# Parasitic Endohelminths from Fishes of Southern Indiana

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## Introduction

There are numerous surveys of the parasites of freshwater fishes; however, there is still little information available on the parasites of fishes from certain areas. One such area is Indiana. The most extensive listing of parasites of Indiana fishes occurs in Dolley's 1933 article on the biology of the St. Joseph River. He reported 10 parasites of which only three were identified to species. A list of fish parasites reported from Indiana fishes by Dolley (7) and other authors is given in Table 1. The present study provides additional information on the parasites of fishes from this poorly studied area.

TABLE 1. Helminths known from Indiana, their piscine hosts, sites of infection, counties where collected, and bibliographic references.

| Helminth | Host | Site | County | Ref. |
|---|---|---|---|---|
| Monogenea | | | | |
| *Gyrodactylus bairdi* Woods & Mizelle, 1957 | *Cottus bairdi* | gl | St. Joseph | 18 |
| *Gyrodactylus limi* Woods & Mizelle, 1957 | *Umbra limi* | " | " | 14,18 |
| Digenea | | | | |
| *Azygia* sp. | *Amia calva* | st | " | 7 |
| *Azygia acuminata* Goldberger, 1911 | " | " | ? (Lost Lake) | 10 |
| *Azygia bulbosa* Goldberger, 1911 | " | " | Marshall | 10 |
| *Clinostomum complanatum* (Rudolphi, 1819) | *Umbra limi* | bs | St. Joseph | 14 |
| *Cyathocotyloides* sp. | *Ictalurus punctatus* | in | Tippecanoe | 10 |
| *Hassallius hassalli* Goldberger, 1911 | *Ambloplites rupestris* | st | Marshall | 10 |
| *Holostephanus ictaluri* Vernberg, 1952 | *Ictalurus punctatus* | in | Tippecanoe | 17 |
| Holostomid cyst | *Micropterus dolomieu* | fl | St. Joseph | 7 |

TABLE 1.—Continued

| Helminth | Host | Site | County | Ref. |
|---|---|---|---|---|
| *Leuceruthrus micropteri* Marshall and Gilbert, 1905 | *Amia calva* | st | Marshall | 10 |
| | *Micropterus dolomieu* | " | " | " |
| | *Micropterus salmoides* | " | " | " |
| *Microphallus opacus* (Ward, 1894) | *Amia calva* | in,st | St. Joseph | 7 |
| *Neascus* sp. | *Ambloplites rupestris* | vs | " | " |
| | *Chaenobrittus gulosus* | " | " | " |
| *Neochasmus umbellus* Van Cleave & Mueller, 1932 | *Morone mississippiensis* | ? | Gibson and Monroe | 12 |
| *Phyllodistomum brevicecum* Steen, 1938 | *Umbra limi* | ub | Tippecanoe | 15 |
| | " | " | St. Joseph | 14 |
| *Phyllodistomum undulans* Steen, 1938 | *Cottus bairdi* | " | Tippecanoe | 15 |
| *Pristotrema manteri* Cable, 1952 | *Scaphirhynchus platorhynchus* | in | " | 4 |
| *Prohemistomum chandleri* Vernberg, 1952 | *Micropterus dolomieu* | vs | " | 17 |
| | *Micropterus salmoides* | " | " | " |
| Cestoda | | | | |
| Cestodarian | *Catostomus commersoni* | in | St. Joseph | 7 |
| | *Cyprinus carpio* | lv,st | " | " |
| *Glaridacris catostomi* Cooper, 1920 | *Catostomus commersoni* | in | " | " |
| *Proteocephalus* sp. | *Esox lucius* | in | " | " |
| *Proteocephalus ambloplites* (Leidy, 1887) | *Morone mississippiensis* | ? | Gibson and Monroe | 12 |
| *Trianophorus* sp. | *Perca flavescens* | lv | St. Joseph | 7 |
| Acanthocephala | | | | |
| *Pomphorhynchus bulbocolli* Linkins in Van Cleave, 1919 | *Ameirus melas* | st | St. Joseph | " |
| | *Catostomus commersoni* | in | " | " |
| | *Cyprinus carpio* | vs | " | " |
| Nematoda | | | | |
| Nematode | *Ambloplites rupestris* | in | " | " |
| *Philometra* sp. | *Morone mississippiensis* | ? | Gibson and Monroe | 12 |

bs = body surface, fl = flesh, gl = gills, in = intestine, lv = liver, st = stomach, ub = urinary bladder, and vs = viscera.

## Materials and Methods

From the fall of 1976 through the spring of 1978 fishes were collected from small streams of Vanderburgh and Posey Counties, Indiana, and examined for endohelminths. Fishes were collected by seining and maintained alive or kept on ice until necropsied, usually within 24 hours of capture. The parasites were fixed in AFA, stained with Mayer's carmalum, and mounted in Canada balsam. Nematodes were fixed in acetic acid or hot 70% ethanol and examined as temporary mounts in lactophenol. Representative specimens have been deposited in the University of Nebraska State Museum, Harold W. Manter Laboratory (HWML), Lincoln, Nebraska.

## Results and Discussion

A total of 386 fish representing 10 families and 25 species were examined for parasites. Of the total number of fishes examined 215 (56%) were found to be infected. Helminths were found in all species except *Aphredoderus sayanus* (8 specimens examined). Seventeen species of helminths were collected—3 digeneans, 5 cestodes, 5 nematodes, and 4 acanthocephalans—none of which have been previously reported from Indiana. A listing of these helminths and their hosts is given in Table 2.

TABLE 2. Prevalence and intesity of endohelminths collected in Posey and Vanderburgh Counties, Indiana, 1976-1978.

| Helminth | Host | HWML No. | Preval. | Inten. | County |
|---|---|---|---|---|---|
| Digenea | | | | | |
| *Allocreadium lobatum* Wallin, 1906 | Semotilus atromaculatus | — | 5/64 | 1-2 | V. |
| *Alloglossidium corti* (Lamont, 1921) | *Ictalurus natalis* | 21464 | 1/8 | 1 | V. |
| *Pisciamphistoma stunkardi* (Holl, 1929) | *Lepomis cyanellus* | 21465 | 1/47 | 1 | V. |
| Cestoda | | | | | |
| *Biacetabulum biloculoides* Mackiewicz & McRae, 1962 | **Carpiodes velifer* | 21469 | 2/3 | 1,3 | P. |
| *Bothriocephalus formosus* | **Fundulus notatus* | — | 4/26 | 1 | P. |
| Mueller & Van Cleave, 1932 | **Lepomis cyanellus* | — | 1/47 | 1 | P. |
| | *Notropus umbratilus | — | 3/22 | 1-4 | P. |
| | **Phenacobius mirabilis* | — | 1/3 | 1 | P. |
| | **Pimephales notatus* | 21487 | 10/31 | 1 | P. |
| *Corallobothrium fimbriatum* Essex, 1927 | *Ictalurus melas* | 21466 | 1/6 | 1 | P. |
| *Megathylacoides intermedia* (Fritts, 1959) | *Ictalurus nebulosus* | 21468 | 2/8 | 1,5 | V. |
| *Proteocephalus pinguis* LaRue, 1911 | *Esox americanus* | 21467 | 1/8 | 1 | P. |
| Nematoda | | | | | |
| *Camallanus ancylodirus* | **Lepomis cyanellus* | 21474 | 2/47 | 1 | P. |
| Ward & Magath, 1916 | **Lepomis macrochirus* | 21475 | 1/34 | 1 | V. |
| *Camallanus multilineatus* Kung, 1948 | **Carpiodes velifer* | 21470 | 1/3 | 1 | P. |
| *Dichelyne* sp. | *Ictalurus natalis* | — | 1/8 | 1 | V. |
| | *Lepomis cyanellus* | 21473 | 1/47 | 1 | V. |
| *Philometra nodulosa* + Thomas, 1929 | *Carpiodes velifer* | 21471 | 1/3 | 1 | P. |
| *Spinitectus micracanthus* Christian, 1972 | *Lepomis macrochirus* | 21472 | 3/34 | 1-4 | P.,V. |
| Acanthocephala | | | | | |
| *Acanthocephalus dirus* | *Aplodinotus grunniens* | 22855 | 2/2 | 2,6 | P.,V. |
| (Van Cleave, 1931) | *Campostoma anomalum* | 22853, 22854 | 5/12 | 1-9 | P.,V. |
| | **Carpiodes velifer* | 22847 | 3/3 | 1-22 | P. |
| | *Cyprinus carpio* | 22859 | 1/2 | 18 | V. |
| | **Ericymba buccata* | 22848 | 15/29 | 1-44 | P.,V. |
| | *Esox americanus* | 22846 | 3/8 | 1-4 | P.,V. |
| | **Etheostoma squamiceps* | 22843 | 9/9 | 2-28 | V. |
| | **Fundulus notatus* | 22845 | 19/26 | 1-9 | P.,V. |
| | *Ictalurus melas* | — | 2/6 | 2,42 | P.,V. |
| | *Lepomis cyanellus* | 22838, 22861 | 30/47 | 1-15 | P.,V. |
| | *Lepomis macrochirus* | 22851 | 10/34 | 1-15 | P.,V. |
| | *Lepomis megalotis* | 22842 | 7/12 | 1-123 | P.,V. |
| | *Micropterus salmoides* | 22844, 22852 | 3/3 | 2-15 | P.,V. |
| | *Notemigonus crysoleucas* | 22856 | 1/14 | 1 | V. |
| | **Notropus atherinoides* | 22857 | 3/10 | 1-4 | P.,V. |
| | *Notropus spilopterus* | 22860 | 7/12 | 1-13 | P.,V. |
| | *Notropus umbratilis* | 22849 | 13/22 | 1-11 | P. |
| | **Phenacobius mirabilis* | 22839, 22840 | 3/3 | 1-4 | P.,V. |
| | *Pimephales notatus* | 22858 | 15/31 | 1-23 | P. |
| | **Pomoxis annularis* | — | 1/13 | 15 | V. |
| | *Semotilus atromaculatus* | 22841 | 54/64 | 1-50 | P.,V. |
| *Gracilisentis gracilisentis* (Van Cleave, 1913) | *Dorosoma cepedianum* | — | 2/6 | 5/7 | P. |
| *Neoechinorhynchus cylindratus* (Van Cleave, 1913) | *Micropterus salmoides* | 22837 | 1/3 | 1 | V. |

TABLE 2.—Continued

| Helminth | Host | HWML No. | Preval. | Inten. | County |
|---|---|---|---|---|---|
| *Neoechinorhynchus cylindratus* (Van Cleave, 1913) | *Micropterus salmoides* | 22837 | 1/3 | 1 | V. |
| *Neoechinorhynchus notemigoni* Dechtiar, 1967 | *Notemigonus crysoleucas* | 22850 | 1/4 | 3 | V. |
| *Pomphorhynchus rocci* Cordonnier & Ward, 1967 | *Aplodinotus grunniens* | 21476 | 1/1 | 1 | P. |
| | | 21477 | 1/1 | 1 | V. |

* = new host record, + = occurred in cheek galleries, P. = Posey County, and V. = Vanderburgh County

*Acanthocephalus dirus* (Van Cleave, 1931) was the most frequently found parasite, occurring in 21 species (8 families). Heavy fish predation on isopods may account for the prevalence of this parasite. Isopods, many of which were found to be infected with *A. dirus*, occurred in large numbers in most of the areas where fish were collected and were commonly found in the intestines of the fish examined. Because of the advanced state of maturity of *A. dirus* cystacanths, it is often difficult to distinguish definite hosts from accidental hosts. However, in the present collection gravid worms occurred in all 21 species of fish.

Amin (1) analyzed species of the genus *Acanthocephalus* occurring in fishes of North America. He concluded that *A. jacksoni* Bullock, 1962 and *A. parksidei* Amin, 1975 represent geographic variants of *A. dirus*. He noted marked variation between northern and southern populations. The number of proboscus hooks per longitudinal row was one of the more prominent differences. Specimen from the present collection represent a deme situated between the populations examined by Amin (1). A wide range of variation, especially regarding proboscus armature, was observed within this collection.

Three specimens of *Neoechinorhynchus notemigoni* Dechtiar, 1967 were recovered from one *Notemigonus crysoleucas*. This species was described from Lake Ontario, Canada (6). In 1983 Buckner (3) reported it from *N. crysoleucas* of Alabama and Mississippi. This is the third report of *Neoechinorhynchus notemigoni*. These specimens are in agreement with those reported by Buckner (3).

*Bothriocephalus formosus* Mueller and Van Cleave, 1932 occurred in five species but was more prevalent in *Pimephales notatus*. Specimens from the present collection agree with the original description except in number of testes and lengths of scolices. These specimens possess 50 to 70 testes and scolices up to 600 mm long whereas Mueller and Van Cleave (13) reported 30 to 45 testes and scolices up to 475 mm long.

A procedure for discrimination between *Pomphorhynchus bulbocolli* Linkins in Van Cleave, 1919 and *P. rocci* Cordonnier and Ward, 1967 was provided by Huffman and Nickol (11) and refined by Gleason and Huffman (9). Specimens of *P. rocci* were identified from two *Aplodinotus grunniens* according to the procedure outlined by these authors. Lengths of proboscis hooks in the 60 to 80% position region ranged from 46 to 62 um (54) and the ratio of anterior hook lengths to most massive hook lengths ranged from 0.81 to 1.00. Specimens were sent to Dr. Brent Nickol, the University of Nebraska-Lincoln, for verification. He concurred with the identification, as determined by the above procedure. This is the first identification of *P. rocci* from a freshwater fish collected in a non-coastal habitat.

*Megathylacoides intermedia* (Fritts, 1959) Befus and Freeman, 1973 was identified from two *Ictalurus nebulosus*. This cestode was originally described from *I.*

*nebulosus* of Idaho by Fritts (8) as *Corallotaenia intermedia.* This is the first report of this species east of the Mississippi River.

*Camallanus ancylodirus* Ward and Magath, 1916 was collected from two species of centrarchids, *Lepomis cynallus* and *L. macrochirus.* These occurrences may be accidental since, with the exception of a report in *Stizostedion vitreum* by Sutherland and Holloway (16), *C. ancylodirus* is known only from catostomids (2).

Immature *C. multilineatus* Kung, 1948 was collected from *Carpiodes velifer.* This nematode is previously known only from its original description from a North American frog that died in a London zoo.

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