

THE DIGENEAN FAUNA OF SOME FISH SPECIES IN THE LAKE LADOGA

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ABSTRACT. In this study, digeneans of 4 cyprinid fishes (bream, ide, white bream, and vimba) from Lake Ladoga were investigated in May-June 2001-2003. Twenty one parasite species were recorded. Data on the species composition and intensity in some fishes are presented for each fluke species. The parasite species composition in different host species was compared. The results obtained were compared with earlier data.

Key words: digeneans, fish, lake Ladoga.

INTRODUCTION

Lake Ladoga is the largest freshwater body of Europe. In spite of the numerous investigations of fish parasites in different lakes, the digenean fauna of Lake Ladoga has not been sufficiently researched. This is true both for adult specimens and larval stages. So far, only several papers devoted to fish parasites in Lake Ladoga have been published (Jääskeläinen 1921, Barysheva and Bauer 1957, Bauer and Nikolskaya 1957). Unfortunately, the data are incomplete. Some studies have recently been conducted in Lake Ladoga (Rumyantsev et al. 2001), but they have not been completed yet. Research into digeneans is necessary for human activities because most fluke species are widespread in pools and affect fish. Furthermore, the Lake Ladoga ecosystem undergoes significant changes due to human activities. Parasites including digeneans are an indicator of these changes; thus, information on the species structure and invasion values may be useful in impact assessment. The aim of this study was to investigate the species composition and diversity of digeneans, the distribution of digeneans among different host groups, the impacts of ecological conditions on fish invasions.

MATERIAL AND METHODS

Lake Ladoga is situated in Republic of Karelia (Russia) between 59°54' and 61°47' N. The total lake area is 17680 km², maximum depth – 228 m, mean depth – 51

m. During our study, samples were taken in May-June 2001-2003. The following host species were studied: bream (*Abramis brama* L.), ide (*Leuciscus idus* L.), white bream (*Blicca bjorkna* L.) and vimba (*Vimba vimba* L.). These fish species are the most numerous among cyprinids in catches. Fish was caught using nets by local commercial fishermen. Infection with digeneans was studied. Immediately after dissection, the skin, fins, gills, liver, gallbladder, intestine, heart, muscles, eyes, urinary bladder, kidneys were placed in separate Petri dishes. To determine the presence of parasites, all parts were thoroughly examined under a binocular microscope. Parasites found in the host were removed using a sharp preparation needle. Encysted metacercariae were freed by subjecting them to antiformin solution. They were then rinsed in distilled water. The parasite specimens were preserved in 70 per cent alcohol and then stained with acetic acid carmine and mounted in Canada balsam. Parasite identification was carried out using Bauer's reference key (1987) and Frese (2002).

RESULTS AND DISCUSSION

The digenean fauna of the fishes studied was represented by 21 species (Table 1). All parasites are specific to cyprinids. Two fluke species (*Parasymphylodora markewitschi* and *Allocreadium baueri*) have not been reported from other waters of Karelia. Thirteen species (62%) used the fishes as the intermediate host for the metacercariae stage. They penetrated the fish organism through the skin. Adult digenans of 8 species (38%) parasitized fish intestine. They used it as the definitive host. Fish acquired these parasites feeding on benthic invertebrates (molluscs, aquatic insect larvae, leeches) and free-swimming cercariae.

The bream digenean fauna was the most diverse (21 species). The ide was the host of 15 parasite species. The digenean fauna of the white bream comprised 13 species. The vimba was infected with 11 digeneans because this fish species occurred in the northern part of its distribution range in Lake Ladoga.

Among metacercariae, the fluke parasites of gills and muscles, *Rhipidocotyle campanula* and *Paracoenogonimus ovatus*, were the most abundant and widespread. Fish specimens were also heavily infected with *Diplostomum chromatophorum*, *D. huronense*, *D. spathaceum* and *Ichthyocotylurus platycephalus*. These species are generalists. They infected all fishes studied. *Diplostomum nordmanni*, *D. mergi*, *D. commutatum*, *D. helveticum* were infrequent. No *Tylodelphys clavata* was detected in bream eyes. The parasite fauna of the ide was lacking *Ichthyocotylurus pileatus*. The white bream was not infected with *I. variegatus*.

Among maritae, digeneans of the genus *Sphaerostomum* were the dominant parasites and occurred at the northern limit of the distribution range. *S. globiporum* was found on all fish species studied, although fishes of genus *Leuciscus* are the only specific host for the fluke. The other three cyprinid fishes are specific hosts for

Table 1. List of digeneans found in bream, vimba, ide, white bream in Ladoga Lake (prevalence = %)

Parasite species	Bream		Vimba		Ide		White bream	
	Prevalence (%)	Intensity	Prevalence (%)	Intensity	Prevalence (%)	Intensity	Prevalence (%)	Intensity
<i>Rhipidocotyle campanula</i>	81.3	4-332	72.0	2-24	48.0	1-18	69.6	1-46
<i>Phyllodistomum elongatum</i>	27.8	1-21	-	-	8.0	1-2	4.3	1-62
<i>Ph.folium</i>	5.6	7	-	-	-	-	-	605
<i>Ph.simile</i>	5.6	7	-	-	-	-	-	-
<i>Allocreadium isoporum</i>	10.5	14-65	-	-	36.0	1-176	4.2	8
<i>A. baueri</i>	-	-	-	-	-	-	4.2	9
<i>Sphaerostomum bramae</i>	42.1	1-125	20.0	1-3	-	-	41.7	2-234
<i>S. globiporum</i>	36.8	3-41	10.0	1-1	16.0	1-45	25.0	1-17
<i>Parasymphylodora markewitschi</i>	-	-	-	-	4.0	1	-	-
<i>Ichthyocotylurus pileatus</i>	5.9	2	5.6	3	-	-	4.3	2
<i>I. platycephalus</i>	35.3	1-13	44.4	1-5	20.0	1-35	65.2	1-86
<i>I. variegatus</i>	5.9	3	5.6	1	4.0	4	-	-
<i>Paracoenogonimus ovatus</i>	70.6	2-72	17.0	2-52	36.0	1-40	83.3	4-208
<i>Tylodelphys clavata</i>	12.5	1-2	-	-	8.0	3-14	8.7	2-2
<i>Diplostomum chromatophorum</i>	7.3	2-11	14.3	14	60.0	1-8	18.2	25-116
<i>D. helveticum</i>	-	-	-	-	10.0	3	-	-
<i>D. commutatatum</i>	11.0	11	-	-	-	-	-	-
<i>D. huronense</i>	100.0	4-164	100.0	2-131	60.0	5-20	81.8	14-250
<i>D. mergi</i>	11.0	9	-	-	10.0	4	-	-
<i>D. nordmanni</i>	22.0	9-22	14.3	7	10.0	8	-	-
<i>D. spathaceum</i>	33.3	9-27	42.9	2-9	30.0	2-5	36.4	4-16

S. bramae. Some authors (Zhokhov 2002) hypothesized that at the limits of the distribution range, digeneans of this genus expanded the range of definitive hosts by including nonspecific fish-hosts. According to our results, *S. bramae* did not change its host specificity and *S. globiporum* expanded the range of fish hosts.

The parasite fauna of 3 fish species included *Allocreadium isoporum*. The ide was heavily infected with it. Infection of the bream and the white bream was less intensive. The degree of infection with this digenean depends on the share of aquatic insect larvae in the diet. *Allocreadium baueri* and *Parasymphylodora markewitschi* were found once in the intestine of white bream and ide, respectively; their quantity was low. Rare occurrence of *A. baueri* is pointed out for northern waterbodies, where it was recorded from minnow (Mitenev 2000). *P. markewitschi* also had low intensity of occurrence. Like genus *Sphaerostomum*, this digenean probably has the northern limit of its distribution range in Lake Ladoga, because *P. markewitschi* was found in cyprinid fishes of more southern waterbodies (Wyrzykowska 1964, Izyumova 1977). These two digenean species have not yet been recorded from other Karelian waterbodies.

Parasites of the fish excretory system, flukes of genus *Phyllodistomum*, were observed in all fishes studied, except the vimba. The bream was more heavily infected with these digenean than ide and white bream. This was due to different habitats of the fishes. Being a typical benthos feeder, the bream is closely connected to mussel habitats, where it is invaded by flukes while feeding on molluscs. The ide and white bream are less infected with *Phyllodistomum*, because they feed further away from the bottom.

We compared the digenean faunas of the fishes studied. The bream and the ide had the most similar parasite species composition (13 common species). The bream and the white bream had 12 species in common. All digeneans found in the bream occurred also in the vimba (11 species). The vimba and the white bream had the lowest number of coincident digenetic trematodes (7 species).

We also compared our results with earlier data. Fish infection with different metacercariae recorded in 2001-2003 increased 2-4 times compared with 1957 indices. It appears that the degree of cyprinid infection with these digeneans can be considered as an indicator of the eutrophication of Lake Ladoga. To support this idea, investigations into the species structure and biology of fish digeneans in Lake Ladoga will be continued.

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