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Survey of the Helminth Parasites of Selected Game Fishes of Lake Fort Smith, Arkansas

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A SURVEY OF THE HELMINTH PARASITES OF SELECTED GAME FISHES OF LAKE FORT SMITH, ARKANSAS[1]

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INTRODUCTION

The only published study of the parasites of game fishes in Arkansas is that of Becker, Heard, and Holmes (1966) who limited their investigations to a pre-impoundment survey of the helminth and copepod parasites of the black basses of Beaver Reservoir in northwest Arkansas and samples of basses used in the stocking of Beaver Reservoir from hatcheries at Centerton, Hamilton, and Lonoke, Arkansas.

The present study thus attempts to extend this knowledge to other fishes and becomes only the second investigation of this nature to be conducted in Arkansas.

The primary purpose of the present study was to determine the species, number, and extent of parasitism of selected game fishes in Lake Fort Smith, Arkansas.

Lake Fort Smith was impounded in 1936 as a water supply for the city of Fort Smith. The lake is located on the southern slope of the Boston Mountains in Crawford County, about 28 mi northeast of the city of Fort Smith. The lake has a maximum depth of 63 ft and a surface area of 525 acres. The southern half of the lake is closest to the dam, and ranges in depth from 30 to 63 ft: the northern half is less than 30 ft deep with a greater portion less than 15 ft in depth. The watershed is covered primarily with an oak-hickory forest. The lake bottom is composed of silty materials washed into it from its watershed, small rocks, and shale fragments. There is little emergent vegetation along the shores except for weed beds along the north shore (Nelson, 1952; and Rorie, 1961).

MATERIALS AND METHODS

The fishes were collected from Lake Fort Smith from February to November, 1961, with the largest number taken during April, May, June, October, and November. The fishes were obtained by the following methods: 100 ft experimental nets with a mesh

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size ranging from 1 to 3 in; application of Rotenone to a 7 acre section of the lake; a trap net; and fishing with rod and reel. After collection, the fishes were placed in a live box or packed in ice and brought directly to the laboratory for dissection.

The helminths were fixed, stained, and mounted according to Cable (1950 and 1958). Trematodes, cestodes, and acanthocephalans were fixed in alcohol-formalin-acetic acid at a temperature of 50 C. Trematodes and cestodes were stained with Delafield's hematoxylin; acanthocephalans with Ehrlich's acid hematoxylin. These helminths were cleared in Terpineol and mounted in Permount.

After fixation in glycerine, small nematodes were mounted on slides in hardened varnish craters filled with liquified glycerine jelly and sealed with a cover glass and varnish. The larger nematodes were fixed in liquid glycerine, cleared in lactophenol, and identified in their glycerine storage solution.

RESULTS

Table 1 indicates that a total of 107 fishes was examined representing 10 species. Of these, 103 fishes or 96.3% were infected with at least two species of helminths. A total of at least 16 species of helminths was recovered. *Micropterus salmoides* was infected with more speices of helminths (11) than any of the other hosts examined. The average number of parasites per fish was 22.9, with *M. punctulatus* having the highest average number of parasites per fish (76).

Table 2 gives an indication of host specificity with each species of parasite. *Camallanus oxycephalus* appeared to be the least host specific, while *Posthodiplostomum minimum* and *Leptorhynchoides thecatus* had the highest host specificity. The largest number of one species of parasite per fish was *Camallanus oxycephalus*: 75 were recovered from one *Pomoxis annularis* or *P. nigromaculatus*. Of at least 16 species of parasites recovered, six species were found to infect 100% of their respective hosts examined.

DISCUSSION

None of the parasites recovered represented a human health hazard.

As fishes were not returned to the laboratory alive, it was impossible to make an accurate recovery or to properly prepare monogenetic trematodes for indentification.

The study of fish parasites is of value to the fisheries scientist, parasitologist, and sportsman because of the detrimental effects certain parasites may have on the fish population. These effects may be summarized as follows: stunting, emaciation, sterility, and

TABLE 1

Host	Number Examined	Number Infected	Percent Infected	Ave. No. Per Fish	Parasites Found
Channel catfish *Ictalurus punctatus* (Rafinesque)	3	3	100	17.3	*Crepidostomum* sp., *Alloglossidium corti, Corallobothrium fimbriatum*
Yellow bullhead *Ictalurus natalis* (Le Sueur)	4	4	100	16.5	*Crepidostomum* sp., *Alloglossidium corti, Corallobothrium giganteum, Neoechinorhynchus cylindratum*
Black bullhead *Ictalurus melas* (Rafinesque)	1	1	100	3.0	*Proteocephalus ambloplitis, Corallobothrium fimbriatum*
Spotted bass *Micropterus punctulatus* (Rafinesque)	2	2	100	76.0	*Proteocephalus ambloplitis, Camallanus oxycephalus, Neoechinorhynchus cylindratum*
Largemouth bass *Micropterus salmoides* (Lacepede)	22	22	100	29.5	Monogenea, *Clinostomum marginatum, Posthodiplostomum minimum, Pisciamphistoma stunkardi, Proteocephalus ambloplitis, Contracaecum spiculigerum, Camallanus oxycephalus, Spinitectus carolini, S.* sp., *Ncoechinorhynchus cylindratum, Leptorhynchoides thecatus*
Warmouth *Chaenobryttus gulosus* (Cuvier)	21	19	90.5	5.4	Monogenea, *Crepidostomum cornutum, Clinostomum marginatum, Pisciamphistoma stunkardi, Proteocephalus ambloplitis, Camallanus oxycephalus, Spinitectus carolini*

TABLE 1 (Continued)

Host	Number Examined	Number Infected	Percent Infected	Ave. No. Per Fish	Parasites Found
Green sunfish *Lepomis cyanellus* Rafinesque	1	0	0	0	
Bluegill *Lepomis macrochirus* Rafinesque	21	20	95.2	23.0	*Crepidostomum cornutum*, *Pisciamphistoma stunkardi*, *Proteocephalus ambloplitis*, *Camallanus oxycephalus* *Spinitectus carolini*, *S.* sp., *Neoechinorhynchus cylindratum*
Black crappie *Pomoxis nigromaculatus* (Le Sueur)	10	10	100	45.0	*Pisciamphistoma stunkardi*, *Contracaecum spiculigerum*, *Camallanus oxycephalus*, *Spinitectus carolini*, *S.* sp.
White crappie *Pomoxis annularis* Rafinesque	22	22	100	12.9	Monogenea, *Pisciamphistoma stunkardi*, *Camallanus oxychephalus*, *Spinitectus carolini*, *S.* sp.
Totals: 10 species of fish	107	103			At least 16 species of parasites
Average infection rate			96.3	22.9	

TABLE 2

Parasite Classification	Name of Parasite	Fish Host and Number Examined	Parasites Per Fish	% Fish Infected	Site in Fish
Trematoda					
Order Monogenea	Monogenea Carus, 1863	*Chaenobryttus gulosus* (21)	0-7	19.04	Gills
		Micropterus salmoides (22)	0-3	0.09	Gills
		Pomoxis annularis (22)	0-1	0.05	Gills
Order Digenea					
Family Allocreadiiae	*Crepidostomum cornutum*	*Chaenobryttus gulosus* (21)	0-1	0.05	Intestine
	(Osborn, 1903)	*Lepomis macrochirus* (21)	0-53	57.14	Intestine
	Crepidostomum sp. Braun,	*Ictalurus natalis* (4)	0-3	25.00	Intestine
	1900	*Ictalurus punctatus* (3)	0-3	33.33	Intestine
Family Clinostomidae	*Clinostomum marginatum*	*Chaenobryttus gulosus* (21)	0-1	0.05	Gills
	(Rudophi, 1819)	*Micropterus salmoides* (22)	0-7	0.09	Gills
Family Paramphi-stomidae	*Pisciamphistoma stunkardi*	*Chaenobryttus gulosus* (21)	0-9	66.67	Intestine
	(Holl, 1929)	*Lepomis macrochirus* (21)	0-1	0.05	Intestine
		Micropterus salmoides (22)	0-2	13.63	Intestine
		Pomoxis annularis (22)	0-8	40.90	Intestine
		Pomoxis nigromaculatus (10)	0-1	20.00	Intestine
Family Plagiorchiidae	*Alloglossidium corti*	*Ictalurus natalis* (4)	0-22	75.00	Intestine
	(Lamont, 1921)	*Ictalurus punctatus* (3)	0-8	66.67	Intestine
Family Strigeidae	*Posthodiplostomum minimum* (MacCallum, 1921)	*Micropterus salmoides* (22)	0-14	0.09	Liver
Cestoda					
Order Proteocephalidea					
Family Proteocephal-idae	*Corallobothrium fimbriatum*	*Ictalurus melas* (1)	2	100.00	Intestine
	Essex, 1927	*Ictalurus punctatus* (3)	5-18	100.00	Intestine
	Corallobothrium giganteum Essex, 1927	*Ictalurus natalis* (4)	0-9	25.00	Intestine
	Proteocephalus ambloplitis	*Chaenobryttus gulosus* (21)	0-5	28.57	Mesentery of intestine
	(Leidy, 1887)	*Ictalurus melas* (1)	1	100.00	and stomach, intestine
		Lepomis macrochirus (21)	0-26	80.95	liver, ovary of all
		Micropterus punctulatus (2)	50-68	100.00	hosts
		Micropterus salmoides (22)	0-54	59.09	

TABLE 2 (Continued)

Parasite Classification	Name of Parasite	Fish Host and Number Examined	Parasites Per Fish	% Fish Infected	Site in Fish
Nematoda					
Order Spiruridea					
Family Camallanidae	*Camallanus oxycephalus* Ward & Magath, 1917	*Chaenobryttus gulosus* (21)	0-7	19.04	Intestine
		Lepomis macrochirus (21)	0-8	23.80	Intestine
		Micropterus punctulatus (2)	0-7	50.00	Intestine
		Micropterus salmoides (22)	0-46	36.36	Intestine
		Pomoxis annularis (22)	0-75	77.27	Intestine
		Pomoxis nigromaculatus (10)	15-75	100.00	Intestine
Family Rhabdochonidae	*Spinitectus carolini* Holl, 1928	*Chaenobryttus gulosus* (21)	0-16	14.28	Stomach & intestine
		Lepomis macrochirus (21)	0-25	66.67	Stomach & intestine
		Micropterus salmoides (22)	0-6	18.18	Stomach & intestine
		Pomoxis annularis (22)	0-12	18.18	Stomach & intestine
		Pomoxis nigromaculatus (10)	0-35	10.00	Stomach & intestine
	Spinitectus sp. Fourment, 1883	*Lepomis macrochirus* (21)	0-20	0.05	Stomach & intestine
		Micropterus salmoides (22)	0-3	0.09	Stomach & intestine
		Pomoxis annularis (22)	0-15	0.05	Stomach & intestine
		Pomoxis nigromaculatus (10)	0-28	20.00	Stomach & intestine
Order Ascarididea					
Family Heterocheilidae	*Contracaecum spiculigerum* (Rudolphi, 1809)	*Micropterus salmoides* (22)	0-1	.05	Mesenteries of stomach
		Pomoxis nigromaculatus (10)	0-3	10.00	and intestine
Acanthocephala					
Order Echinorhynchidea					
Family Echinorhynchidae	*Leptorhynchoides thecatus* (Linton, 1891)	*Micropterus salmoides* (22)	0-3	0.09	Intestine
Order Neoechinorhynchidea					
Family Neoechinorhynchidae	*Neoechinorhynchus cylindratum* (Van Cleave, 1913)	*Ictalurus natalis* (4)	0-1	25.00	Intestine
		Lepomis macrochirus (21)	0-6	0.05	Intestine
		Micropterus punctulatus (2)	5-22	100.00	Intestine
		Micropterus salmoides (22)	0-62	81.81	Intestine

mortality, not to mention the rejection of fishes by the sportsman for being "grubby" or "wormy" (Sinderman, 1953). The parasite causes these effects by three methods: (1) mechanical injury to the host caused by the parasite, (2) physiological injury to the host through interference with the normal functioning of organs, and (3) physiological injury due to the toxins produced by the parasite (Van Cleave, 1919). Thus, "Parasites definitely affect all phases of fishery operations, production, preparation, marketing, and research. Many of their effects remain to be assessed. Undoubtedly, fishery science must pay increased attention to parasites, not only because they are commercially important but also because they have potential value as research tools" (Hargis, 1958).

Control or eradication of parasites in a large body of water is economically impossible. Therefore, the best temporary solution seems to be the applied chemical treatments at fish hatcheries prior to stocking of fishes. Of course this does not insure that these stocked fishes will not become parasitized at a later date. In small bodies of water practical solutions may be found in draining, or a complete kill of infected fishes with Rotenone. Restocking may then be accomplished with hatchery fishes, samples of which have been checked for parasites.

It is hoped that the information contained in this paper will be of value in future determinations of the geographic distribution of the parasites of fishes and their host-parasite relationships.

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