ACTA ICHTHYOLOGICA ET PISCATORIA (2004) 34 (1): 33–42

PARASITE FAUNA OF IDE, *LEUCISCUS IDUS* (L.) IN LAKE DĄBIE, POLAND

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Sobecka E., Jurkiewicz E., Piasecki W., 2004. Parasite fauna of ide, *Leuciscus idus* (L.) in Lake Dąbie, Poland. Acta Ichthyol. Piscat. 34 (1): 33–42.

Background. The previous survey on parasites of ide in Poland was carried out in 1987 and there has been no data available on the parasites of this fish from areas in Poland west of the Vistula River. The aim of the present study was to survey the parasite fauna of ide, *Leuciscus idus* in Lake Dąbie and to compare the results with the relevant data on the subject published by other authors.
Material and methods. Standard parasitological procedures were applied to 110 individuals of ide, *Leuciscus idus* (L.) caught within 2000–2003 in Lake Dąbie, Szczecin, Poland.
Results. All fish examined were infected with parasites. The parasites recovered, represented 32 species and 11 higher taxa (Oligohymenophorea, Myxosporea, Monogenea, Digenea, Nematoda, Palaeacanthocephala, Euacanthocephala, Hirudinea, Copepoda, Branchiura, and Bivalvia). A total of 15 parasite species represented new host records for ide in Poland (*Dermocystidium* sp., *Myxidium pfeifferi, Zschokella nova, Myxobolus carassii, M. muelleri, Henneguya cutanea, Tripartiella copisa, Paradiplozoon bliccae, Gyrodactylus prostae, Anisakis simplex, Streptocara crassicauda, Philometra rischta, Argulus foliaceus, Piscicola geometra, Hemiclepsis marginata*). The highest values of prevalence were recorded for: *Ergasilus sieboldi, Diplostomum* spp., *Tylodephys clavata*, and *Paracoenogonimus ovatus*.
Conclusion. Infection parameters of the presently surveyed ide were distinctly different from those previously described. It is possible that populations of some parasites grew within the past 20 years.

Key words: fish, ide, *Leuciscus idus*, Cyprinidae, parasites, Lake Dąbie, Poland.

INTRODUCTION

The Polish parasitological literature contains very scant data on ide parasites. There may be two reasons for the lack of interest among parasitologists. Firstly, the

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commercial importance of ide is very low and the fish is usually marketed under the name of roach. Secondly, ide very frequently hybridises with other cyprinids, mainly with roach and European chub, so it is difficult to obtain individuals representing the true species (Brylińska 2000).

Abundance and species composition of parasite fauna of ide were studied in Poland in the 1960s (Radwan 1960, Wyrzykowska 1964, Wysocka 1965, Perłowska 1969) and in the 1970s (Niewiadomska 1977). While those studies involved the ide caught in the Vistula River and in bodies of water situated east of it. Rokicki (1975) described the ide helminth fauna in the Gulf of Gdańsk. The last study on record that dealt with ide parasites was published by Grabda-Kazubska and Pilecka-Rapacz (1987) and concerned the fish caught from the Vistula near Warsaw. All those studies yielded a total of 35 parasite species. No research on ide inhabiting waters west of the Vistula has hitherto been carried out.

This study was aimed at comparing species composition and abundance of ide parasites in Lake Dąbie with relevant data from other bodies of water in Poland and reported in earlier papers. Analyses of frequency of occurrence were made to find out which of the parasites were most common, rare, or accidental. Of interest was also to find out if the abundance of the earlier-described parasites had changed.

MATERIALS AND METHODS

The study, carried out from 14 April 2000 to 22 April 2003 involved 14 samples containing a total of 110 ide individuals caught in Lake Dąbie. The fish total length averaged 310 mm (205–395 mm), the average weight being 375 g (90–765 g). The fish were examined when still fresh, a few hours after capture. The parasites were identified when live or after fixation in 75% alcohol. They were studied with techniques recommended for individual parasite taxa (Lonc and Złotorzycka 1994).

RESULTS

All the ide speciemens examined proved to be parasite-infected. The parasites found represented 31 species of the following 11 classes: Oligohymenophorea, Myxosporea, Monogenea, Digenea, Nematoda, Palaeacanthocephala, Euacanthocephala, Hirudinea, Copepoda, Branchiura, and Bivalvia. For 15 species, this study is the first record in ide in Poland.

The highest prevalence was shown by *Ergasilus sieboldi*, *Diplostomum* spp., *Tylodelphys clavata,* and *Paracoenogonimus ovatus* (Table 1). No water temperature effect on the extent of infection was observed.

The lowest prevalence (0.91%) was typical of *Henneguya cutanea*, *Sanguinicola volgensis*, and *Anisakis simplex. H. cutanea* was found, in the form of a solitary spore, in mucus sampled from the nasal cavity. A mucus sample collected from the second gill arch was parasitised by *S. volgensis*. An encysted larva of the nematode *A. simplex* was encountered in the body cavity of a single fish.

The highest mean intensity of infection was an attribute of *Zschokella nova*. Spores of the parasite were detected in the suspension of the gall bladder content of a single fish.

Bivalve glochidia were found to occur at a high mean intensity (69.86) as well. The actual intensity varied greatly and ranged from 1 to 630 larvae observed on gills of a fish. The invasion of that seasonal parasite was at its most severe in April and May.

Table 1

Parasites found in the surveyed ide from Lake Dąbie

Species	Prevalence [%]	Intensity	Mean intensity	Abundance
Dermocystidium sp.	5.45	2–5 cysts	3.33	0.055
Myxidium pfeifferi Auerbach, 1908	6.36	3–8 spores	2.57	0.064
Zschokella nova Klokačeva, 1914	0.91	150 spores	150	0.009
Myxobolus carassii Klokačeva, 1914	6.36	1–10 cysts	2.43	0.064
Myxobolus muelleri Bütschli, 1882	10.00	1–11 cysts	3.82	0.100
Tripartiella copiosa (Lom, 1959)	39.09	2–13	2.91	0.390
Paradiplozoon megan (Bychowsky et Nagibina, 1959)	14.55	1–12	4.69	0.145
Paradiplozoon bliccae (Reichenbach-Klinke, 1961)	1.81	1–2	1.50	0.018
Dactylogyrus tuba Linstow, 1878	27.27	1–97	8.53	0.272
Gyrodactylus prostae Ergens, 1963	5.45	1–8	2.83	0.955
Diplostomum spp.	73.64	1–60	11.26	0.736
Posthodiplostomum cuticola (von Nordmann, 1832)	12.73	1–5	1.93	0.127
Tylodelphys clavata (von Nordmann, 1832)	71.82	1–173	20.18	0.718
Paracoenogonimus ovatus Katsurada, 1914	64.55	1–470	27.19	0.527
Ichthyocotylurus platycephalus (Creplin, 1825)	23.64	1–35	4.73	0.236
Asymphylodora markewitschi Kulakowskaja, 1947	25.45	4–70	21.39	0.255
Asymphylodora kubanicum (Issaitschikoff, 1923)	17.27	1–37	4.79	0.173
Sanguinicola volgensis (Razin, 1929)	0.91	1.00	1.00	0.009
Anisakis simplex (Rudolphi, 1809)	0.91	1.00	1.00	0.091
Streptocara crassicauda (Creplin, 1829)	4.55	1 –2	1.22	0.045
Philometra rischta Skrjabin, 1917	5.45	1–6	3.67	0.200
Acanthocephalus lucii (Müller, 1776)	1.82	1.00	1.00	0.018
Acanthocephalus anguillae (Müller, 1780)	21.82	2–19	21.38	0.218
Neoechinorhynchus rutili (Müller, 1780)	46.36	1–84	13.14	0.464
Piscicola geometra (Linnaeus, 1761)	25.45	1–12	2.36	0.255
Hemiclepsis marginata (Müller, 1774)	3.64	1–2	1.25	0.036
Ergasilus sieboldi von Nordmann, 1832	79.09	1–43	8.30	0.791
Tracheliastes polycolpus von Nordmann, 1832	31.82	1–5	1.97	0.318
Argulus foliaceus (Linnaeus, 1758)	6.36	1–3	1.43	0.064
Unionidae gen. sp.	57.28	1–630	69.86	0.572

DISCUSSION

The ide of Lake Dąbie was found to be a host for 31 parasitic species. Of the 42 species reported previously from ide of the central and eastern Poland (Radwan 1960, Wyrzykowska 1964, Wysocka 1965, Perłowska 1969, Puciłowska 1969, Rokicki 1975, Niewiadomska 1977, Grabda-Kazubska and Pilecka-Rapacz 1987) as few as 16 were recorded in this study. The reason has to be most probably looked for in site- or area-specificity of the parasites. It has to be also remembered that, prior to this study, the most recent (published) research on ide was carried out in 1987. Moreover, except for that of Niewiadomska (1977), the previous studies did not involved parasitic protozoans.

In the former Soviet Union, Byhovskij (1962) listed 93 ide parasites, more than twice the number of parasites reported so far from Poland. The higher number of species in Byhovskij's study was a result of a much more extensive area being surveyed. In addition, difficulties in identification of the host species could have contributed to the differences in species composition of the parasitic faunas.

The most recent survey of ide parasites in northern Europe was carried out by Sterud and Appleby (1997). They found a total of 39 parasite species of which at least 8 were new species records for Norway.

In spring, *Dermocystidium* sp. cysts were found on the skin of 6 ide individuals, the parasite's intensity of infection ranging from 2 to 5 cysts. The parasite, not hitherto recorded from ide, had been reported on the skin and gills of other cyprinids in Poland (Witała et al. 1971).

The urinary bladder and, in one fish, the gall bladder of a total of 7 fish revealed the presence of *Myxidium pfeifferi*. The parasite's infection intensity ranged from 3 to 8 spores. *M. pfeifferi* is a cyprinid parasite (Kozicka 1953). Lom and Dykova (1992) reported *M. rhodei* from the cyprinid kidney and found them to be identical, in terms of the body structure, to *M. pfeifferi;* they suggested the two species be most probably a single one. Plasmodia of *M. rhodei* are commonly found in the renal corpuscles of cyprinid hosts in Eurasia and elicit hypertrophy of corpuscles (Woo 1995). It had not been recorded in ide in Poland before.

Zschokella nova, another parasite not known in the Polish ide before, was found in April 2003 in a single ide individual: the fish examined hosted 150 spores in its gall bladder. Brummer-Korvenkontio et al. (1991) described the parasite from roach in lakes of central Finland.

Myxobolus carassii occurred at an intensity of 1 to 10 cysts on gills of seven ide individuals. It is a cyprinid parasite, reported from ide in the former USSR (Šul'man 1984), but not found in Poland's ide population before.

Myxobolus muelleri was found dwelling on the gills, skin, and in the intestinal wall of 11 fish individuals. The parasite's infection intensity and prevalence was 1–11 cysts and 10%, respectively. *M. muelleri* occurred in spring and autumn. An infection prevalence similar to that found in this study was described in bream by Reda (1987).

The nasal cavity secretion sampled from an ide individual was found to contain a single spore of *Henneguya cutanea.* The parasite, not recorded in ide in Poland so far, was reported in ide and other cyprinids in the former USSR (Šul'man 1984).

The ciliates *Tripartiella copiosa* were collected from the skin, gills, and from the nasal cavity secretion. The parasites occurred in April and May. Many of them were juvenile forms. They had been reported from more than 40 fish species, primarily cyprinids (including ide), in Eurasia (Lom and Dykova 1992). Prior to this study, they had not been recorded in Poland.

Paradiplozoon megan and *Dactylogyrus tuba* are ide-specific representatives of the Monogenea. They dwelled mainly on gills, although two *D. tuba* were found in the nasal cavity. The parasites occurred mainly in early spring. Their prevalence amounted to 14.55 and 27.27%. The parasites were reported by Grabda-Kazubska and Pilecka-Rapacz (1987) from the ide caught in the Vistula near Warsaw; in their study the monogenean prevalence were lower than those in Lake Dąbie.

Gills of two ide individuals were found to host 3 specimens of *Diplozoon bliccae*, while gills of six ide (5.45% prevalence) were the site of *Gyrodactylus prostae*. Both species appeared in April 2003. *P. bliccae* had been recorded in other cyprinids. *G. prostae* was reported in rivers of the Baltic Sea catchment (Gusev 1985). Neither of the parasites had been reported from ide in Poland before.

Among the ide parasites, digeneans proved to be the species-richest group. Byhovskij (1962) found a total of 32 species, 19 being reported from the ide in Poland. The Lake Dąbie ide was found to host 8 digenean species. The most abundant digeneans were metacercariae of *Tylodelphys clavata*, occurring in the eye's vitreous body, and *Paracoenogonimus ovatus*, dwelling in skeletal muscles. The two parasites were also characterised by high prevalence. In the Lake Siemień ide, *T. clavata* occurred at a prevalence of 22% (Radwan 1960), making it the most common parasite. Metacercariae of *T. clavata* and *P. ovatus* were also reported from ide examined by Grabda-Kazubska and Pilecka-Rapacz (1987). The first species was also common and abundant, its infection intensity ranging from 1 to 314 parasites in a fish. On the other hand, single metacercariae of *P. ovatus* were found by the authors mentioned in muscles of as few as two fish individuals.

The eye lens was a site of occurrence of *Diplostomum* spp. metacercariae, most frequently recorded in April and May. They occurred at an intensity of 1–60 per fish. As reported by Grabda-Kazubska and Pilecka-Rapacz (1987), the Vistula ide eye lens housed 5–158 *Diplostomum* spp. metacercariae.

The presence of *Asymphylodora markewitschi* in ide was first signalled by Wyrzykowska (1964) in the Zegrzyński Reservoir. The parasite was also reported from ide caught in the Gulf of Gdańsk (Rokicki 1975). In Lake Dąbie, the parasite occurred in ide intestines in spring, the intensity varying from 4 to 70 speciemens. The genus *Asymphylodora* was represented also by *A. kubanicum*, another intestinal parasite, found in ide in Poland for the first time in 1975 (Rokicki 1975) and occurring

then at an intensity of 1–10 individuals. The parasite had been earlier reported from other cyprinids (Bauer 1987). In the present study, the infection intensity ranged from 1 to 37 individuals.

A mucus sample collected from gills of one ide was found to contain a single digenean, identified as *Sanguinicola volgensis*. Grabda-Kazubska and Pilecka-Rapacz (1987) who reported the parasite for the first time from the ide in Poland found a single individual as well.

The body cavity of an ide individual revealed the presence of an *Anisakis simplex* larva. The presence of a typically marine and estuarine nematode in ide resulted from biological characteristics of the fish which dwells in downstream sections of rivers, close to their mouths, and feeds on insect larvae, worms, molluscs, crustaceans, and small fish (Terofal and Militz 1996). Thus ide became another, in addition to zander (Piasecki and Sobecka 1987, Rolbiecki and Rokicki 2000), accidental host of *A. simplex*, the nematode not found in ide anywhere in Poland before.

Another nematode present in the ide examined was *Streptocara crassicauda* the stage 3 larvae of which were found in the intestine of 5 fish. The species is cosmopolitan. Adults occur in the stomach of waterfowl. The species had been reported from numerous freshwater fish in the former Czechoslovakia and Yugoslavia, and in Hungary and Ukraine as a paratenic parasite (Moravec 1994). It had not been found in the Polish ide prior to this study.

In May and June 2001, the gill operculum and head of 6 ide individuals yielded *Philometra rischta.* Under the climatic conditions prevailing in Poland, the nematode has a single developmental cycle, proceeding from June until May of the subsequent year. The nematode was reported from the crucian carp in Poland by Wierzbicki (1958) as *P. opercularis*. It had not been found in the Polish ide before; neither had it been recorded in ide in the former Soviet Union (Byhovskij 1962).

The fish examined revealed the presence of 3 acanthocephalan species. Two individuals of *Acanthocephalus lucii* were found in the intestine of two fish individuals. That ide is not a typical *A. lucii* host was confirmed by the fact that the parasite was found in the intestine lumen and its proboscis was drawn in. The acanthocephalan was first mentioned in ide in Poland by Wysocka (1965) who recorded a 2% prevalence in the Zegrzyński Reservoir ide, the prevalence in roach being 62%. *A. lucii* was also reported from ide in the same water body by Puciłowska (1969) who, too, recorded a low prevalence (5%).

The two other acanthocephalans, *Acanthocephalus anguillae* and *Neoechinorhynchus rutili* occurred in the Lake Dąbie ide at prevalence amounting to 21.82 and 46.36%, respectively. The two parasites were never co-occurring. *A. anguillae* had been earlier found by Grabda-Kazubska and Pilecka-Rapacz (1987) in ide in the Vistula where the infection was much more prevalent than in Lake Dąbie, the prevalence amounting to 78.18%. A survey on this particular acanthocephalan was repeated after some 12 years by Kamara (2000). He found that the overall prevalence

value for *A. anguillae* amounted to 46.97%. Such considerable decline in the parasite's abundance Kamara attributed to "drastic declines in annual populations of the intermediate host Asselus aquaticus due to intensification of water pollution over the years." The ide infections in the Zegrzyński Reservoir showed higher prevalence as well (Wysocka 1965, Perłowska 1969, Puciłowska 1969), while in the Lake Siemień ide the prevalence was as low as 4% (Radwan 1960).

Single findings of *N. rutili* had been reported from ide dwelling in the Gulf of Gdańsk (Rokicki 1975). The parasite's presence was also recorded in *Abramis ballerus, A. brama,* and *Blicca bjoerkna* in Lake Dąbie (Wierzbicka 1977), the infection prevalence amounting to 1.3–4.8%. It may be concluded that ide is a more suitable host for the parasite. Another reason could be sought in an increased population size of the acanthocephalan in the water body studied.

The skin, gills, gill and mouth cavities, and fins of the Lake Dąbie ide revealed the presence of the leeches *Piscicola geometra* and *Hemiclepsis marginata*, found in late spring and summer. The first occurred much more frequently, the infection prevalence amounting to 25.45%. The two hirudinean species inhabit Polish waters and are particularly frequent on cyprinids, *H. marginata* being much less abundant than *P. geometra* (Prost 1994).

Ergasilus sieboldi was a parasite whose infection in the ide under study was most prevalent. A total of 772 individuals of the copepod were found, the intensity of infection ranging from 1 to 43 copepods on the gills, in the nasal cavity, and—in 1 case—on the skin. In the Vistula, the parasite's prevalence on ide amounted to 5.45% (Grabda-Kazubska and Pilecka-Rapacz 1987).

Tracheliastes polycolpus is a frequent cyprinid parasite, found in ide in the Biebrza River valley (Kozikowska and Witkowski 1979), in the Vistula (Grabda-Kazubska and Pilecka-Rapacz 1987), and in the Narew River (Galicka and Penczak 1989). It had not appeared abundantly in the studies reported on so far. The ide examined in this study showed the infection intensity of 1 to 5 copepods.

Argulus foliaceus, the only representative of the class Branchiura, was found to occur on the skin of the head and, in a single case, on the gills. It was encountered in 7 fish individuals, in May only. Prior to this study, the parasite had been frequently recorded in Poland (Prost 1994) and had been reported from the former Soviet Union (Byhovskij 1962). The available literature contains, however, no mention of *A. foliaceus* occurring in ide in Poland.

Glochidiosis is a condition usually observed in lacustrine and farmed fish. A strong invasion of bivalve larvae may be a cause of fish mortality (Prost 1994). In 1987, glochidia were reported from gills of two ide individuals in the Vistula, the infection intensity amounting to 3–29 individuals (Grabda-Kazubska and Pilecka-Rapacz 1987). This study revealed the presence of glochidia on the ide examined as well. They occurred at an infection intensity of 1 to 630 individuals per fish, which made the glochidia the most abundant ide parasites observed in this study.

An interesting aspects of ide parasitology in Europe has recently been its potential to transmit larvae of *Anguillicola crassus*, a nematode specific (as adult) to swim bladder of eels. Thomas and Ollevier (1992), surveying a number of fish species in Belgium, found out that ide was a paratenic host for *A. crassus*. A similar study repeated in the Vistula Lagoon in Poland (Rolbiecki 2002) did not reveal larval *A. crassus* in ide.

ACKNOWLEDGEMENT

We are grateful to Dr Beata Więcaszek (Division of Fish Systematic, Agricultural University of Szczecin) for assistance in fish identification.

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Received: 9 February 2004
Accepted: 18 May 2004