

REDESCRIPTION OF TWO SPECIES OF TREMATODE
WORMS FROM THE MACCALLUM COLLECTION, WITH A
NOTE ON THE FAMILY PRONOCEPHALIDAE

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Recently Dr. G. A. MacCallum deposited his extensive and valuable collection of helminths and other parasites in the collections of the United States National Museum, thus making the material available for study. In going over this collection the writer found many of the original specimens of species described by Doctor MacCallum. In view of the fact that some of the species which he described were placed in genera no longer recognized as valid except as collective genera, the writer has undertaken to reclassify the trematodes of this collection and to redescribe those of which the original descriptions are inadequate from the viewpoint of present-day standards. This paper contains a redescription of two species of monostomes belonging to the family Pronocephalidae, and in this connection an attempt has been made to revise the family.

MacCallum (1916) described a monostome from the intestine of the French angel fish, *Pomacanthus paru*, for which he proposed the name *Monostomum pomacanthi*. An examination of the available specimens of this species shows that it belongs to the genus *Pleurogonius* Looss, 1902, and represents the only species of this genus known from a fish host.

The specimens available for study are as follows: One specimen, a toto mount stained with carmine (U.S.N.M. No. 8087), labeled "Monostome, int., *Angelichthys ciliaris* (blue angel fish). Aquarium, N. Y., Feb. 5, '14"; 10 specimens (3 slides), stained with hematoxylin (U.S.N.M. No. 8088), labeled "*Monostomum pomacanthi*, int., French angel fish, *Pomacanthus paru*. Aq. May 29, '15"; 1 badly damaged specimen, a toto mount stained with carmine (U.S.N.M. No. 8089), labeled "Distome ?, int., *Angelichthys isabelita*. Aquarium. May 27, '16"; 1 specimen, a toto mounted stained with carmine (U.S.N.M. No. 8090), labeled "Distome, int., *Pomacanthus*

arcuatus. Black angel fish. Aq. Jany. 13, '17"; and 1 specimen, a toto mount stained with carmine (U.S.N.M. No. 8091), labeled "*Monostomum pomacanthi*, int., *Pomacanthus paru*. Aq. Ap. 18, '17." All of these specimens show evidence of having been flattened before fixation and certain details can not be made out. The measurements given in the following description are doubtless considerably in excess of what they would have been had a different technique been followed in the handling and preserving of the specimens.

PLEUROGONIUS POMACANTHI (MacCallum, 1916)

Synonym.—*Monostomum pomacanthi* MacCallum, 1916.

Specific description.—*Pleurogonius*: Body elongated, 3.5 to 6 mm. long by 1.25 to 2 mm. wide in the region of the ovary; anterior end bluntly pointed and posterior end rounded. A short distance caudad of the oral sucker, the ventral surface shows a deep depression over which project two shoulderlike structures, one on each side, which are not connected dorsally by a ridge as in *Pronocephalus* and related genera. The cuticle is smooth and without spines. The oral sucker is terminal, 153μ to 236μ in diameter; esophagus 310μ to 465μ long; intestinal ceca extend to posterior end of body, the posterior portions bending medially, passing between the testes, and provided with pocketlike diverticula throughout their entire length. The excretory pore is oval in outline and situated dorsally near the posterior end of the body, but owing to the extreme flattening of the specimens the remainder of the excretory system can not be made out. The genital pores are close together, 1.5 to 2.5 mm. from the anterior end, and situated near the margin on the left side of the body. The testes are ovoid, 524μ to 620μ long by 356μ to 387μ wide, with irregular outline, situated near the posterior end of the body and separated from each other by the terminal portions of the ceca. The cirrus pouch is from 0.93 to 1.5 mm. long by 155μ to 310μ wide and directed obliquely backward; it is strongly muscular and contains a well-developed prostate and a simple, unarmed cirrus. The seminal vesicle is strongly convoluted and lies free in the parenchyma at the base of the cirrus pouch. The ovary is more or less triangular in outline, 310μ to 520μ long by 232μ to 248μ wide, pretesticular, and situated to the right of the median line. The shell gland is about one-half the size of the ovary and lies in the median line caudad of the ovary. The vitellaria consist of ovoid follicles and are situated immediately anterior to the testes. (The masses which are shown in MacCallum's (1916) figure of this species, lying in the extreme posterior end and in the anterior half of the body, and described as vitelline follicles, are intestinal diverticula filled with ingesta.) The

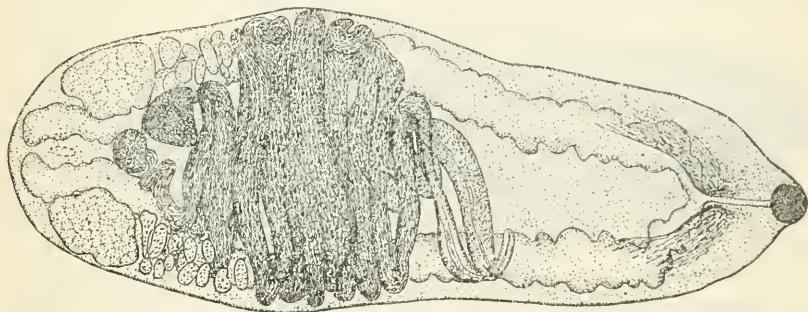
uterus runs anteriorly from the shell gland in more or less regular coils extending beyond the lateral limits of the ceca, and terminates in a well-developed metraterm which is about two-thirds as long as the cirrus pouch. The eggs are oval, 30μ long by 18μ wide, provided with a slender filament at each pole.

Hosts.—*Angelichthys ciliaris*, *A. isabelita*, *Pomacanthus arcuatus*, and *P. paru*.

Location.—Intestine.

Distribution.—United States (New York Aquarium).

In 1917 a peculiar species of trematode was described by MacCallum from the oviducts of *Trionyx aspidonectes ferox* to which the name *Paramphistomum aspidonectes* was given. Poche (1926) in discussing his supersuperfamily Paramphistomida writes that "in no case does this species belong to the genus *Paramphistomum* or to any of the other genera of Paramphistomida which are differ-



1mm.

FIGURE 1.—PLEUROGONIUS POMACANTHI (MACCALUM, 1916). VENTRAL VIEW

entiated at present." Fukui (1929) states: "The general anatomy is apparently that of an amphistome, as the author pointed out. But the situation of the genital pore is entirely different from that of all the other amphistomes, the arrangement of the vitellaria is peculiar and the position of the excretory pore is also remarkable. In general appearance this worm is somewhat like a distome stood on its head." Because of these characters which are so outstandingly different from all other amphistomes, he proposed a new genus, *Opisthoporus*, and family, Opisthoporidae, for this species, assuming, as he says: "that there are no mistakes in the original description."

The specimens of this species which are available for study consist of five specimens representing two different lots. The first consists of four specimens stained with carmine and mounted on a single slide (U.S.N.M. No. 8092) labeled "*Paramphistomum aspidonectes*, oviduct, *Aspidonectes ferox*. Soft-shelled turtle. Aq. May 10, '16."

and the second, one specimen, also a toto mount stained with carmine (U.S.N.M. No. 8093), labeled "*Paramphistomum aspidonectes* n. sp., int., *Trionyx spinifer*, soft-shelled turtle. First found May 10, '16. W. H., Aug. 16, '23." As in the case of *Pleurogonius pomacanthi*, the specimens have been flattened and are somewhat distorted, and some characters can not be made out with certainty.

OPISTHOPORUS ASPIDONECTES (MacCallum, 1917) Fukui, 1929¹

Synonym.—*Paramphistomum aspidonectes* MacCallum, 1917.

Specific description.—*Opisthoporus*: Body spindlelike in outline, more attenuated posteriorly than anteriorly, 2.4 to 3.2 mm. long by 620μ to 930μ wide at the equator. Cuticle smooth and without spines. Oral sucker subterminal, 310μ to 403μ in diameter. There is a low ridge or collar immediately posterior to the oral sucker which resembles that in the genus *Eucotyle*. This collar is indistinct in the speci-

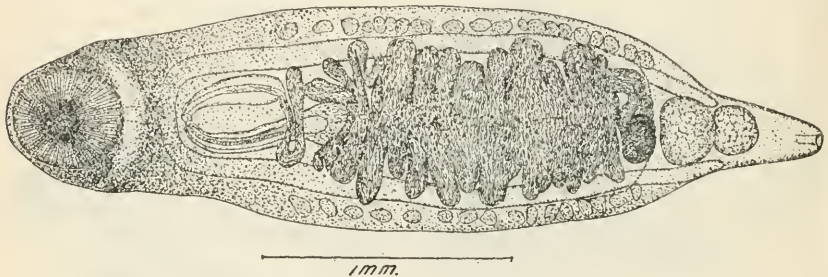


FIGURE 2.—OPISTHOPORUS ASPIDONECTES (MACCALLUM, 1917). VENTRAL VIEW

mens from *Aspidonectes ferox* but is quite evident in the specimen from *Trionyx spinifer*. There is no acetabulum. The esophagus is from 230μ to 310μ long; intestinal ceca simple and without diverticula, and terminating near the posterior edge of the anterior testis. The excretory pore is simple and terminal, but the details of the remainder of the excretory system can not be made out. The genital pore is situated in the median line at the bifurcation of the intestine. It is impossible to determine whether the male and female genital openings are separate or whether they open into a common sinus. The cirrus pouch is pestle-shaped, 685μ to 774μ long, strongly muscular, containing a well-developed prostate and a long cirrus armed with needlelike spines. The seminal vesicle is a convoluted dilation of the vas deferens and lies free in the parenchyma. The testes are

¹ While this paper was in course of publication a paper has appeared by Stunkard (Trans. Amer. Microsc. Soc., vol. 48, no. 3, 1930), in which a description of this species is given. Stunkard had access to an abundance of well-preserved material and his description of this form is, therefore, more complete than that given in this paper.

situated in the posterior end of the body and are unequal in size. The anterior testis is rounded, 248μ by 217μ ; the posterior testis is about 200μ in diameter and lies somewhat postero-dorsal of the anterior. Ovary round to oval, 125μ to 155μ in diameter, pretesticular, and situated to the right of the median line. The shell gland is about one-half the size of the ovary and is situated somewhat dorsal to it. The uterus runs anteriorly in irregular transverse coils and terminates in a metraterm which is about one-half the length of the cirrus pouch. The vitellaria are extracecal and composed of large, discrete, rounded follicles extending from the level of the posterior edge of the ovary to the level of the origin of the metraterm. Eggs oval, 23μ long by 13μ wide, provided with a long filament at each pole.

Hosts.—*Amyda ferox* and *A. spinifera*.²

Location.—Oviducts and intestine.

Distribution.—United States (New York, N. Y., and Woods Hole, Mass.).

From the above description the genus may be tentatively defined as follows:

Genus OPISTHOPORUS Fukui, 1929

Generic diagnosis.—Pronocephalidae: Body spindlelike in outline, more attenuated posteriorly than anteriorly; cuticle smooth and without spines; cephalic collar present. Oral sucker subterminal; esophagus simple; intestinal ceca without lateral diverticula. Genital pore median; cirrus pouch pestle-shaped, well developed; cirrus spiny; testes situated in posterior end of body with their fields coinciding and zones slightly overlapping, the posterior testis being slightly dorsal of anterior; ovary pretesticular, to right of median line; shell gland dorsal and slightly median of ovary; vitellaria extracecal, extending from ovary to level of origin of metraterm; egg with long filament at each pole. Parasitic in turtles.

Type species.—*Opisthoporus aspidonectes* (MacCallum, 1917) Fukui, 1929.

The genus *Opisthoporus* shows affinities with both the Notocotylidae and Pronocephalidae, but its resemblances to the latter group are greater than to the former. The position of the genital pore is suggestive of the Notocotylidae, but the presence of a cephalic collar and the pretesticular, dextral position of the ovary are characteristic of most members of the Pronocephalidae; *Opisthoporus* is therefore regarded as belonging to the latter family.

Up to the present time the following genera have been included in the family Pronocephalidae: *Pronocephalus* Looss, 1899; *Charaxi-*

²The writer is indebted to Miss Doris M. Cochran, of the U. S. National Museum, for the correct names of these hosts.

cephalus Looss, 1901; *Pleurogonius* Looss, 1901; *Oricocephalus* Looss, 1899; *Glyphicephalus* Looss, 1901; *Epibathra* Looss, 1902; *Pyelosomeum* Looss, 1899; *Desmogonius* Stephens, 1911; *Diaschistorchis* Johnston, 1913; *Wilderia* Pratt, 1914; *Synechorchis* Barker, 1922; *Hippocrepis* Travassos, 1923; and *Astororchis* Poche, 1926.

The genera *Diaschistorchis* Johnston, *Synechorchis* Barker, and *Wilderia* Pratt are so similar in shape and arrangement of the internal organs that *Synechorchis* and *Wilderia* should be considered as synonyms of *Diaschistorchis*, and *D. pandus* and *S. megas* apparently should be regarded as being specifically identical as well as congeneric. *Diaschistorchis ellipticus* (Pratt) differs from *D. pandus* in the absence of a cephalic collar and polar egg filaments, and for the present they may be considered as distinct species.

The genus *Hippocrepis* which was proposed by Travassos (1922) for *Monostoma hippocrepis* Diesing, a parasite of *Hydrochoerus capybara*, has been placed in the family Pronocephalidae by Poche (1926). From a study of the descriptions and figures of this species as given by Braun (1901) and Diesing (1855), it is the writer's opinion that the genus *Hippocrepis* should be retained in the family Notocotyliidae where it was placed originally by Travassos. *Hippocrepis hippocrepis* is characterized by the presence of two muscular flaplike lobes at the anterior end of the body, a pretesticular ovary, a preovarial shell gland, and a genital pore situated in the median line in the anterior part of the body. The cephalic lobes and pretesticular position of the ovary give this species a superficial resemblance to certain members of the Pronocephalidae. The structure of these lobes, however, according to the description of them as given by Braun (1901), does not appear to be comparable to that of the cephalic collar of members of the Pronocephalidae. The median position of the ovary and preovarial position of the shell gland are characteristic of all genera of Notocotyliidae, while in the genera of Pronocephalidae the ovary is situated to the right of the median line and the shell gland is either dorsal, median, or posterior to the ovary.³ The host relationship of *Hippocrepis*, although not necessarily a deciding factor, is in support of the opinion that this genus should be placed in the family Notocotyliidae, as all members of this family are parasitic in warm-blooded vertebrates while those of the Pronocephalidae are parasitic in cold-blooded vertebrates. Fuhrmann (1928) doubtfully places *Hippocrepis* in the subfamily Nudacotyliinae, but it seems to the writer that it should be placed in the subfamily Notocotyliinae on account of the position of the genital pore and the

³ Baylis (1928) described a species, *Notocotylus chionis*, in which he says that the shell gland lies behind the ovary. The body which he figures as being the shell gland may be this structure, but if so the postovarial position of the shell gland in a species of *Notocotylus* is unusual and a notable exception to the rule.

distribution of the uterine coils. In the genera of Nudacotylinæ the genital pore is postuterine and to the side of the median line, and the uterine coils extend a considerable distance beyond the lateral limits of the ceca, while in the Notocotylinæ the genital pore is preuterine and median in position, and the uterine coils are confined for the most part within the lateral limits of the ceca.

Monostomum sphargidis MacCallum, 1921, is considered a synonym of *Astrorchis renicapite* (Leidy). A comparison of specimens (U.S.N.M. No. 8094) of this species from the MacCallum collection with specimens from the Leidy collection shows no essential differences.

Linton (1910) described two trematodes, *Barisomum erubescens*, new genus and species, and *Himasomum candidulum*, new genus and species, which unquestionably belong to the Pronocephalidae. So far as it is possible to determine from the descriptions of these trematodes, there appears to be no justification for regarding these species as belonging to separate genera and *Himasomum* is considered a synonym of *Barisomum*, *H. candidulum* Linton, therefore, becoming *Barisomum candidulum* (Linton). The genus *Barisomum* is apparently closely related to *Glyphicephalus* Looss and *Epibathra* Looss, the principal difference between these genera being in their excretory systems. In *Barisomum* the limbs of the excretory vesicle unite at the anterior end of the body, in *Glyphicephalus* the limbs do not unite anteriorly, and in *Epibathra* the limbs do not unite but are connected by means of a number of transverse anastomoses. Whether the excretory system is a character of sufficient importance to justify the separation of these otherwise identical genera is a matter of personal opinion. Further investigation is necessary before this point can be definitely settled and for the present these genera may be regarded as valid.

In considering the classification of this family certain difficulties arise in regard to the validity of the name Pronocephalidae. Looss (1899) proposed the subfamily Pronocephalinae, but he designated no type genus, although he apparently intended the genus *Pronocephalus* as such, since he bases the name on it and gives the diagnosis of this genus immediately following the subfamily diagnosis. In 1902, he elevated this subfamily to the rank of family and designated *Glyphicephalus* as type genus. This is in violation of article 4 of the International Rules of Zoological Nomenclature which says: "The name of a family is formed by adding the ending *idae*, the name of a subfamily by adding *inae*, to the stem of the name of its type genus." Two solutions of this problem, therefore, appear possible: (1) *Pronocephalus* is intended as type genus of the subfamily Pronocephalinae and the elevation of this subfamily to the rank of family retains *Pronocephalus* as type in spite of the later designation

of *Glyphicephalus* as type, or (2), the name Pronocephalidae is invalidated by the designation of *Glyphicephalus* as type and a new family name must be proposed. *Pronocephalus*, unfortunately, is one of the least typical of the genera of this group, but in view of the fact that the adoption of the second alternative would introduce a new and unfamiliar name for one which has been in use for almost 30 years and would serve no useful purpose, it is the writer's opinion that the family Pronocephalidae should be retained in spite of its atypical type genus.

The genera assigned to the family Pronocephalidae appear to fall into three distinct groups which are regarded as constituting subfamilies and the following classification is, therefore, proposed with keys as formulated here for the separation of the genera:

Family PRONOCEPHALIDAE Looss, 1902

Synonym.—Opisthoporidae Fukui, 1929.

Family diagnosis.—Elongated monostomes, more or less deeply concave ventrally and convex dorsally; anterior end usually provided with a collarlike enlargement; posterior end either rounded or truncate, or provided with two papillalike processes. Oral sucker simple, terminal, or subterminal; intestinal ceca simple or provided with diverticula, and extending to posterior end of body. Excretory pore dorsal, near posterior end of body; excretory vesicle Y-shaped, the stem extending to the shell-gland complex and the limbs extending to the anterior end of body. Genital pore in the anterior half of the body, usually to the left of the median line. Cirrus pouch well developed, containing cirrus, ductus ejaculatorius, and pars prostatica; seminal vesicle convoluted and lying free in parenchyma; testes usually postovarial, entire or divided into follicles, zones coinciding or overlapping, and fields usually separate. Ovary pretesticular or posttesticular, to the right of median line; shell-gland complex median, postovarial; Laurer's canal present; receptaculum seminis absent; vitellaria moderately developed, extracecal, in posterior half of body; uterus consisting of regular transverse coils terminating in well-developed metraterm; eggs relatively small, numerous, usually provided with polar filaments. Parasites of cold-blooded vertebrates.

Type genus.—*Pronocephalus* Looss, 1899.

KEY TO THE SUBFAMILIES OF PRONOCEPHALIDAE

1. Testes postovarial and tandem in position; genital pore in median line.

Opisthoporinae.

Testes preovarial or postovarial, lateral and opposite in position; genital pore to left of median line.....2.
2. Testes preovarial..... **Charaxicephalinae.**

Testes postovarial..... **Pronocephalinae.**

Subfamily PRONOCEPHALINÆ LOOSS, 1899

Subfamily diagnosis.—Pronocephalidae: Cephalic collar present. Genital pore to left of median line. Testes postovarial, zones coinciding or overlapping, fields separate or touching. Parasites of marine turtles and fishes.

Type genus.—*Pronocephalus* Looss, 1899.

KEY TO THE GENERA OF THE SUBFAMILY PRONOCEPHALINÆ

1. Testes intercecal, situated obliquely to long axis of body.

Pronocephalus Looss, 1899.

 Testes largely extracecal, situated opposite each other.....2.
2. Testes divided into several distinct follicles...Diaschistorchis Johnston, 1913.
 Testes not divided into follicles.
3. Posterior end of body more or less truncate and bearing two small, conical, lobe-like projections.....Cricocephalus Looss, 1899.
 Posterior end of body rounded and without lobelike projections.....4.
4. Subventral lobes of cephalic collar not connected by a dorsal ridge.

Pleurogonius Looss, 1901.

 Subventral lobes of cephalic collar connected by a dorsal ridge.....5.
5. Ventral surface of body provided with longitudinal rows of glands.

Adenogaster Looss, 1901.

 Ventral surface not provided with glands as above.....6.
6. Testes deeply lobed; cirrus pouch short and hardly extending medially beyond inner limit of left cecum; ceca in wide serpentine undulations.....7.
 Testes smooth or slightly indented but not deeply lobed; cirrus pouch long and extending to median line; ceca not as above.....8.
7. Body strongly concave ventrally, wider posteriorly than anteriorly; ceca pass between testes.....Pyelosomum Looss, 1899.
 Body not strongly concave ventrally, sides of body almost parallel; ceca pass dorsad of testes.....Astorchis Poche, 1926.
8. Limbs of excretory vesicle unite near anterior end of body.

Barisomum Linton, 1910.

 Limbs of excretory vesicle do not unite anteriorly.....9.
9. Limbs of excretory vesicle connected by transverse anastomoses.

Epibathra Looss, 1902.

 Limbs of excretory vesicle not connected by anastomoses.

Glyphicephalus Looss, 1901.

CHARAXICEPHALINÆ, new subfamily

Subfamily diagnosis.—Pronocephalidae: Cephalic collar present or absent. Posterior end of body provided with two conical projections. Genital pore to left of median line. Testes preovarial, consisting of two rows of follicles, either intercecal or extracecal. Parasites of marine turtles.

Type genus.—*Charaxicephalus* Looss, 1901.

KEY TO THE GENERA OF THE SUBFAMILY CHARAXICEPHALINÆ

- Cephalic collar present; testes intercecal.....Charaxicephalus Looss, 1901.
 Cephalic collar absent; testes extracecal.....Desmogonius Stephens, 1911.

OPISTHOPORINAE, new subfamily

Subfamily diagnosis.—Pronocephalidae: Body spindle-shaped in outline. Oral sucker subterminal. Cephalic collar present. Genital pore median. Testes with zones slightly overlapping and fields coinciding. Parasites of soft-shelled turtles.

Type genus.—*Opisthoporus* Fukui, 1929.

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