# NEW PARASITE RECORDS FOR LAKE ERIE FISH

Great Lakes Fishery Commission

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by

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## ABSTRACT

During 1961-1969 inclusive, 1,112 fish representing 46 species, were examined for parasites. Fish were taken mainly from the Port Dover area in the eastern end, and from the Wheatley area in the western end of Lake Erie. Ninety-six percent of the fish were infected by at least one species of parasite. This study adds 96 new records, including several new species, to the parasite fauna of Lake Erie fish, bringing the present known total to 215 species.

## INTRODUCTION

Several studies of the parasite fauna of fish from Lake Erie have been published. Ward (1919) described *Unicauda brachyura* syn. *Henneguya brachyura* from *Lepomis gibbosus* (Linnaeus); Herrick (1936) described *Myxobolus osburni* and *M. kostiri* from *Micropterus dolomieui* Lacépède, *Chloromyxum gibbosum* and *Myxobolus gibbosus* from *Lepomis gibbosus* (Linnaeus) and *Henneguya rupestris* from *Ambloplites rupestris* (Rafinesque). Herrick (1941) also described *Henneguya ohioensis,* (which was transferred by Davis (1944) to the genus *Myxobilatus)* from *Lepomis gibbosus* (Linnaeus); Dickerman (1954) described *Paurorhynchus hiodontis* from the body cavity of *Hiodon tergisus* LeSueur. The outstanding work by Bangham and Hunter (1939) covered 2,156 fish representing 78 species and recorded the occurrence of 112 species of parasites. Bangham (1965) also reported on the examination of an additional 1,684 fish representing 66 species from the western basin of Lake Erie. These authors record 120 fish parasites in Lake Erie.

1 Contribution number 70-12 of the Ontario Department of Lands and Forests, Research Branch, Maple, Ontario.

A survey of the occurrence and distribution of fish parasites throughout Ontario was initiated in 1961. This report presents, as a discrete part of the Province-wide survey, the results of the examinations of 1,112 fish representing 46 species from Lake Erie. Although the number of species of fish examined in this study was smaller than the number reported upon by Bangham and Hunter (1939), the occurrence of 96 new records and of significant changes in the apparent level of infection suggest the importance of bringing the record up to date. Changes in the aquatic environment, and in the fish fauna, documented elsewhere, have probably resulted in major and relatively rapid changes in the parasite fauna.

## METHODS

Most fish specimens for examination were collected from the catches of commercial fishermen operating out of Port Dover in the eastern, and Wheatley in the western end of the Lake. Additional specimens from a variety of locations came from experimental gear fished by the staff of the Lake Erie Fisheries Research Unit, Wheatley. Some specimens were supplied by anglers and other interested persons. Most specimens were obtained either in the spring (May-June) or in the fall (September-October), but some were collected in almost every month of the year.

Normal parasitological practice was followed in all examination of specimens. Before autopsy the nasal cavities were removed and placed separately in a 1:4000 formalin solution. The fish also were placed in such a solution according to the method of Putz and Hoffman (1963). After one hour the parasites were removed from the sediment and placed in 5% formalin solution for further study. All parasites found during the autopsy were placed in tap water and refrigerated at 2 to 4°C for from 12 to 24 hours. Thereupon all were preserved in 5% formalin except the crustaceans and molluscs which were preserved in 70% alcohol.

Some groups of parasites were stained and mounted in *toto*. Most monogeneans were mounted, unstained, in glycerine jelly for identification. When description of new species of monogeneans was involved e.g. *Neodiscocotyle carpioditis* n. sp., n.g. and n. subfam. Dechtiar (1967), specimens were stained with Gomori's trichrome, cleared in beechwood creosote, and mounted in Piccolyte. Sections were made only in connection with special identification problems. Digeneans, acanthocephalans, and tapeworms were stained with Mayer's carmalum, borax carmine or Gomori's trichrome, cleared in beechwood creosote, and mounted in Piccolyte. Nematodes were cleared in lactophenol and were investigated as wet mounts.

All parasites from this survey were identified by the author

and have been retained in his collection at the Research Branch, Department of Lands and Forests, Maple, Ontario, Canada. Fish identifications were confirmed, when necessary, by Dr. W. B. Scott, Royal Ontario Museum, Toronto, Canada.

## RESULTS

The following summary of the new records obtained during the study is arranged by host species according to Scott (1963); scientific and common names of fish conform to the American Fisheries Society (1970). For each host the numbers examined and the numbers infected by at least one species of parasite are given. Parasites are listed by name and by frequency of occurrence, the latter being indicated by the number in brackets. An asterisk adjacent to a name denotes that the parasite is present in the larval or immature stages. Comments, if any, follow the listing.

*Acipenser fulvescens* Rafinesque-lake sturgeon
Examined- 10 Infected- 10
*Rhabdochona cascadilla (7)*
*Diclybothrium armatum (3)*
All specimens were taken from the Port Dover area.

*Lepisosteus osseus* (Linnaeus)-longnose gar
Examined-5 Infected-5
*Proteocephalus perplexus (5)*
Both young and mature tapeworms were present in all hosts.

*Dorosoma cepedianum* (LeSueur)-gizzard shad
Examined-3 1 Infected-8
*Mazocraeoides olentangiensis (5)*
*Plistophora cepedianae (3)*
Only one parasite, an unidentified larval trematode was recorded for this host by Bangham and Hunter (1939).

Coregonus clupeaformis (Mitchill)-lake whitefish
Examined-4 Infected-4
*Metechinorhynchus salmonis* (4)[1]
*Neoechinorhynchus tumidum* (1)
**Diplostomulum flexicaudum* (1)
*Achtheres ambloplitis* (1)
All four host specimens from the Port Dover area were young. Bangham and Hunter (1939) reported a plerocercoid of *Schistocephalus* sp. from a 39-cm. whitefish. In this study I was unable

1 According to Petrochenko (1956) and Golvan (1969).

to confirm this record but I have found plerocercoids of *Diphyllobothrium* sp. in whitefish from Lake Huron and Lake Ontario. Mueller (1940) reported finding plerocercids having the characteristics of *Diphyllobothrium* in lake whitefish.

*Coregonus artedii* LeSueur-cisco or lake herring
Examined-6 Infected-5
*Metechinorhynchus salmonis (5)*
**Tetracotyle* sp. (3)

Although both of these parasites are considered pathogens, they were present in only small numbers.

Osmerus *mordax* (Mitchill)-rainbow smelt
Examined-114 Infected- 80
Glugea *hertwigi (66)*
*Metechinorhynchus salmonis (35)*
**Diplostomulum flexicaudum* (21)
**Tetracotyle* sp. (5)
**Proteocephalus* sp. (2)

*Glugea hertwigi* is the most abundant parasite in Lake Erie smelt; its incidence is high in fish of all ages including young-of-the-year. Comparably serious outbreaks of this microsporidian are reported to have contributed to smelt mortalities in Europe, Barycheva, and Bauer (1957); in the United States, Kudo (1924) and Haley (1952); and in Canada, Legault and Delisle (1967). This parasite was first reported in Lake Erie smelt by Dechtiar (1965a).

*Esox lucius* Linnaeus-northern pike
Examined-7 Infected-7
*Tetraonchus monenteron (7)*
*Triaenophorus nodulosus (6)*
*Metechinorhynchus salmonis (4)*
*Trichodina* sp, (2)
**Uvulifer ambloplitis (2)*
*Centrovarium lobotes (2)*
*Azygia angusticauda* (1)

All fish were from western Lake Erie. *Trichodina* sp. is thought to be new but awaits more detailed examination.

*Esox masquinongy* Mitchill-muskellunge
Examined-1 Infected-1
*Ergasilus caeruleus* (1)
**Diplostomulum flexicaudum (1)*

Muskellunge were not examined by earlier investigators.

*Hiodon tergisus* LeSueur - mooneye
Examined-13 Infected-13
*Mazocraeoides* sp. (3)
*Pomphorhynchus bulbocolli* (1)

Seven species of parasites were listed for this host by Bangham and Hunter (1939). The most numerous species were *Crepidostomum illinoiensis, Rhabdochona cascadilla* and *Camallanus oxycephalus*. The same species were noted in this study, but the degree of infection was different.

*Carpiodes cyprinus* (LeSueur)-quillback

Examined-81 Infected-70

*Neodiscocotyle carpioditis* n. sp. *(63)*
*Spartoides wardi (30)* [1]
*Neoechinorhynchus carpiodi* n. sp. (25)
*Myxosoma rotundum (15)*
*Camallanus oxycephalus* (12)
*Triganodistomum attenuatum* (10)
*Sanguinicola* Sp. (9)
*Anonchohaptor anomalum (8)*
*Pellucidhaptor* spp. (7)
*Philometra nodulosa (6)*
*Pomphorhynchus bulbocolli (5)*
*Neoechinorhynchus crassus (5)*
*Posthodiplostomum minimum minimum (5)*
*Trichodina* Sp. *(5)*
Glochidia (5)
*Anonchohaptor* spp. (5)
*Acolpenteron catostomi (5)*
*Ergasilus caeruleus (2)*

Bangham and Hunter (1939) reported only two species of parasites : *Rhabdochona cascadilla* and *Hypocaryophyllaeus paratarius* from this host. The 20 new records herewith may include several new species. Two of these have been described: *Neodiscocotyle carpioditis,* Dechtiar (1967); *Neoechinorhynchus carpiodi,* Dechtiar (1968). Further investigation of other parasites considered likely to be new is pending.

*Catostomus commersoni* (LacepBde) - white sucker

Examined-39 Infected-39

*Octomacrum lanceatum (20)*
*Pseudomurraytrema copulatum (15)*
**Diplostomulum flexicaudum* (15)
*Gyrodactylus spathulatus* (10)
*Phyllodistomum lysteri* (10)
*Neoechinorhynchus cristatum* (10)
*Anonchohaptor anomalum (5)*
*Acolpenteron catostomi (5)*
*Myxobolus* sp. (4)

1 Confirmed by Dr. J. Mackiewicz, (State Univ., Albany, N.Y.)

Of the eight parasites recorded by Bangham and Hunter (1939), the dominant species were; *Glaridacris catostomi, Octospinifer macilentus,* and *Neoechinorhynchus crassus.* This study records nine additional species; *Octomacrum lanceatum, Pseudomurraytrema copulatum* and *Gyrodactylus spathulatus* dominate.

*Moxostoma anisurum* (Rafinesque)-silver redhorse
Examined- 12 Infected-12
*Pseudomurraytrema copulatum (5)*
*Myxobolus* sp. (5)
*Myxobolus conspicuus (4)*
**Triaenophorus nodulosus (3)*
*Pomphorhynchus bulbocolli (3)*
*Gyrodactylus* sp. (3)
*Dactylogyrus urus (3)*
*Anonchohaptor* anomalum (3)
Earlier investigators reported no parasites for this host.

*Moxostoma erythrurum* (Rafinesque)-golden redhorse
Examined-17 Infected-17
*Dactylogyrus* sp. (10)
*Myxobolus* sp. (6)
*Pomphorhynchus bulbocolli (5)*
*Pseudomurraytrema copulatum (5)*
*Anonchohaptor anomalum (4)*
**Diplostomulum flexicaudum (4)*
**Triaenophorus nodulosus (4)*
*Sanguinicola* sp. (1)
*Phyllodistomum* sp. (1)
*Rhabdochona milleri* (1)

*Moxostoma macrolepidotum* (LeSueur)-shorthead redhorse
Examined-33 Infected-33
*Pomphorhynchus bulbocolli* (21)
*Dactylogyrus* sp. (20)
*Anonchohaptor anomalum* (19)
*Gyrodactylus* sp. (15)
**Diplostomum flexicaudum* (10)
*Pseudomurraytrema copulatum (5)*
*Sanguinicola* sp. (9)
*Pseudomurraytrema moxostomi* n. sp. (in press) (7)
*Rhabdochona milleri (4)*
*Pellucidhaptor* sp. (3)
*Phyllodistomum* sp. (1)
Bangham and Hunter (1939) reported only *Neascus* sp. and unidentified nematodes for this host. This study includes 10 new records and at least one new species, Pseudomurraytrema moxo-*stomi* (in press).

*Carassius auratus* (Linnaeus)-goldfish

Examined- 15 Infected-10

*Dactylogyrus anchoratus (5)*

*Lernaea cyprinacea (5)*

**Triaenophorus nodulosus (2)*

*Dactylogyrus vastator* (1)

The newly recorded species are now much more abundant than the two parasites, *Agamonema* sp. and *Pomphorhynchus* sp. reported by Bangham and Hunter (1939).

*Cyprinus carpio* Linnaeus-carp

Examined-24 Infected-20

*Dactylogyrus extensus (20)*

*Dactylogyrus anchoratus* (19)

*Lernaea cyprinacea* (10)

*Pomphorhynchus bulbocolli (10)*

*Argulus appendiculosus* (syn. *A. biramosus)* (3)

*Glochidia (3)

**Diplostomulum flexicaudum (3)*

*Khawia iowensis (3)*

*Ergasilus caeruleus (3)*

*Pseudocolpenteron pavlovskii (3)*

**Ligula intestinalis* (1)

Earlier studies recorded only three species of parasites for this host. The above constitutes a first record of *Pseudocolpenteron pavlovskii* Bychovsky and Gussev (1955) in carp, in Canada. Rogers (1968) provided the first record of this parasite in the United States.

*Notropis atherinoides* Rafinesque-emerald shiner

Examined-l 8 Infected-10

*Dactylogyrus* sp. (18)

*Glochidia (10)

**Diplostomulum flexicaudum (9)*

**Posthodiplostomum minimum minimum* (8)

Ten species of parasites were listed by Bangham and Hunter (1939); the dominant species *was Plagioporus cooperi* (Syn. *Lebouria cooperi).* This investigation adds four new records and shows current dominance by *Dactylogyrus* sp.

*Notropis cornutus* (Mitchill) - common shiner

Examined-5 Infected-5

**Diplostomulum flexicaudum (5)*

*Dactylogyrus* sp. (4)

**Triaenophorus nodulosus (2)*

*Myxobolus* sp. (2)

Three species of parasites were listed by previous investigators, the dominant species being *Ligula intestinalis.* This study

adds four new records and shows current dominance by *Diplostomulum flexicaudum.*

Notropis hudsonius (Clinton) - spottail shiner
Examined- 117 Infected- 115
*Dactylogyrus* sp. *(50)*
*Gyrodactylus* sp. *(25)*
*Neoechinorhynchus rutili (20)*
*Sanguinicola* sp. (15)
**Posthodiplostomum minimum minimum (3)*
**Centrovarium lobotes (3)*
*Thelohanellus* sp. (1)

The above is the first time that *Thelohanellus* sp. has been recorded in this host in Lake Erie.

*Notropis stramineus* (Cope)-sand shiner
Examined- 1 Infected- 1
*Ceratomyxa* sp.

This is the first record of a representative of the genus *Ceratomyxa* for Lake Erie fish.

*Semotilus atromaculatus* (Mitchill)-creek chub
Examined-4 Infected-4
*Cleidodiscus brachus (4)*
*Myxosoma pendula (3)*
*Lernaea cyprinacea* (1)

*Ictalurus nebulosus* (LeSueur)-brown bullhead
Examined- 11 Infected- 11
*Cleidodiscus pricei* (11)
*Henneguya exilis (9)*
*Camallanus oxycephalus (9)*
*Ergasilus elegans (7)*
*Phyllodistomum* sp. (7)
*Cleidodiscus floridanus (6)*
*Pomphorhynchus bulbocolli (3)*
**Posthodiplostomum* minimum *minimum (3)*
*Phyllodistomum staffordi (3)*

*Ictalurus punctatus* (Rafinesque)-channel catfish
Examined-35 Infected-35
*Cleidodiscus floridanus (35)*
*Cleidodiscus pricei (20)*
*Henneguya exilis (8)*
*Haplobothrium. globuliforme (3)*
*Phyllodistomum lacustris (3)*
*Illinobdella moorei (3)*

Bangham and Hunter (1939) reported 14 species of parasites for this fish. This study confirmed the occurrence of the same

species, added six new records, and found the currently dominant species to be *Cleidodiscus floridanus* and C. *pricei.*

*Noturus flavus* Rafinesque-stone cat
Examined-27 Infected-2 7
*Cleidodiscus pricei (20)*
*Acetodextra ameiuri (7)*

Six species of parasites were reported in this host by previous investigators. Two new records are provided by this study; *Cleidodiscus* pricei is the currently dominant species.

Noturus *gyrinus* (Mitchill)-tadpole madtom
Examined-5 Infected-5
*Cleidodiscus pricei (5)*
*Cleidodiscus floridanus (2)*

*Cleidodiscus pricei* is now the dominant species among the six parasites recorded for this host to date.

*Anguilla rostrata* (LeSueur)-American eel
Examined-5 Infected-5
*Ergasilus caeruleus (5)*
**Diplostomulum flexicaudum (3)*
*Myxobolus* sp. (2)
*Azygia longa (2)*
*Crepidostomum cornutum (2)*
*Proteocephalus macrocephalus (2)*
*Microphalus opacus* (1)

Bangham and Hunter (1939) did not report on this species. All of our specimens came from the eastern end of the lake.

Culaea inconstans (Kirtland)-brook stickleback
Examined-10 Infected-7
*Dactylogyrus eucalius (5)*
*Gyrodactylus* sp. (3)

One of the two newly recorded monogeneans is thought to be a new species.

*Percopsis omiscomaycus (Walbaum) - trout perch*
Examined-37 Infected-30
*Cleidodiscus* sp. (25)
*Ergasilus caeruleus (5)*
**Bucephalus* sp. (3)
**Triaenophorus stizostedionis (3)*
**Diplostomulum flexicaudum (3)*
*Illinobdella* sp. (3)

The trout perch is the usual second intermediate host for *Triaenophorus stizostedionis* described by Miller (1945). The adult form of this parasite was found only in walleye, *Stizostedion v. vitreum* (Mitchill).

*Morone chrysops* (Rafinesque)-white bass
Examined-63 Infected-60
Cleidodiscus *chrysops (47)*
**Triaenophorus nodulosus (15)*
*Trichodina* sp. (5)
*Ichthyophthirius multifiliis (5)*
*Trichophrya* sp. (1)

Of the 16 presently known species of parasites for this host, the larvae of *Triaenophorus nodulosus, a* serious pathogen, is second in abundance.

*Amploplites rupestris* (Rafinesque)-rock bass
Examined-39 Infected-39
*Cleidodiscus chautauguensis* (15)
*Cleidodiscus alatus (14)*
*Cleidodiscus stentor (10)*
*Cleidodiscus* sp. (10)
*Lyrodiscus rupestris* n. sp. (in press) (9)
*Gyrodactylus* sp. (2)
*Phyllodistomum* sp. (2)
*Pomphorhynchus rocci (2)*

The eight new records are thought to include four new species; the description of *Lyrodiscus rupestris* is now in press.

Lepomis gibbosus (Linnaeus)-pumpkinseed
Examined-31 Infected-31
**Posthodiplostomum minimum centrarchi (20)*
*Cleidodiscus ferox* (15)
*Cleidodiscus similis* (14)
*Pomphorhynchus bulbocolli (3)*
*Lernaea cyprinacea (2)*
*Actinocleidus oculatus (2)*
*Actinocleidus recurvatus (2)*
Lymphocystis (2)

*Lepomis macrochirus* Rafinesque-bluegill
Examined-30 Infected-25
**Posthodiplostomum minimum centrarchi (25)*
*Actinocleidus unguis (20)*
*Actinocleidus bakeri (20)*
*Cleidodiscus vanardi* (15)
*Cleidodiscus* sp. (5)
*Lyrodiscus longibasus (4)*
*Lyrodiscus* sp. (1)
*Lernaea cyprinacea* (1)
Lymphocystis (1)

*Micropterus dolomieui* La&p&de-smallmouth bass
Examined- 10 Infected- 10

*Syncleithrium fusiformis* (10)
*Cleidodiscus banghami* (10)
*Cleidodiscus* sp. (3)
*Pomphorhynchus bulbocolli (3)*

Among the 22 species of parasites listed by Bangham and Hunter (1939) the dominant species were *Crepidostomum cornutum, Proteocephalus ambloplitis* and *Spinitectus carolini.* The same 22 species and four new ones were noted in this study but dominance had shifted to *Syncleithrium fusiformis* and *Cleidodiscus banghami.*

*Micropterus salmoides* (LacBpBde) - largemouth bass
Examined-5 Infected-5
*Syncleithrium fusiformis (5)*
*Cleidodiscus helicus (5)*

*Pomoxis annulavis* Rafinesque-white crappie
Examined-32 Infected-30
*Cleidodiscus longus (25)*
*Cleidodiscus capax (25)*
*Cleidodiscus uniformis (20)*
*Ergasilus caeruleus (6)*
**Tetracotyle* sp. (5)
*Lyrodiscus longibasus (5)*

*The* newly recorded *Cleidodiscus longus, C.* capax, and C. *uniformis* are now the most abundant parasites in the white crappie.

*Pomoxis nigromaculatus* (LeSueur)-black crappie
Examined-21 Infected-20
*Cleidodiscus capax* (19)
*Cleidodiscus longus* (10)
*Lyrodiscus longibasus (10)*
*Myxobolus* sp. (2)
*Lyrodiscus* sp. (1)

This is the first record of *Lyrodiscus longibasus* in fish from the Great Lakes. Further study of the parasite listed as *Lyrodiscus* sp. will probably result in the description of a new species.

*Perca flavescens* (Mitchill)-yellow perch
Examined-150 Infected-150
*Cleidodiscus adspectus (50)*
*Cleidodiscus* sp. (25)
**Crassiphiala bulboglossa* (15)
*Myxosoma scleroperca* (15)
*Henneguya doori* (15)
**Apophallus itascensis (15)*
*Sanguinicola occidentalis (5)*
*Trichodina* spp. (5)
*Ichthyophthirius multifiliis (5)*

*Ichthyosporidium* sp. (5)
**Eustrongylides* sp. (3)
*Neoechinorhynchus rutili (3)*
*Neoechinorhynchus* sp. (3)

Bangham and Hunter (1939) reported *Philometra cylindracea* in only one specimen of yellow perch. This parasite was found in 33 to 65% of the specimens with as many as 12 parasites in a single host. Further study will probably show the parasites listed *as Trichodina* sp., *Cleidodiscus* sp. and *Neoechinorhynchus* sp. to be new species.

Of the parasites listed for yellow perch from Lake Erie, the following are considered to be pathogens: *Philometra cylindracea, Myxosoma scleroperca, Apophallus itascensis, Sanguinicola occidentalis, Eustrongylides Sp.* and *Ichthyophthyrius multifiliis. A* substantial mortality of yearling yellow perch in Lake Erie during 1963 was attributed to the last named parasite.

*Stizostedion canadense* (Smith)-sauger
Examined- 1 Infected- 1
*Cleidodiscus aculeatus* (1)
**Tetracotyle* sp. (1)
**Eustrongylides* sp. (1)

*Stizostedion vitreum glaucum* Hubbs-blue pike
Examined-2 Infected-2
*Cleidodiscus aculeatus (2)*
*Ergasilus centrarchidarum (2)*

*Stizostedion vitreum vitreum* (Mitchill)-walleye
Examined-27 Infected-27
*Cleidodiscus aculeatus (27)*
*Sanguinicola occidentalis (5)*
*Illinobdella moorei (5)*
*Neoechinorhynchus tenellum (2)*

*Cleidodiscus aculeatus* was found in walleye of all ages. *Sanguinicola occidentalis* is considered dangerous to the host because its eggs sometimes occlude blood vessels.

*Percina caprodes* (Rafinesque)-log perch
Examined- 12 Infected-2
*Cleidodiscus malleus (2)*

All specimens examined were from the western end of the lake.

*Aplodinotus grunniens* Rafinesque-freshwater drum
Examined-79 Infected-79
*Lintaxine cokeri* (10)
*Sanguinicola* sp. (10)
*Philometra* sp. *(8)*
*Ichthyophthirius multifiliis (8)*

*Pomphorhynchus bulbocolli (3)*
*Phyllodistomum* sp. (1)
*Cotylogaster occidentalis* (1)

Bangham and Hunter (1939) listed 19 parasite species for freshwater drum. This study adds seven species to the list; *Lintaxine cokeri* and *Cotylogaster occidentalis* are recorded for the first time from a Great Lakes fish. The parasites listed as *Philometra* sp., *Sanguinicola* sp. and *Phyllodistomum* sp. are likely new species.

*Cottus bairdi* Girard-mottled sculpin
Examined-10 Infected-9
*Gyrodactylus bairdi (7)*
*Dactylogyrus* sp. (6)
**Tetracotyle* sp. (6)

One parasite, *Dactylogyrus* sp. is probably a new species.

## SUMMARY

A total of 96 new parasite records for Lake Erie fish are presented in addition to those listed by Bangham and Hunter (1939).

The new records represent several groups as follows: Virus-1; Protozoa-14; Monogenea-50; Aspidocotylea-l; Digenea-10; Cestoda-4; Nematoda-4; Acanthocephala-6; Hirudinea-l; Crustacea-4; Mollusca-l.

Among the parasites presently occurring in Lake Erie fishes several are considered to be pathogens. This fact, together with the rapidly changing aquatic environment and fish community, suggests the possibility of epizootics. In 1963, for example, there was a considerable mortality among yearling yellow perch and freshwater drum, and although the cause was not certain, heavy infestation by *Ichthyophthyrius multifiliis* was suspected. Furthermore extensive mortalities of young smelt in 1969 may have been caused by the microsporidian *Glugea hertwigi.* This case is still under investigation. Particular attention is also drawn to the pathogens *Myxosoma scleroperca* (Dechtiar, 1965b) and *Henneguya doori* on yellow perch, and *Thelohanellus* sp. on sand shiners. Dogiel, Petrushevski and Polyanski (1961) and Reichenbach-Klinke and Elkan (1965) point out that the most destructive species of myxosporidians are those which occur on the gills and muscles of fish.

Among the monogeneans detected in Lake Erie are the following pathogens: *Neodiscocotyle carpioditis, Dactylogyrus* SPP. *and Gyrodactylus* spp. (Mizelle, 1938; Tripathi, 1959 and Prost, 1963). Among the trematodes, the larval stages of several digeneans are considered as pathogens including: *Diplostomulum* spp., *Postho-*

*diplostomulum minimum minimum, P. m. centrarchi, Tetracotyle* spp. and *Sanguinicola* spp. Serious mortalities caused by *Sanguinicola* spp. among the young fish in many parts of the world have been reported by Leger (1930) and by Bychovskaya-Pavlovskaya et al. (1964). Sanguinicola *occidentalis* and several other species were detected in walleye, freshwater drum, white sucker, shorthead redhorse, spottail shiner, and yellow perch in Lake Erie.

Species of cestodes considered pathogenic include: larval stages of *Triaenophorus nodulosus, Proteocephalus ambloplitis* and *Ligula intestinalis.* Plerocercoids of these species appear to have been associated with fish mortalities elsewhere, Matthey (1963), Lawler (1969), and Petrushevski and Shulman (1961), and may have contributed to fish mortalities in Lake Erie.

Among the nematodes present in Lake Erie fish, *Contracaecum* spp., *Eustrongylides* sp. and *Philometra cylindracea* are considered pathogens. The recent increase in the abundance of the latter two may be associated with the changing perch population in Lake Erie.

Among the acanthocephalans, the pathogen *Pomphorhynchus bulbocolli,* is particularly dangerous to catostomids and cyprinids.

The crustacean parasites *Argulus* spp. and *Lernaea cyprinacea* are considered serious pathogens, and have caused extensive mortalities in North America and Europe (Schumacher, 1952; Allum and Hugghins, 1959).

## Additions to Check List of Fish Parasites for Lake Erie Fish

Virus

Lymphocystis

Protozoa

*Ceratomyxa* sp.
*Glugea hertwigi* Weissenberg, 1911
*Henneguya doori* Guilford, 1963
*Henneguya exilis* Kudo, 1929 *(Myxobilatus* Davis, 1944)
*Icythyosporidium* sp.
*Myxobolus* sp.
*Myxobolus conspicuus* Kudo, 192 9
*Myxosoma rotundum* Meglitsch, 1937
*Myxosoma pendula* Guilford, 1966
*Myxosoma scleroperca* Guilford, 1963
*Plistophora cepedianae* Putz, Hoffman and Dunbar, 1965
*Thelohanellus* sp.
*Trichodina* sp.
*Trichophrya* sp.

Monogenea

Acolpenteron catostomi Fischthal and Allison, 1942
*Anonchohaptor anomalum* Mueller, 1938
*Anonchohaptor* sp.
*Actinocleidus bakeri* Mizelle and Cronin, 1943
*Actinocleidus oculatus* (Mueller, 1934); Mueller, 1937
*Actinocleidus recurvatus* Mizelle and Donahue, 1944
*Cleidodiscus aculeatus* (Van Cleave and Mueller, 1932) Mizelle and Regensberger, 1945
*Cleidodiscus adspectus* Mueller, 1936
*Cleidodiscus alatus* Mueller, 1938
*Cleidodiscus brachus* Mueller, 1938
*Cleidodiscus banghami* (Mueller, 1936) Mizelle, 1940
*Cleidodiscus capax* Mizelle, 1936
*Cleidodiscus chautauguensis* (Mueller, 1938) Mizelle and Hughes, 1938
*Cleidodiscus chrysops* Mizelle and Klucka, 1953
*Cleidodiscus ferox* Mueller, 1934
*Cleidodiscus floridanus* Mueller, 1936
*Cleidodiscus* helicus (Mueller, 1936) Mizelle and Hughes 1938
*Cleidodiscus longus* Mizelle, 1936
*Cleidodiscus malleus* (Mueller, 1938) Mizelle and Hughes, 1938
*Cleidodiscus pricei* Mueller, 1936
*Cleidodiscus similis* (Mueller, 1936) Mizelle and Hughes, 1938
*Cleidodiscus* sp.
*Cleidodiscus stentor* Mueller, 1937
*Cleidodiscus uniformis* Mizelle, 1936
*Cleidodiscus unguis* (Mizelle and Cronin, 1943)
*Cleidodiscus venardi* Mizelle and Jaskoski, 1942
*Dactylogyrus anchoratus* (Dujardin, 1845) Wagener, 1857
*Dactylogyrus eucalius* Mizelle and Regensberger, 1945
*Dactylogyrus extensus* Mueller and Van Cleave, 1932
*Dactylogyrus* sp.
Dactylogyrus urus Mueller, 1938
*Dactylogyrus vastator* Nybelin, 1924
*Diclybothrium armatum* Leuchart, 1835
*Gyrodactylus bairdi* Wood and Mizelle, 1957
*Gyrodactylus spathulatus* Mueller, 1936
*Gyrodactylus* sp.
*Lintaxine cokeri* (Heteraxine cokeri Linton, 1940) Sprostan, 1946
*Lyrodiscus longibasus* Rogers, 1967
*Lyrodiscus* sp.
*Lyrodiscus* rupestris Dechtiar (in press)
*Mazocraeoides olentangiensis* Sroufe, 1958
*Mazocraeoides* sp.
*Neodiscocotyle carpioditis* Dechtiar, 1967

*Octomacrum lanceatum* Mueller, 1934
*Pellucidhaptor* sp.
*Pseudocolpenteron pavlovskii* Bychowsky and Gussev, 1955
*Pseudomurraytrema copulatum* (Mueller, 1938) Bychowsky, 1957
*Pseudomurraytream moxostomi* Dechtiar (in press)
*Syncleithrium fusiformis* (Mueller, 1937) Price, 1967
*Tetraonchus monenteron* (Wagener, 1857) Diesing, 1858

Aspidocotylea

*Cotylogaster occidentalis* Nickerson, 1902

Digenea

**Apophallus itascensis* Warren, 1953
*Azygia longa* (Leidy, 1851) Manter, 1926
**Diplostomulum flexicaudum* (Rudolphi, 1819)
*Phyllodistomum lysteri* Miller, 1940
*Phyllodistomum* sp.
**Posthodiplostomum minimum centrarchi* (MacCallum, 1921; Dubois, 1936) Hoffman, 1958
*Sanguinicola occidentalis* Van Cleave and Mueller, 1932
*Sanguinicola* sp.
*Triganodistomum attenuatum* Mueller and Van Cleave, 1932
**Uvulifer ambloplitis* (Hughes, 1927) Dubois, 1938

Cestoda

Khawia *iowensis* Calentine and Ulmer, 1961
*Spartoides wardi* Hunter, 1929
*Proteocephalus macrocephalus* (Creplin, 1825)
**Triaenophorus stizostedionis* Miller, 1945

Nematoda

**Eustrongylides* sp.
*Philometra nodulosa* Thomas, 1929
*Philometra* sp.
*Rhabdochona* milleri Choquette, 195 1

Acanthocephala

*Neoechinorhynchus carpiodi* Dechtiar, 1968
*Neoechinorhynchus cristatum* Lynch, 1936
*Neoechinorhynchus rutili* (Mueller, 1780)
*Neoechinorhynchus* sp.
*Neoechinorhynchus tumidum* Van Cleave and Bangham, 1949
*Pomphorhynchus rocci* Gordonnier and Ward, 1967

Crustacea

*Argulus americanus* Wilson, 1904
*Argulus appendiculosus* Wilson, 1907: Syn. A. *biromous* Beri, 1931
*Ergasilus elegans* Wilson, 1916
*Lernaea cyprinacaea* Linnaeus, 1761

Hirudinea

*Illinobdella moorei* (Meyer, 1940) Meyer, 1946

Mollusca

*Glochidia sp.

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