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Note

DIFFERENTIAL INFECTION OF WALLEYES BY *CONTRACAECUM* SPP. IN HEATED AND NONHEATED RESERVOIRS — Walleye fingerlings (*Stizostedion vitreum*) were introduced into heated and nonheated reservoirs at the Big Stone Power Plant, Grant County, South Dakota, to develop a brood stock source for South Dakota hatcheries. During periodic examinations of the fish, we observed large numbers of the nematode, *Contracaecum spiculigerum*, in fish from the heated reservoir. We report here the different levels in infection intensity of walleyes in the heated and nonheated reservoirs.

Fifteen walleyes were collected on 23 June 1983, one year after stocking, from each of the reservoirs. The mean total length was 286 mm (range 256-315 mm) for fish from the heated reservoir and 279 mm (range 260-307 mm) for fish from the nonheated reservoir. The fish were dissected and nematodes removed from

the abdominal cavities. The 30 walleyes examined were infected with third-stage *C. spiculigerum* larvae. Though *C. spiculigerum* was the only nematode identified it is probable that other *Contracaecum* spp. were present. The mean number of larvae per fish was 211 (range 38-423) in the heated reservoir and 6 (range 1-17) in the nonheated reservoir. Infection intensity of walleyes from the heated reservoir was significantly higher (ANOVA, $P < .0001$) compared to that of fish from the nonheated reservoir. Lowe et al. (1977, Southwest. Nat. 22:537-538) reported an intensity of 90 *Contracaecum* spp. larvae per largemouth bass (*Micropterus salmoides*), but we know of no other reported infection of fish by *C. spiculigerum* as high as that in walleyes from the heated reservoir. Although *C. spiculigerum* has not previously been reported in walleyes, there are numerous infection reports of other fish species by this parasite (Hoffman, 1967, Parasites of North American freshwater fishes, University of California Press, Berkeley; Tedla and Fernando, 1969, J. Fish. Res. Board Can. 26:833-843; Huggins, 1972, S. Dak. Agric. Exp. Sta. Bull, 484; Holloway and Hagstrom, 1981, Prairie Nat. 13:85-93).

Adult *C. spiculigerum* has been reported in more than 60 species of fish-eating birds (Bakke and Barus, 1975, Norw. J. Zool. 23:183-191). Cormorants (*Phalacrocorax* spp.) have been recognized as effecting the wide distribution of the parasite (Whitfield and Heeg, 1977, S. Afr. J. Sci. 73:121-122). During the present study, double-crested cormorants (*P. auritus*) were observed feeding in both reservoirs. In addition, we observed birds in the families Laridae, Ardeidae, and Anatidae, which are reported hosts for the adult worms (Huizinga, 1971, J. Wildl. Dis. 7:198-204; Bakke and Barus, op. cit.; Buck and Cooper, 1976, Proc. Helminthol. Soc. Wash. 43:233-234). Eggs of *C. spiculigerum* are deposited in the feces of the bird host. Elevated water temperatures in the heated reservoir provide open water throughout the year for deposition of eggs. Water temperatures in the heated reservoir are above 19 C throughout the year, while ice covers the nonheated reservoir during November-April. Also, development of the egg is suspended at below 7 C, whereas at 21 C the eggs hatch in 5 to 7 days (Huizinga, 1966, J. Elisha Mitchell Sci. Soc. 82:181-195). Optimal water temperatures in the heated reservoir allow eggs to develop and hatch throughout the year. These temperatures may also result in increased numbers of the copepod intermediate host and enhanced feeding and infection of smaller fish.

Huizinga (1966, op. cit.) suggested three probable pathways of infection: 1) direct ingestion of second-stage larvae, 2) ingestion of infected copepods, and 3) ingestion of other infected fish. Lowe et al. (op cit.) found that larger older fish accumulated increased numbers of the parasite. Since walleyes in the heated reservoir were yearlings, they may accumulate even more numerous parasites, as they become older.

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