

Research Note

Parasites of the Round Goby, *Neogobius melanostomus*, and Tubenose Goby, *Proterorhinus marmoratus* (Perciformes: Gobiidae), from the St. Clair River and Lake St. Clair, Michigan

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ABSTRACT: Totals of 144 round gobies, *Neogobius melanostomus* (Pallas), and 48 tubenose gobies, *Proterorhinus marmoratus* (Pallas), were collected in June through September 1994 from the St. Clair River and Lake St. Clair, Michigan, and examined for parasites. Seven species (*Diplostomum* sp., *Eustrongylides tubifex*, *Rhabdochona decaturensis*, *Spinitectus* sp., *Spiroxys* sp., *Leptorhynchoides thecatus*, and glochidia) infected round gobies. More parasite species infected gobies from Lake St. Clair than from the St. Clair River, with *Diplostomum* sp. being most common at both locations. Four species (*Trichodina* sp., *Contracaecum* sp., *Spiroxys* sp., and *Neoechinorhynchus* sp.) infrequently infected tubenose gobies. All species infecting gobies have been reported from other fish species in Lake Huron and Lake Erie. Apparently, no parasites from the Black Sea have become established in this system with the original goby colonizers.

KEY WORDS: gobies, *Neogobius melanostomus*, *Proterorhinus marmoratus*, exotic fish, parasites, Michigan, Great Lakes.

Mills et al. (1993) discussed the animal species that have made their way to the Great Lakes of North America. The parasites of some of these exotic species have been studied. Toews et al. (1993) reported on the parasites of zebra mussels, *Dreissena polymorpha*, from Lake St. Clair and Lake Erie. Cone et al. (1994) found *Dactylogyrus amphibothrium* on the Eurasian ruffe, *Gymnocephalus cernuus*, in western Lake Superior and suggested that this monogenean arrived in North America with the original ruffe colonizers. Crossman et al. (1991) and Jude et al. (1992) have reported on the occurrence of the round goby, *Neogobius melanostomus*, and tubenose goby, *Proterorhinus marmoratus*, in the St. Clair River. Both species of gobies probably were transported from the Black Sea in Europe to the St. Clair River system in ballast water by freighter between 1986 and 1988. Jude et al. (1992) discussed the biology and potential impact of gobies on fishes in these waters. The present study reports on parasites that these goby species acquired in the St. Clair River and Lake St. Clair

and whether or not Eurasian parasites were introduced into this system with the original goby colonizers.

Gobies were collected by angling, trawling, and electrofishing from the St. Clair River and Lake St. Clair, Michigan. The St. Clair River is a 63-km-long strait connecting Lake Huron to Lake St. Clair; midchannel depths range from 8.2 to 21.5 m and current velocity can approach 1.8 m/sec (Derecki, 1984). Lake St. Clair is a small, shallow body of water connecting the St. Clair and Detroit rivers, with a surface area of 1,114 km², a mean depth of 3 m, and a maximum depth of 8 m along a dredged shipping channel. The following fish data include information on location, month and year of collection, number of fish examined, and total length with range in millimeters (followed by mean \pm SD):

1. Round gobies, St. Clair River (Marine City, Richardson Island), July and August 1994, $n = 82$, 62–142 (96 ± 18.5); Lake St. Clair (Anchor Bay, Huron Point, Middle Channel), August and September 1994; $n = 62$, 60–117 (86 ± 14.6).
2. Tubenose gobies, Lake St. Clair (Anchor Bay, Goosebay, Huron Point); June and August 1994; $n = 48$; 35–87 (56 ± 15.3).

Gobies were frozen in the field, measured (in millimeters), and sexed at necropsy. The entire fish was examined. Parasites were collected and processed using routine procedures. Prevalence is the percentage of fish infected, and mean intensity is the mean number of worms of a species per infected fish. Voucher specimens have been deposited in the U.S. National Parasite Collection, Beltsville, Maryland 20705: *Diplostomum* sp. (84550), *Contracaecum* sp. (84552), *Eustrongylides tubifex* (84545), *Rhabdochona decaturensis* (84546), *Spinitectus* sp. (84547), *Spiroxys* sp. (84548, 84553), *Leptorhynchoides thecatus*

Table 1. Prevalence (P), mean intensity (MI), and maximum number of parasites (max.) found in *Neogobius melanostomus* from the St. Clair River and Lake St. Clair, 1994.

Parasite	St. Clair River (n = 82)		Lake St. Clair (n = 62)		Site
	P	MI ± 1SD (max.)	P	MI ± 1SD (max.)	
Digenea					
<i>Diplostomum</i> sp.*	11	1.6 ± 0.7 (3)	89	9.8 ± 16.1 (82)	Lens
Nematoda					
<i>Eustrongylides tubifex</i> *	—	—	2	1	Encysted in mesenteries
<i>Rhabdochona decaturensis</i> †	—	—	21	4.0 ± 5.0 (16)	Intestine
<i>Spinitectus</i> sp.‡	—	—	2	2	Intestine
<i>Spiroxys</i> sp.*	—	—	5	1	Encysted in mesenteries
Acanthocephala					
<i>Leptorhynchoides thecatus</i> *	—	—	2	3	Encysted in mesenteries
Mollusca					
Glochidia*	1	—	—	—	Gills

* Larval or immature stages.

† Gravid females.

‡ Immature females.

(84551), *Neoechinorhynchus* sp. (84554), and glochidia (84549).

The present study is the first report of parasites from naturalized gobies in the Great Lakes area. Ten (12%) of 82 round gobies from the St. Clair River and 55 (89%) of 62 round gobies from Lake St. Clair harbored 1 or more metazoan parasite species. A total of 7 species (2 from the St. Clair River and 6 from Lake St. Clair) infected round gobies (Table 1). Most helminth species were represented as larval or encysted stages. *Diplostomum* sp. was the most common parasite at each location. *Rhabdochona decaturensis* Gustafson, 1949, also commonly infected gobies from Lake St. Clair. The other parasite species were infrequent. There were no significant differences in prevalence (chi-square analysis, $P > 0.05$) and intensity (Student's t -test, $P > 0.05$) of parasitism for *Diplostomum* sp. and *R. decaturensis* between female and male gobies. The round goby is a new host record for *R. decaturensis* and *Leptorhynchoides thecatus* (Linton, 1891) Kostylew, 1924.

Diplostomum sp. was the only species from round gobies shared between locations. The correlation coefficients for *Diplostomum* sp. intensity and host length were significant at the St. Clair River ($r = 0.579$, $P < 0.05$) and Lake St. Clair ($r = 0.537$, $P < 0.01$), indicating that *Di-*

plostomum sp. intensity increased with host length. *Diplostomum* sp. had a higher mean intensity and a significantly higher prevalence (chi-square, $\chi^2 = 35.9$, $P < 0.005$) in round gobies from Lake St. Clair than from the St. Clair River. However, infected gobies from the St. Clair River had a significantly larger mean length ± SD (112 ± 18.1) than their counterparts (88 ± 13.7) from Lake St. Clair (Student's t -test, $t = 21.0$, $P < 0.001$). Therefore, fish length does not play a major role in this difference. *Diplostomum* sp. was more common in gobies from Lake St. Clair because the snail intermediate host probably was more common there.

Only 5 (10%) of the 48 tubenose gobies from Lake St. Clair were infected with 1 or more parasites. The protozoan, *Trichodina* sp., occurred on the gills of 1 goby from Anchor Bay. Two larval nematodes, *Spiroxys* sp., were encysted in the mesentery of another goby from Anchor Bay. Two other larval nematodes, *Contracaecum* sp., and 1 acanthocephalan, *Neoechinorhynchus* sp., were encysted in the livers of 3 tubenose gobies from Goosebay.

Gobies from each location had a varied diet. Amphipods, isopods, and ostracods often were found in tubenose gobies. Zebra mussels, finger-nail clams, snails, amphipods, chironomids, and caddisfly larvae were present in round gobies.

Hexagenia sp., mayfly naiads that are intermediate hosts for *R. decaturensis* and *Spinitectus* sp., were found in round gobies from Lake St. Clair but not from the St. Clair River. This probably explains why these nematodes were present in the lake but not the river.

The low intensities for most helminth species in round and tubenose gobies may be due to the limited time they have been in this system. However, native fish species (sculpins, *Cottus* spp., and johnny darter, *Etheostoma nigrum*) also may have low intensities in similar niches and merit examination for comparative purposes. Each goby species harbors helminths as larvae (*Diplostomum* sp., *E. tubifex*, *Spiroxys* sp., and *Contractaecum* sp.), which occur as larval stages in other Great Lakes fishes and mature in vertebrates common to the region. Endemic parasites known from other Great Lakes fishes (Dechtiar et al., 1988; Dechtiar and Nepszy, 1988) were acquired by both goby species. Apparently, none of the 10 parasites species found in gobies in the present study arrived with the original goby colonizers. In contrast, at least 1 Eurasian helminth species has entered the Great Lakes through the naturalization of an exotic fish species (Cone et al., 1994).

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