

The Occurrence of *Ichthyophthirius multifiliis* (Ciliata: Hymenostomatida) in Kentucky Waters.¹

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ABSTRACT

This is the first report of *Ichthyophthirius multifiliis*, parasitizing the blackstripe topminnow *Fundulus notatus*. Data indicating site preferences and intensities of infestation of the parasite on its host are based on the examination of 10 males and 6 females. The caudal fin, head, and upper body surface are implicated as the most heavily parasitized areas on the host. Smaller fish were more heavily infested than larger fish. A brief history of the occurrence of *I. multifiliis* in Kentucky waters is also included along with its distribution in nearby states.

INTRODUCTION

Ichthyophthirius multifiliis is a cosmopolitan protozoan ectoparasite capable of infesting a wide variety of freshwater fishes. Until the present time, however, there have been no published records of the organism's occurrence in Kentucky waters. *I. multifiliis*, known colloquially as "ich," most often parasitizes aquarium and cultured fishes, but its appearance in natural systems is by no means uncommon. Outbreaks of the disease, ichthyophthiriasis, usually occur in warm waters where host density is high and flow rate low.

The present report is based on a study of 10 male and 6 female blackstripe topminnows *Fundulus notatus* given to the author by Mr. James Pitts, Louisville, Kentucky. An outbreak of ichthyophthiriasis was suspected by Mr. Pitts and later confirmed by me.

In Kentucky, prior to the present observations, *I. multifiliis* had been noticed on 2 occasions, both of which have been recorded but never published. Mr. Charles C. Bowers, Jr., Director, Division of Fisheries, Kentucky Department of Fish and Wildlife Resources (pers. comm.), indicated that an outbreak of ichthyophthiriasis occurred among channel catfish *Ictalurus punctatus* at the federal hatchery near Frankfort, Kentucky, but he did not know

the exact date. Complete control of the infestation was obtained with chemicals. The second report described a fish kill that extended from Campbell through Lewis counties on the Ohio River, including the mouths of some of its tributaries, during the spring of 1971. Mr. Bonny Laflin of the Fisheries Division and Mr. W. A. Rogers, Leader, Southeastern Cooperative Fish Disease Project at Auburn, Alabama (pers. comm.), revealed that although many species were observed dead, only gizzard shad *Dorosoma cepedianum*, bluegill *Lepomis macrochirus*, and freshwater drum *Aplodinotus grunniens*, were actually parasitized by *I. multifiliis*.

The presence of the parasite in the waters of nearby states has been reported by Allison and Kelly (1963) in the Coosa River system of northeastern Alabama where gizzard shad, and threadfin shad *D. petenense*, as well as 9 other species were affected; Pearson (1932) reported an epizootic which involved 9 species in an Indianapolis municipal park pond; Kudo (1934), from a large reservoir near Peoria, Illinois, involving carp *Cyprinus carpio*; and Elser (1955), at Deep Creek Lake impoundment in Maryland, with perch *Perca flavescens*.

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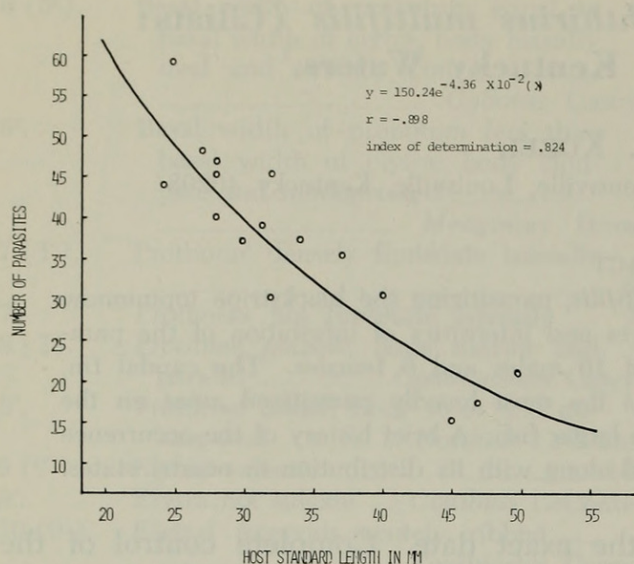


FIG. 1. Total number of parasites per fish plotted against standard length of *F. notatus*.

MATERIALS AND METHODS

On 18 November 1973, during the collection of various minnow species with seine and dipnet from the area surrounding the confluence of Pope Lick Creek and Floyds Fork Creek, near the Pope Lick Road bridge, in southeastern Jefferson County, Mr. James Pitts obtained 16 blackstripe topminnows, one of which apparently had ichthyophthiriasis. All specimens were captured over sand and gravel near banks overhung with vegetation. Normal fall flow and turbidity conditions prevailed. The fish were transported live and held in a 37.85-l aquarium for 5 days at 15–18 C until I could examine them. During that time, the remaining 15 fish exhibited gross signs of ichthyophthiriasis.

Host specimens were sacrificed by pithing immediately behind the parietal spot, and the live parasites examined in situ with the aid of a 45× binocular dissecting microscope. Aquarium water from the collection site was used to keep the host epithelium and parasites moist during the examination. Site preferences and the numbers of parasites on each host were determined. To facilitate counting the individual ciliates, the body of the host was divided into 5 sections, the head, a left and right upper section, and a left and

right lower section. The head region was that portion anterior to a line perpendicular to the lateral stripe, and tangential to the rear margin of the orbit. Upper body surfaces were those dorsal to the upper margin of the lateral stripe and posterior to the head region. Lower body surfaces were those ventral to the upper margin of the lateral stripe and posterior to the head region. Right and left sections were determined by the midline. After body and fin surfaces were examined, the gills were excised and searched for *I. multifilis*. Individual parasites freed from epithelial cysts with a dissecting needle were placed in depression slides with 2 drops of aquarium water and examined microscopically.

Specimens of the parasites were fixed in Schaudinn's solution, stained with Harris' hematoxylin, and mounted in Euparal.

The keys of Hoffman (1967) and description by Meyer (1969) were used to aid in identification of the organism.

RESULTS

Ten male and 6 female *F. notatus* were infested with *I. multifilis*. Based on reproduction times for the ciliate in the cyst from data of Bauer (1959), it is concluded that all 16 fish were infested at time of capture and not subsequently from the aquarium in which they were held. At the 15–18 C temperature, the life cycle would take approximately 2 weeks to complete, whereas all the present fish developed visible signs of ichthyophthiriasis within 5 days.

I. multifilis occurred most often on the caudal fin, head, and upper body surface of its host (Table 1).

The relationship between the standard length of *F. notatus* and the number of parasites found on each fish is shown in Fig. 1. With 14 degrees of freedom, the correlation coefficient $r = -.898$, is significant at the 0.01 level. A least squares curve fit indicates that a curve represented by the formula $y = ae^{bx}$, where $e = 2.718$, $a = 150.24$, and $b = -4.36 \times 10^{-2}$, best represents the data. The index of determination

TABLE 1.—DISTRIBUTION OF PARASITES ON 16 *F. NOTATUS*

| Location | Number of parasites per location | | |
|----------------|----------------------------------|-------|------------|
| | Total | Mean | % of total |
| Left pectoral | 19 | 1.00 | 3.23 |
| Right pectoral | 20 | 1.50 | 3.40 |
| Left pelvic | 12 | 0.67 | 2.04 |
| Right pelvic | 18 | 1.33 | 3.06 |
| Anal | 26 | 1.83 | 4.41 |
| Dorsal | 28 | 2.50 | 4.75 |
| Caudal | 108 | 6.33 | 18.34 |
| Head | 84 | 4.67 | 14.26 |
| Left upper | 85 | 3.33 | 14.43 |
| Right upper | 90 | 3.58 | 15.28 |
| Left lower | 48 | 2.00 | 8.15 |
| Right lower | 39 | 1.17 | 6.62 |
| Gills | 12 | 0.67 | 2.04 |
| | 589 | 30.83 | |

for this curve is .824. Smaller fish carried more parasites than larger fish.

Host behavioral manifestations due to ichthyophthiriasis included "clamping" or the holding of fins close to the body, sluggish swimming motions and reduced general activity, residing near sides and bottom of the aquarium, and wagging movements of the caudal fin and peduncle areas. Since fish were sacrificed on the day the author received them, no feeding behavior was observed.

DISCUSSION

This report constitutes the first record of occurrence of *I. multifilis* on the black-stripe topminnow *F. notatus* and is the first record of occurrence of the parasite from stream waters in Kentucky. It helps link the geographic distribution north and south of the Ohio River.

Parker (1965, unpublished doctoral dissertation, University of Maryland, College Park, Maryland), Hines and Spira (1973), Meyer (1969), Wolf (1938), and Paperna (1972) performed site preference analyses of *I. multifilis* on its host, but none are as detailed as the present work. Hines and Spira (1973) commented on the preponderance of organisms infesting the dorsal surface of *C. corpio*, but offer no explanation.

Unfortunately, without histological examination of the hosts' body surfaces, no complete explanation can be given.

Although the gills are seemingly excellent attachment sites, and Meyer (1969) stated that the golden shiner *Notemigonus crysoleucas* often has heavy infestations on them and nowhere else, *F. notatus* examined here had few organisms on the gills.

Since length may be an indicator of age, it appears that younger fish had a more severe infestation than older specimens. The work of Bauer (1959) and Hines and Spira (1974) indicate that immunity to *I. multifilis* may be acquired through previous infestation. In carp, Hines and Spira (1974) found that fish remained free of the parasite 8 months after an initial infestation. The older hosts examined here may have been previously infested with *I. multifilis* and therefore exhibited at least partial immunity to reinfestation. The younger fish may not have been previously exposed.

LITERATURE CITED

- ALLISON, R., AND H. D. KELLY. 1963. An epizootic of *Ichthyophthirius multifilis* in a river fish population. *Prog. Fish-Cult.* 25(3): 149-150.
- BAUER, O. N. 1959. Parasites of freshwater fish and the biological basis for their control. *Bulletin of the State Scientific Research Institute of Lake and River Fisheries*, Vol. XLIX. Leningrad. Trans. by L. Kochva. 236 pp.
- ELSER, H. J. 1955. An epizootic of ichthyophthiriasis among fishes in a large reservoir. *Prog. Fish-Cult.* 17(3):132-133.
- HINES, R. S., AND D. T. SPIRA. 1973. *Ichthyophthirius multifilis* (Fouquet) in the mirror carp, *Cyprinus carpio* L. I. Course of infection. *J. Fish Biol.* 5(3):385-392.
- , AND ———. 1974. Ichthyophthiriasis in the mirror carp *Cyprinus carpio* (L.). V. Acquired immunity. *J. Fish Biol.* 6(4): 373-378.
- HOFFMAN, G. L. 1967. Parasites of North American freshwater fishes. Univ. Calif. Press, Berkeley, Calif. 486 pp.
- KUDO, R. R. 1934. Studies on some protozoan parasites of fishes of Illinois. *Ill. Biol. Monogr.* 13(1):1-44.
- MEYER, F. P. 1969. Parasites of freshwater fish. II. Protozoa. 3. *Ichthyophthirius multifilis*. Fish Disease Leaflet 2. U.S. Dept. Int., Washington, D.C. 4 pp.

PAPERNA, I. 1972. Infection by *Ichthyophthirius multifiliis* of fish in Uganda. Prog. Fish-Cult. 34(3):162-164.

PEARSON, N. E. 1932. Ichthyophthiriasis among

the fishes of a pond in Indianapolis. Proc. Ind. Acad. Sci. 41(1931):455-463.

WOLF, L. E. 1938. Ichthyophthiriasis in a trout hatchery. Prog. Fish-Cult., Memo. 131 pp.



Kozel, Thomas R. 1976. "The occurrence of *Ichthyophthirius multifiliis* (Ciliata: Hymenostomatida) in Kentucky waters." *Transactions of the Kentucky Academy of Science* 37(1-2), 41-44.

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