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Binder 025, Bucephalidae [Trematoda Taxon Notebooks]

Harold W. Manter Laboratory of Parasitology

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Rhipidocotyle Diesing, 1858Syn. *Nannenterum* Ozaki, 1924

Generic diagnosis. — Bucephalidae, Bucephalinae: Body elongate, more or less slender. Rhynchus with pentagonal cap- or hood-like expansion and suctorial pit ventroposteriorly. Mouth opening usually in middle third. Intestine short. Testes tandem or oblique, in posterior half of body. Cirrus pouch and genital pore as in *Bucephalopsis*. Ovary pretesticular. Vitellaria usually divided into two preovarian groups. Uterus not extending so far forward as it does in *Bucephalus* and *Bucephalopsis*. Excretory vesicle very long, may well reach the rhynchus. Flame cell pattern worked out by Komiya and Tajimi for *R. lingualis*. Parasitic in marine and freshwater fishes.

Genotype:¹⁾ *R. galeata* (Rud., 1819) Eckmann, 1932, syn. *Gasterostomum minimum* Wagener, 1852; *G. triglae* van Beneden, 1870; *R. viperae* Nicoll, 1914, nec Bened., 1870, in *Lichia amia*; Triest. Also in *Trigla* spp.; Brit. Isl.

of Nicoll,
1909
1888 to 1890
p. 21

Other species:

- R. adbaculum* Manter, 1940, in *Scomberomorus regalis*; Florida.
- R. angusticollis* Chandler, 1941, in *Sarda sarda*; Texas coast.
- R. apapillosa* Chauhan, 1943, in *Clupea* sp.; Bombay.
- R. baculum* (Linton, 1905) Eckmann, 1932, in *Scomberomorus maculatus*; Beaufort, N. C.; also in *Scomberomorus regalis* (?); Florida.
- R. barracudae* Manter, 1940, in *Sphyræna barracuda*; Florida, Cuba.
- R. capitata* (Linton, 1940) in *Auxis rochei*; Woods Hole.
- R. eckmanni* Nagaty, 1937, in *Trachinotus bailloni*; Red Sea.
- R. elongata* McFarlane, 1936, in *Ophiodon elongatus*; Canada.

R. khalili Nagaty, 1937, in *Chanos chanos*; Red. Sea, also in *Sphyræna* sp.; Macassar, Celebes.

R. lepisostei Hopkins, 1954, in *Lepisosteus spatula*; Louisiana. Encysted metacercariae of probably the same species in *Mugil cephalus*, *M. curema*.

This species may possibly turn out to be identical with *Bucephalus cuculus* McCrady, 1874; if this is so the correct combination should be *Rhipidocotyle cuculus* (McCrady, 1874) — Hopkins (1954).

- R. ligulum* Chauhan, 1943, in *Arius falcarius*; Bombay.
- R. lingualis* Komiya et Tajimi, 1941, in *Pseudorasbora parva*; Shanghai.
- R. lintoni* Hopkins, 1954, in *Strongylura marina*; Louisiana, Virginia, Massachusetts.
- R. longleyi* Manter, 1934, in *Hypoclydonia bella*; Florida; also in *Telescopias* sp. and *Synagrops japonica*; Suruga Bay, Japan.
- R. nagatyi* Manter, 1940, in *Euthynnus alletteratus*; Florida.
- R. papillosa* (Woodhead, 1929) Eckmann, 1932, in *Micropterus dolomieu*, *Aplites salmoides*, *Esox lucius*, *Lepomis macrochirus*; N. America.

Miracidium with four ciliated cephalic plates and three pairs of single-jointed caudal appendages; cercaria develops in *Elliptio dilatatus*, encysts at base of fin rays of *Ambloplites rupestris* (mode of penetration observed experimentally); adult in *Micropterus dolomieu*, *Aplites salmoides* and *Esox lucius*. Feeding experiment not carried out — Woodhead (1927, 29).

R. pentagonum (Ozaki, 1924) (Pl. 1, Fig. 10), in *Scomberomorus nipponicus*, *Thynnus thynnus*, *Caranx* sp.; Pacific, Red Sea Mediterranean.

¹⁾ There is some discrepancy of opinions in the designation of the genotype, but I agree with Eckmann (1932) in this respect.

R. septapapillata Krull, 1934, in *Eupomotis gibbosus*, *Fundulus diaphanus*, Virginia; also in *Thynnus thynnina*, Red Sea — Nagaty (1937), *Chrysophrys berda*, Bombay — Chauhan (1943).

Adult fluke was obtained experimentally in *Eupomotis gibbosus* by feeding metacercaria occurring in nature in *Fundulus diaphanus diaphanus* and *Eupomotis gibbosus* — Krull (1934). *Cercaria basi* Woodhead, 1936, from *Lampsilis siliquoides* has been shown to be the larval form. It encysts in various small fishes (*Lepomis gibbosus*, *Semotilus atromaculatus*, *Micropterus salmoides* and *Lebistes* sp.), develops to maturity in *Lepomis gibbosus* — Kniskern (1950, 52).

R. transversalis Chandler, 1935, syn. *Prososhynchus gracilescens* (Rud.) of Linton, 1940 — Manter (1947), in wall of intestine of

Menidia menidia; *Strongylura marina*; Atlantic coast of U.S.A.
Flame cell formula: $2[(2+2)+(2+2)]$ — Hopkins (1954).

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Flame cell formula: $2[(2+2)+(2+2)]$ — Hopkins (1954).

Krull's (1934) key to species
of Rhipidocotyle

1. Sucker bearing a horse-shoe-like structure.....R. baculum
Sucker bearing papillae-like structures.....2
2. Sucker bearing 5 papillae not arranged in a semicircle.....3
Sucker bearing 7 or more papillae " " " " " ".....4
3. Papillae directed posteriorly;pharynx postequatorial.....
R. galeatum
Papillae having a star-like arrangement;pharynx pre-
equatorial or equatorial.....R. pentagonum
4. Papillae 7.....R. septpapillata
Papillae 15.....R. papillosus

Rhipidocotyle galeatum (Rud., 1819)

Diagnosis from Eckmann's description of type material.

Length 1.5; width 0.3

Anterior sucker 0.11 in diameter surmounted by a papilla-bearing fold with 5 dorsally directed papillae.

Pharynx at border of the middle and last body thirds, 0.05.

Esophagus 0.15 long. Intestine sac-shaped.

Testes about 0.2 in diameter, in middle third of body.

Ovary 0.15 at level of anterior testis.

Vitellaria not clearly seen but at least a part of them in the midbody region.

Egg size not given.

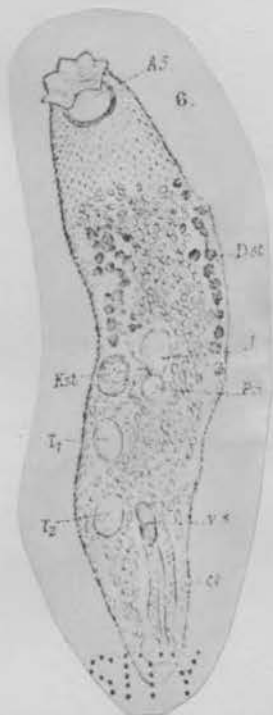
Cirrus sac in last body third.

Eckmann believes that Gasterostomum minimum is a synonym.

It agrees in structure of anterior end and in position of pharynx. Eggs 17 to 19 by 30 μ

Eckmann also lists as synonyms: Gasterostomum ^{of} triglae Nicoll, 1909
(nec VanBen.)

Rhipidocotyle viverae Nicoll, 1914
(nec VanBen.)



GASTEROSTOMUM TRIGLAE
V. BEN. OF NICOLL, 1909

Rhipidocotyle adbaculum, n. sp. Manter, 1940

(Figures 9-12)

Host. *Scomberomorus regalis* (Bloch)

Location. Intestine

Frequency. Present in 1 of 3 hosts examined

Diagnosis. Body elongate, 1.215 to 1.620 by 0.232 to 0.300. Anterior sucker 0.090 to 0.120 in diameter, with a conspicuous cephalic disc noticeably wider than anterior end of body, 0.160 to 0.190 in diameter (fig. 10). Dorsal and two ventral lobes of disc well marked, lateral edges rounded. Mouth usually slightly anterior to midbody in 2 specimens; pharynx 0.041 to 0.053 in diameter; intestine short, saclike, extending posteriorly.

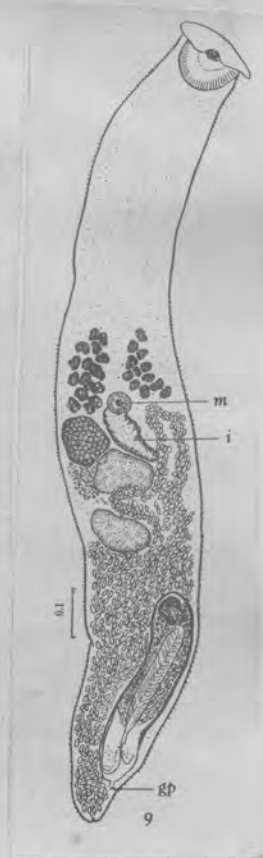
Gonads more or less tandem immediately posterior to mouth. Ovary globular, pretesticular, to the right and partly overlapping anterior testis; seminal receptacle small; Mehlis' gland just posterior to ovary, opposite anterior testis or between testes. Vitelline follicles in two lateral, separated groups extending from level of pharynx only a short distance anteriorly, each group with 12 to 17 follicles approaching the other group medianly but not meeting. Uterus filling most of body posterior to mouth (in 1 of 17 specimens the uterus barely reached beyond the mouth, extending posterior to genital pore; eggs thin-shelled, 15 to 17 by 9 to 10 microns.

Testes globular, tandem or slightly diagonal, in contact or not far apart. Cirrus sac extending forward to posterior or anterior testis, containing a subspherical seminal vesicle and a long, straight or slightly curved pars prostatica with tall cells; genital atrium with one large and a smaller tri-papillated genital lobe; atrium duct muscular, variable in length; genital pore a short distance anterior to posterior end of body. Excretory pore terminal; anterior extent of vesicle not determined.

The name *adbaculum* indicates similarity to *R. baculum*.

Comparisons. *R. adbaculum* can be distinguished from *R. baculum* by the size and shape of the cephalic disc (figs. 10, 11), which in *R. adbaculum* is larger and has a dorsal point. The body is larger and more

elongate. *Rhipidocotyle adbaculum* differs from *R. barracudae* in more slender body, much smaller pharynx, and much smaller eggs. It differs from *R. nagaty* in body form, in location of vitellaria and pharynx, and in uterine coils.



Rhipidocotyle adbaculum Manter, 1940

Hosts: *Scomberomorus maculatus* (1 of 2);
Scomberomorus regalis (2 of 2).

Site: Pyloric caeca and intestine.

Discussion: My specimens differ slightly from the original description. The eggs measure 17 to 23 by 12 to 15 microns rather than 15 to 17 by 9 to 10, and the ovary does not always overlap the anterior testis.

Overstreet, 1969

Rhipidocotyle adbaculum Manter, 1940

HOST: *Scomberomorus maculatus* (Mitchill) (new host record).

INCIDENCE: In one of 33.

HABITAT: Upper small intestine.

LOCALITY: Off Grand Isle, Louisiana (new locality record).

A single specimen from *S. maculatus* is tentatively identified as *R. adbaculum*. It differs from the original description in being a slightly larger worm with a uterus that exceeds the level of the pharynx and with ova of greater dimensions. The nature of the cephalic hood and the relative disposition of the reproductive and digestive organs, however, serve as strong indications of its similarity to *R. adbaculum* from *S. regalis* (Manter, 1940).

In his description of *R. adbaculum* Manter (1940) noted the similarity of this species to *R. baculum* (Linton, 1905) from *S. maculatus*. There is a possibility these are synonymous species. Linton (1905, 1910), however, listed so many different forms under a single name that it is not possible to be certain of which species he had reference to in his descriptions. For this reason, both species are considered valid until further studies demonstrate otherwise.

TAMS 87(3)

From Corkum, 1968

RESEARCH NOTES

TWO NEW TREMATODES FROM THE BONITO, *SARDA SARDA*, IN THE GULF OF MEXICO

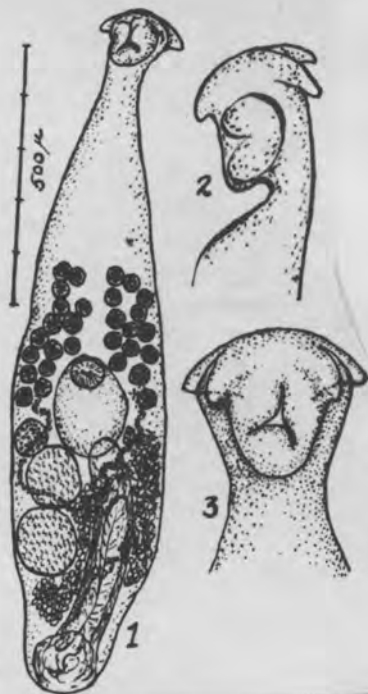
A specimen of bonito, *Sarda sarda*, taken off the Texas coast near Freeport, yielded two new species of trematodes, one a gasterostome of the genus *Rhipidocotyle*, the other a hemiurid of the genus *Sterrhurus*. Descriptions of them follow:

Rhipidocotyle angusticolle n. sp. Chandler,

(Figs. 1-3)

Body elongate, broadest at about level of ovary; anterior portion constricted to a narrow neck just behind sucker. Anterior end of very peculiar shape with two hornlike projections on each side dorsally, a pair of lobes overhanging the sucker ventrally, and the sucker itself projecting ventrally and posteriorly like a chin. Length 1.2 to 1.4 mm; maximum diameter 300 to 420 μ ; diameter of neck about 65 μ , its depth only about 30 μ ; diameter across dorsal horns about 170 μ ; length of sucker about 110 μ . Pharynx about 60 μ in diameter; intestinal sac about 190 μ long and 135 μ wide, situated behind middle of body. Ovary at level of posterior portion of intestinal sac, at right, about 65 to 70 μ in diameter; testes one behind the other, posterior to the ovary, about 120 to 130 μ in diameter. Cirrus sac about 400 μ long; copulatory bursa about 125 μ in diameter. Vitellaria in two clusters of about 15 follicles each, the follicles about 40 μ in diameter, situated at level of anterior part of intestinal sac and anterior to it; vitelline ducts unite at level of junction of two testes. Uterus occupies available space behind intestinal sac and to left of testes; eggs about 21 to 22 μ long and 14 to 16 μ broad.

This species differs from all of the nine members of the genus hitherto described from marine fishes (see Eckmann, 1932; Chandler, 1935; Manter, 1940) by the very slender neck, deeply indented ventrally behind the anterior sucker, the posterior edge of which projects chinlike, and in the peculiar shape of the cephalic hood, with its prominent horns projecting dorso-laterally



Rhipidocotyle angusticolle Chandler, 1941

HOSTS: *Euthynnus alletteratus* (Rafinesque); *Scomberomorus cavalla* (Cuvier) (new host record).

INCIDENCE: In six of six *E. alletteratus*. In two of 11 *S. cavalla*.

HABITAT: Upper small intestine.

LOCALITY: Off Grand Isle, Louisiana (new locality record).

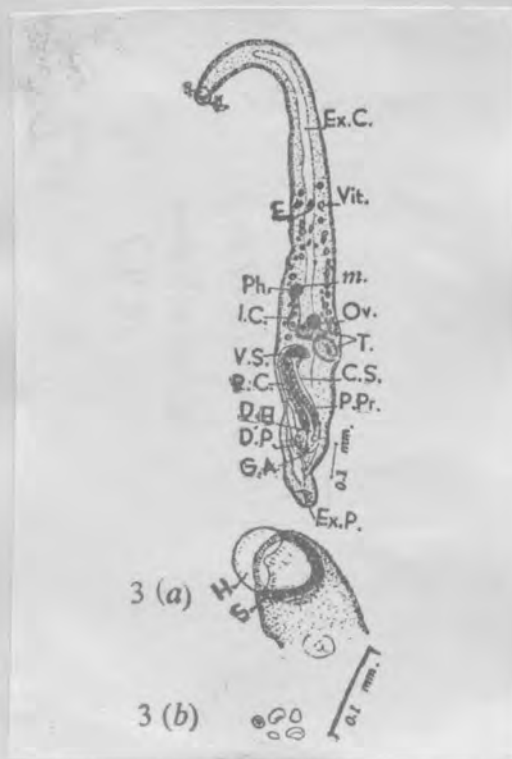
Chandler (1941) described the anterior end of *R. angusticolle* as possessing "two horn-like projections on each side dorsally, a pair of lobes overhanging the sucker ventrally. . . ." A close examination of living material revealed that there are actually five lappet-like folds of tissue associated with the anterior sucker. There are two ventral, two lateral, and one dorsal. This observation was later confirmed by an examination of the type specimen (USNM Helminthological Collection 36786).

TAMS 87(3)

From Corkum, 1968

Rhipidocotyle apapillosum Chauhan, 1943

Length 1.51; width 0.18 (1/8th); all important organs in posterior 2/3rds.
Anterior sucker 0.095 by 0.085; hood slightly wider, notched ventrally, with a dorsal pad-like structure.
Mouth 0.92 from anterior end; gut sac-like extending posteriorly to near middle of anterior testis.
Gonads contiguous, crowded together almost at same level.
Ovary small, by left side of gut; anterior to anterior testis but overlapping it.
Vitellaria in two separated lateral groups from level of anterior testis to 0.62 from anterior end; length 0.45 on right, 0.46 on left; 14 on right, 16 on left.
Uterus does not extend anterior to vitellaria.
Eggs minute (size not given)
Testes obliquely tandem, contiguous.
Cirrus sac to anterior end of posterior testis, 0.36 mm.
Seminal vesicle a sac extended horizontally. Genital tongue not conspicuous.
Excretory vesicle extending to 0.10 from anterior end.
Host: Clupea sp., a marine fish
West Coast of India; Bombay



Rhipidocotyle baculum (Linton) Eckmann

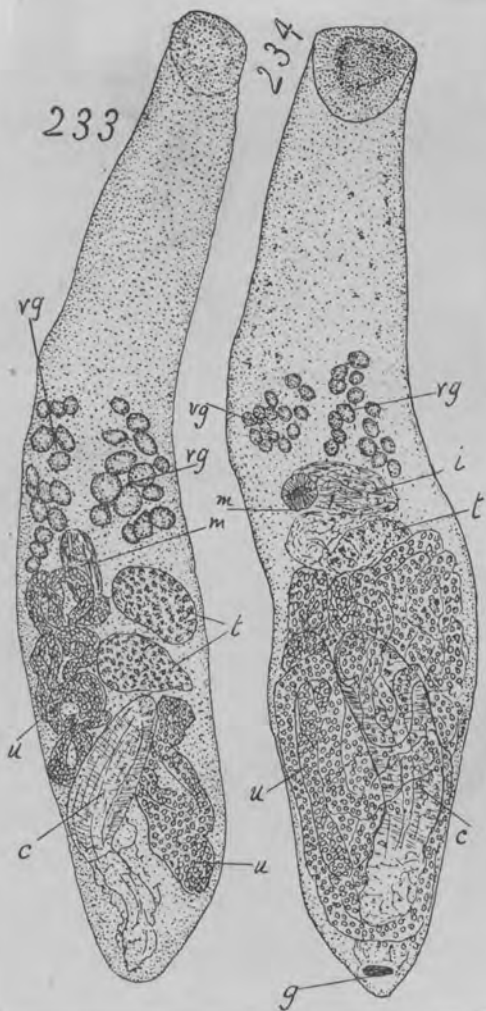
Synonyms: Gasterostomum baculum Linton, 1905
Gasterostomum species Linton, 1910, p. 447
 from Scomberomorus maculatus
Nannoenterum baculum (Linton, 1905)

Length 0.7 to 0.9 divided into two almost equal parts, the anterior is flattened dorsao-ventrally and contains no organs, the posterior is round in cross-section and contains all the inner organs. The sucker is 0.09 to 0.11 surrounded by a horseshoe-like swelling. Pharynx at midbody, 0.02 to 0.04. Testes and ovary round, tandem. Ovary (0.05) directly behind the pharynx; testes (0.07) behind the ovary. Vitellaria consist of 2 irregular follicle groups, about 10 in each, lying on each side of the pharynx. Cirrus sac about 1/3 body length at the hind end. The eggs fill the entire free space in the hind body covering all organs. They are 19 to 21 by 11 μ .

Linton gives 17 x 14 (1901)
 also 28 x 24

The following figures are from Linton, 1905.

For later figure see Eckmann, 1932 from whom the above diagnosis is derived.



Rhipidocotyle baculum (Linton, 1905) Eckmann, 1932

Synonyms: Gasterostomum baculum Linton, 1905
Gasterostomum sp. Linton, 1901 from Scomberomorus maculatus
Nannoenterum baculum (Linton)

Host: Scomberomorus regalis ?
 Frequency: Collected once from a single mackerel the identification of which was uncertain

It seems very possible that this fish was actually Scomberomorus maculatus. Rhipidocotyle baculum has hitherto been known only from S. maculatus. On the other hand, the only gasterostome previously found in 3 specimens of S. regalis examined has been R. adbaculum.

Rhipidocotyle baculum (Linton, 1905)
Eckman, 1932**

Synonyms: *Gasterostomum baculum* Linton, 1905; *Gasterostomum* sp. Linton, 1900; *Nannoenterum baculum* (Linton, 1905)

Host: *Scomberomorus maculatus*

Site: intestine

Locality: Dog Island Reef

APALACHEE BAY, GULF OF MEXICO
FROM NAHHAS AND SHORT (1965)

Rhipidocotyle baculum (Linton, 1905)
Eckmann, 1932

Synonyms: *Gasterostomum baculum* Linton, 1905; *Gasterostomum* sp. Linton, 1901; *Nannoenterum baculum* (Linton, 1905).

Host: **Scomberomorus cavalla* (C).

Site: intestine and ceca.

Our material is referred to *Rhipidocotyle baculum* as described by Linton (1901, 1905); his later paper (1940) evidently includes more than one species as *Nannoenterum baculum*. *Rhipidocotyle baculum* is very similar to *R. adbaculum* Manter, 1940, which Manter (1940c) distinguished on the

basis of "size and shape of the cephalic disc which in *R. adbaculum* is larger and has a dorsal point. The body is larger and more elongate." In body shape, our material is more like *R. baculum*. The shape of the cephalic disc is variable but in no case was a dorsal point evident nor did the cephalic disc extend laterally beyond the edges of the body. In some specimens, the uterus extends to the anterior level of the vitellaria.

Siddiqi and Cable (1960) reported *Proso-rhynchus stunkardi* from *Scomberomorus* sp. A reexamination of paratypes indicates that *P. stunkardi* is a synonym of either *R. baculum* or *R. adbaculum*. Because the specimens were dead when removed from the host, the body and cephalic disc are not normal in shape.

CURACAO; FROM NAHHAS + CABLE, 1964

Syn. *Prosorhynchus stunkardi* n. sp. (FIGURE 6)

Description based on 15 specimens with characters of the genus. Body elongate, 1.056 to 1.227 long, 0.171 to 0.264 wide; anterior half spatulate, posterior half cylindrical. Cuticle distinctly spinose from anterior end to about level of pharynx. Rhynchus oval to pyriform, muscular, 0.052 to 0.118 by 0.064 to 0.099, without papillae. Mouth median, posterior to mid-level; pharynx small, spherical, 0.039 to 0.052 in diameter; esophagus not evident, intestine small, oval in shape. Testes 2, entire, 0.078 to 0.082 by 0.064 to 0.067, close together, slightly to left of midline, posterior to ovary. Cirrus sac long, usually extending to posterior testis; with small, rounded seminal vesicle, well-developed tubular pars prostatica and prostate cells. Genital pore ventral, near end of body. Ovary entire, 0.067 to 0.097 by 0.052 to 0.059, to left of midline, pretesticular, near intestine and anterior testis. Vitellaria in 2 short, lateral bands of small follicles immediately anterior to level of pharynx. Uterus spacious, from posterior end of body to level of pharynx. Eggs very numerous, colorless or yellow, 0.016 to 0.018 by 0.011 to 0.015. Excretory system not observed.

Host: *Scomberomorus* sp.

Site: intestine and ceca.

Locality: Puerto Real, P. R.

Type specimen: Holotype No. 39305.



Siddiqi and Cable (1960) reported *Prosorhynchus stunkardi* from *Scomberomorus* sp. A reexamination of paratypes indicates that *P. stunkardi* is a synonym of either *R. baculum* or *R. adbaculum*. Because the specimens were dead when removed from the host, the body and cephalic disc are not normal in shape.

FROM NAHHAS AND CABLE, 1964

This species is similar to *P. freitasi* Nagaty, 1937, and *P. facilis* Ozaki 1924 in general body shape and disposition of gonads, but differs from *P. freitasi* in the shape of the rhynchus, more anterior location of the vitellaria and size of eggs. It differs from *P. facilis* in size and shape of the rhynchus, size and extent of vitelline follicles, and in egg size.

Rhipidocotyle barracudae, n. sp. Manter, 1940

(Figures 7, 8)

Host. *Sphyræna barracuda* (Linn.)

Location. Intestine and ceca

Frequency. Identified in 2 of 15 hosts examined; frequency probably greater

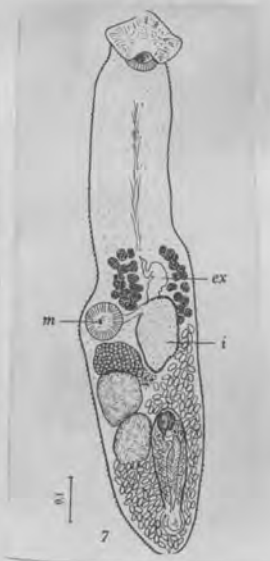
Diagnosis. Body elongate, 1.207 to 1.782 by 0.240 to 0.547; anterior half flat, thin and more narrow, without organs, posterior half plump, cylindrical, thick and wide, containing reproductive organs (body form similar to that of *R. baculum*). Anterior sucker slightly wider than long, 0.093 to 0.120 in transverse diameter, cephalic disc 0.157 to 0.180 in diameter, with 5 lobes (2 ventral, 2 lateral, and 1 dorsal); 2 ventral lobes separated by a broad indentation. Mouth almost always slightly posterior to midbody (exactly in midbody in 1 specimen) pharynx suckerlike, subspherical, large, 0.078 to 0.119 in diameter; esophagus extending dorsally and anteriorly; intestine saclike, extending posteriorly (in all of 10 specimens the intestine reached posterior to the ovary and in 9 of 10 specimens it reached to or almost to the cirrus sac). Gonads contiguous, either tandem or crowded together almost at the same level. Ovary to the right, pretesticular, immediately posterior to pharynx. Vitelline follicles in two separated clusters extending from level of pharynx only a short distance anterior to midbody; usually 12 to 15 follicles on each side. Uterus not extending anterior to vitellaria, filling most of posterior half of body, extending posterior to genital pore; eggs 27 to 31 by 10 to 17 microns.

Testes tandem or oblique, close together. Cirrus sac 0.352 to 0.435 long by 0.087 to 0.112 wide, overlapping posterior testis, extending to the anterior testis; seminal vesicle subspherical; genital atrium rather long, genital lobes weak; genital pore near posterior end of body. Excretory pore terminal; excretory vesicle extending forward to middle of vitelline field, not anterior to vitellaria.

The name *barracudae* is for the host.

One specimen was infected by some very minute microorganism filling the parenchyma in the pharynx region.

Comparisons. This species differs from most members of the genus in its 5-lobed cephalic disc without papillae. It has a body form similar to that of *R. baculum*, but differs in larger size and much larger eggs. It differs from *R. pentagonum* in more posterior extent of intestine, less anterior extent of vitellaria, more anterior extent of excretory vesicle and uterus, and larger eggs. It differs from *R. nagaty* in shape of body, more posterior vitellaria, broader ventral indentation of disc, in lacking markedly longitudinal coils, and in larger eggs.



Rhipidocotyle n. comb.

Rhipidocotyle

GASTEROSTOMUM CAPITATUM, ~~n. sp.~~ (LINTON, 1940) Manton, 1947

PLATE 18, FIGURES 236-239

Fusiform, tapering rather more toward anterior than posterior end; densely covered with minute, blunt spines; anterior sucker ventral, preceded by a capitate hoodlike structure, which when fully expanded is much broader than the diameter of the neck at the level of the anterior sucker. Vitellaria 16 or more on each side, separated from the anterior sucker by a space equal to one-fifth or more of the length and extending little, if any, back of the level of the ventral sucker. Ventral sucker a little in front of the middle of the body; intestinal caecum, in uncompressed specimens, posterior to ventral sucker; ovary on right side of intestine; testes on right side, close together, one following the other, the first testis near the ovary. The cirrus pouch extends forward to the level of the second testis. The uterus may fill the greater part of the body back of the vitellaria, but was not observed to extend in front of the vitellaria.

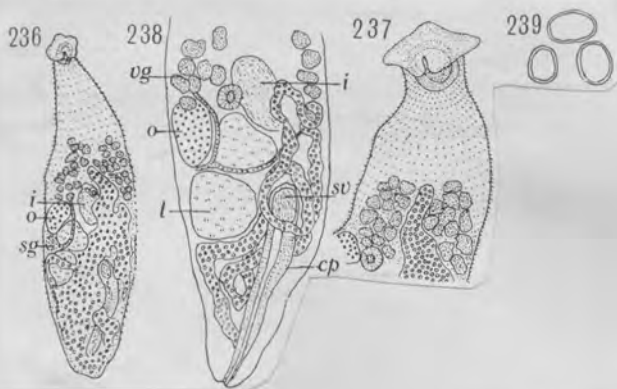
Type specimens.—U.S.N.M. No. 8172 (holotype and paratypes).

TABLE 6.—Measurements of five specimens of *Gasterostomum capitatum* in balsam

Measurement	1	2	3	4	5
Length.....	Mm. 1.82	Mm. 1.96	Mm. 1.82	Mm. 1.68	Mm. 1.05
Breadth, of capitate head.....	.17	.20	.22	.22	.21
Breadth, level of anterior sucker.....	.14	.17	.17	.14	.15
Breadth, near middle, maximum.....	.57	.50	.63	.43	.42
Anterior sucker, length.....	.10	.11	.11	.11	.12
Anterior sucker, breadth.....	.10	.11	.11	.11	.12
Diameter ventral sucker.....	.06	.07	.07	.07	.07
Anterior end to vitellaria.....	.55	.59	.42	.38	.35
Anterior end to ventral sucker.....	.76	.90	.73	.62	.52

Host.—Frigate mackerel (*Auxis rochei*).

Record of collection.—Seventeen (U.S.N.M. No. 8172), collected July 12, 1912. Dimensions, life, compressed: Length, 2.21 mm.; breadth, of capitate anterior end, 0.24 mm., maximum of body, 0.66 mm.; diameter of anterior sucker, 0.21 mm., of ventral sucker, 0.1 mm.; ova, 0.015 by 0.01 mm., shells not thick.



much like *R. pentagonum*
but has smaller eggs.
much like *R. adhaerens* but
has deeper cleft in cephalic dia
eggs smaller than *R. barraundae*.

most like *R. nagaty*?
smaller eggs
much smaller pharynx

From Linton, 1940

7. *Rhipidocotyle capitata* (Linton, 1940)

Manter, 1947

(Figs. 7 and 316)

HABITAT: Small intestine of *Auxis thazard* (local name "keokeo"); Hawaii.

DESCRIPTION (based on three whole mounts): Body

fusiform, spinose, 1.3-1.5 X 0.3-0.45 mm. Rhynchus bowl-shaped, pentagonal in apical view, 0.11-0.12 X 0.13-0.18 mm, with oval pit ventrally. Pharynx 70 μ in diameter, at anterior part of middle third of body. Intestine saccular, 0.2-0.25 X 0.11-0.14 mm, extending back of pharynx.

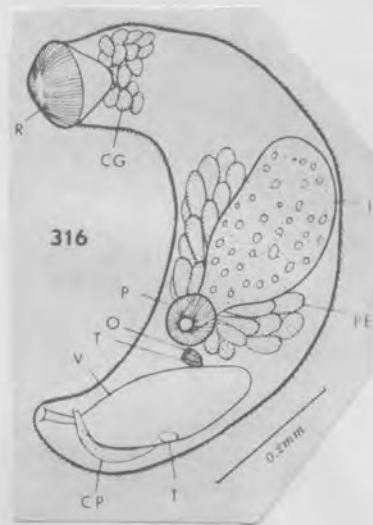
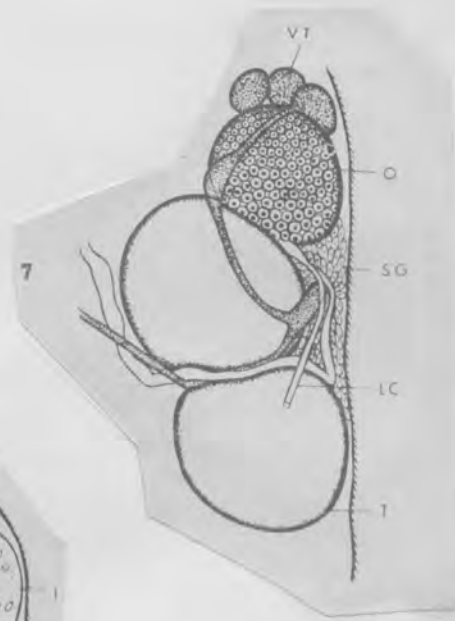
Testes ovoid, 0.14-0.16 X 0.1-0.13 mm, obliquely tandem on right side, postequatorial. Cirrus pouch sub-cylindrical, 0.33-0.4 X 0.09-0.11 mm, reaching to level of anterior or posterior testis. Seminal vesicle oval, 0.1-0.15 X 0.06-0.08 mm, prostatic complex well developed; genital lobe bilobate, occupying whole genital atrium; latter 70-150 μ wide, opening ventrally about 50 μ from extreme posterior end of body.

Ovary subglobular, 0.14-0.16 X 0.1-0.13 mm, equatorial or pre-equatorial, immediately anterodextral to anterior testis. Laurer's canal opening dextrodorsally at level of anterior testis. Vitelline follicles 28-32 in total number, divided into two lateral groups of 12-18 follicles each, in pre-ovarian zone, leaving a wide free space in front; right vitelline duct descending dorsal to ovary and united with left duct dorsal to right portion of anterior testis; a small vitelline reservoir present on right surface of anterior testis. Uterus occupying most of posterior half of body, not extending further forward than pharynx. Eggs oval, 15-19 X 9-12 μ . Excretory vesicle tubular, almost reaching pharynx; pore terminal.

DISCUSSION: Our specimens are smaller than Linton's from *Auxis rochei*, but they agree well with Linton's description and figures.

A fusiform larva (Fig. 316), apparently of the present species, was found along with the three adult worms mentioned above. The larva was 0.9 mm long by 0.21 mm wide under cover glass pressure, and covered with very fine spines; rhynchus 110 X 115 μ , dome-shaped apically, blunt-conical posteriorly, without ventral pit as seen in the adult, with a mass of a number of large and small gland cells (cervical gland?) behind.

Pharynx with weak radial muscle fibers, 70 μ in diameter, situated at anterior end of caudal third of body; esophagus not differentiated; intestine elongate saccular, 0.25 X 0.13 mm, lined with a layer of vacuolar epithelia, directed forward from pharynx. Between the intestine and the body margin extends longitudinally a compact mass of elongate pyriform, finely granular cells, whose pointed ends are directed toward the esophagus. It seems very likely that this mass of cells represents the periesophageal gland. Testes rounded, 58 μ in diameter, obliquely tandem, to left of pharynx; anlage of cirrus pouch curved along left margin of excretory vesicle, 93 X 42 μ , represented by an elongate mass of cells enclosed in a capsule; genital pore 44 μ from posterior extremity.



Ovary oval, overlapping anterior testis, 58 X 42 μ . Excretory vesicle elliptical, 0.25 X 0.09 mm, occupying greater part of caudal third of body, with terminal pore.

Although this larval form differs from the adult of *Rhipidocotyle capitata* with which it was found associated, especially in the structure of the rhynchus and the relative position of the digestive and reproductive organs, there is no doubt about its specific identity.

Rhipidocotyle clavivesiculum sp. nov. Chang-tung and Ji-wei, 1978

Specific Diagnosis: Body small, $1.321-1.453 \times 0.347-0.462$ mm elongated, truncate anteriorly. Rhynchus suckershaped, $0.099-0.182 \times 0.165-0.228$ mm. Cap $0.066-0.082 \times 0.198-0.264$ mm, with a lateral horn on each side. Pharynx spherical, 0.066 mm in diameter. Intestinal sac small, $0.083-0.132 \times 0.066-0.083$ mm.

Testes elliptical, obliquely arranged. Anterior testis $0.099-0.132 \times 0.099-0.132$ mm. Posterior testis $0.099-0.149 \times 0.083-0.165$ mm. Cirrus sac far apart from the posterior testis, cylindrical, $0.347-0.413 \times 0.132-0.149$ mm. Internal seminal vesicle is long, bar-shaped, this being a peculiar character of this species. Ovary ovoid, $0.083-0.099 \times 0.066-0.099$ mm. Mehlis' gland well-developed. Vitelline follicles arranged in 2 groups, 10-17 in the left and 11-19 in the right respectively. Uterine loops extensively filling up most part of body. Ova oval in shaped, $0.029-0.037 \times 0.018-0.022$ mm with thickened shells.

This species is distinguished from all the other described species in the genus *Rhipidocotyle* in having a club-shaped internal seminal vesicle. For this reason, the specific name *R. clavivesiculum* is suggested.

Host: *Plectropomus leopardus* (Lacépède).

Location: Small intestine.

Distribution: Haikow, Hainan Island, South China Sea, China.

Date: May 17, 1958.

Incidence and intensity of infection: 20% infected with 5 specimens.

Type and paratype specimens: Deposited in the Institute of Oceanology, Academia Sinica, Tsingtao, China.

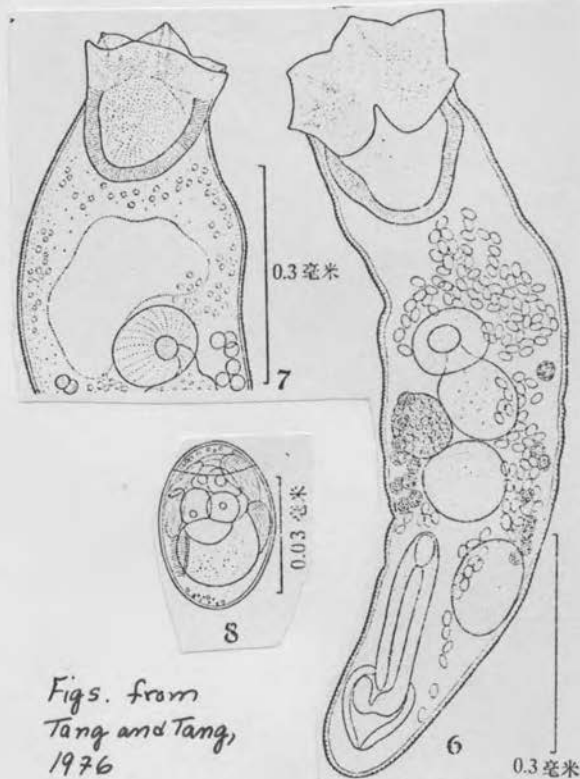


Bucephalidae

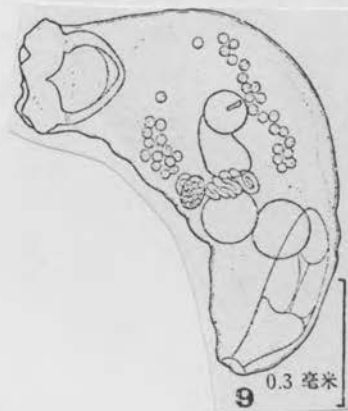
Rhipodoctyle coronatum

Tang Changti and Tang Zhangzhong,
1963

Listed in Chinese text of Tang and Tang
(1976) as "sp. nov." Listed in English
summary as Tang and Tang, 1963



Figs. from
Tang and Tang,
1976



Rhipidocotyle croceae sp. nov. Chang-tung and Ji-wei, 1975

Specific Diagnosis: Body long fusiform, 1.601—2.129 × 0.550—0.594 mm. Cuticle spined. Rhynchus sucker-shaped, 0.148—0.181 × 0.165—0.247 mm, with an ovoid cap, 0.132—0.148 × 0.181—0.280 mm. Pharynx 0.083—0.099 × 0.066—0.099 mm. Oesophagus short, 0.033 mm long. Intestinal sac located in the level of ovary, 0.211—0.247 × 0.115—0.195 mm.

Testes elliptical, tandem mostly, otherwise parallelly or obliquely arranged toward the left side of the body. Anterior testis 0.211—0.247 × 0.181—0.198 mm, while posterior testis 0.228—0.264 × 0.165—0.211 mm. Cirrus sac 0.379—0.627 × 0.115—0.132 mm toward the right side of body, anterior end extending to the level of anterior testis. Ovary elongated oval, 0.165—0.181 × 0.115—0.165 mm, located in front of anterior testis. Oviduct long. Vitellaria follicular, 26—30 in number, arranged as a transverse band in front of ovary. Uterine loops filling up the space between rhynchus and intestinal sac, forming longitudinal loops. Ova ovoid, thin shelled, 0.018—0.021 × 0.014 mm.

Rhipidocotyle croceae sp. nov. resembles *R. transversale* Chandler, 1935, *R. lepisostei* Hopkins, 1954 and *R. lintoni* Hopkins, 1954 both in the proportion of the body length with the body width and in having the vitelline groups united. But it differs from *R. transversale* in the large size of the body and the anterior border of the uterine loops extending anteriorly to the vitellaria. It differs from *R. lepisostei* Hopkins in the arrangement of the vitellaria in a transverse band and the size of the cirrus sac being almost two times as large as that of the *R. lepisostei*, which is a parasite of freshwater fishes. It differs from *R. lintoni* in the greater body size, the smaller size of ova, and in having the uterine loops extending anteriorly to vitellaria.

Host: *Pseudosciaena crocea* (Richardson).

Location: Intestine.

Distribution: Tungsoa, Chusan Archipelago, East China Sea, China.

Date: April 27, 1960.

Incidence and intensity of infection: Almost 100% infected each with 8—14 specimens.

Type and paratype specimens: Deposited in the Institute of Oceanology, Academia Sinica, Tsingtao, China.



Rhipidocotyle eckmanni Nagaty, 1937

Body elongate, flattened anteriorly, cylindrical posteriorly -- one specimen not quite mature.

Size: 1.254 X 0.144 mm.

Anterior sucker: In the form of a longitudinal depression surrounded dorsally and laterally by an elevated horse-shoe-shaped structure devoid of papillae and interrupted ventrally.

Mouth: About 1/4 from posterior end.

Intestine: Sac-like, between vitelline follicles.

Testes: Oblique, central, in posterior half of body.

Cirrus Sac: 0.236 mm long, extending to anterior testis, about 1/5 body length. Seminal vesicle ovoid.

Ovary: Dorsal to intestine, to the right, anterior to posterior testis. The three gonads form a triangle.

Vitellaria: Two sets, in 3rd. quarter, meeting anteriorly to form an arc.

Uterus and eggs not developed.

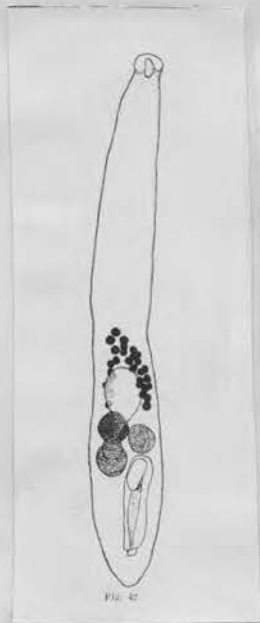
Host: Trachynotus bailloni

Locality: Red Sea

Reference: Nagaty, 1937
Egypt. Univ., Faculty Med., Pub. No.12

Similar to R. baculum except:

1. larger
2. arrangement of gonads
3. extent of vitellaria
4. pharynx more posterior.



Rhipidocotyle eggletoni n. sp.

(Figs. 17-18)

Velasquez, 1959

Hosts: *Sillago sihama* (Forskäl); *Gazza minuta* (Bloch)

Location: muscles

Locality: Manila Bay, Luzon island, Philippines

Prevalence: 6 immature from 3 of 5 hosts examined.

Type: U.S. Nat. Mus. Helm. Coll. No. 37692

Paratypes: University of the Philippines, Dept. of Zoology, Helm. Coll. No. 494(2)g

Specific diagnosis: (Based on 4 immature specimens). Body elongate, truncate, 0.98-1.98 by 0.14-0.2. Cuticle with fine spines. Rhynchus 0.077-0.09 by 0.072-0.091 with hood, dome-shaped in 1 specimen, notched medially at more anterior convex side; front view, more posterior border with short, conical, rather small papillae, 1 short median and 2 lateral. Hood when wrinkled not showing papillae (Fig. 18). Mouth in midbody; pharynx weak, 0.032-0.041 by 0.023-0.045 (2 specimens); esophagus relatively long, almost as long as intestine. Gonads at junction of median and last thirds of body, dextral in 1 specimen, median in type. Testes tandem; cirrus sac, 0.16-0.25 by 0.028-0.045 at posterior 1/4th of body; seminal vesicle ovoid; pars prostatica narrow; genital pore subterminal. Ovary overlapping intestine (1 specimen), anterior to anterior testis; uterus without mature eggs, limb ascending level of pharynx and then descending to genital atrium. Vitellaria (1 specimen) in lateral fields at level of testes. Excretory pore terminal. Excretory vesicle in posterior 4/5th of body.

This species is named after my former Professor, Dr. Frank E. Eggleton, Dept. of Zoology, University of Michigan, Ann Arbor, Michigan.

Discussion: This species resembles *Rhipidocotyle kahlili* Nagaty, 1937 and *R. adbaculum* Manter, 1940 in general anatomy but differs from *R. kahlili* in the character of the hood; extent of the excretory vesicle and relative size and extent of uterus. It differs from *R. adbaculum* in the nature of the hood; more elongate body; and more posterior position of the genital organs. Because of immaturity,

VELASQUEZ—THE FAMILY BUCEPHALIDAE

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the extent of the uterus and the size of the eggs cannot be used for specific determination. *Chanos chanos*, the host of *R. kahlili*, abounds in Philippine waters. My specimens though immature present certain useful characters of specific significance. Until the life cycle is known, I am considering the present species as new.



Rhipidocotyle elongatum McFarlane, 1936

Body elongate, 0.86 to 1.5 by 0.11 to 0.25.
Pharynx anterior to middle of body, 0.32 to 0.046 in diameter.
Intestine sac-like. Excretory pore terminal.
vitellaria small separate follicles from region of ovary
to anterior limit of uterus.
Ovary pretesticular. Uterus voluminous. Eggs 29 to 32 by
15 to 19 μ .
Testes oblique or tandem, ovoid. Seminal vesicle within
cirrus sac.
Host: Ophiodon elongatus Girard. ling cod.

Compared with R. baculum but differs in that uterus
extends anterior to pharynx, vitellaria greater in
extent, eggs larger, anterior part of body not depressed.

Ref.: Jour. Biol. Bd. Can., 2(4):335-347. 1936



Rhipidocotyle ghanensis n. sp.
(Fig. 6)

HOST: *Psettodes belcheri* Bennett (Psettodidae).

HABITAT: Small intestine.

LOCALITY: Tema, Ghana.

SPECIMENS: USNM Helm. Coll. No. 63338 (holotype and two paratypes on same slide).

DIAGNOSIS (based on five specimens; four measured): Body 1,770–2,510 by 290–450 at postvitellarian or testicular level, dorsoventrally flattened anterior to midlength of vitellaria, much rounded posteriorly, anterior extremity truncate, posterior round. Tegument entirely spined, anterior spines more scalelike. Anterior sucker 190–205 by 143–175, subterminal ventral, opening round to elongate oval, with seven-lobed polygonal hood measuring 82–107 by 220–242, lobes may show muscular papilla when extended. Mouth 1,060–1,670 from anterior extremity, well posterior to midlength of body, posterior to pharynx; latter 61–76 by

58–77, round to longitudinally elongate, level of anterior testis; esophagus long, 97–1 by 42–58, muscular, passing anteriorly from pharynx to ovarian level; intestine 196–272, 126–150, oval, conspicuously cell-lined, dorsomedian, extending very slightly anterodorsal before looping posteriorly, terminating anterior to or at pharyngeal level, may overlap medial parts of ovary and anterior testis.

Gonads smooth, tandem, usually overlapping adjacent one, dextral, posterior to midbody length. Anterior testis 220–278 by 157–193; posterior testis 222–240 by 150–193; posttesticular space 405–585 long. Cirrus sac 518–720 by 78–95, thick-walled, muscular, C-shaped to straight, extending from level of posterior testis to 100–240 from posterior extremity. Seminal vesicle 114–170 by 60–70, elongate oval. Pars prostatica 276–392 by 45–53, cell-lined, surrounded by dense mass of prostate cells. Genital lobes muscular, unequal, projecting into genital atrium. Lathe 114–140 by 100–125; narrow, very thick-walled, muscular duct leading to subterminal ventral genital pore.

Ovary 138–182 by 116–129, pretesticular lying 715–1,380 from anterior extremity. Oviduct muscular, from posterior or dextralateral margin of ovary, extending posteriorly dorsad to anterior testis. Vitelline follicles in narrow lateral fields, extending from 505–840 from anterior extremity to ovarian level; follicles numbering (right-left) 8–14, 13–16, 13–17, 15–18 in four specimens, respectively; vitelline duct from each field extending long distance posteriorly, dorsal to ovary and anterior testis, uniting to form short common duct at overlap of anterior and posterior testes. Uterus extensive, extending from 495–640 from anterior extremity (previtellarian) to level of posterior margin of genital atrium or more posteriorly. Eggs numerous, yellow-brown, thick-shelled, operculate, 20 older ones measuring 23–27 by 16–18; younger eggs nearest ovary thin-shelled, larger and rounder.

Excretory bladder very long, narrow posteriorly, considerably expanded anteriorly and filling most of body width, extending almost to anterior sucker to slightly overlapping latter dorsally; pore terminal.

DISCUSSION: Our species appears closest to *Rhipidocotyle longleyi* Manter, 1934, from serranid and lutjanid fishes from Florida and

Japan, and to *R. laruei* Velasquez, 1959, from a psettodid fish from Luzon Island, Philippines. Both these species differ from ours in having the mouth near midbody length, lacking an esophagus or having only a very short one, and the excretory bladder extending anteriorly only to the level of the digestive tract. *R. longleyi* differs further in the intestine extending both anterior and posterior to the mouth, and in possessing a papilla on the posterior margin of the genital pore. *R. laruei* differs further in the intestine extending anteriorly from the pharynx, having the gonads at midbody length, the cirrus sac comprising almost one-half of the body length, the seminal vesicle being coiled, and the uterus extending anteriorly only to the level of the anterior vitelline follicles.



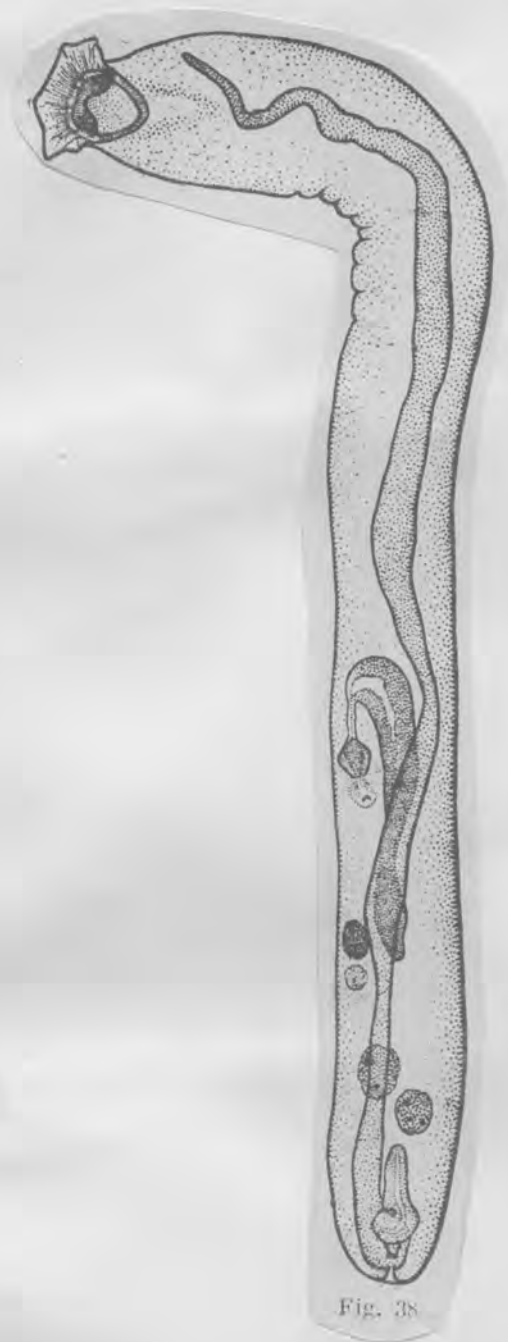
RHIPIDOCOTYLE HEPTATHELATA N. SP., Stunkard, 1974

syn. RHIPIDOCOTYLE SEPTAPAPILLATA Krull, 1934 of Nagaty, 1937

When working during the winter of 1935 on members of the family Bucephalidae collected from fishes from the Red Sea, the author came across this form and described it as a new species belonging to the genus *Rhipidocotyle*. Later on during the summer of the same year the author noted a review in the *Journal of Helminthology* of a paper by W.H. Krull about a *Rhipidocotyle septapapillata* n.sp.; suspecting that the two species may be identical I asked the author of this paper if he can forward me with a reprint, as the *Transactions* in which the paper is published is not available in this country. This he very kindly did and on comparing my species with Krull's description, the author was satisfied that they are identical; only they represent two different developmental stages.

One trematode was collected from *Thynnus thunnina* locally called "Mokeba". This trematode was not mature but on examination before staining, it was shown that a few convolutions of the uterus were already developed and mostly occupied the hinder part of the body of the trematode, a few loops, however, were observed in the anterior half of the body. They did not contain any ova. The vitelline glands likewise were not yet fully developed, but again on examination before staining the anlage of the follicles were observed to be arranged in two rows of about two follicles deep in the anterior half of the body. The right and the left set of vitelline follicles do not meet anteriorly.

The body of the trematode is elongated with the sides parallel throughout the whole length of the body. It becomes slightly narrowed at the anterior end just posterior to the cephalic hood forming a neck-like constriction. The posterior end is rounded. It is a fairly large trematode, measuring 3.168 mm. in length and 0.363 mm. in maximum breadth in the pressed and mounted condition. This is a much larger specimen than Krull's which gives the measurement of 0.938 long by 0.195 mm. wide to his specimens. The cuticle is covered by minute spines which after the process of staining and mounting most of them were lost. The anterior end of the body is furnished with an ovoid sucker and a fan-shaped hood. The anterior sucker is shallow and measure 0.18 mm. antero-posteriorly and 0.165 mm. from side to side and is situated ventrally. The hood is a fairly thin membranous structure and has seven processes. One of these is median dorsal, two latero-dorsal, two latero-ventral and two ventral. In this respect the hood of this species differs from that of *Rhipidocotyle pentagonum* (Ozaki, 1924). In the latter mentioned species there are five processes in the hood. The ventral part of the hood partly overlaps the anterior sucker in the mounted specimen.



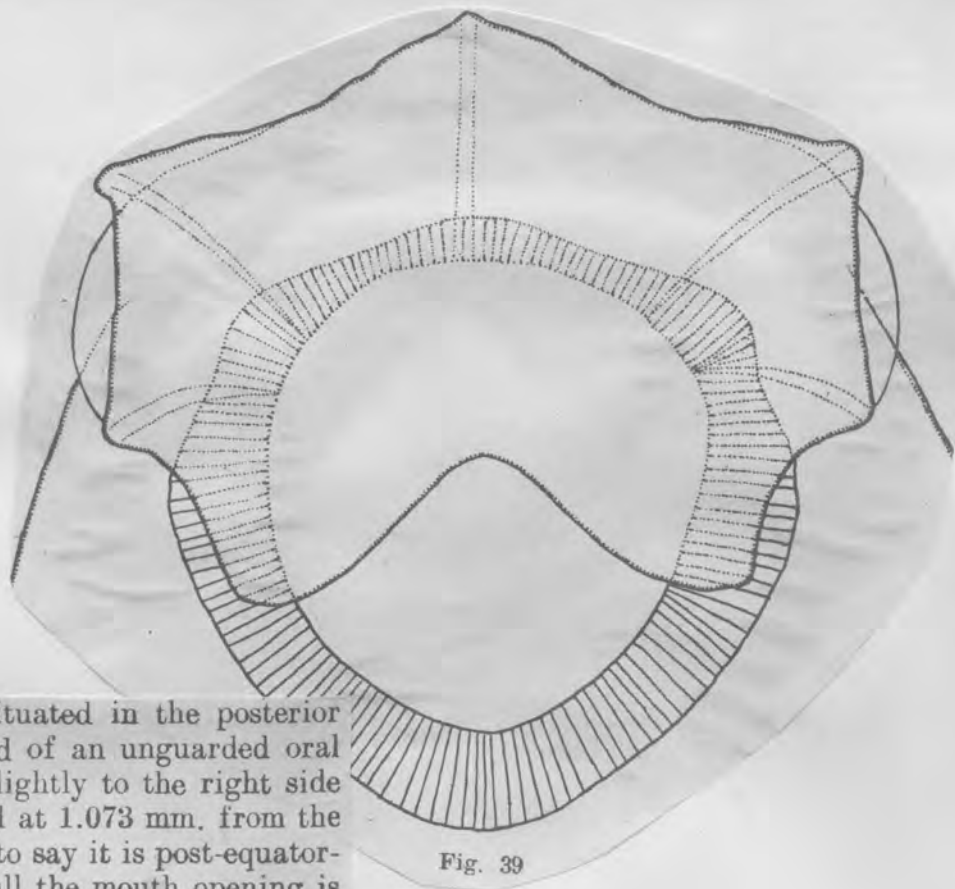


Fig. 39

The digestive system : is situated in the posterior half of the body and is composed of an unguarded oral opening on the ventral surface slightly to the right side of the median line and is situated at 1.073 mm. from the posterior end of the body, that is to say it is post-equatorial in position. According to Krull the mouth opening is approximately equatorial. This opening leads into a well defined vestibule or pre-pharynx of about the same length as the well developed spindle-shaped muscular pharynx that follows. This latter organ measures 0.122 mm. antero-posteriorly and 0.133 mm. from side to side. According to Krull the muscular pharynx measures 0.052 mm. in diameter. This leads anteriorly into the oesophagus which is directed forward and measure 0.116 mm. in length. It joins the widened intestinal caecum which is directed posteriorly towards its blind end forming a U-shaped bend with the oesophagus. The intestinal caecum measures 0.875 mm. in length and is about one quarter the diameter of the body of the trematode in breadth. The blind end of the intestinal caecum is at 0.743 mm. from the posterior end.

The male genitalia : is composed of two tandem testes in the posterior fifth of the body length. They slightly overlapp and appear as oblique when observed from a ventral or a dorsal view, the anterior one is more ventrally situated than the posterior one. They are spherical in shape and smooth contoured. They measure 0.103 mm. in diameter. In the accompanying figure the body of the trematode is slightly twisted laterally. From the left side of each of the testes comes out a delicate vas efferens, that of the anterior testis crosses the posterior testis on its ventral surface and uniting with its fellow immediately before they enter the cirrus sac at its anterior end. The cirrus sac is a comparatively small pear-shaped organ posterior to the testes and slightly towards the left side of the median plane of the body. Its anterior part is narrow and its posterior part is fist-shaped and broader than the anterior part. It measures 0.266 mm. in length. Its outer opening is funnel-shaped and is on the ventral surface a short distance from the posterior edge and in the median plane.

continued --

Rhipidocotyle heptathelata n. sp., Stunkard, 1974

syn. Rhipidocotyle septapapillata Krull, 1934 of Nagaty, 1937

The female genitalia : is composed of an ovoid, smooth contoured ovary, a good distance anterior to the anterior testis and in the median plane. It is at the same level and to the right of the blind end of the intestinal caecum. It measures 0.057 mm. in diameter antero-posteriorly and 0.038 mm. from side to side. There is another compact spherical structure that lies posterior to the ovary and this is probably the premordium of the receptaculum seminis. It is slightly smaller than the ovary and has a diameter of 0.038 mm. The measurements of different genital organs is smaller than those recorded by Krull on account that his specimens were mature.

The excretory system : is composed of a long tubular excretory vesicle of about one quarter the diameter of the body and runs through its whole length in the median plane. Its blind anterior end is slightly narrower than the rest of the vesicle and stops at the level of the posterior border of the ventral sucker. It opens terminally at the posterior end in the middle of the rounded posterior edge of the body through a small funnel-shaped canal.

Nagaty, 1937

An immature bucephalid trematode from *Thynnus thunnina*, taken in the Red Sea, was described by Nagaty (1937) as *Rhipidocotyle septapapillata* Krull, 1934. The report was a misidentification and an unjustified emendation, since Krull (1934) spelled the specific name *septapapillata*, which is conserved by the Code of Nomenclature. The specimen was described and figured by Nagaty. It was immature, but the specific features are recognizable.

The body was 3.168 mm long, 0.363 mm in maximum width, with almost parallel sides. The anterior sucker measured 0.18 mm long and 0.165 mm wide. The hood was thin, fan-shaped, with seven processes: a median dorsal, two dorsolateral, two ventrolateral, and two ventral papillae. The excretory vesicle extended the length of the body, but collecting ducts and flame-cells were not mentioned. The pharynx and intestine were situated in the posterior half of the body. The pharynx measured 0.122 by 0.133 mm; the cecum was 0.875 mm long, and its posterior end was 0.743 mm from the caudal end of the body. The worm was juvenile; the gonads not yet functional. The testes were small, oblique, partially overlapping, situated in the posterior one-fifth of the body; the ovary was some distance anterior to the testes. The cirrus-sac was pyriform, 0.266 mm long, located posterior to the testes.

Krull (1934) fed bucephalid metacercariae, encysted in *Fundulus diaphanus* from the Potomac River, to *Lepomis gibbosus* and recovered adult worms which he described as *Rhipidocotyle septapapillata* n. sp. Sexually mature and gravid specimens were less than 1.00 mm in length and less than 0.20 mm in greatest width. The anterior sucker was 0.160 mm in diameter, and the pharynx was 0.052 mm in diameter.

Kniskern (1952a) reported the complete life history of *R. septapapillata* Krull, 1934. He found that *Cercaria basi* Woodhead, 1936, from *Lampsilis siliquoidea* taken from the Huron River near Ann Arbor, Michigan, encysted in *Lepomis gibbosus*, *Semotilus atromaculatus*, *Micropterus salmoides*, and the common guppy, *Lebistes* sp. The metacercariae were fed to *Lepomis gibbosus* and developing stages to gravid adults were recovered from the pyloric ceca. The worms were compared with *R. septapapillata* and proved to be identical. Kniskern found the excretory collecting ducts open into the sides of the vesicle

and the flame-cell formula was $2[(3+3+3)+(3+3+3)]$, the same as that reported by Woodhead (1936) for the cercaria. Kniskern (1952b) presented a systematic review of the family Bucephalidae. He recalled the report by Nagaty (1937) and the assignment of the specimen from *T. thunnina* to *R. septypapillata* Krull, 1934. He noted differences in size and in morphology between the specimen from *T. thunnina* and *R. septypapillata* and stated that the worm should properly be included in a new species.

The specimen described by Nagaty (1937) is immature, the reproductive organs are juvenile, and the only comparable measurements are of total size and size of the anterior sucker and pharynx. Although immature, the worm is three times as large as *R. septypapillata*, and the diameters of the sucker and pharynx are about twice as large as those of *R. septypapillata*. These differences in size, and differences in location of the digestive and reproductive organs, exclude the specimen from *R. septypapillata* Krull, 1934. Therefore, it is recognized as type of a new species, for which the name *Rhipidocotyle heptathelata* n. sp. is proposed.

From Stunkard, 1974

**HIPIDOCOTYLE KARTHAI* ~~n. sp.~~ Hafeezullah and Siddiqi, 1970
Figure 5

Host: *Psettodes erumei* (Schneider); Indian halibut; Psettodidae

*Named after Mr. K. N. R. Kartha of Central Marine Fisheries Research Institute, Mandapam, South India.

Site: Intestine

Number: 8

Locality: Visakhapatnam

Description (based on 3 with measurements on 2 specimens; other 5 specimens are not in good condition.): Body 2.082-2.2 mm. long, 0.447-0.47 mm. wide; elongate, tapering towards both ends. Cuticle spinose. Rhynchus with cap-like hood, 190-193 by 193-202, sub-terminal, hood heptagonal with one median, two pairs of anterolateral and one pair of posterolateral papillae. Mouth in posterior part of middle third of body; pharynx 81-87 in diameter; intestine first extending anteriorly, then curving back and directed posteriorly.

Testes 152-249 by 87-209, entire, tandem, dextral, at junction of middle and posterior thirds of body. Cirrus sac in posterior part of body, extending anteriorly to anterior level of posterior testis. Seminal vesicle saccular; pars prostatica a straight tube surrounded by prostatic gland cells, opening into genital atrium. Genital pore near posterior end of body.

Ovary 167-181 by 99-119, oval or subglobular, immediately pretesticular, dextral. Vitelline follicles in two lateral rows, from level of anterior testis to anterior junction of middle and anterior thirds of body. Uterus voluminous, extending a little anterior to anterior level of vitellaria. Eggs 15-21 × 15-18. Extent of excretory vesicle obscured, definitely not extending in the anterior half of body.

In the shape and structure of the hood and the number of papillae, *R. karthai* is similar to *R. septapillata* Krull, 1934 but differs in having a body with attenuated anterior and posterior ends, shorter excretory vesicle and in the size and shape of eggs. It also resembles *R. laruei* Velasquez, 1959 from the same host in body shape and probably in the structure and number of papillae of the hood, but differs from it in the shape of the body spines (in *R. laruei* the spines are scale-like), postequatorial position of the gonads and saccular seminal vesicle.



8. *Rhipidocotyle kawakawa* n. sp. Yam. 1970

(Figs. 8 and 318)

HABITAT: Intestine of *Euthynnus yaito* (local name "kawakawa"); Hawaii.

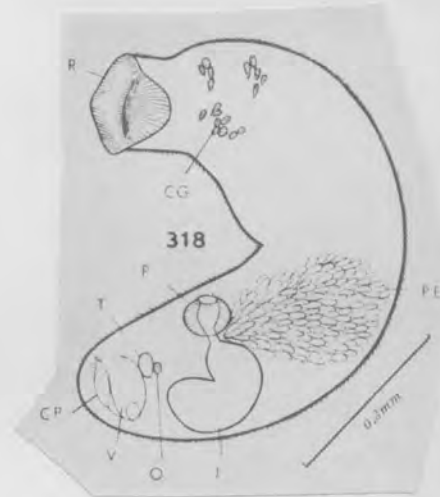
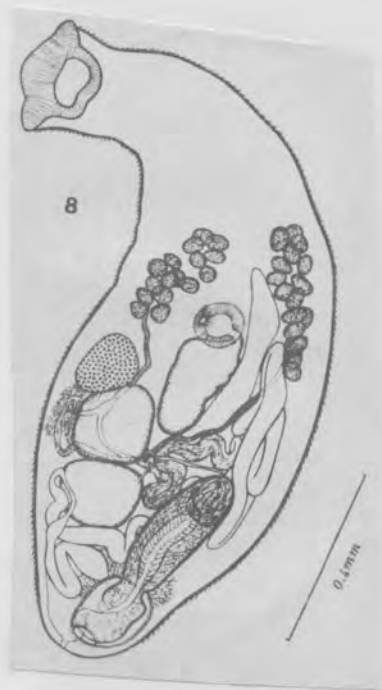
HOLOTYPE: U. S. Nat. Mus. Helm. Coll., No. 63536.

DESCRIPTION (based on 19 whole mounts): Body elongate pyriform, markedly attenuated anteriorly, spinulate all over, 1.75-2.6 mm in length, with maximum width of 0.5-0.8 mm near posterior extremity. Rhynchus pentagonal, 0.1-0.2 × 0.11-0.2 mm. Pharynx oval, 70-130 × 60-150 μ, at anterior part of middle third of body; intestine saccular, 0.08-0.2 mm wide, with its posterior end in direct contact with anterior testis.

Testes ovoid, 0.14-0.2 × 0.1-0.2 mm, obliquely tandem largely in middle or posterior third of body; anterior testis sinistral or sinistroposterior to ovary. Cirrus pouch subcylindrical, provided with longitudinal muscles, 0.4-0.66 × 0.1-0.13 mm, may or may not reach level of posterior testis; seminal vesicle oval, 50-80 μ wide; prostatic complex well developed; genital lobe large, turned back on itself; genital atrium funnel-shaped, with ventroterminal pore.

Ovary elliptical, 0.1-0.22 × 0.06-0.14 mm, intercalated between right margin of body and anterior testis. Laurer's canal opening dorsal to posterior testis or dorsolateral to anterior testis. Vitelline follicles 29-33 in all, divided into two divergent groups of 13-18 each, in pre-ovarian zone, leaving long neck region free; two descending vitelline ducts joining together dorsal to anterior testis. Uterine coils occupying most of body posterior to vitellaria; anteriormost loops may extend forward to the left side beyond the pharynx. Eggs oval, 13-16 × 9-12 μ. Excretory vesicle tubular, reaching to pharynx or a little more anteriorly.

DISCUSSION: This species differs from the most closely related *Rhipidocotyle nagaty* Manter, 1940 from Atlantic *Euthynnus yaito* in the neck being longer and in the eggs being smaller (13-16 × 9-12 μ vs. 17-27 × 10-18 μ).



Rhipidocotyle khalili Nagaty, 1937

Body elongate, anterior half flattened, posterior half cylindrical.

Size: 2.558-3.3 X 0.314-0.363 mm

Anterior Sucker: Rounded posteriorly and truncate anteriorly, diameter 0.122 mm.

Hood: crown-shaped, continuous, muscular, with three small distinct papillae, one median and dorsal, 2 lateral.

Mouth: Near middle of body.

Pharynx: Spherical, 0.057-0.076 mm in diameter.

Intestine: Extends forward, then backward to ovary.

Testes: Smooth, oblique, in contact, just anterior to posterior fourth of body.

Cirrus Sac: Long, in posterior third of body, to the left. 0.594-0.825 mm in length or about 1/5 body length.

Ovary: Oblong or spherical, anterior to testes.

Seminal Receptacle: Present, posterior to ovary.

Vitellaria: Two separated rows, parallel to the sides of the body, occupying the third quarter, 14 follicles on the right; 21 on the left.

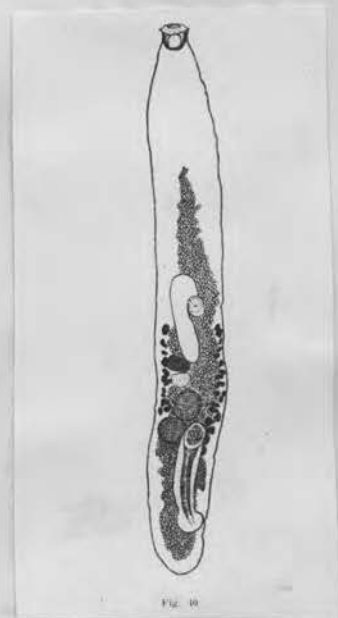
Uterus: Anteriorly to about 1/4 from the anterior end.

Eggs: 19-23 X 13-15 μ

Host: Chanos chanos

Locality: Red Sea

Reference: Nagaty, 1937
Egypt. Univ., Fac. Med., Pub. no 12.



Habitat. Small intestine and pyloric appendages of *Sphyaena* sp.

Material and locality. 5 gravid specimens fixed, stained and mounted as usual; Macassar.

Body slender, tapering anteriorly, 2.0-4.8 mm long, 0.23-0.3 mm broad; cuticle beset all over with very small spines. Rhynchus muscular, 105-150 μ long by 100-150 μ broad; truncated in front and rounded behind, with a pair of lappets like a lying-down collar and a central depression on the ventral side, and three small conical projections on the anterior margin: one of the projections lying middorsally and the others one each on the lateral edge. Pharynx 48-90 \times 51-84 μ , at or near middle of body. Intestine turning backward just in front of pharynx, terminating at level of ovary.

Testes subglobular, contiguous, obliquely tandem, 0.12-0.2 \times 0.12-0.18 mm, situated at junction of middle with posterior third of body or a little further behind. Cirrus pouch subcylindrical, provided with well developed longitudinal muscle, 0.45-0.7 \times 0.066-0.12 mm, containing oval vesicula seminalis 60-140 μ long, well developed pars prostatica surrounded by prostate cells, and a lobed cirrus projecting into genital atrium, reaching as far forward as posterior testis. Genital atrium, 90-140 μ in diameter at its dilated base, opening ventrally near rounded posterior extremity.

Ovary subglobular, 95-180 \times 78-150 μ , situated between pharynx and anterior testis, usually a little nearer to the latter than to the former.

The initial portion of the uterus, containing abundant sperm, is convoluted between the ovary and the anterior testis. This is what Nagaty mistook for the receptaculum seminis. Ascending uterus usually reaching to middle of anterior third of body but may extend only a short distance beyond the pharynx in young individuals; descending uterus forming a loop behind base of genital atrium when fully developed. Eggs oval, 21-23 \times 13-15 μ . Vitelline follicles commencing on each side at the same level a little behind pharynx, terminating on the right at level of anterior testis, but on the left a little more posteriorly at level of posterior testis or anterior end of cirrus pouch; right follicles numbering 13-14, left ones 19-21.

Excretory vesicle tubular, long, reaching a considerable distance beyond pharynx; in young individuals it may well extend beyond the anterior end of the uterus; pore terminal.

The cuticular spines of Nagaty's specimens have fallen off evi-

dently before the fixation. Evanescent as they are, they having been fixed never disappear during the process of staining and mounting.

Rhipidocotyle larvae n. sp.

(Figs. 19-20)

Velasquez, 1959

Host: *Psettodes erumei* (Bloch and Schneider)

Location: stomach and intestine

Locality: Malabon, Rizal, Luzon island, Philippines

Prevalence: 5 mature and 1 immature from 1 host of 9 examined

Type: U.S. Nat. Mus. Helm. Coll. No. 37693; paratype No. 37694

Paratypes: University of the Philippines, Dept. of Zoology, Helm. Coll. No. 540 (1) f.

Specific diagnosis. (Based on 2 specimens). Body truncate, elongate, 1.0-1.15 by 0.25-0.28. Neck-like region well formed (one contracted specimen). Body with rather coarse, spines scale-like, arranged in transverse rows, more closely set anteriorly and more sparse posteriorly. Anterior sucker subterminal, with hood hardly discernible in side view; but seen in front view, hood provided with median and 2 lateral papillae (probably a total of 7) making a sort of polygonal cap (Fig. 20). Mouth at midbody; pharynx subglobular; intestine saccular, directed anteriorly. Gonads in midbody. Testes tandem; anterior testis smaller than posterior and overlapping. Cirrus sac (type) 0.4 by 0.08, almost $\frac{1}{2}$ body length, extending to anterior border of posterior testis. Seminal vesicle coiled; pars prostatica elongate, wider anteriorly. Genital atrium well developed; genital pore subterminal. Ovary rounded, slightly anterior to anterior testis. Uterus extending to anterior groups of vitellaria. Vitelline follicles in 2 lateral rows, 9-10 on the left side and 13-15 on the right, in type specimen compressed, tending to be confined at median field. Excretory vesicle elongate, extending to level of gut; excretory pore terminal.

Discussion: I agree with Hopkins (1950) (mimeographed) that under certain circumstances, diagnosis is difficult. The specimens must be properly fixed and oriented in order to see the hood. However, fortunately, 1 specimen of this species was properly oriented with the cap rather well spread (Fig. 19). This species resembles *Rhipidocotyle longleyi* Manter, 1934 in general anatomy but differs from it in size of body, length of cirrus sac, position of genital atrium, extent of vitellaria, character of the papillae of the hood and cuticular spines.

Manter (1934) noted the resemblance of *R. longleyi* with *R. baculum* (Linton, 1905) Eckmann, 1932. I have noted, however, that the latter species presents much confusion. It was first described by Linton (1901) as *Gasterostomum* sp. from *Scomberomorus maculatus* (U.S. Nat. Mus. Helm. Coll. 6672). The description was based on poorly preserved specimens but he later (Linton, 1905) named the species *Gasterostomum baculum*, and presented new figures. Examination of Linton's unstained specimens (U.S. Nat. Mus. Helm. Coll. 6672) showed an anterior sucker with a cap. Nicoll (1915) wrongly placed this species in the genus *Bucephalus*. Manter (1931) made a new combination, *Nannoenterum baculum* (Linton, 1905) Manter, 1931. Subsequently, Eckmann (1932) on the basis of Manter's specimens taken from the same host, transferred the species from *Nannoenterum* Ozaki, 1924 to *Rhipidocotyle* Diesing, 1858, the species then becoming *Rhipidocotyle baculum* (Linton, 1905) Eckmann, 1932. Without noting Eckmann's synonymy Linton (1940), using new material collected from several hosts, described and figured a species which he erroneously identified as that which he had described in 1901 and 1905 and named the new material *Nannoenterum baculum*. Manter (1947) referred Linton's material described in 1940 to *Rhipidocotyle baculum* (Linton, 1905) Eckmann, 1932, a name which was correct for the material reported in 1901, 1905 by Linton. Examination of Linton's specimens reported in 1940 and



deposited in the U.S. Nat. Mus. Helm. Coll. Nos. 8180-8185 from *Sphyaena borealis*, *Decapterus macarellus*, *Menticirrhus saxatilis*, *Raja diaphanes* and *Raja laevis* showed that these worms possessed tentacles; his descriptions indicate 20 tentacles, his illustrations fewer. But, unluckily, he said that the one from *Scomberomorus maculatus* (type host) was imperfect; yet he indicated that he saw tentacles in it. It is apparent that Linton (1940) was not unaware of the fact that he was not dealing with *baculum*. Likewise, Manter (1947) may have presumed that Linton's material described in 1940 was that reported in 1901, 1905. I therefore propose that one of the lectotypes of Linton's *G. baculum* (unmounted specimens) described in his paper (1901, 1905) be designated as syntype for *Rhipidocotyle baculum* (Linton, 1905) Eckmann, 1932.

No additional species of gasterostomes has been reported from the above hosts for Linton's misidentified specimens (1940) with tentacles, described and figured by him as *Nannoenterum baculum* and which Manter (1947) referred to as *Rhipidocotyle baculum* (Linton, 1905) Eckmann 1932. I propose a new name *Bucephalus confusus* for the misdetermined specimens with tentacles described and figured in 1940 as *Nannoenterum baculum* Linton (See Linton, 1940: pp. 33-36; Figs. 252-253).

Separated out from the U.S. Nat. Mus. Helm. Coll. No. 6672 (unstained specimens) from *Scomberomorus maculatus* is 1 specimen (38337) which is without a hood but having a sucker lacking tentacles and resembling that figured by Linton (1905) as *Gasterostomum arcuatum* (Linton, 1900). This species was renamed *Bucephalopsis arcuata* (Linton, 1900) Eckmann, 1932. Hopkins (1954) proposed that *Bucephalopsis* be restricted only to a cercaria, *B. haimeanus* Lacaze-Duthiers, 1854 whose life history is not known, and further that all other species formerly included in the genus *Bucephalopsis* be designated as *Bucephaloides*. Therefore, *Bucephalopsis arcuata* (Linton, 1900) Eckmann, 1932 becomes *Bucephaloides arcuatus* (Linton, 1900) new comb. The specimen (38337, U.S. Nat. Mus.) is now entered as *Bucephaloides arcuatus* (?) (Linton). Since the only specimen is unstained, the specific determination is not certain.

As noted above, Tennent never did establish any connexion between the oyster cercaria and the bucephalids of *Menidia* and *Strongylura*. His only successful experiment involving both fish and oyster stages was the one in which he infected

oysters by injecting farrows of *Lepisosteus osseus*. The mature gasterostomes in the gars were not drawn or described; Tennent simply assumed that they were the same species as the ones in *Strongylura marina*.

No gasterostomes have been reported from any species of *Lepisosteus* from Tennent's time until now. Working at Grand Isle, Louisiana, in 1950 and 1952, I found and studied adult bucephalids from the intestine of alligator gars, *L. spatula* Lacépède, from Barataria Bay. A single species was found, and it was present in all of the four gars examined. It is very different from all of the three species found in *Strongylura marina*. It seems probable, though of course not certain, that this is the species which Tennent used in his oyster infection experiment. The new species from the alligator gar is described below. Immature specimens (encysted metacercariae) of what is almost certainly the same species were found in young mullets (*Mugil cephalus* and *M. curema*).

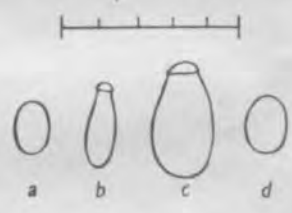
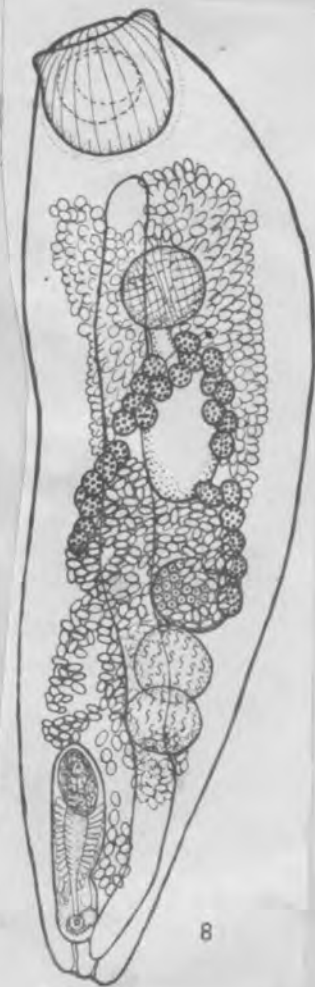
Hopkins 1954
***Rhipidocotyle lepisostei* n.sp.** (Figs. 8, 9 and 10c)

With the characters of the genus. Body length 1.2-2.0 mm.; width at widest point (level of pharynx) about 0.3-0.6 mm., approximately one-third of length in unflattened specimens killed by heat. Anterior sucker nearly spherical, or hemispherical with the anterior edge flattened, 0.16-0.26 by 0.16-0.30 mm. A weakly developed 'hood' forms a slight ridge which runs transversely across the anterior edge of the sucker and sometimes shows ear-like lobes or projecting corners at its lateral extremities. There are no papillae or tentacles. Cephalic glands, if present, are very inconspicuous, but there are two large, conspicuous masses of gland cells massed around each side of the pharynx and intestine, with ducts running toward the mouth. In mature specimens the mouth is in the anterior third of the body; immature specimens have the mouth farther back, at or near the middle of the body. The large pharynx measures 0.10-0.15 by 0.10-0.16 mm. The intestine is pouch-shaped and posterior to the pharynx, to which it is joined by a short oesophagus. The vitelline follicles form an inverted U or V posterior to the pharynx and anterior to the testes. The spherical ovary is about half-way from the pharynx to the posterior end, on the right side. The testes are close behind the ovary and are tandem, oblique, or symmetrical in position. The relatively small cirrus pouch, only about one-fifth as long as the body, extends forward to the level of the posterior testis. The coils of the uterus fill the region posterior to the mass of glands around the digestive system. The eggs are 27 to 35 μ long and 15 to 21 μ broad; the width averages six-tenths of the length. The excretory bladder runs forward to or almost to the anterior sucker; its anterior end is sometimes pressed against the anterior sucker in such a way that it appears to be Y-shaped, but actually it is undivided as in all other bucephalids. The main excretory vessels run into the excretory bladder on each side at about the level of the ovary or half-way between the

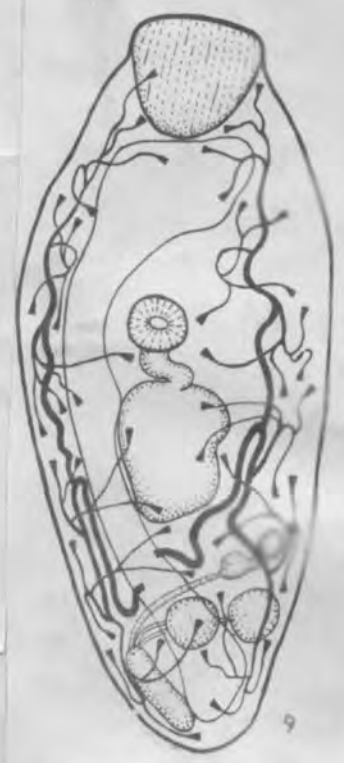
pharynx and posterior end.

Final host: *Lepisosteus spatula* the alligator gar
 2nd Intermediate host: *Mugil cephalus* and *M. curema*, mullet
 Geo. Distrib. Barataria Bay, La.

REPORTED IN 6 OF 8 *L. SPATULA*, UPPER SM. INT., SAME LOCALITY
 FROM CORKUM, 1968



10
 Fig. 10. Eggs of the four species, drawn to the same scale (scale line = 50 μ): a, *Rhipidocotyle transversale*, b, *R. lintoni*, c, *R. lepisostei*, d, *Bucephaloides strongyluræ*. All from balsam mounts.



Rhipidocotyle ligulum Chauhan, 1943

Length 2.68; width 0.21 (about 1/13th)

Anterior sucker 0.12 by 0.075; hood prominent but weakly muscular, crescent shape, without papillae; no mid-ventral notch observed.

Mouth 1.35 mm. from anterior end.

Pharynx 0.04 by 0.02 mm. esophagus narrow and small; gut long and narrow, about 0.31 mm. (1/8th body length)

Gonads space, posterior to gut. Ovary pear-shaped, pre-testicular. Vitellaria large, 21 on right; 13 on left.

Uterus not much coiled but filled with eggs, not extending anterior to gonads, nor posterior to atrium.

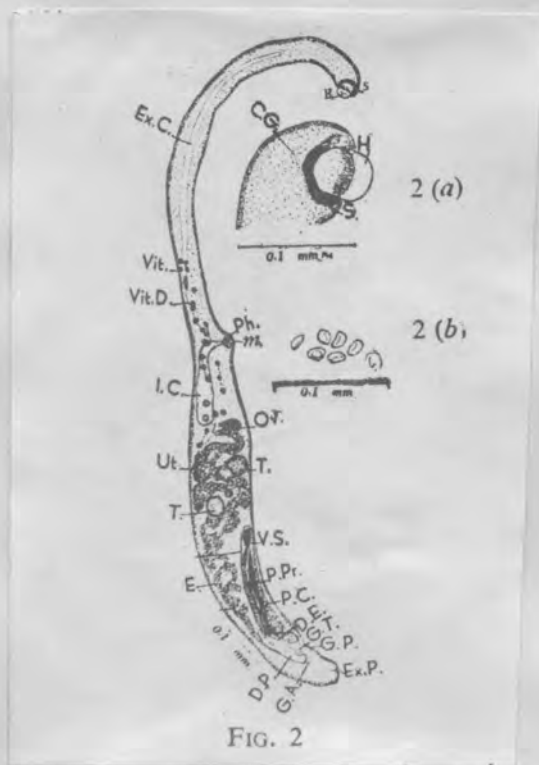
Eggs 35 by 17 u.

Testes separate, obliquely tandem. Cirrus sac very elongate and narrow, 0.53 mm. long (1/5th body) by 0.08. seminal vesicle small, compact, longitudinally oval.

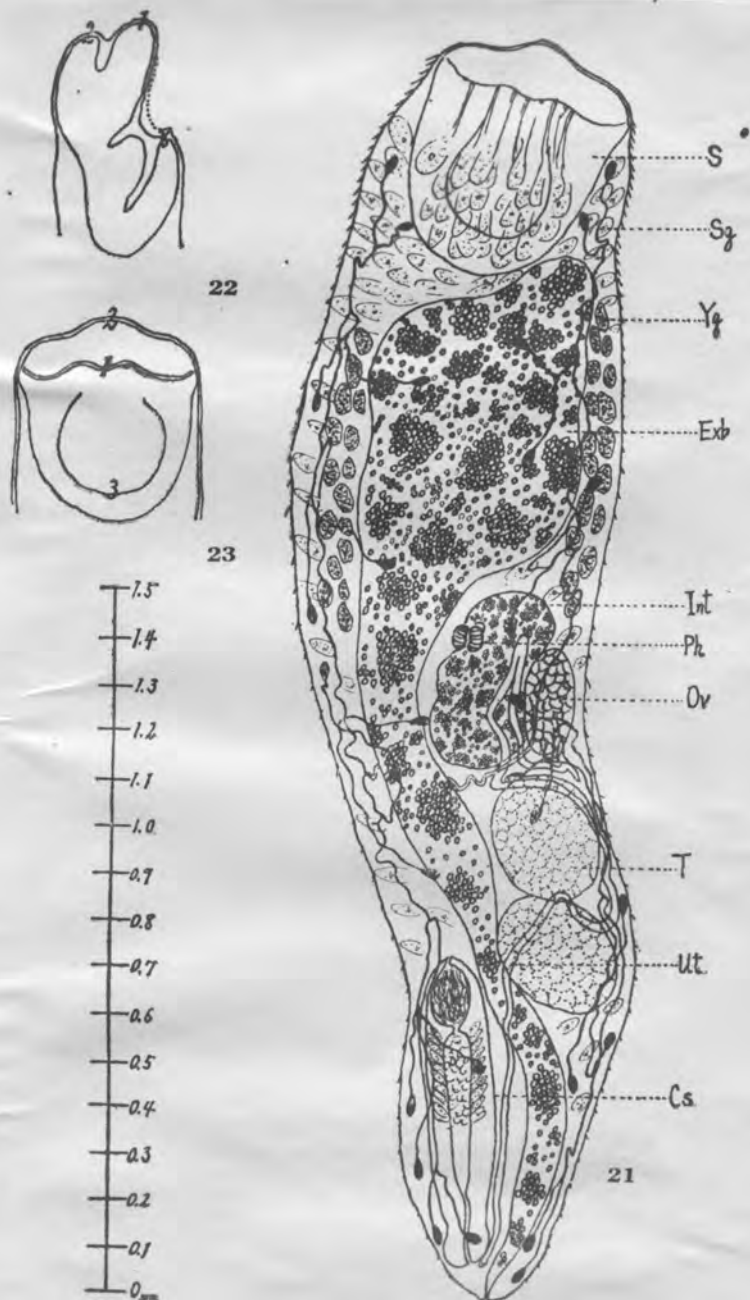
Genital atrium large containing genital tongue and two more or less ventral and dorsal lobes or papillae.

Excretory vesicle extends anteriorly to a point 0.29 mm. from anterior end.

Host: Arius falcarius, a marine fish
Wesly Coast of India, Bpmbay



c) *Rhydidocotyle lingualis* Komlyar & Tadjimajid (1991) Body length 1.55 mm and body width 0.45 mm in its metacercaria stage. At its anterior end is found a large characteristic sucker. The characteristic feature consists in its having a short, broad, tongue-like projection on its proximal part. The distribution of body spines is the same as in the two former species. The intestine is saciform and is connected with the oval pharynx situated ventrally about the centre of



Figs. 21-23. Metacercaria of *Rhydidocotyle lingualis* n. sp. and the lateral (fig. 22) and ventral (fig. 23) views of its sucker. The numbers in figures 22 and 23 show the respective corresponding parts.

Rhipidocotyle lintoni n.sp. (Figs. 4, 5 and 106) Hopkins 1954

With the characters of the genus. Length of body 0.45–1.00 mm., width 0.25–0.45 mm., widest part anterior to middle of body. Anterior sucker nearly spherical, 0.15–0.25 by 0.15–0.25 mm.; its diameter is approximately one-fifth the length of the body. There is a small muscular extension of the anterior wall of the sucker, forming a diminutive 'hood'. Compare Linton (1940, p. 31): 'the cap is reduced to a buttonlike process'. Vitelline follicles just posterior to anterior sucker, either in a single transverse zone or in two lateral groups which almost meet in the middle. Mouth in middle or slightly anterior to middle of body length. Pharynx nearly spherical, diameter 0.05–0.07 mm. Intestine pouch-shaped, dorsal or dorsal and anterior to pharynx. Ovary lateral or slightly anterior to level of pharynx. Testes just posterior to pharynx, tandem, oblique, or symmetrical. Cirrus pouch extending forward to level of testes and nearly to middle of body length; its length is approximately one-third of the body length (sometimes more). Uterus extensively coiled both anterior and posterior to pharynx and intestine, filling all the space not filled by other organs and often hiding all other internal structures from sight. Eggs 2.5 to 3 times longer than wide, 25–30 by 8–12 μ , with a conspicuous operculum on one end. Excretory bladder not extending forward to level of posterior testis; main collecting tubes running into anterior end of bladder. Each main excretory tube divides, at the level of the pharynx or forward, into an anterior and a posterior branch. Flame cell formula 2 [(2 + 2) + (2 + 2)].

FINAL HOST. *Strongylura marina* (Walbaum), needle gar or billfish.

INTERMEDIATE HOSTS. Not known.

GEOGRAPHICAL DISTRIBUTION. Grand Isle, Louisiana; York River, Virginia; Woods Hole, Massachusetts.



Rhipidocotyle lintoni Hopkins, 1954

HOST: *Strongylura marina* (Walbaum).

INCIDENCE: In two of three.

HABITAT: Upper small intestine.

LOCALITY: Barataria Bay, Louisiana.

TAM587(3)

From (ORKUM, 1968)

Manter, 1934

Rhipidocotyle longleyi

(Figs. 2-5)

Host—*Hypoclydonia bella* Goode & Bean.

Position—intestine.

Frequency—Present in 5 of 17 hosts examined.

Depths—140 to 197 fath., 150 fath., 249 fath., 250 fath.

SPECIFIC DIAGNOSIS

Length 1.71 to 3.7 mm., width 0.344 to 0.680 mm. Body not much flattened, widest at midbody or somewhat posterior to midbody, covered with spines. Anterior sucker subterminal, surmounted by a flattened cephalic disc ("hood") bearing seven lobes, one group of three dorsal, and two lateral pairs; lobes inconspicuous when retracted (fig. 5), but blunt, finger-like processes with transparent narrowed tips when extended (fig. 4). Mouth ventral at midbody; pharynx almost spherical; intestine extending both anterior and posterior to mouth, mostly posterior. Testes large, tandem or diagonal, near one side, in posterior half of body. Cirrus sac large, extending from anterior border of posterior testis to posterior end of body; seminal vesicle a simple sac, pas prostatica sinus but not coiled; prostate gland well developed; genital atrium large, with large glandular lobe (genital tongue); genital pore usually subterminal and ventral, sometimes terminal; a small transparent papilla immediately posterior to genital pore. Ovary rounded or somewhat extended transversely, immediately anterior to anterior testis; uterus coils anteriorly beyond the vitellaria to about 1/5 body length from anterior end. Eggs 20 to 24 by 11 to 12 μ . Vitellaria in two lateral rows extending from level of ovary about half way to anterior end, approximately 15 vitelline follicles on each side.

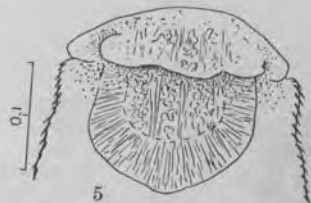
Measurements

Length	Width	Sucker diameter	Disc diameter	Mouth to anterior end	Genital pore to posterior end	Pharynx	Eggs
mm.	mm.	mm.	mm.	mm.	mm.	mm.	μ
2.755	0.680	0.156	0.204	1.33	0.098		21 by 11
2.18	.546	.137	.196	1.13	.050		24 12
3.705	.562	.168		1.90	.098		22 12
1.71	.344	.117	.176	0.966		.101 by .107 by	22 11
2.47	.562	.129	.176	1.209		.064 by .080 wide	20 12 20 12

This parasite sometimes occurs in large numbers. It is named in honor of Dr. W. H. Longley, Director of the Biological Laboratory of the Carnegie Institution at Tortugas, Florida.

One specimen was recovered by washing the cœlom of *Chlorophthalmus chalybæus*. Since this collection was made the same day as those from *Hypoclydonia bella* there is a probability of accidental contamination from a previous examination. Although two different species of fish were examined between the two hosts in question, the *Hypoclydonia*, examined shortly before the *Chlorophthalmus*, was heavily infected. *Chlorophthalmus chalybæus* should be considered a questionable host for this parasite.

Reported from: *Telescopias* sp.
Synagrops japonicum
Japan, by Yamaguti, 1938



COMPARISONS

Eckmann (1932) recognizes five species of *Rhipidocotyle*. *R. longleyi* differs from all of them primarily in the number of lobes (or papillæ) of the cephalic disc. Five is the usual number, although none are present in *R. baculum* (Linton) and there are 15 in *R. papillosum* (Woodhead). *R. longleyi* is larger and more elongate than *R. galeatum* (Rud.), but at the same time has smaller eggs. It is much larger than *R. baculum* and has a more anterior extent of the uterus. It differs from *R. pentagonum* (Ozaki) in that the uterus extends to near the posterior end. Ozaki (1928, 54) describes 40 to 80 vitelline follicles on each side for *R. pentagonum*, but his figure (p. 55, fig. 24) shows 15 on each side. The transparent papilla posterior to the genital pore of *R. longleyi* is not described for any of the other species. *R. longleyi* differs from *Gasterostomum* sp. of Linton (1910) and from *Mycteroperca bonaci* in anterior extent of the uterus and in much smaller eggs.

The 7-lobed character of the disc of *R. longleyi* is probably a modification of the typical number of 5. It could not be decided, however, whether the increased number has arisen by a doubling of lateral papillæ or the double splitting of a median dorsal papilla. Figure 4 shows that the three dorsal papillæ or lobes are closely associated and the four lateral lobes appear to be two pairs.

Eckmann (1932, 99-100) follows Nicoll in accepting *Gasterostomum minimum* Diesing as type of the genus *Rhipidocotyle* Diesing, 1858, but finds that *G. minimum* Wagener is a synonym of *G. galeatum* Rud., which thus becomes *Rhipidocotyle galeatum* (Rud.), the type of the genus. Eckmann defines the genus as follows: "Bucephalidæ at the anterior end of which occurs a sucker and a structure usually provided with papilla-like processes. Ovary at the level of anterior testis or in advance of this level. Intestine sac-like." She considers *Nanncenterum* Ozaki as a synonym and lists the following species: *R. galeatum* (Rud.), *R. baculum* (Linton), *R. papillosum* (Woodhead), *R. pentagonum* (Ozaki), and (?) *Gasterostomum* sp. Linton, 1910, p. 79.

The term cephalic disc as used above is suggested for the flap-like structure surmounting the anterior sucker.

Rhipidocotyle longleyi Manter, 1934

HOST: *Synagrops bella* (Goode & Bean).

INCIDENCE: In five of seven.

HABITAT: Upper small intestine.

LOCALITY: 29° 09' N-88° 12' W, 29° 17' N-87° 41' W, 225 fathoms (new locality records).

Manter (1934) first reported this species from a deep-water fish at Tortugas, Florida, and in 1938, Yamaguti collected it from a related host off the coast of Japan. Ward (1954) tentatively identified this species from the barracuda taken off Miami, Florida. It would seem, however, that this species is restricted to the deeper water fishes and that its occurrence in pelagic animals is rather unlikely.

From Corkum, 1968

Bucephalus marinum Wlassenko, 1931

Body long and narrow, size of the complete mature specimen reaches 2 X 0.2 mm. Cuticula is entirely spined. The organ of attachment at the anterior end consists of a large sucker 0.19 X 0.17 mm, on the dorsal edge of which and partly on the sides is a much shortened fringe. It is provided with more or less longitudinal muscles and with seven more or less clearly marked papillae and when expanded it has a more or less fan-like form. The mouth, with a very small sucker, occurs not far from the middle of the body; in young worms it is in the middle of the body. The inconspicuous esophagus goes into a short sac-like intestine which ends in the region of the ovary. The excretory vesicle extends to the region of the ovary. The testes are on the right, tandem, about one-half the way between the mouth and the posterior end of the body. Cirrus sac extends almost to the posterior testis and is 0.36 mm long. Seminal vesicle is oval. Ovary in front of the anterior testis. Vitellaria in two clearly separated rows, beginning somewhat above the mouth, extending backwards, ending in the region of the anterior testis. Eggs fill almost the whole body except a small region behind the sucker. Eggs are 15 X 24 μ .

Host: Onos tricirrhata



Rhipidocotyle megagaster n. sp. CORKUM, 1968

Figures 2, 3

DIAGNOSIS (measurements in mm based on ten specimens): Body heavily spinous, elongate 6.27 (4.34-8.52) × 0.84 (0.63-0.96); anterior sucker nearly spherical 0.306 (0.385-0.420) × 0.323 (0.275-0.370); capped with a well-defined hood which bears a mid-ventral cleft; pharynx in anterior one-fifth of body 0.297 (0.275-0.384) × 0.310 (0.286-0.408); large cluster of glandular cells empty into short, slightly muscular esophagus; intestine very long and thick walled, extending to within one-fifth the body length of posterior extremity; testes subspherical, in tandem or slightly diagonal, located at mid-body separated by several uterine coils and ovary, anterior testis 0.312 (0.279-0.400) in diameter, posterior testis 0.296 (0.231-0.400) in diameter; cirrus pouch confined to posterior one-sixth of body, 1.04 (0.847-1.23) × 0.295 (0.275-0.430); seminal vesicle ovoid; genital pore sub-terminal; ovary intertesticular with ootype and Mehlis' gland posterior, 0.271 (0.165-0.400) in diameter; Laurer's canal very sinuous, but appearing to terminate a short distance posterior to ovary; uterine coiling simple, uterus proceeds from ovary to level of esophagus before coursing posteriorly to genital atrium, vitellaria of widely separated follicles arranged linearly from level of pharynx to that of posterior testis, 16-20 distal and 12-16 sinistral follicles; ova 0.018 × 0.010; excretory bladder thick walled, extending anteriorly from terminal end of bladder to level of pharynx before subdividing into secondary tubules.

TYPE HOST: *Lophius americanus* Valenciennes.

INCIDENCE: In ten of 13.

LOCATION: Gastric caeca.

TYPE LOCALITY: Gulf of Mexico, 29° 10'N, 88° 05'W, 225 fathoms.

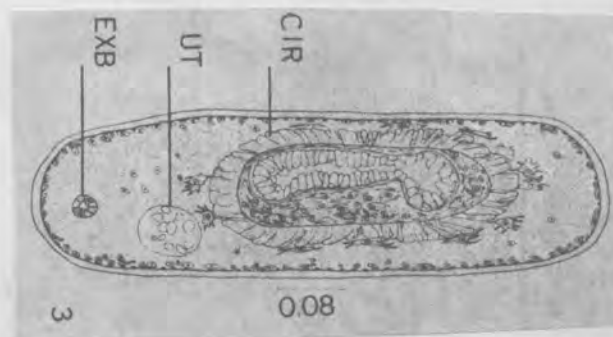
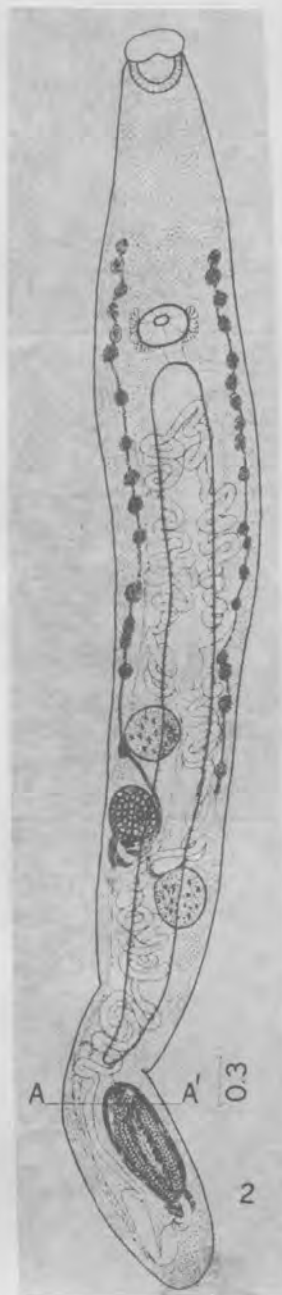
TYPE: USNM Helminthological Collection 70981.

UNSM 20270

COMPARISONS: The anterior sucker of *R. megagaster* is like that of other rhipidocotylids in that it is surmounted by a well-developed hood. It is at this point, however, that the similarity to the other members of genus ends. The anterior location of the pharynx, the long intestine, the intertesticular ovary, and the cellular nature of the excretory bladder are characteristics not known in other rhipidocotylids. For this reason, *Rhipidocotyle megagaster* is considered to represent a previously undescribed species and is here named to denote the unique appearance of its intestine.

DISCUSSION: *R. megagaster* possesses a number of anatomical features that are worthy of further discussion. Of greatest interest is the nature of the excretory bladder. In whole mounts, it appears as a thick-walled structure extending from the terminal pore to near the posterior tip of the intestine. In cross-section, the bladder appears to be made up of a series of pyramidal cells lying in the longitudinal plane of the bladder (Fig. 3). These cellular components are not restricted to the bladder but can be observed throughout the length of the primary excretory ducts. While it is generally held that the gasterostomes are among those trematodes which possess a primitive, thin-walled excretory bladder (LaRue, 1957), *R. megagaster* represents an exception in at least its adult form. It is not possible, however, to attach any greater significance to the nature of this structure since its formation in larval stages is unknown.

TAM 87(3)

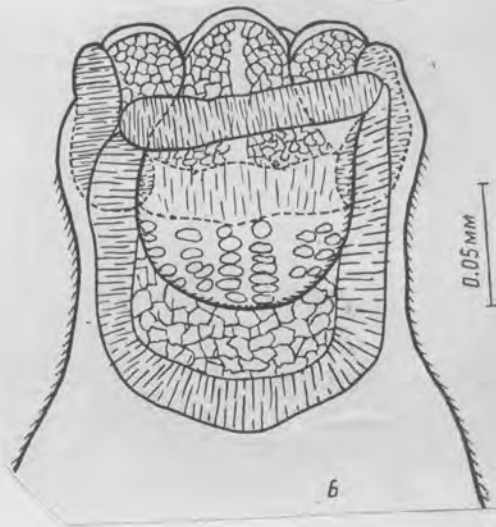


1977 *undulata*: see reprint

5. *Rhipidocotyle microovatum* Zhukov, sp. n. (рис. 2). Обнаружен в кишечнике 1 экз. *Chorinemus tala* района Мадраса (интенсивность заражения 7 экз.). Длина червей (по 5 экз.) 1.7—2.3 мм, ширина 0.47—0.52 мм. Тело густо покрыто шипиками до заднего конца. Прикрепительный орган имеет вид присосковидной ямки со спинным мускулистым воротничком, несущим 5 лопастей. Его длина 0.13—0.16 мм, ширина 0.12—0.14 мм. Ротовое отверстие в средней трети тела, направлено вперед. Глотка 0.10—0.12×0.08—0.11 мм. Яичник овальной формы (0.12—0.15×0.16—0.19 мм), расположен в непосредственной близости от мешковидного кишечника в правой части тела червя. Желточники двумя полями из 12—16 фолликулов лежат в средней части тела. Их протяженность 0.52—0.66 мм. Семенники 0.16—0.17×0.24—0.26 мм и 0.11—0.17×0.17—0.25 мм, расположены друг за другом. Сумка цирруса 0.52—0.67×0.12—0.16 мм, достигает уровня переднего семенника. Петли матки заходят за передний край желточных полей на расстояние 0.23—0.57 мм, но не достигают прикрепительного органа. От *Rhipidocotyle barracudae* Manter, 1940; *Rh. capitata* Linton, 1940; *Rh. galeatum* Rud., 1819 и *Rh. pentagonum*, имеющих пятилопастной воротничок прикрепительного органа, отличается параллельным расположением лопастей вместо звездчатого или веерообразного (у *Rh. galeatum*). По положению петель матки приближается к *Rh. galeatum*, однако отличается от него меньшими размерами яиц. Голотип и паратипы хранятся в коллекциях Зоологического института АН СССР.

Хозяин: *Chorinemus tala* Cuv. Локализация: кишечник. Место обнаружения: район Мадраса (Бенгальский залив). Материал: 7 экз.

INDIA



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.

From same host in Puerto Rico
in Australia



From Siddiqi & Cable
1960

Rhipidocotyle nagaty, n. sp. Manter, 1940

(Figure 6)

Host. *Euthynnus alletteratus* (Raf.)

Location. Intestine

Frequency. Collected from 3 of 3 hosts examined

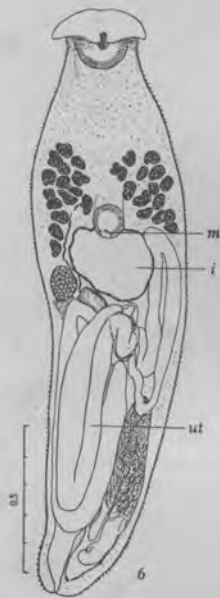
Diagnosis (based on 9 specimens). Body more or less flattened, width usually about 1/3 length; size 1.593 to 2.241 by 0.487 to 0.675; widest at about the level of the pharynx somewhat anterior to midbody. Pre-oral portion of body not narrowed. Truncate anterior end with a conspicuous, distinctly pentagonal, muscular "hood" or cephalic disc. Disc deeply notched at mid-ventral line with a pair of median-ventral lobes thickened medianly on the under side. Disc more or less pointed laterally on each side and at a median dorsal point. Median dorsal lobe with an internal strip of granular tissue. Anterior sucker 0.105 to 0.202 in diameter. Cephalic disc 0.277 to 0.338 in diameter. Pharynx spherical, slightly anterior to midbody, 0.105 to 0.133 in diameter. Intestine short, tubelike or inflated, extending posteriorly to overlap anterior testis.

Gonads close together, more or less in line, either almost tandem or definitely diagonal. Ovary subglobular, smooth or slightly irregular in outline, pretesticular, to the right, posterior to pharynx, lateral to intestine. Vitelline follicles large, distinct, more or less lobed or irregular in outline, 12 to 18 on each side forming two separated, lateral clusters from posterior edge of pharynx somewhat less than halfway to anterior sucker. Anterior to pharynx the follicles extend somewhat medianly but do not meet. Vitelline ducts uniting between testes or lateral to anterior testis, in which case one duct runs between testes. Seminal receptacle small, postovarian. Coils of uterus chiefly longitudinal, not extending anterior to pharynx or posterior to genital atrium. Eggs ovoid, broadly rounded at each end, 17 to 27 by 10 to 18 microns. However, within any one specimen the size range is small (e.g., 17 to 18 by 11 to 12 microns; 22 to 25 by 15 to 17 microns; 25 to 27 by 17 to 18 microns).

Testes closely posterior to ovary, slightly or markedly diagonal, extended diagonally. Cirrus sac rather slender, reaching anterior to or almost to posterior testis, which it may overlap; containing a small ovoid seminal vesicle and sinuous pars prostatica. Two genital lobes, more or less right and left; the left lobe very much larger, rather irregular in shape, more or less filling genital atrium. Genital pore ventral, a short distance anterior to posterior end of body. Excretory pore terminal; vesicle extending to posterior edge of pharynx.

The species is named for Professor H. F. Nagaty.

Comparisons. The pentagonal shape of the cephalic disc without papillae separates *R. nagaty* from other species in the genus except *R. pentagonum*. It differs from *R. pentagonum* in its wider body, more diagonal gonads, less linear arrangement of the vitelline follicles, relatively larger pharynx, more longitudinal uterine coils, and deeper median cleft of the cephalic disc.



Rhipidocotyle nagatyi Manter, 1940

HOST: *Euthynnus alletteratus* (Rafinesque).

INCIDENCE: In one of six.

HABITAT: Upper small intestine.

LOCALITY: Off Grand Isle, Louisiana (new locality record).

Sparks (1957) suggested *R. nagatyi* may be a synonym of *R. capitatum* (Linton, 1940). A study of both Manter's and Linton's type specimens (USNM Helminthological Collection 36707 and 8172 respectively) was made and the conclusion drawn that both represent good species. *R. capitatum* was noted to have uterine coils further anterior, a longer cirrus, and much smaller ova. Furthermore, the anterior hood of the two species appears quite different.

From Corkum, 1968

Rhipidocotyle papillosum (Woodhead, 1929)

Eckman, 1932

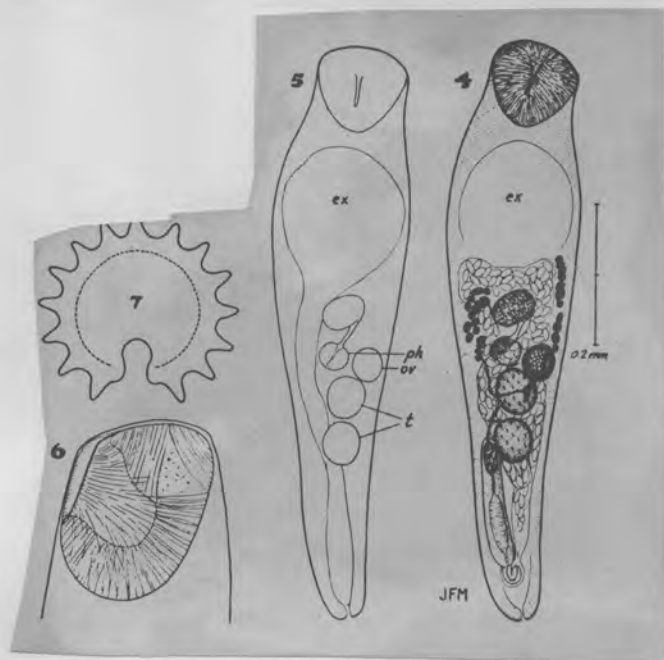
Text Figure 1, Figures 4-7

Hosts.—*Micropterus dolomieu* and *Micropterus salmoides*. In digestive tract.

As characterized by Woodhead (1929:259), *R. papillosum* is distinguishable from *B. elegans* on the basis of a single morphological character, the fact that in late maturity *R. papillosum* bears fifteen cephalic papillae while *B. elegans* bears but seven. Other characteristic differences such as relative size of body, size of eggs, and relative size of the digestive tract are unavailable for differentiation of our specimens because of complete overlapping of size ranges in material before us. We have concluded that specimens from both species of the black bass in Oneida Lake are referable to *R. papillosum*, basing our determination in large measure upon the claims of host limitations set forth by Woodhead in his publications and emphasized in private communications. We have never seen any indication of cephalic papillae or fimbriae on our bucephalids from black bass, but specimens submitted to Woodhead were kindly verified as to determination.

Esox lucius has been recorded as a host of *R. papillosum*, but not one of the nineteen specimens of this fish which we have examined from Oneida Lake has borne this species. Possibly this is explainable on the ground that all of our records involve pike twelve inches or more in length, whereas the infestation records of Woodhead concerned "small specimens".

Woodhead (1929:270) has traced the development of *R. papillosum*, having determined that the cercariae are developed in *Elliptio dilatatus*, a fresh-water mussel. These cercariae after leaving the mussel actively penetrate the skin of fishes, becoming encysted usually at the base of the fin rays. Here the cyst remains until the host is eaten by a larger fish, within whose digestive tract the Bucephalus is liberated. Functional maturity is attained only by those flukes which find themselves in suitable hosts. Both species of black bass carry this worm frequently, but the number per fish is low, usually not more than six to ten but occasionally more.



Body 2.22 to 3.24 by 0.35 to 0.53.

Anterior sucker with pentagonal hood in front of it on the ventral side.

Oral aperture ventro-central, pharynx 0.065 to 0.091 in diameter. Esophagus runs anteriorly; cecum a simple short sac running posteriorly, 0.15 by 0.35.

Genital pore 0.04 to 0.08 from posterior end.

Testes globular, 0.12 to 0.18 in diameter, on right side, tandem, in third quarter.

Cirrus sac conical, 0.32 to 0.52 by 0.08 to 0.09, from genital sinus to near posterior testis. Genital tongue extending into genital sinus.

Ovary globular, on the right, in front of anterior testis, slightly smaller than the latter. Seminal receptacle absent, Laurer's canal present. Uterine coils entirely behind the mouth.

Vitelline follicles globular extending from the pharynx about $\frac{1}{2}$ way toward the anterior end 40 to 80 (an error) on each side.

Eggs 20 to 22 by 13 to 15 μ

Excretory vesicle a simple sac extending into the testicular zone.

Host: Scomberomorus nipoonius (Cuv. & Val.)

Locality: Japan



Recorded by Eckmann from Thynnus-species in the Mediterranean.

Length 1.7
Width 0.5
Sucker 0.16
Cirrus sac $\frac{1}{4}$ body length
no eggs

Recorded by Nagaty (1937) from
Caranx sp. & Caranx compressus
from Red Sea

Rhipidocotyle quadriculatum Kohn, 1961

(Est. 2, figs. 5-6; est. 3, figs. 7-8)

Rhipidocotyle quadriculatum Kohn, 1961: 41-43

Trematódeos com o corpo alongado; medem 2,99 a 4,49 mm de comprimento por 0,64 a 0,73 mm de largura. Cutícula espinhosa, apresentando, principalmente na porção pré-cecal do corpo, numerosas estrias oblíquas, que lhe dão um aspecto quadriculado. Extremidade anterior com *rhynchus* pouco desenvolvido, com 0,23 a 0,31 mm de comprimento

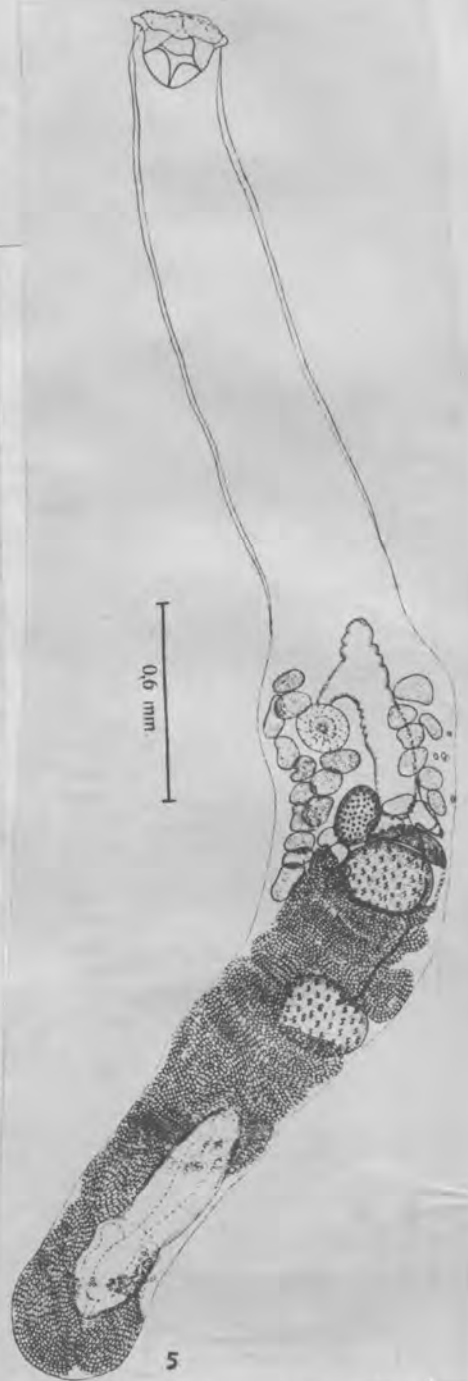
por 0,25 a 0,34 mm de maior largura; é constituído por 4 saliências anteriores, que formam uma espécie de capuz, e uma ventosa subterminal, bem desenvolvida. Bóca simples, ventral, situada no terço médio do corpo. Faringe muscular presente com 0,168 a 0,205 mm de comprimento por 0,168 a 0,187 mm de largura. Esôfago presente com 0,063 a 0,135 mm de comprimento, dirigido de trás para diante, ligando-se subterminalmente ao ceco intestinal. Ceco intestinal com 0,35 a 0,78 mm de comprimento por 0,13 a 0,24 mm de largura, dirigido de diante para trás, com paredes pregueadas transversalmente. Átrio genital ventral muito desenvolvido. Bólsa do cirro alongada, dirigida do poro genital para diante; mede 0,84 a 1,12 mm de comprimento por 0,22 a 0,30 mm de maior largura; encerra vesícula seminal pouco desenvolvida, ligando-se a um canal prostático saliente no átrio genital, e que é cercado por numerosas células prostáticas. Testículos de contorno liso, mais ou menos arredondados, situados no mesmo campo ou com campos parcialmente coincidentes; têm zonas parcialmente coincidentes ou um pouco afastadas; são pós-farigeanos e pós-ovarianos. O testículo anterior mede 0,22 a 0,35 mm de comprimento por 0,21 a 0,28 mm de largura; o posterior mede 0,24 a 0,34 mm por 0,28 mm. Ovário de contorno liso, mais ou menos arredondado, pré-testicular e pós-faringeano; fica situado total ou parcialmente no campo testicular e sua zona é parcialmente coincidente com a do testículo anterior; mede 0,19 a 0,22 mm de comprimento por 0,13 a 0,28 mm de largura. Glândula de Mehlis com 0,22 a 0,29 mm de comprimento por 0,09 a 0,15 mm de largura; fica situada na região compreendida entre o ovário e o testículo anterior. Canal de Laurer não evidenciado. Útero dirigindo-se da região do ovário para trás, formando numerosas sinuosidades que enchem toda a área pós-testicular do corpo, localizando-se ao lado da bólsa do cirro e estendendo-se até a extremidade posterior do corpo. Ovos de casca lisa, operculados, pardacentos; medem 0,017 a 0,019 mm de comprimento por 0,010 a 0,015 mm de largura. Vitelinos constituídos por folículos bem desenvolvidos, que medem 0,09 a 0,15 mm de comprimento por 0,06 a 0,13 mm de largura; situam-se lateralmente, estendendo-se da zona cecal até o nível superior da bólsa do cirro, nos exemplares com menos ovos, e da zona cecal ao nível do testículo anterior nos exemplares com muitos ovos; seu número varia de 10 a 12 em um lado e de 12 a 16 no outro. Poro genital feminino abrindo-se no átrio genital. Poro excretor terminal. Vesícula excretora tubular, parecendo atingir a proximidade do *rhynchus*.

Habitat — Intestino delgado de *Scomberomorus maculatus* (Hitch.).

Proveniência — Angra dos Reis, Estado do Rio de Janeiro, Brasil.

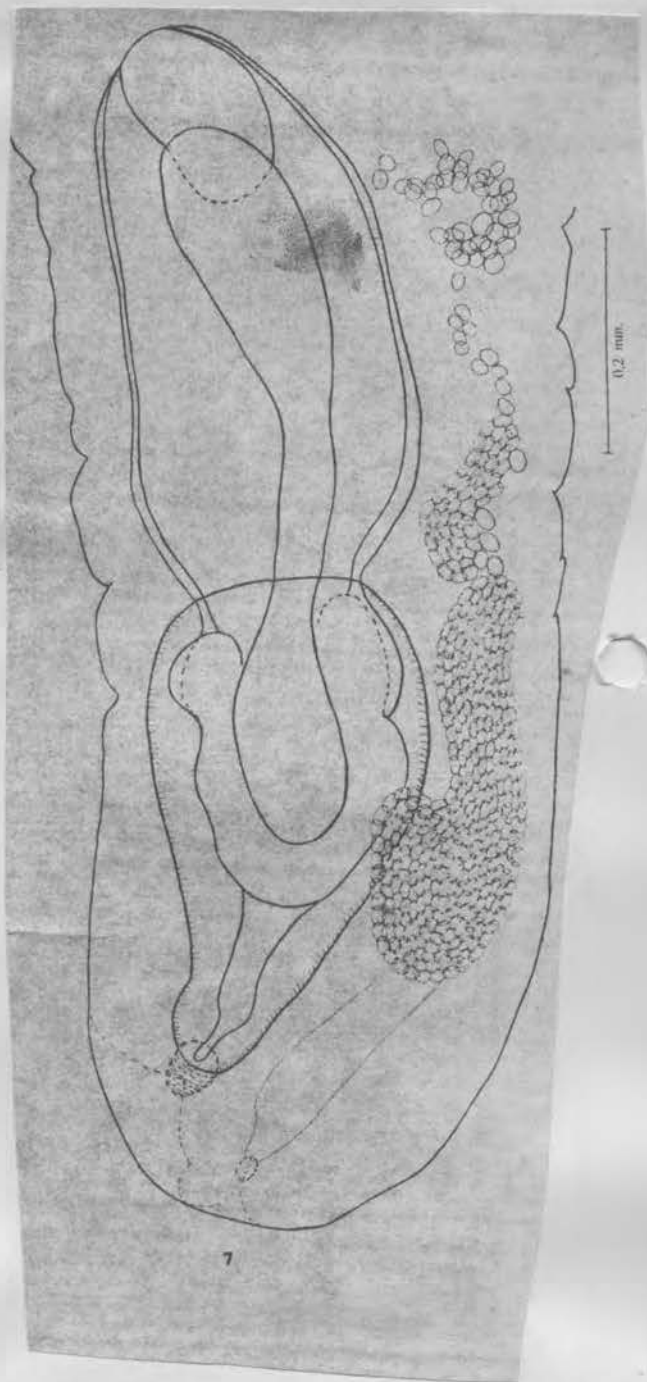
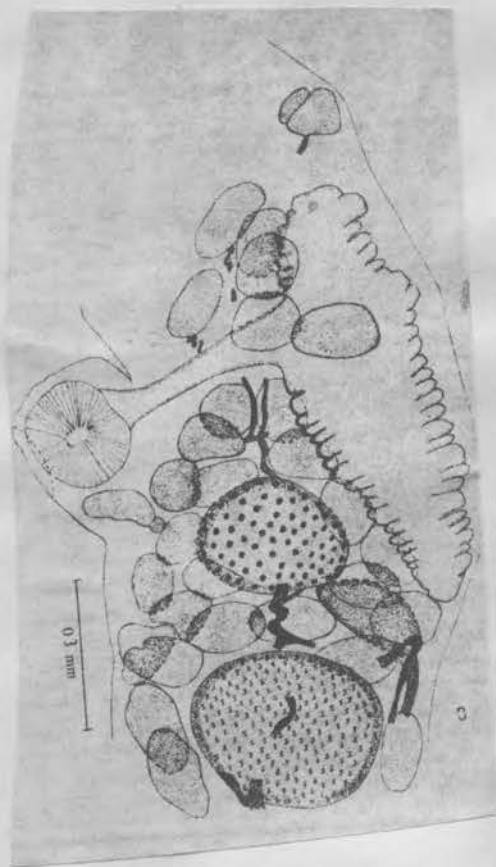
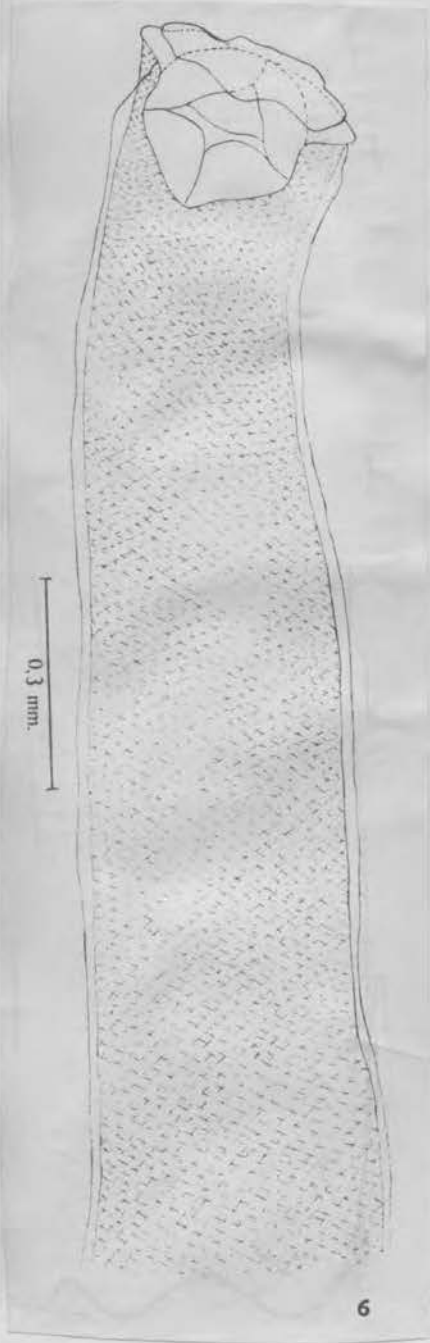
Tipo n.º 28 740a e parátipos ns. 28 740b, 28 741a-c e 28 742a-f, depositados na Coleção Helmintológica do Instituto Oswaldo Cruz.

No Quadro II damos as principais medidas de alguns espécimes.



From KOHN, 1967

reprint for table of measurements of individual specimens



Rhipidocotyle senegalensis n.sp.

Fischthal & Thomas, 1972.

Rhipidocotyle senegalensis, n. sp. (fig. 1).HOST : **Antennarius commersonii* (LACÉPÈDE) (Antennariidae).

SITE : Gills.

LOCALITY : Cape Rouge, Senegal.

DATE : 12 March 1955.

SPECIMEN DEPOSITED : USNM Helm. Coll. No. 71872 (holotype).

DESCRIPTION (based on single specimen) : Body elongate oval, anterior extremity truncate, posterior rounded, entirely spined, 1,405 long by 720 wide. Anterior sucker 405 by 240, subterminal ventral, funnel shaped, bluntly pointed posteriorly, opening elongate oval, with five lobed hood measuring 110 by 415. Mouth 820 from anterior extremity, well posterior to midlength of body, surrounded by pharynx; latter 128 by 105; oesophagus short; intestine saccular, extending anteriorly. Gonads smooth, in obliquely oriented straight line with posterior testis posterosinistral, ovary anterodextral and anterior testis between them, each slightly overlapping adjacent gonad. Anterior testis 210 by 205; posterior testis 190 by 210; posttesticular space 295 long. Cirrus sac thick walled, muscular, elongate oval, 405 by 190, commencing sinistral to posterior testis, extending posteromedianly to 85 from posterior extremity. Seminal vesicle short, tubular; pars prostatica conspicuously cell lined, tubular, very long, much coiled, surrounded by prostate cells. Genital lobes muscular, unequal, projecting into genital atrium. Genital pore subterminal ventral. Ovary elongate oval, next to dextral margin of body, 157 by 115, lying at level of pharynx. Oviduct muscular, emerging from posteroventral part of ovary. Vitellaria with 28 large follicles, inverted U-shaped with loop crossing posterior part of anterior sucker, lying 275 preovarian on right and 305 on left. Uterus postpharyngeal, coils few, with two eggs near ovary, one measuring 28 by 20. Glandular masses in lateral parenchyma, extending from vitellaria to gonads.

DISCUSSION : Our specimen may be a metacercaria as it was recovered from the gills, but no information is available to us regarding this point. All organs are fully formed and two eggs are present. The unique combination of features, especially the funnel shaped anterior sucker, clearly separates our form from all other species in the genus. Because of the position of the gonads our new species most closely resembles *R. transversale* CHANDLER, 1935, from belonid and *R. lintoni* HOPKINS, 1954, from atherinid (metacercaria) and belonid (adult worm) fishes from the Gulf of Mexico and U. S. Atlantic. The latter two species differ further in lacking papillae on the hood of the anterior sucker, the cirrus sac extending more anteriorly, the pars prostatica being relatively short and straight, and the pharynx lying preequatorial.



Rhipidocotyle septpapillata Krull, 1934

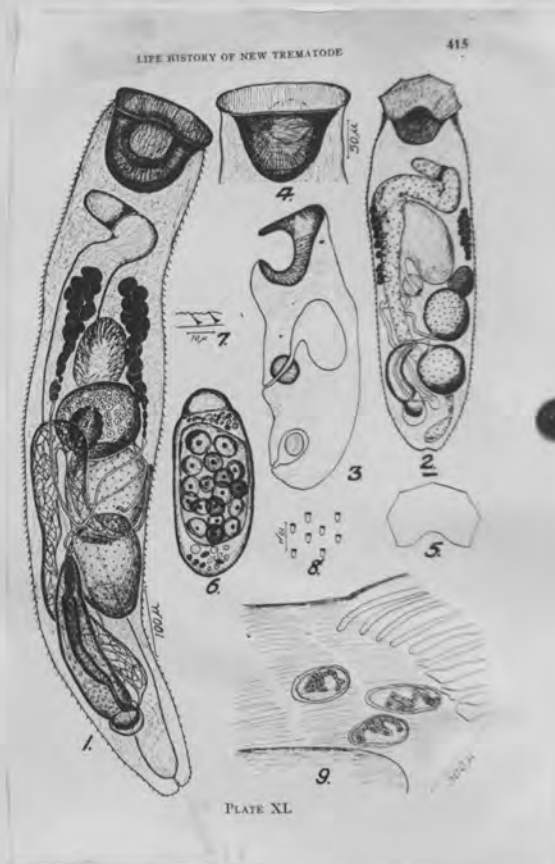
Body elongated, circular in x-section, averaging 0.938 by 0.195, anterior end truncated, posterior end rounded. Anterior sucker muscular, average 0.154 wide and 0.160 wide; margin of anterior face of sucker showing 7 angles, each with a very small blunt papilla. Mouth approximately equatorial, prepharynx about half as long as well developed pharynx; pharynx 52 μ in diameter; esophagus short, directed antero-dorsad expanding to form a sac-like intestine not extending posterior beyond the pharynx. Excretory bladder long, winding, extending from near anterior sucker to near posterior end of body, terminated by a short duct in a terminal pore. Testes tandem, larger than ovary and immediately posterior to it, subequal in size, irregular in shape, to right of median line and usually overlapping to some degree except in extended specimens. Cirrus pouch as long as testicular zone, somewhat curved, thick-walled, on left side near posterior end, containing a short seminal vesicle, a long, thick pars prostatica. Genital pore ventral near posterior end. Ovary in equatorial region, variable in shape and position in long axis. Proximal portion of oviduct with a bulb-like expansion functioning as a seminal rec. Uterus quite broad, looping dorsally, sometimes extending to anterior sucker. Vitellaria of 13 to 18 large follicles in a linear series, closely massed together on each side, from a level anterior to intestine to posterior end of pharynx. Eggs oval 38 by 17 μ (in live specimen, 42 by 18 μ)

Final host: Eupomotis gibbosus

First intermediate host: unknown

Second intermediate host: Fundulus diaphanus diaphanus
Eupomotis gibbosus

Distribution: Potomac River, Virginia



~~Recorded from
Thynnus thynnina
from Red Sea by
Nagaty 1937
but his form was
immature (one
specimen, without eggs)
SEE RHIPIDOCOTYLE HEPATATHELATA
(over) STUNKARD, 1974~~

Kniskern (J.P. 36 (2): 155-156, 1950) worked out life cycle.

Cercaria basi shed from the fat mucket, Lampsilis siliguoidea, encyst in various small fishes, & develop to maturity in the cecal pouches of the pumpkin seed, Lepomis gibbosus.

Rhipidocotyle seppapillata Krull, 1934

(continued)

Nagaty (1937) records this species from Thynnus thunnina in the Red Sea, but he had a single immature specimen. This identification seems very doubtful. SEE RHIPIDOCOTYLE HEPATATHELATA STUNKARD, 1974.

Chauhan (1943) reports it from Chrysophrys berda from Bombay. He merely states the specimens were very much longer than those obtained by Krull, and gives no description or figures. Egg size and extent of excretory vesicle must be known to identify this species.

Kniskern (1950) reports cercaria and life history. Cercaria is C. basi

Woodhead, 1936. Kniskern (1952) discusses history.

2. *Rhipidocotyle sphyraenae* n. sp.

(Pl. XX, Figs. 3-4) Yamaguti, 1959

Habitat: Small intestine of *Sphyraena pinguis* GÜNTHER.

Material, locality and date: 8 gravid specimens; Sagami Bay; June 7, 1958.

Body subcylindrical, $0.9-1.7 \times 0.16-0.26$ mm, covered all over with minute scale-like spines. Rhynchus bowl-shaped, $0.07-0.11$ mm long by $0.095-0.14$ mm broad, with comparatively thin-walled muscular base and a semicircular apical hood, which is invaginated along its convex margin with a row of seven double papillae at nearly equal intervals and terminates on each side in an inwardly directed blunt point. Pharynx $3-52\mu$ in diameter, just pre-equatorial. Intestine elongated saccular, terminating at level of anterior part of ovary.

Testes oval, tandem, postequatorial, to right of median line, $0.08-0.16 \times 0.06-0.12$ mm; posterior testis on the right of base of cirrus pouch. Cirrus pouch subcylindrical, $0.23-0.35 \times 0.04-0.06$ mm, extending on the left nearly whole length of caudal third of body, its wall consisting of longitudinal muscle bundles; seminal vesicle oval, at base of cirrus pouch; prostatic complex occupying greater part of cirrus pouch; ductus ejaculatorius strongly muscular, winding at distal end of cirrus pouch, may be diverted into genital atrium in form of a stout cirrus when the cirrus is protruded; the reduced genital lobe is seen at the base of the cirrus. Genital pore ventral, with thick cuticular lining, $50-80\mu$ from posterior tip of body.

Ovary subglobular, $0.07-0.12 \times 0.05-0.1$ mm, postequatorial, on the right immediately in front of anterior testis. Uterine coils ascending far forward to near rhynchus; eggs oval, $18-21 \times 13-14\mu$. Vitelline follicles lateral, numbering about 10 on the right, but more numerous on the left; right follicles terminating at level of pharynx, left posterior follicles dorsal to uterus, extending as far backward as anterior testis. Excretory vesicle long, tubular, wide, reaching to near anterior end of uterus; pore terminal.

This species differs from the most closely related *R. barracudae* MANTER, 1940, from *Sphyraena barracuda* in the apical hood of the rhynchus being provided with seven marginal double papillae. In *R. barracudae* the apical hood is pentagonal, and apparently devoid of papillae.



Description of immature forms encysted in Menidia.—Size 0.45 by 0.24 mm to 1.22 by 0.5 mm. Body oval with broadest region near middle. Anterior half of body covered by minute spines in transverse rows; posterior part of body with spines inconspicuous, embedded in cuticle. Anterior sucker with its forward-projecting structure cuspidor-shaped; sucker 160 μ to 185 μ in diameter, base of sucker 200 μ to 265 μ from anterior end. Very young specimens have a mass of glandular material in anterior end of body (=“cystogenous organ” of Tennent, 1906, and “penetration organ” of Woodhead, 1929). Anterior sucker develops in midst of this mass, and vitelline follicles from posterior part of it. Pharynx about two-fifths length of body from anterior end, about 90 μ to 100 μ in diameter, without prepharynx. Intestine egg-shaped or nearly spherical, in large specimen about 310 μ in diameter. Testes round or oval, side by side or diagonally situated, somewhat posterior to center of body; size variable, up to 175 μ in diameter. Cirrus pouch about 250 μ to 350 μ long and 70 μ to 125 μ in diameter, with a small seminal vesicle at its proximal end, about 50 μ long. Genital atrium large, in a large specimen 180 μ long and 120 μ in diameter, often nearly filled by the partially everted cirrus. Ovary smaller than testes, usually oval, up to 95 μ by 130 μ , situated beside or diagonally in front of anterior testis. Developing uterus present in older specimens, with several twists or loops, entering genital atrium beside cirrus. Vitelline follicles 32 in number, arranged transversely, and not separated into two distinct groups but connected across median line just posterior to anterior sucker.

Host.—*Menidia menidia*.

Location.—In walls of intestine.

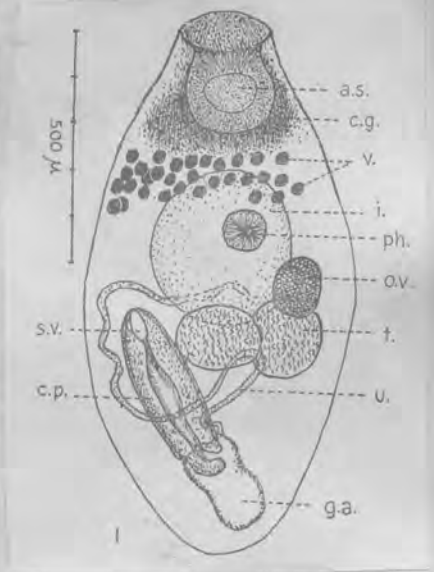
Locality.—Galveston Bay, Tex.

Type specimen.—U.S.N.M. Helm. Coll. no. 39516; paratypes, no. 39517.

Remarks.—*Rhipidocotyle transversale* differs from other members of the genus in the form of the anterior sucker and its forward-projecting structure and in the arrangement of the vitellaria, which in all other forms are arranged in two lateral groups. It appears to be identical with the form figured by Linton (1901, pl. 34, figs. 367, 368) as “*Gasterostomum* sp. from *Tylosurus marinus*”, but it is not the same as the one that he recorded from this host at Beaufort,

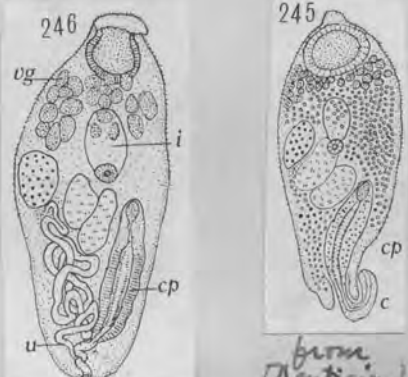
N. C., and that Tennent (1906) erroneously referred to as *Gasterostomum gracilescens*; the Beaufort form is apparently *Bucephalopsis haimeana*.

The last-mentioned species was recorded by Tennent (1906) in a metacercarial state in washings from the stomach and intestine of *Menidia*. When viscera of infected *Menidia* were fed to carnivorous fishes, some further development of the young flukes took place. The first intermediate host of this parasite was found to be the oyster, and it is not improbable that the same is true of the species here described. The method of infection of *Menidia* is uncertain; the occurrence of the young flukes in the walls of the intestine makes it highly probable that the cercariae, liberated from sporocysts in a bivalve host, are swallowed by the *Menidia*. In the case of a related fresh-water bucephalid, *Bucephalus papillosus* (referred to the genus *Rhipidocotyle* by Eckmann, 1932), the cercariae liberated from fresh-water mussels (Unionidae) penetrated the flesh of young bass at the base of the fins and encysted there (Woodhead, 1929).



In 1940, Linton lists
“*Prosorhynchus gracilescens*”
from “*Strongylura*
marina”: *Menidia*
notata, *Menticirrhus*
and *Trachurops*
crumenophthalma”

Material at least
from the first 2 hosts
are almost certainly
this species. His figures
are!



(over)

from
Strongylura

from
Menticirrhus

From Sogandares (1959)

Rhipidocotyle transversale Chandler, 1935
Synonym: *Prosorhynchus gracilescens*
(Rud.) of Linton, 1940
Hosts: *Strongylura marina*, **S. notata*
Site: intestine
Locality: Alligator Harbor

APALACHEE BAY, GULF OF MEXICO
FROM NANNAS AND SHURT (1965)

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

Host: *Strongylura timucu* (Walbaum) sp. inq.; needlefish;
new host record?; family Belonidae

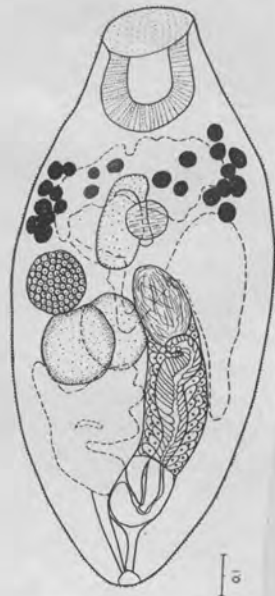
Incidence of Infection: In 1 of 3 hosts

Number: One

Location: Mid-intestine

Locality: Bayboro Harbor, Tampa Bay, Florida; new lo-
cality record

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



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

Rhipidocotyle transversale Chandler, 1935

HOST: *Strongylura marina*.

INCIDENCE: In one of three.

HABITAT: Upper small intestine.

LOCALITY: Baratataria Bay, Louisiana.

From Corkum, 1968

With the characters of the genus. Length of body 0.8-1.3 mm., width 0.35-0.60 mm.; depth (dorso-ventral dimension) about equal to width when killed by heat in unflattened condition. Anterior sucker 0.18-0.26 mm. long and 0.2-0.30 mm. wide, with a muscular extension or so-called 'hood' projecting dorsally from its anterior edge, without papillae or 'tentacles'. Numerous gland cells lateral, dorsal, and posterior to anterior sucker, with ducts running over and around anterior sucker to open near anterior tip of body. Mouth near junction of first and second thirds of body length, or in middle third but anterior to the middle of the body length. Pharynx nearly spherical, 0.06-0.10 mm. in diameter and in length.

Intestine pouch-shaped, dorsal to pharynx. Vitelline follicles in a single compact group or filling a transverse zone extending across the width of the body just posterior to the cephalic gland cells and just anterior or dorsal to the pharynx and intestine. Ovary nearly spherical, just posterior or lateral to the pharynx and intestine. Uterus coiling posterior to pharynx and intestine and dorsal to testes, mostly on left side of body lateral and posterior to testes. Eggs 20-25 by 10-14 μ ;

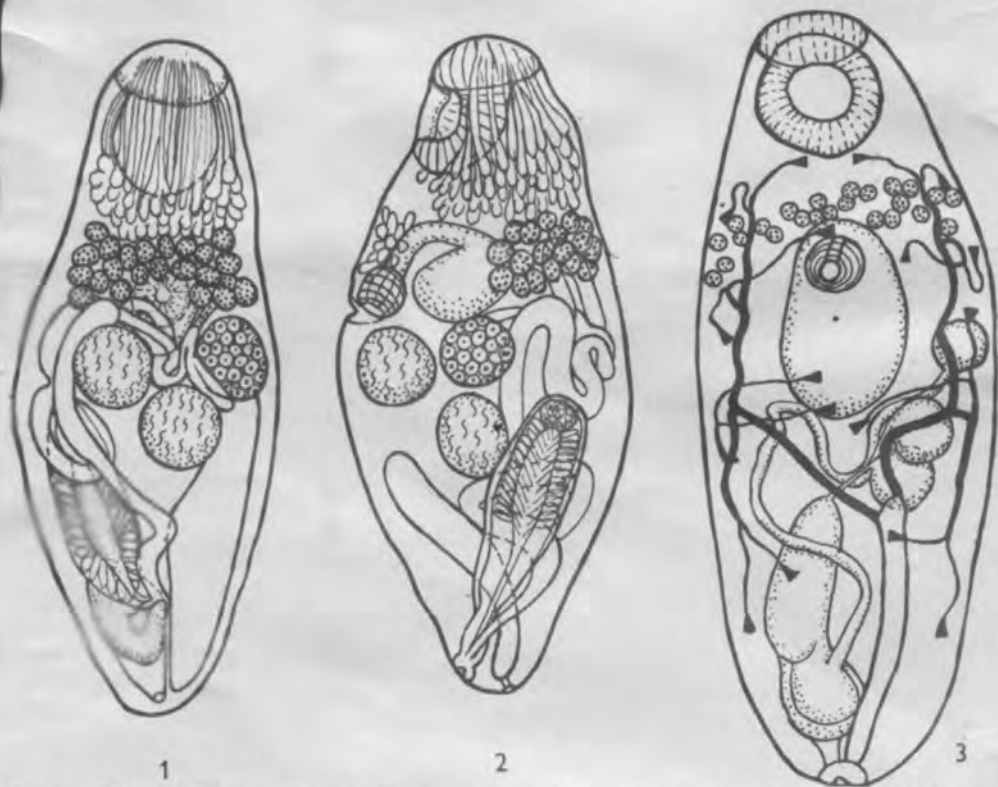


Fig. 1. *Rhipidocotyle transversale* Chandler. Dorsal view of stained and mounted adult from intestine of *Strongylura marina*.

Fig. 2. *Rhipidocotyle transversale* Chandler. Lateral view of stained and mounted adult from intestine of *Strongylura marina*.

Fig. 3. *Rhipidocotyle transversale* Chandler. Dorsal view of living metacercaria from cyst in body cavity of *Menidia* sp., showing the entire excretory system but omitting the cephalic glands.

width one-half to seven-tenths of length. Testes nearly spherical, in ventral half of body just posterior to pharynx and intestine, and either tandem, oblique, or nearly symmetrical. Cirrus pouch extending forward to level of anterior testis, which is approximately in middle of body length. Common genital pore ventral to posterior tip of body. Excretory bladder extending forward to level of posterior testis; main collecting tubes on each side running into anterior end of bladder. In middle of body length, each collecting tube divides, near the lateral margin of the body, into an anterior and a posterior branch. Flame cell formula

$$2 [(2+2) + (2+2)].$$

Bucephalidae Poche, 1907

Rhipidocotyle xishaensis sp. nov. (fig. 1) Gu and Shen, 1983

Eight specimens were secured from caeca of a *Caranx* (*Caranx*) *ignobilis* (Forskal).

This species differs from *R. eckmani* Nagaty, 1937 in the posterior border of the vitellaria being in front of the caecal sac, in the cirrus sac being behind the posterior testis in the ovary beings at the rear of the rhynchus. The distribution of the vitellaria bring it close to *R. illense* (Ziegler, 1883) Vejner, 1956, but it differs from the latter in the genital organs lying in the posterior half of body, in the unlobed crown, in the cirrus sac being located behind the posterior testis and in being parasite in marine fish.

Xisha Islands, Guangdong Province, China

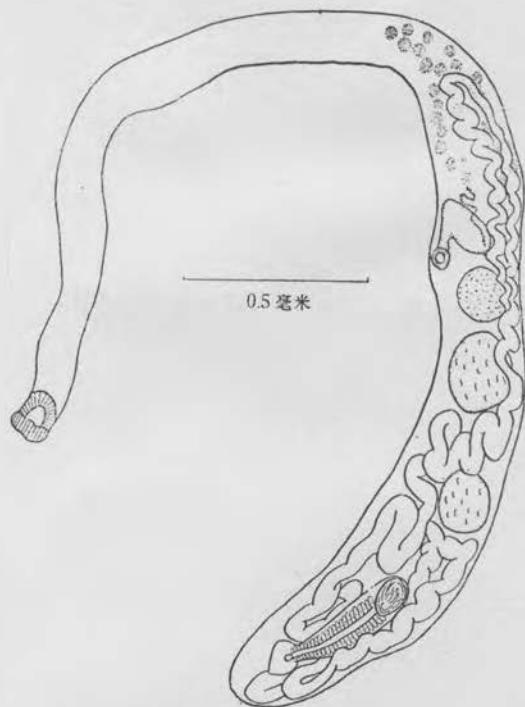


图1 西沙扇盘吸虫(新种) *Rhipidocotyle xishaensis* sp. nov. 的腹面图