Raphidascaris acus (Bloch, 1779) in Northern Pike, Esox lucius L., Walleye, Stizostedion vitreum vitreum (Mitchill), and Yellow Perch, Perca flavescens (Mitchill), from Central Canada

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Raphidascaris acus **(Bloch, 1779) in Northern Pike,** ***Esox lucius*** **L., Walleye,** ***Stizostedion vitreum vitreum*** **(Mitchill), and Yellow Perch,** ***Perca flavescens*** **(Mitchill), from Central Canada**

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Raphidascaris acus is a widely reported parasitic nematode of holarctic distribution with an extensive list of fish hosts (Hoffman, 1967, Parasites of North American Freshwater Fishes, Univ. of California Press, Los Angeles, California, 486 pp.; Margolis and Arthur, 1979, Bull. Fish. Res. Board Can., No. 199, 269 pp.). The general impression from studies in North America is that yellow perch (*Perca flavescens*) and northern pike (*Esox lucius*) are the key fish species required for the transmission of *R. acus*, but as pointed out by Smith (1984, Can. J. Zool. 62: 685–694) the extent of its distribution in North America is unknown. Moreover, the role of other fish predators, like the economically important walleye (*Stizostedion vitreum vitreum*), is poorly understood. Poole and Dick (1985, J. Wildl. Dis. 21: 371–376) noted the presence of *R. acus* in the liver and intestine of walleye, but did not discuss parasitism of walleye relative to northern pike, make comparisons with other lakes, nor discuss the role of walleye in transmission. The objective of this study was to determine the distribution of *R. acus* in fish from two small boreal lakes in central Canada and its site within the hosts.

Walleye, northern pike, and yellow perch were collected using gill nets and live traps during June to October in 1980 and 1981 from Heming and Quigly lakes (54°53′N, 101°07′W). Procedures of necropsy of the fish and preservation of the nematodes were as outlined in Poole and Dick (1985, op. cit.). Larvae of *R. acus* were identified by the criteria of Moravec (1970, Vestn. Cesk. Spol. Zool. 34: 33–49) and Smith (1984, Can. J. Zool. 62: 1378–1386), and adults in the gastrointestinal (GI) tract were differentiated from larvae by the presence of eggs in the females and the total length of the worms. The terms mean intensity, prevalence, and abundance were used in accordance with Margolis et al. (1982, J. Parasitol. 68: 131–133). Representative specimens of *R. acus* have been deposited in the parasite collection, National Museum of Canada: NMCIC 1985-0040 (larvae) and NMCIC 1985-0041 (adult).

Walleye from both lakes harbored adult and larval *R. acus* in the GI tract and larval stages in the liver. The mean intensity, prevalence, and abundance of *R. acus* in walleye, northern pike, and yellow perch from each lake are given in Table 1. The abundance of *R. acus* in the GI tract of walleye was comparable to northern pike in Heming Lake, but the mean intensity was higher and the prevalence lower. However, walleye from Quigly Lake had a lower abundance, mean intensity, and prevalence of *R. acus* in the GI tract than northern pike. Gravid female *R. acus* were present in the GI tract of walleye during June and in the GI tract of northern pike into the third week in July in both lakes. Smith and Anderson (1982, *In* Molecular

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TABLE 1. Population estimates for *Raphidascaris acus* in walleye (*Stizostedion vitreum vitreum*), northern pike (*Esox lucius*), and yellow perch (*Perca flavescens*) from Heming and Quigly lakes, Manitoba, Canada.

Lake	Walleye		Northern pike	Yellow perch
	GI[a]	L[a]	GI	L
Heming	22 ± 41 (21)[b]	12 ± 9 (63)	8 ± 13 (64)	31 ± 38 (93)
(n = 48, 187, 176)[c]	[4.54][d]	[7.77]	[4.86]	[28.46]
Quigly	3 ± 3 (46)	8 ± 7 (70)	19 ± 18 (73)	32 ± 20 (64)
(n = 78, 33, 11)	[1.33]	[5.67]	[13.51]	[20.29]

[a] GI = gastrointestinal tract; L = liver.
[b] Mean intensity ± SD (prevalence).
[c] Sample size (walleye, northern pike, yellow perch) in each lake.
[d] [Abundance.]

and Biochemical Parasitology, Muller et al. (eds.), Elsevier Biomedical Press, Amsterdam, The Netherlands, pp. 352–353) also reported gravid female *R. acus* as late as July in northern pike from two small lakes in Ontario, Canada. The reason for differences in the length of stay in the GI tract of gravid worms between walleye and northern pike is not clear, but does not seem to be related to feeding patterns as yellow perch were common in the diet of both fish species during this time. Nevertheless the presence of gravid females from late May until the end of June confirms that walleye can serve as a definitive host of *R. acus*. However, higher abundances of *R. acus* in northern pike than walleye from Quigly Lake (Table 1) indicate that pike remains the main definitive host in some systems. The reasons for this are not clear, but may relate to feeding patterns and size structure of the fish population.

Prevalence of *R. acus* in the liver of walleye was comparable to yellow perch in Quigly Lake, but lower than yellow perch in Heming Lake (Table 1). Mean intensities and abundances of *R. acus* in the liver were lower in walleye than yellow perch in both lakes (Table 1). Larvae in the liver of walleye were encapsulated, and the lesions associated with these worms were similar to those reported in yellow perch (Poole and Dick, 1984, J. Wildl. Dis. 20: 303–307). Furthermore, these larvae had the same state of development, size, and activity when removed from cysts, as those recovered from the liver of yellow perch. These observations clearly show that, in addition to their role as a definitive host, walleye also serve as an intermediate host for liver stages of *R. acus*.

While further studies are needed to elucidate all routes for the transmission of *R. acus* some new possibilities are emerging. Northern pike feeding on small walleye with liver stages can acquire the parasite and the possibility exists that walleye cannibalism may be a route of transmission. This needs to be verified experimentally. The ability of walleye to serve as intermediate and definitive hosts and the fact that walleye can acquire liver stages of *R. acus* from embryonated eggs (Dick, unpublished data) could be important in single-species aquaculture programs.

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