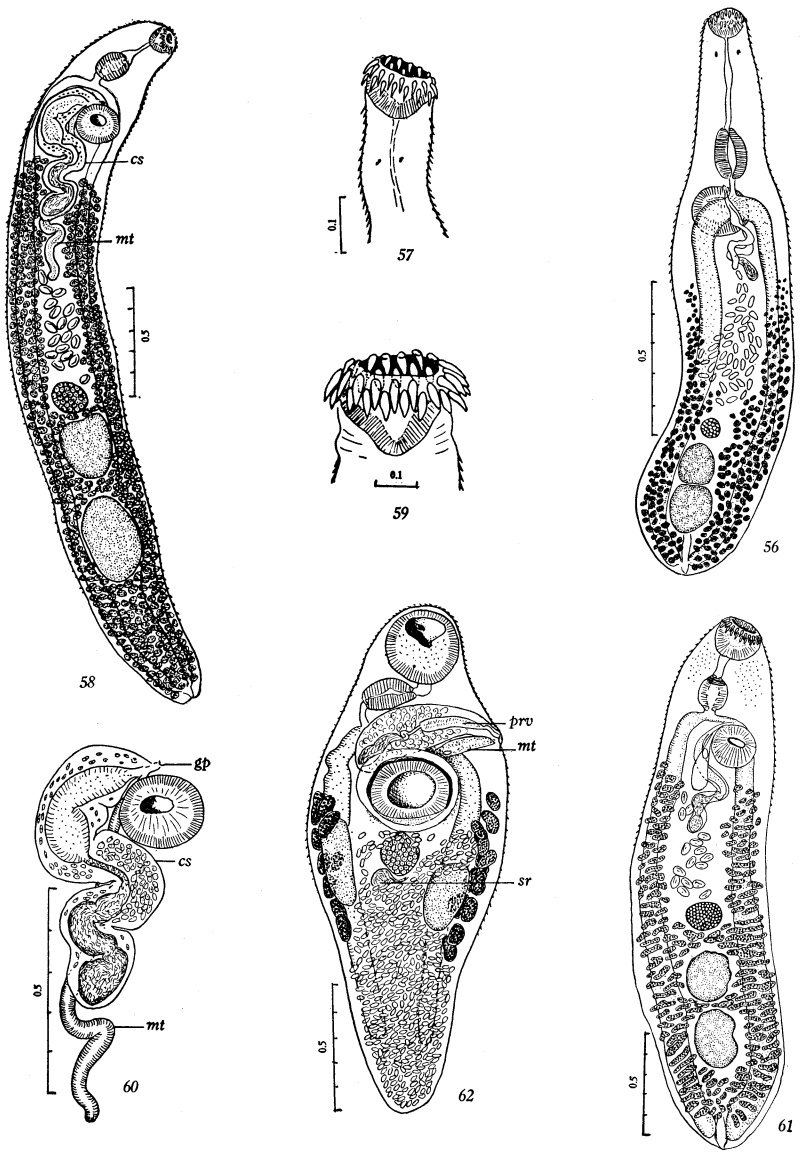
Figs. 35-40. 35. *Opecoeloides elongatus* from *Pseudupeneus maculatus* (latero-ventral view); 36. *O. elongatus*, acetabular region (enlarged view); 37. *Pseudopecoeloides gracilis* from *Trachurops crumenophthalma* (ventral view); 38. *P. gracilis*, terminal reproductive organs (enlarged view); 39. *Pseudopecoeloides equesi* from *Eques lanceolatus* (ventral view). 40. *Pseudopecoeloides priacanthi* from *Priacanthus cruentatus*, anterior portion of body (lateral view).



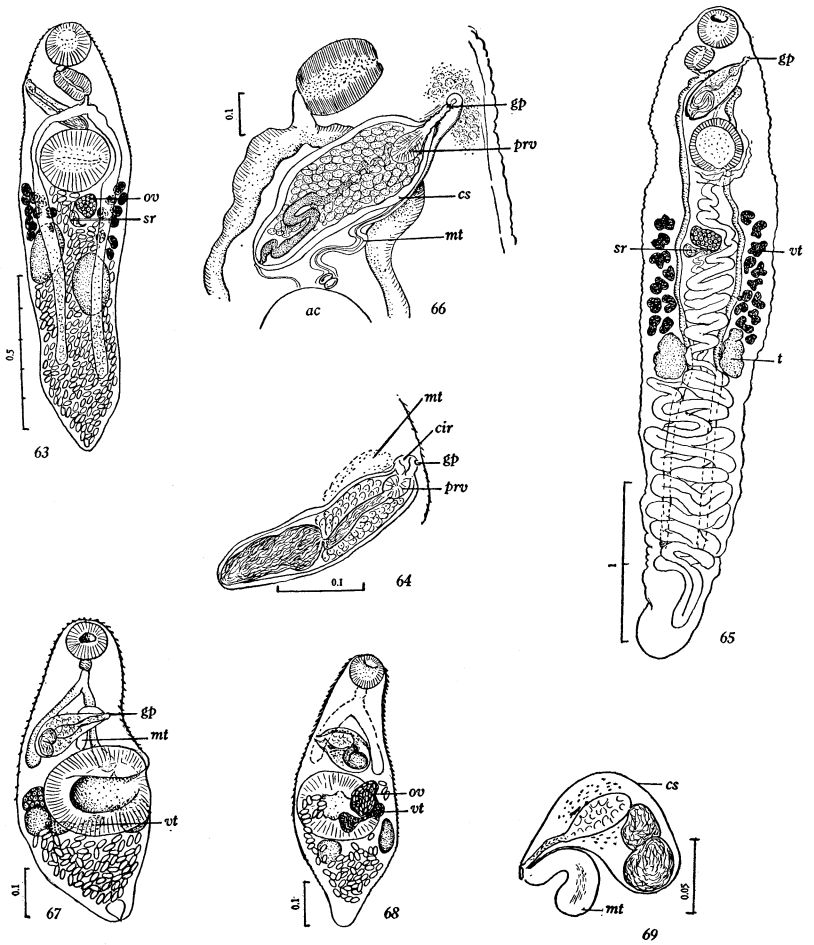
Figs. 41-47. 41. *Neopecoelus scorpaenae* from *Scorpaena grandicornis* (ventral view); 42. *N. scorpaenae*, terminal reproductive organs (ventral view); 43. *Neopocoelus holocentri* from *Holocentrus coruscus* (dorsal view); 44. *N. holocentri*, terminal reproductive organs (dorsal view); 45. *Genitocotyle atlantica* from *Chaetodon ocellatus* (ventral view); 46. *G. atlanticus*, anterior end of body showing terminal reproductive organs (enlarged view); 47. *Horatrema crassum* from *Odontoscion dentex* (ventral view).



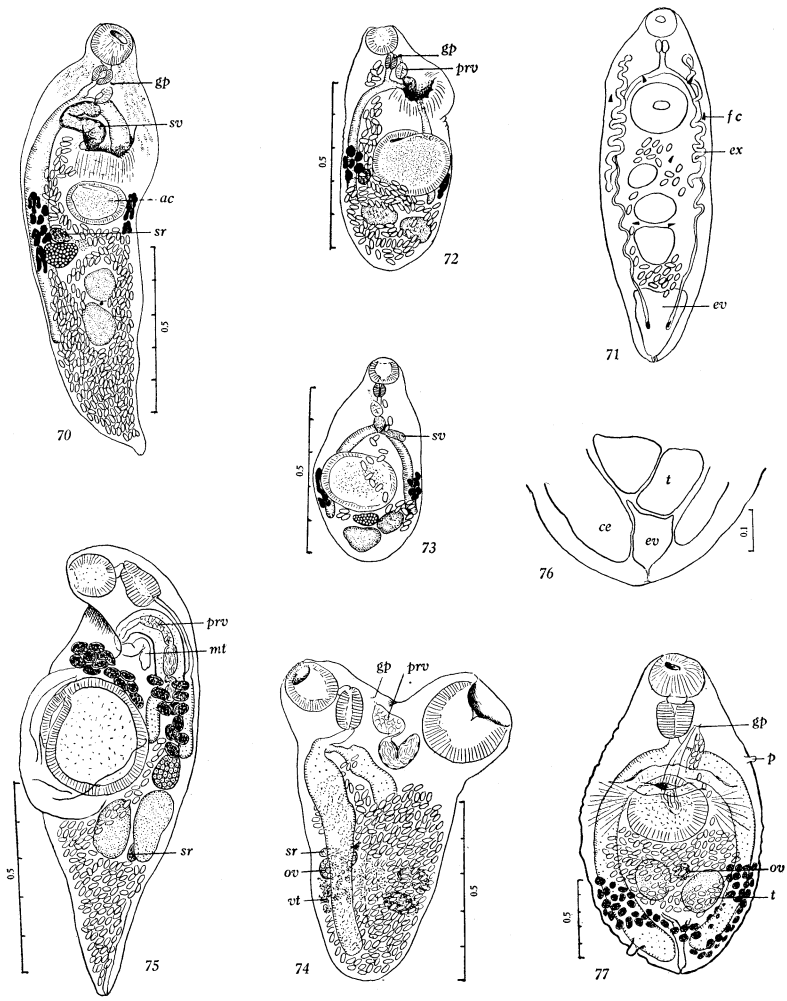
Figs. 48-55. 48. *Horatrema crassum*, terminal reproductive organs (ventral view); 49. *Neonotoporus yamagutii* from *Trachurops crumenophthalma* (ventral view); 50. *Plagioporus crassigulus* from *Diplodus holbrooki* (ventral view); 51-53. *Stephanostomum casum*, portions of oral crown showing abnormal spines; 54. *Stephanostomum promicropsi* from *Promicrops itaiara* (ventral view); 55. *S. promicropsi*, anterior end of body (enlarged view).



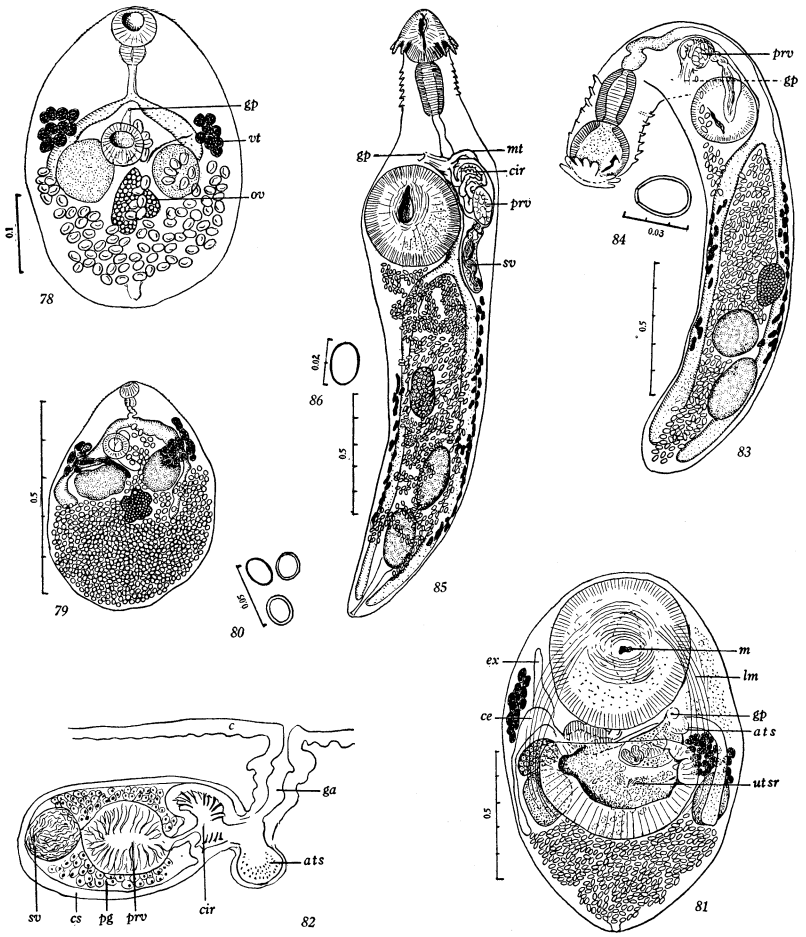
Figs. 56-62. 56. *Stephanostomum sentum* from *Calamus bajonado* (dorsal view); 57. *S. sentum*, anterior end of body; 58. *Stephanostomum coryphaenae* from *Coryphaena hippurus* (ventral view); 59. *S. coryphaenae*, anterior end of body; 60. *S. coryphaenae*, terminal reproductive organs; 61. *Stephanostomum dentatum* from *Epinephelus adsencionis* (ventral view); 62. *Steganoderma parexocoeti* from *Parexocoetus mesogaster* (ventral view).



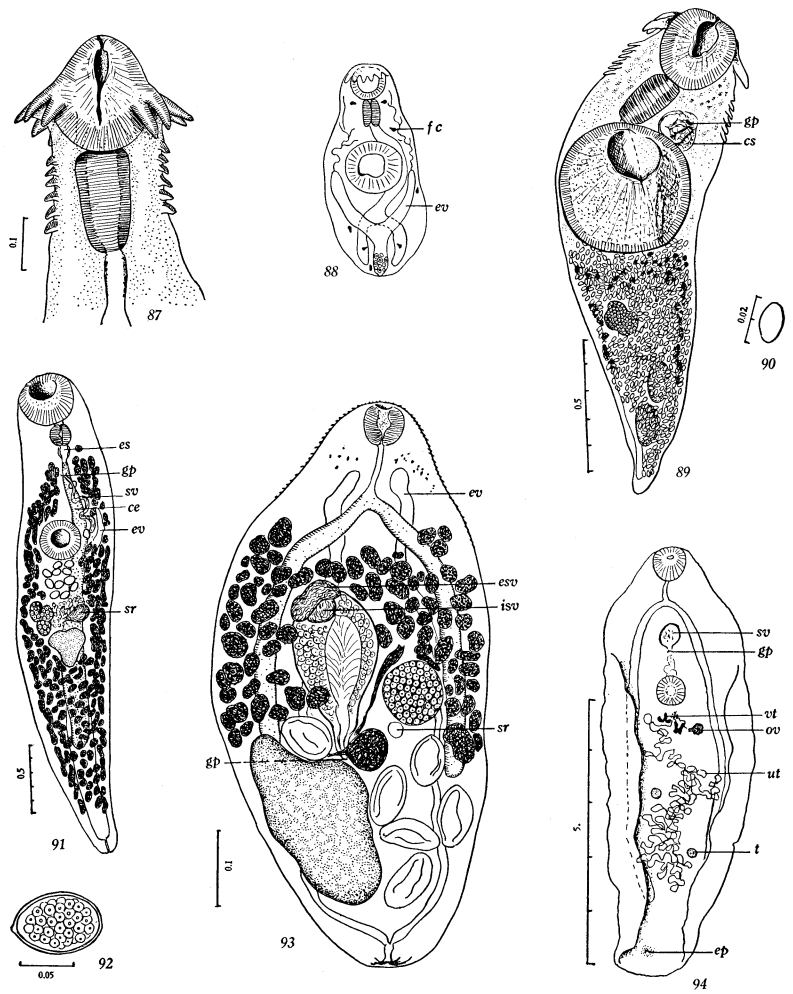
Figs. 63-69. 63. *Steganoderma hemiramphi* from *Hemiramphus brasiliensis* (dorsal view); 64. *S. hemiramphi*, terminal reproductive organs (enlarged view); 65. *Steganoderma elongatum* from *Strongylura timucu* (ventral view); 66. *S. elongatum*, terminal reproductive organs (enlarged view); 67. *Dipherostomum americanum* from *Brachygenys chrysargyreus* (ventral view); 68. *D. americanum*, another specimen (dorsal view); 69. *D. americanum*, terminal reproductive organs.



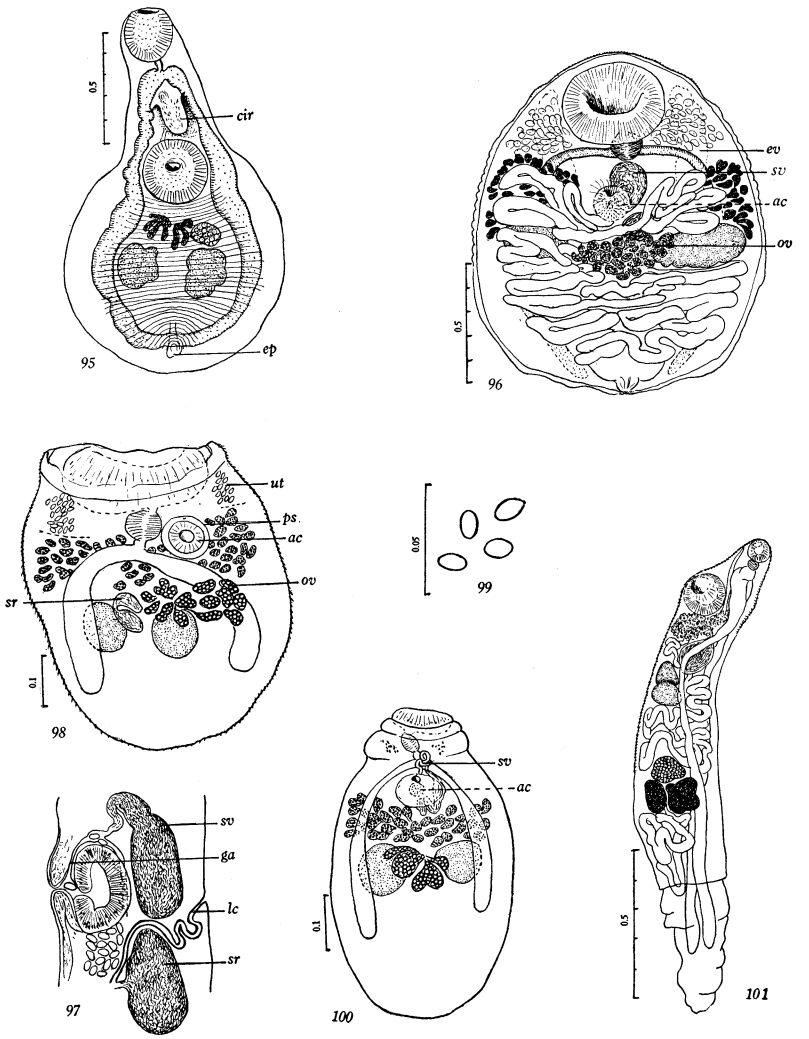
Figs. 70-77. 70. *Diplangus paxillus* from *Haemulon flavolineatum* (ventral view); 71. *D. paxillus*, excretory system including some flame cells (diagram, live specimen); 72. *Diplangus parvus* from *Haemulon flavolineatum* (ventral view); 73. *D. parvus*, another specimen (dorsal view); 74. *Diplangus miolecithus* from *Haemulon album* (lateral view); 75. *Brachyenteron parexocoeti* from *Parexocoetus mesogaster;* 76. *Pycnadena lata* from *Calamus calamus*, portion of posterior end showing excretory vesicle; 77. *Pycnadena calami* from *Calamus bajonado* (ventral view).



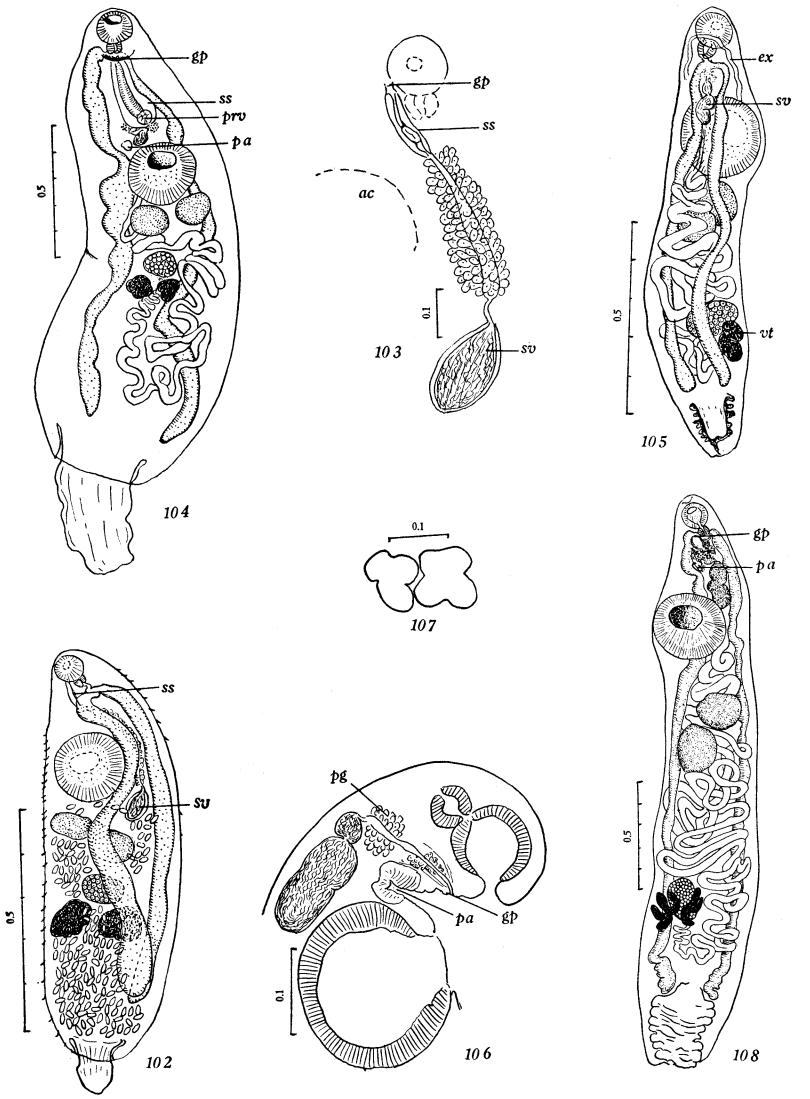
Figs. 78-86. 78. *Bacciger harengulae* from *Harengula macrophthalma* (ventral view); 79. *B. harengulae*, another specimen (ventral view); 80. *B. harengulae*, eggs (enlarged view); 81. *Megalomyzon robustus* from *Lachnolaimus maximus* (ventral view); 82. *M. robustus*, terminal reproductive organs (diagram, lateral view); 83. *Tergestia laticollis* from *Euthynnus alletteratus* (chiefly dorsal view); 84. *T. laticollis*, egg (enlarged view); 85. *Tergestia pectinata* from *Trachurops crumenophthalmus;* 86. *T. pectinata*, egg (enlarged view).



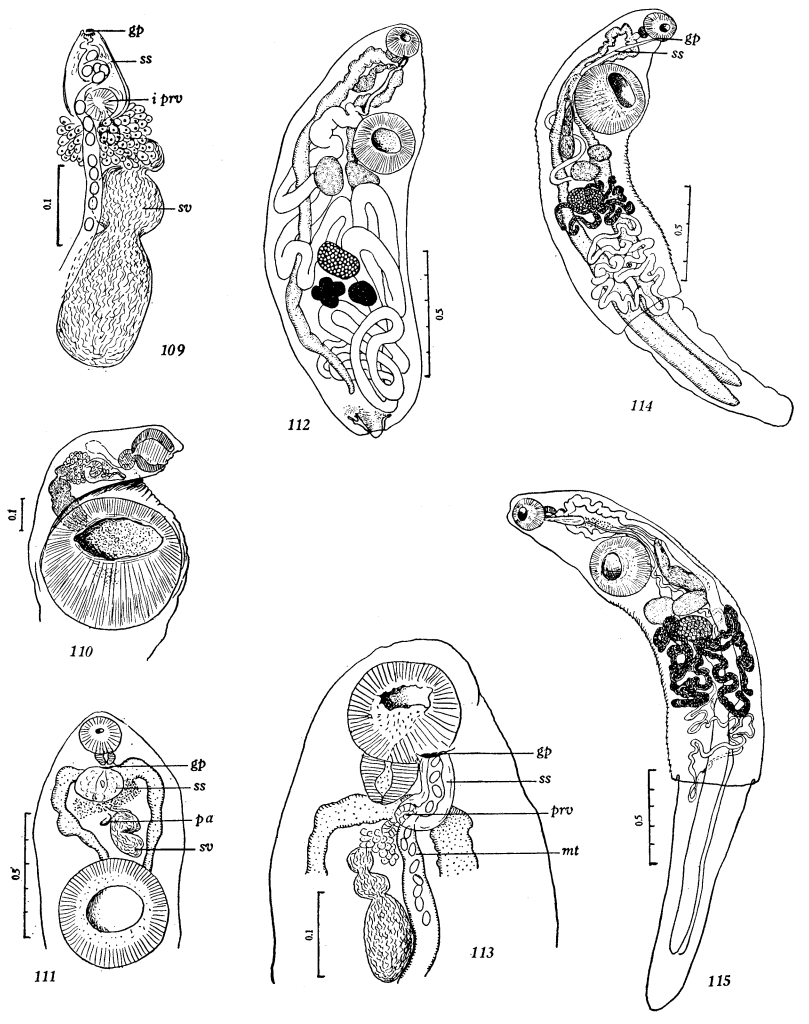
Figs. 87-94. 87. *Tergestia pectinata*, anterior end (enlarged view); 88. *T. pectinata*, excretory system including some flame cells (diagram, live specimen); 89. *Tergestia acuta* from *Caranx bartholomaei* (ventral view); 90. *T. acuta*, egg (enlarged view); 91. *Haplosplanchnus kyphosi* from *Kyphosus sectatrix* (ventral view); 92. *H. kyphosi*, egg enlarged view); 93. *Bivesicula hepsetiae* from *Hepsetia stipes* (dorsal view); 94. *Phyllodistomum carangis* from *Caranx ruber* (dorsal view).



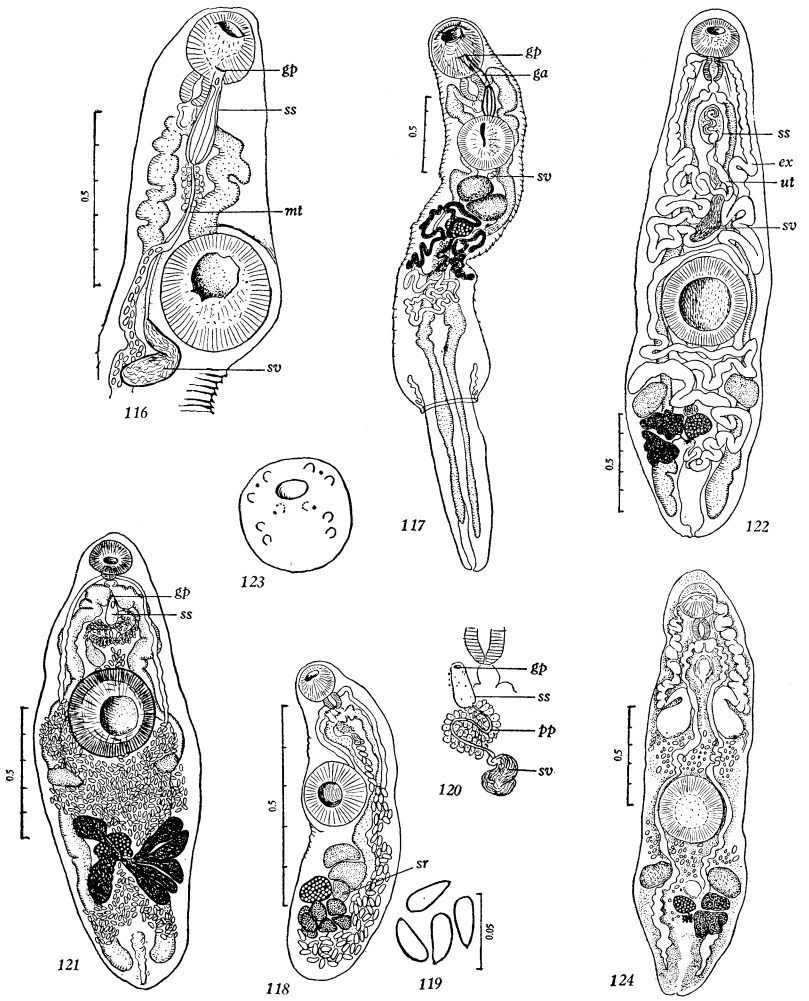
Figs. 95-101. 95. *Xystretrum pulchrum* from *Sphoeroides splengeri* (ventral view); 96. *Stegopa crassulata* from *Lutianus analis* (ventral view); 97. *S. crassulata*, sagittal section through acetabular region (semi-diagrammatic); 98. *Stegopa globosa* from *Lutianus griseus* (ventral view); 99. *S. globosa*, eggs (enlarged view); 100. *Stegopa adglobosa* from *Lutianus griseus* (ventral view); 101. *Parahemiurus merus* from *Harengula macrophthalmus* (ventral view).



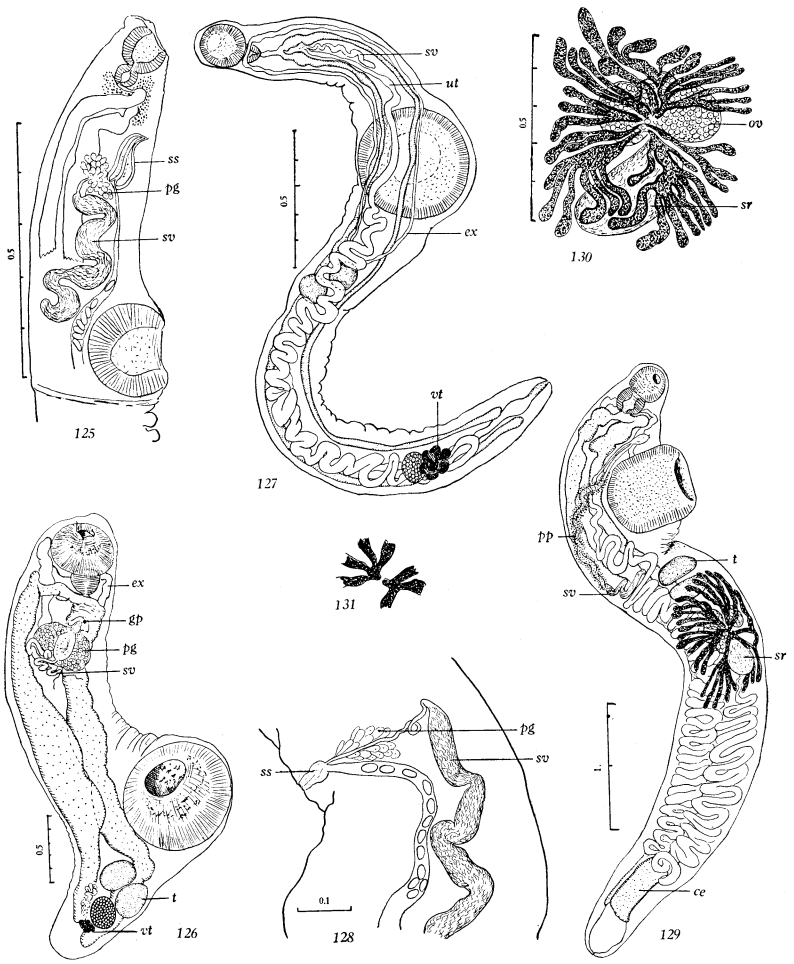
Figs. 102-108. 102. *Anahemiurus microcercus* from *Eucinostomus lefroyi* (dorsal view); 103. *A. microcercus*, terminal reproductive organs; 104. *Lecithochirium mecosaccum* from *Synodus foetens* (ventral view); 105. *Lecithochirium parvum* from *Euthynnus alletteratus* (dorsal view); 106. *L. parvum*, anterior portion of body (lateral view); 107. *L. parvum*, outline of vitellaria; 108. *Lecithochirium synodi* from *Synodus foetens* (ventral view).



Figs. 109-115. 109. *Lecithochirium synodi*, terminal reproductive organs; 110. *Lecithochirium texanum* from *Euthynnus alletteratus*, anterior end of body (ventrolateral view, preacetabular pit concealed); 111. Anterior portion of a specimen in a collection of "*Sterrhurus branchialis*"; 112. *Sterrhurus microcercus* from *Fistularia tabacaria* (ventral view); 113. *S. microcercus*, anterior end (enlarged ventral view); 114. *Ectenurus virgulus* from *Harengula macrophthalma* (ventral view); 115. *Parectenurus americanus* from *Synodus foetens* (ventral view).



Figs. 116-124. 116. *Parectenurus americanus*, anterior portion of body (enlarged view); 117. *Dinurus scombri* from *Gymnosarda pelamis* (ventral view); 118. *Aponurus laguncula* from *Ocyurus chrysurus* (ventral view); 119. *A. laguncula*, eggs; 120. *A. laguncula*, terminal reproductive organs (semi-diagrammatic); 121. *Brachydena pyriformis* from *Orthopristis chrysopterus*, croacker, Beaufort, N. C. (ventral view); 122. *Leurodera decora* from *Anisotremus virginicus* (ventral view); 123. *L. decora*, oral sucker showing papillae (live specimen); 124. *L. decora*, infected with a microsporidian.



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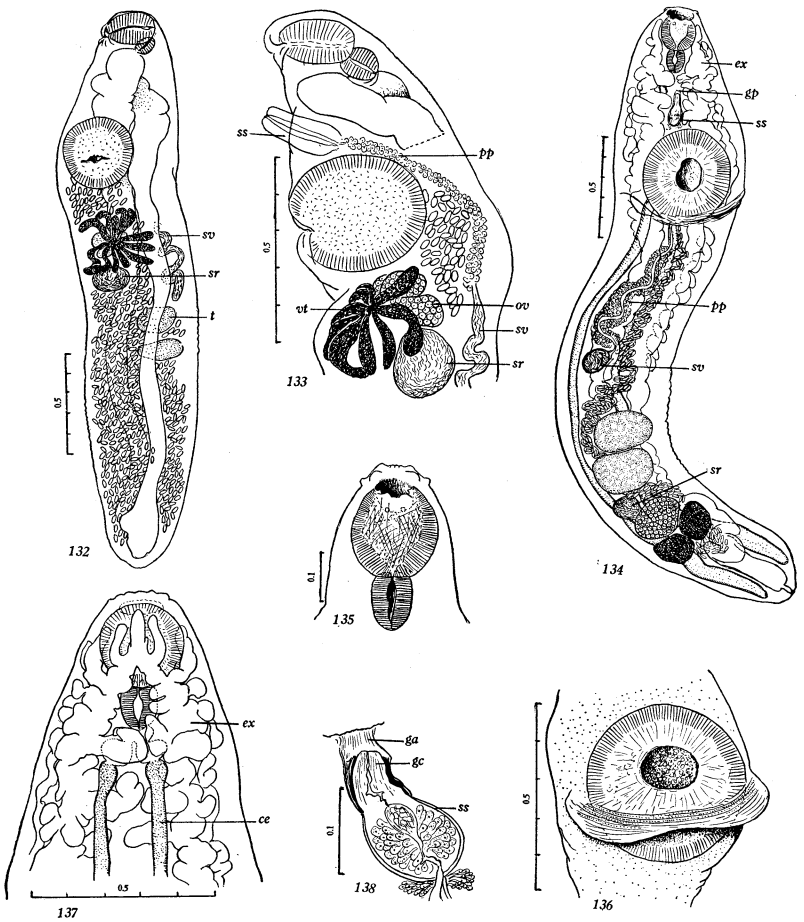

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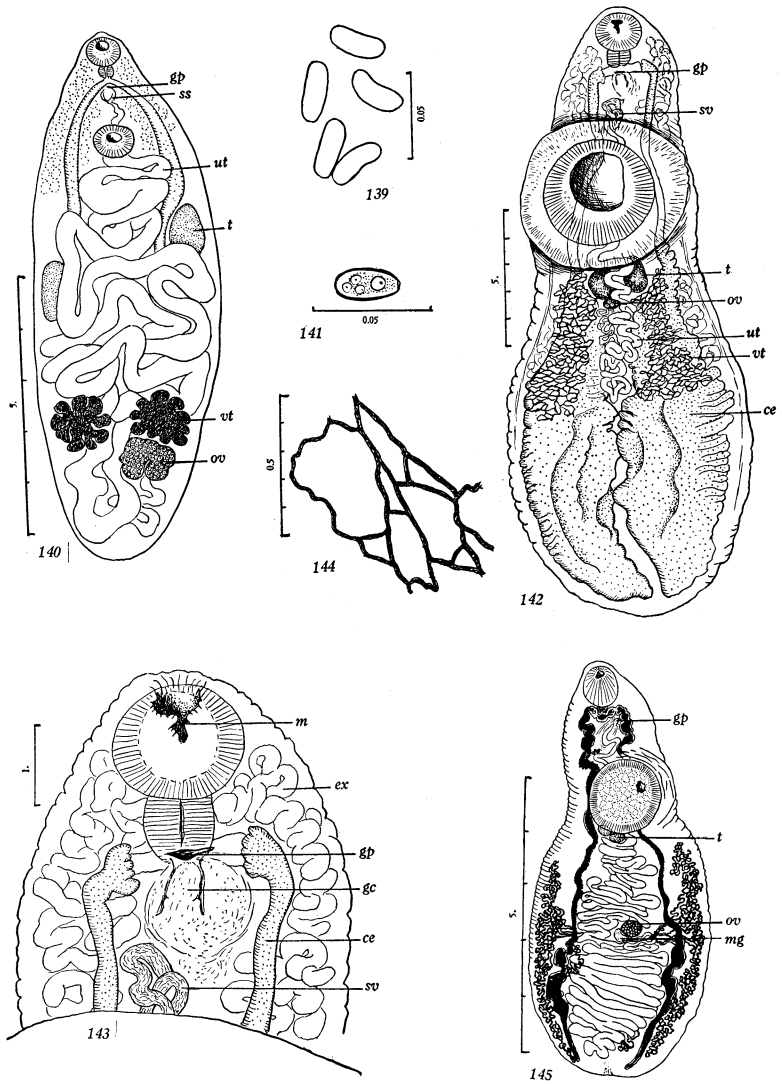

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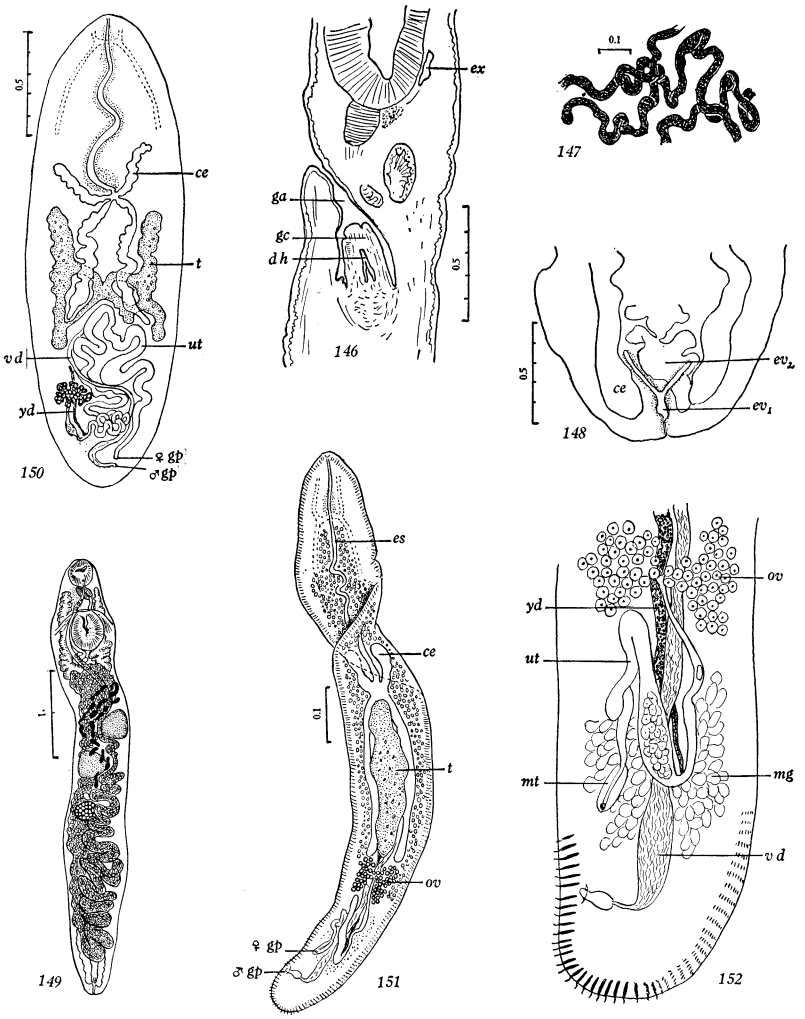

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