

**STUDIES ON *CLINOSTOMUM* LARVAE. I. SOME GENERAL ASPECTS
AND AN ACCOUNT OF A MASSIVE INFECTION**

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ABSTRACT

A brown bullhead catfish, *Ictalurus nebulosus* (Le Sueur), was heavily parasitized by metacercariae of *Clinostomum marginatum* (Rudolphi, 1819). Approximately 500 metacercariae were recovered; the relatively enormous number of parasites apparently caused the death of the catfish host. A review of the life cycle and geographic distribution of *C. marginatum* are furnished. Notes on pathology are included.

INTRODUCTION

The metacercariae of *Clinostomum marginatum* (= *complanatum*) (Rudolphi, 1819) parasitize a wide variety of fishes as second intermediate hosts. The most frequently and most heavily parasitized fishes include the yellow perch, *Perca flavescens* (Mitchill), the bullhead catfishes, *Ictalurus* spp., the suckers, *Catostomus* spp., and members of the bass and sunfish family, Centrarchidae. Hoffman (1967) lists 56 species of North American freshwater fishes in which *C. marginatum* metacercariae have been found.

DISCUSSION

Geographical Distribution: The geographical range of *C. marginatum* is quite extensive, occurring generally throughout North and South America (Van Cleave and Mueller, 1934). In a given locality, it appears that *Clinostomum* metacercariae tend either to: (1) rather evenly infect a wide spectrum of the host species present or, (2) for reasons probably relating to the local ecological situation, to infect certain host species quite heavily while nearly excluding other hosts present. An illustration can be drawn from the reports of Van Cleave and Mueller (1934) and Meyer (1958). In the former study, nearly all of the yellow perches taken carried *Clinostomum* metacercariae, while none were found in bullhead catfishes. Quite the opposite is true in the second study, where 88.5% of the black bullheads carried *Clinostomum*, while none of the yellow perches harbored this parasite.

Clinostomum usually infects two or more fish species in a given locality. The parasite is found almost exclusively in shallow water areas, which support large numbers of snails which serve as the first intermediate hosts, and provide feeding grounds for the herons which serve as final hosts.

Life Cycle: The life cycle of *C. marginatum*, described by Hunter and Hunter (1932, 1934, 1935), has been recapitulated by Van Cleave and Mueller (1934), Fischthal (1944), Meyer (1958), and Klaas (1963).

The Hunters (1934) designate two species of snails, *Helisoma antrosum* (Conrad) and *H. campanulatum* (Say), as the first intermediate hosts invaded by the miracidia. Within approximately four weeks, cercariae emerge to penetrate the fish second intermediate host. The cercariae develop into metacercariae (yellow grubs) over a period of approximately 20 weeks. When infected fish are eaten by the great blue heron, *Ardea herodias*, the metacercariae excyst and lodge in the tissues of the mouth, throat and esophagus of the bird, or are digested out of the flesh and migrate to these tissues. The metacercariae mature in the great blue heron in four days. Migration of the herons could explain the wide geographic range of *C. marginatum* and also provide a reservoir of parasites to reinfect heron feeding grounds from year to year.

The history of *C. marginatum* in the fish host is outlined by Van Cleave and Mueller (1934):

"*Clinostomum* leaves the fish at the end of summer, so that fish caught in the winter are free of grubs. In Oneida Lake [New York] the infestation reaches its height during the month of August, and after this period subsides. The lake reaches its highest temperature about the middle of July. Apparently, it is just at this time that *Clinostomum* infestation in the fish sets in, and within a month the fish have acquired the knotty swellings associated with the condition. We do not know how the *Clinostomum* larvae enter the fish, or how they are lost in the fall. Cysts near the surface are so easily ruptured that frequently the worms burst forth on mere handling of the host. It is possible that in the fall the cysts automatically burst, shedding the worms, to their destruction."

However, Haderlie (1953) found that catfishes in northern California carried yellow grubs during all the summer months and again in October, indicating that catfish carry *Clinostomum* most, if not all, of the year in Clear Lake. Fischthal (1949) in a Wisconsin study found that very few yellow grubs were lost in overwintering.

MATERIAL AND METHODS

The catfish host, *Ictalurus nebulosus* (Le Sueur), was taken by seine from Leaf Park Pond near Lancaster, Pennsylvania. The fish was in very poor condition when taken and died shortly after capture. A large number of metacercariae were issuing from a large abdominal perforation (Fig. 2). The host, with associated parasites, was preserved in 80% isopropyl alcohol.

Dissection was performed on the fish and the trematodes removed from large cysts in the flesh (pockets containing from 15 to 40 worms each) at the bases of the dorsal and pectoral fins. Individual worms were encysted throughout the skin of the fish, in the tissues of the head and in the wall of the coelomic cavity (Figs. 1, 2). Dissection of the viscera revealed no invasion by the parasites.

The metacercariae were of various stages of growth and development, indicating that the fish had apparently been parasitized over a period of time. Approximately 500 parasite specimens were recovered.

The fish was examined for other parasites. The gills carried moderate infestations of the monogenean *Cleiodiscus pricei* and the ciliate *Trichodina* sp.

Photographs were taken with a 35mm Nikon camera on Kodak Tri-X panchromatic film.

Identification of the fish host was made by using Eddy's key (1957).

The identification of the trematode parasites as metacercariae of *Clinostomum*, probably *marginatum*, was made by Dr. Allen McIntosh of the University of Maryland. Simultaneous independent identifications of the parasites as *Clinostomum* sp. were offered by Drs. O. Wilford Olsen (Colorado State University), Grover C. Miller (North Carolina State University at Raleigh) and Paul F. Basch (The George Williams Hooper Foundation). The authors extend their appreciation to these parasitologists for their assistance.

PATHOLOGY

External injuries, probably pathologic results of the extremely heavy *Clinostomum* infection, include (1) a large abdominal perforation, measuring approximately 8mm in diameter, (2) the raw areas at the base of the ventral fin, (3) a large "pockmark" injury approximately 5mm in diameter on the left side of the host and (4) numerous lumpy swellings under the skin, distributed over the body; these swellings are typical of a *Clinostomum* infection and are caused by the worm encysting under the skin. (Figs. 1, 2).

It is probable that the primary cause of death was a general peritonitis, coming about as a consequence of

the abdominal perforation. The raw areas at the base of the ventral fin, the "pockmark" injury, and the abdominal perforation were possibly caused by excystment of the larvae.

The worms were alive and active at the time of host capture. The host itself was barely capable of movement and the massive invasion of its body tissues by the metacercariae was apparent from the cysts visible under the skin and from the large number of worms issuing from the abdominal perforation.

Two previous reports list cases of fatal infections of fish by metacercariae of *C. marginatum*. Schwartz (1956) reports that three specimens of the ictalurid catfish, *Noturus miurus*, were fatally infected by *Clinostomum* metacercariae. Forney (1955) reports massive infections in the black bullhead, *Ictalurus melas*, some of which are apparently similar to the present case, and frequent mortality among young-of-the-year bullheads parasitized by *Clinostomum*. However, other reports present a consensus that the parasite is apparently relatively non-pathogenic. For example, Van Cleave and Mueller (1934) reported relatively enormous infection in *Perca flavescens*, two of which harbored 191 and 325 metacercariae, respectively. These authors, however, found no evidence of host mortality and even the most seriously parasitized yellow perch appeared to suffer no inconvenience from the infection.

Based on information from Bangham (1944), Elliott and Russert (1949), and Fischtal (1949), the nominal *Clinostomum* infection involves 20 or fewer parasites, and still heavier infections being relatively rare. The present case is apparently one of the most extreme cases of *C. marginatum* infection reported.

LITERATURE CITED

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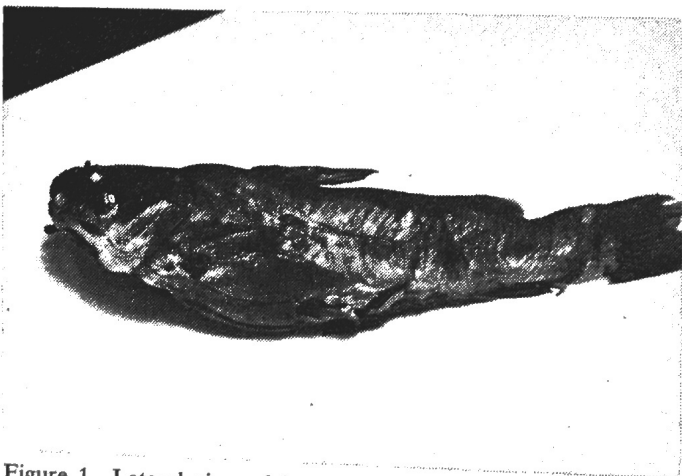


Figure 1. Lateral view of host showing external lesions. Several metacercariae are visible in region of head.



Figure 2. Ventral view of host showing abdominal perforation and lesions at base of ventral fin.