

# A NEW GENUS OF TREMATODES FROM THE WHITE BASS.

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## INTRODUCTION.

During the summer of 1919, the writer was engaged in investigations for the United States Bureau of Fisheries upon worm parasites in fishes of the Mississippi River and some of its tributary streams and lakes. Collections were made in Iowa, Illinois, and Minnesota. In the course of this work some unusual trematodes were encountered in the digestive tract of the white bass, *Roccus chrysope* (Rafinesque). These, in some superficial respects, resemble members of the genus *Acanthochoasmus* of Looss, but the internal organization differs so pronouncedly from that of any recognized species of *Acanthochoasmus* that it becomes necessary to erect a new genus for which the name *Allacanthochoasmus* is proposed.

Looss (1899:579) has aptly shown that superficial resemblances are not sound criteria for the determination of phylogenetic relationships between trematode genera when he pointed out the essential differences between the two genera *Acanthochoasmus* and *Stephanochoasmus*. In like manner he called attention to the fundamental differences which exist between these two genera and the genus *Echinostomum* even though all three of these genera display a pronounced crown of oral spines. The presence of conspicuous spines around the oral orifice, though a conspicuous character, is in itself of little or no phylogenetic significance. Accepting this same fundamental hypothesis, Odhner (1911:522) has maintained that the two genera *Caecincola* and *Cryptogonimus* are closely related to the genus *Acanthochoasmus* in spite of the fact that in them oral spines are lacking. On the other hand, in comparing the trematodes from the white bass with others having the oral crown of spines, unique conditions in the relative position of testes, ovary, and uterus and numerous other differences of fundamental importance are encountered.

This paper forms one of the contributions from the United States Bureau of Fisheries Biological Station, Fairport, Iowa, and from the Zoological Laboratory of the University of Illinois, No. 194.

## MATERIALS.

The materials upon which this study was carried on were taken from various locations in the area under consideration. Individuals were first encountered in the intestine of *Roccus chrysops* at New Boston, Illinois, June 30, 1919. By far the greatest part of the collecting was done during July and August on Lake Pepin at Lake City, Minnesota. A few specimens of the host from Lake Pokegama at Pine City, Minnesota, were also examined and found to be infested with this parasite. A single individual of the white bass taken from the Mississippi River at Fairport, Iowa, bore a moderate infestation of *Allacanthochoasmus*. A considerable number of prepared whole mounts of these trematodes were very kindly turned over to the writer by Prof. A. S. Pearse who collected the specimens in the course of his investigations at Lake City, Minnesota, during the summer of 1920. From one host individual of this collection a number of liver cysts contained egg-bearing trematodes of the same species as those encountered in the intestine of the same host. The writer is unable to determine how these individuals reached this unusual place.

In September, 1913, the writer made rather extensive collections of fish parasites at Sandusky, Ohio. Subsequently only a portion of the material of this collection was worked over and the species determined. Recent examination of some of the previously undetermined trematodes from *Roccus chrysops* has revealed the fact that they are of the same species discovered in the white bass of the Mississippi Basin. It would thus seem that the geographical distribution of this trematode is probably coincident with that of its host or at least the parasite occurs through much of its range.

Members of the genus *Allacanthochoasmus* seem to be remarkably adapted to their host for infestation is apparently specific. Of the hundreds of fishes examined, representing all of the usual species in the regions investigated, not a single specimen of *Allacanthochoasmus* was encountered in any host other than *Roccus chrysops*. Every specimen of the white bass examined carried an infestation and in many instances the parasite was present in large numbers. The worms of this species are very minute and apt to escape observation even though they may be present in great numbers, for they become obscured in the intestinal material.

Mature individuals show extreme variability in size. The differences are so marked that one might feel inclined to consider the largest and the smallest as specifically distinct were it not for the fact that these extremes are united by a series of fine gradations.

In spite of the fact that body musculature is not excessively developed, these worms both in the living and the preserved condition display the results of unusual powers of general and localized con-

traction. As a result, not only body length and diameter show extreme variability but the relative position of internal organs and superficial structures display just as surprising instability. The series of drawings in figure 1, A to G, well illustrate the characteristic differences in body size and shape and also show individual peculiarities in the relative position of the acetabulum and in the arrangement of the testes. Diagnosis of genus and of species are rendered extremely difficult because of the instability of so many characters in these worms. In the following description of the genus it is entirely possible that some of the characters cited as of generic significance may prove to be of only specific value. The description of any monotypic genus is usually subject to emendation upon the discovery of additional species.

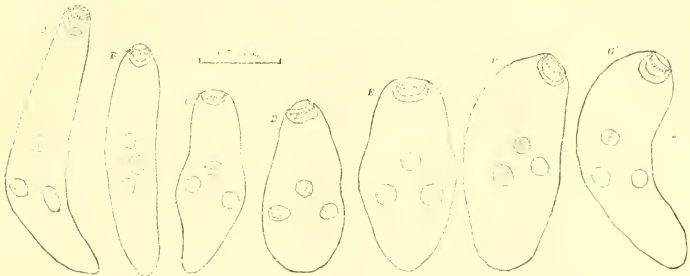


FIG. 1.—SERIES OF OUTLINE DRAWINGS, ALL TO SAME SCALE, SHOWING RELATIVE SIZE AND BODY FORM OF INDIVIDUALS OF *ALLACANTHOCHASMUS VARIUS*. RELATIVE POSITION OF ACETABULUM AND TWO TESTES SHOWN IN EACH DRAWING.

#### *ALLACANTHOCHASMUS*, new genus.

*Diagnosis.*—Small distomid trematodes living in the digestive tract of fresh-water fishes. Body highly variable in form. Oral sucker prominent, surrounded by a single complete circle of spines; the entire oral region strongly resembling that of the genus *Acanthochasmus* Looss. Entire body surface covered with minute, closely applied cuticular spines. Acetabulum in fully extended or completely contracted individuals almost in center of ventral surface. Genital orifice anterior to acetabulum (fig. 2.) Prepharynx and esophagus lacking. Vitellaria along lateral margins of body anterior to testes and grouped around intestinal crura, variable in extent of distribution. Testes almost lateral in some contracted specimens, more frequently obliquely situated in the body and in some instances almost one directly behind the other. Ovary lobed, occupying practically the entire width of body anterior to the testes and posterior to the acetabulum.

*Type species.*—*Allacanthochasmus varius*, new species.

**ALLACANTHOCHASMUS VARIUS**, new species.

Plate 1 and text figures 1 and 2.

Diagnosis.—With the characters of the genus. Body length of mature worms variable from 0.58 to 2.4 mm. Relation of body length to diameter subject to great range due to states of contraction. Diam-

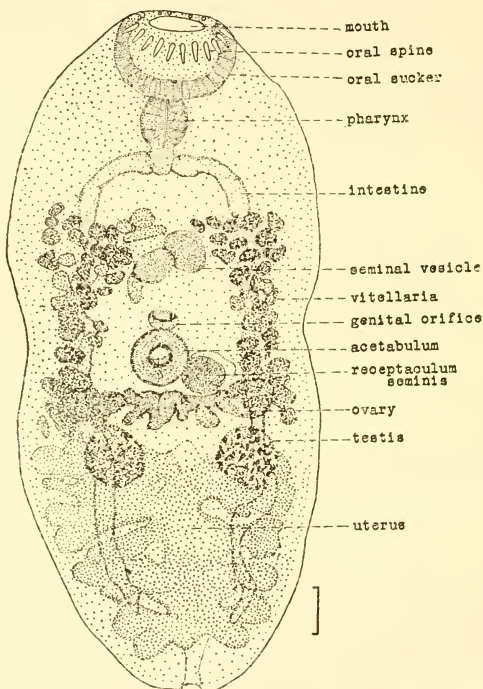


FIG. 2.—DETAILS OF STRUCTURE OF *ALLACANTHOCHASMUS VARIUS*. THE UTERUS IS COMPLETELY FILLED WITH EGGS, BUT FOR CONVENIENCE IN THIS DRAWING IS SHOWN IN FLAT STIPPLING. VITELLARIA OF DORSAL INTERCECAL REGION HAVE BEEN OMITTED, AS HAVE ALSO THE CUTICULAR SPINES. THE SCALE ACCOMPANYING THIS DRAWING HAS THE RELATIVE VALUE OF 0.1 MM.

eter of crown of spines around mouth about 0.18 to 0.25 mm. Individual spines of oral circle usually about  $41\mu$  long though they frequently range from 35 to  $53\mu$ . Usually 24 spines in the oral circle though in some instances a smaller number has been observed and in one individual 28 were present. Oral sucker 0.150 to 0.240 mm. across at widest part. Pharynx located directly posterior to oral sucker and at its posterior margin giving rise to the bifurcated intes-

tine the crura of which extend posteriorly to within a short distance from the posterior extremity of the body. Ovary a lobed band across the body posterior to the acetabulum and laterally reaching a position slightly beyond the intestinal crura. Testes rounded or slightly elongated, from 80 to 150 $\mu$  in diameter. Vitellaria surrounding the intestine and extending forward from the ovary to a short distance posterior to the pharynx; on dorsal surface scattered over entire intercecal field. Receptaculum seminis located laterally between the acetabulum and the ovary. Seminal vesicle a coiled tube near the median plane about midway between the acetabulum and the pharynx. Uterus heavily massed in posterior region of body and extending forward to the anterior margin of the testes, filled with eggs about 18 $\mu$  in diameter. Development unknown.

*Type host.*—*Roccus chrysops* (Rafinesque) from Mississippi River and tributary lakes, also from same host at Sandusky, Ohio.

*Type.*—Cat. No. 7634, U.S.M.M.; *paratypes* Cat. No. 7635, U.S.N.M. and in the collection of the writer at Urbana, Illinois.

*Variability.*—Within this species variations in shape and size are so pronounced that it becomes difficult to appreciate the fact that in other trematodes size and general body form must be relatively more stable. Investigators have frequently based contentions for specific distinctions upon characters which observations of living specimens have demonstrated to be very highly modifiable in the individuals of *A. varius*. In this species contraction and extension of different parts of the body seem to be subject to distinctly localized control, for almost any part of the body may be in a state of contraction or of extension regardless of the state of its adjoining parts. The results of such uncorrelated actions of the body are shown in the typical instances given in figure 1 (A to G). In the varying states of contraction of the individual there is usually a slight constriction of the lateral margins in the region of the acetabulum and genital orifice, but in fully extended individuals this constriction is less marked.

The influence of contraction of the body seems to be manifest even in the arrangement of some of the internal organs. The testes in a contracted specimen lie almost purely lateral in position (fig. 1, D and E). In slightly less contracted individuals they lie obliquely in the body (A and C) and in some extreme instances (B) one is almost directly posterior to the other. The possibility of the mechanical pressure of the gravid uterus crowding the testes into the lateral position might be suggested. In a number of instances immature individuals in which no eggs were yet accumulated in the uterus (pl. 1, fig. 6) shows the testes in distinctly lateral position.

The entire oral region is conspicuously modifiable even in the same individual. Figures 3, 4, and 5 show some of the typical views of this

region. In figure 5 the anterior extremity is distinctly truncated with the oral spines arranged about the margin of a flattened area which in its center bears the mouth opening. A rather unusual condition is shown in figure 4. Naturally the oral sucker in its functional operations undergoes conspicuous movements through the operation of its powerful muscles. As a result the sucker may be either broad and shallow or narrow and deep with all intermediate stages between the two conditions. Some of these stages are shown in text figure 1.

Surface structures such as the acetabulum and the genital orifice are also subject to considerable modifiability in relative positions as well as general form. While the acetabulum is usually circular in outline it is distinctly elongated in the transverse axis in many preserved specimens. The position of the genital orifice with reference to the acetabulum is subject to some variability which is probably directly correlated with the muscular state of the immediately surrounding region of the body wall. In some individuals the crescentic elevation which bears the genital orifice is directly in contact with the anterior margin of the acetabulum, but still others show these two structures separated by a distance as great as the diameter of the prominence which bears the orifice. That these differences are not due to the mobility of the acetabulum alone is evidenced by the fact that separation of the two structures is just as frequently encountered in specimens which have an acetabulum perfectly circular in outline as in those with an elongated lateral axis.

*Relationships.*—Odhner (1911:522) has maintained that certain genera of trematodes which lack oral spines despite that lack still must belong to the same family as Looss's genus *Acanthochasmus*. *Caecincola* and *Cryptogonimus*, two genera from fresh-water fishes of North America, are cited in his discussion of this interrelationship. The genus *Allacanthochasmus* in its fundamental organization rather closely approaches the conditions found in Osborn's genus *Cryptogonimus*. It seems possible, then, that the genus *Allacanthochasmus* provides an additional link in the chain of relationships so strongly maintained by Odhner. A few specimens of *Caecincola* were encountered as a simultaneous infestation with *Allacanthochasmus* in the white bass. In these few individuals the extreme development of the uterus prevented thorough study of the internal organization, but all available evidence corroborates the identification of the species as *Caecincola parvulus* Marshall and Gilbert.

Linton (1898:535) described *Distomum tenue* from the rectum of the striped bass (*Roccus lineatus*) at Woods Hole, Massachusetts. In some respects *Allacanthochasmus varius* simulates the conditions in *D. tenue*, but upon close observation it is readily seen that in

arrangement of the oral spines, location of the reproductive organs, location of the uterus, size of eggs, relative size of the acetabulum, and in many other features the two organisms differ so extremely they could not be included within the same genus. The superficial resemblances between these two trematodes is of especial interest because their respective hosts are members of the genus *Roccus*.

Forbes and Richardson (1908:320) have referred to the similarity in "range, local preferences, feeding habits, and food" of *Roccus chrysops* and *Morone interrupta*. Since *Morone interrupta* (yellow bass) is the only close relative of *R. chrysops* in the region under investigation, the writer endeavored to ascertain if this relationship was in any manner reflected in the parasitic fauna of the two species. Not a single specimen of *Allacanthochoasmus varius* was encountered in *M. interrupta* even in regions where *R. chrysops* was heavily and generally infested by this trematode. The only trematodes encountered in *M. interrupta* belong to an unidentified species, probably of the genus *Allocreadium*, though the cuticula is provided with minute spines. This form was entirely wanting in *R. chrysops*. Regardless of their close phylogenetic and ecological relationships these two species of fish display marked diversity in their respective trematode faunas.

#### SUMMARY.

1. *Allacanthochoasmus varius*, a new genus and species of trematodes, is described.

2. This parasite occurs in the intestine of the white bass (*Roccus chrysops*) of the Mississippi River and some of its tributaries and from the same host at Sandusky, Ohio. No other host has been encountered.

3. Individuals of this species are subject to pronounced variability in form and in relative position of various structures.

4. The trematode fauna of *Morone interrupta*, a near relative of *Roccus chrysops*, is entirely distinct from that of *R. chrysops*.

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## EXPLANATION OF PLATE.

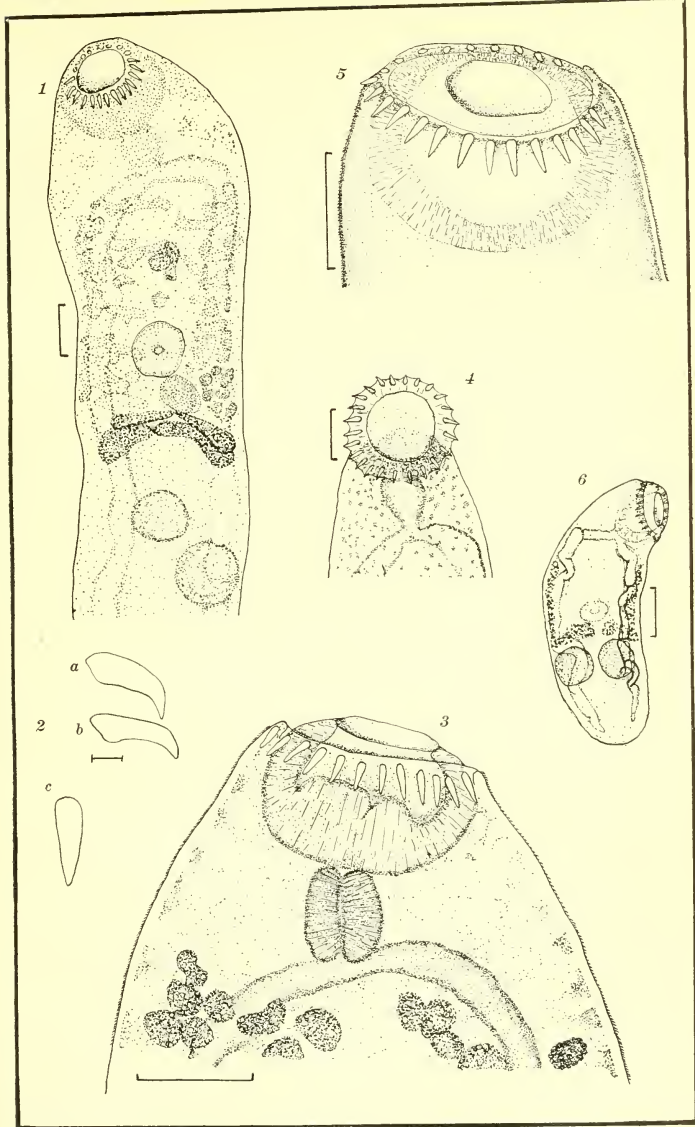
*Allacanthochasmus varius*, new species.

A camera lucida was employed in making all drawings. The scale accompanying the drawings in every instance has the relative value of 0.1 mm. All drawings from stained toto-mounts in balsam.

FIG. 1. Anterior portion of a specimen viewed from ventral surface.

2. *a* and *b*, lateral views of spines from oral circle. *c*, ventral view of a single spine.
3. Detailed study of oral region.
4. Oral crown fully extended and sharply marked off from remainder of body.
5. Oral region of greatly elongated specimen.
6. A very young specimen showing lateral position of testes before the uterus contains any eggs.





ALLACANTHOCHASMUS VARIUS, NEW SPECIES.

FOR EXPLANATION OF PLATE SEE PAGE 8.

