

Prace oryginalne

Parasitic nematodes of pumpkinseed sunfish (*Lepomis gibbosus* L., 1758) from warm-water canal of a power plant in Szczecin, Poland

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ABSTRACT. Parasitological examination of 273 pumpkinseed sunfish, caught in the warm water channel at the Dolna Odra Power Plant in Stare Czarnowo near Szczecin was carried out. The total lengths of the fish ranged from 6.8 to 18.1 cm (13.3 cm means), infected fish 9.8 to 17.5 cm. In 48 individuals the presence of nematodes representing 4 species has been found: *Schulmanella petruschewskii*, *Raphidascaris acus*, *Spiroxys contortus* and *Contracaecum* sp. In total the number of nematodes found was 319, the mean intensity of infection was 6.64. The greatest number of fish infected with parasites was caught in June and April. The most frequently noted has been *S. petruschewskii*, found in adult forms as well as in larval stage in the liver, intestine, stomach and peritoneum in 40 specimens. In total the number of this nematode found was 305. The least frequent has been *S. contortus*, rarely found in Poland and for the first time noted in sunfish. Usually one fish was invaded by one species of nematodes.

Key words: *Lepomis gibbosus*, nematodes, warm-water canal of power plant, Poland

Introduction

The pumpkinseed sunfish is a small thermophilous fish preferring shallow and quickly warming up water with abundant water vegetation. Naturally it occurs in the waters of eastern part of North America, from New Brunswick to Florida. The fish was introduced to Europe in 1877 as a decorative fish to be grown in park pools and aquariums [1]. It fast acclimatised to the new conditions, in a few years it penetrated the natural waters and at present can be met in the majority of fresh waters. In the Odra River catchments area the sunfish appeared already in 1927, colonising gradually the whole length of this river. Populations of pumpkinseed are met near Krosno Odrzańskie, Słubice, from Gryfino to Szczecin, and in the tributary's of the Odra River: in Nysa Łużycka, Warta River, in the Pilchowicki Reservoir on the Bober River, in the fishponds on the Barycz River, in Lake Martwa

Dziwna, in the channel near Szczecin Firth [2, 3]. A large population of this species occurs in the warm water channel at the Dolna Odra Power Plant in Nowe Czarnowo and in the channel of Pomorzany Power Plant in Szczecin. The fish is also noted in the Odra River below the discharge of warm waters from these two power plants [4]. The fish feeds on plankton and fine benthos, mainly larvae of insects from the families Chironomidae, Culicidae and Trichoptera, crustaceans from the orders of Cladocera, Copepoda, Ostracoda, genus *Gammarus*, *Asellus*, oligochaetes, molluscs and fish spawn and hatchery [3]. Literature on the parasites on the sunfish is relatively scarce. Most of the reports concern the fish caught in the areas of its natural occurrence [5–7]. The problem parasites of the pumpkinseed from European waters has been studied by e.g. [8–10].

Material and methods

The fish used in our study were caught in the warm water channel in the Dolna Odra Power Plant in Stare Czarnowo, near Gryfino. The channel is about 3000 m long and carries the thermally contaminated water to the Regalica River (East Odra River). In summer the water temperature was up to 30.4°C, while in winter it was 5.9°C (the mean temperature over two years was 18.4°C) [11]. The fish were caught from June 2004 to March 2007 by electric aggregate, transported to laboratory, measured and weighted, and their alimentary tracts were tested for the presence of parasites. The nematodes found were fixed in a 70% solution of alcohol with 5% glycerine. To identify the species of the parasites, they were cleared in glycerol and observed under a microscope.

Results

The study was performed on 273 pumpkinseed sunfish individuals. The number of fish analysed in particular months and characterisation of the fish is given in Table 1.

The length of the fish varied from 6.8 to 18.1 cm (mean 13.35 cm) and their mass varied from 5 to 128.4 g (mean 53.56 g). From 273 individuals only 14 were over 10 cm long.

Representatives of the four species of nematodes were found: *Schulmanella petruschewskii* (Shulman, 1948) adult forma and larvae; larvae of *Raphidascaris acus* (Bloch, 1779), *Spiroxyx contortus** (Rudolphi, 1819) and *Contracaecum* sp. These four species were found in 48 individuals, making

17.58% of the population studied. The number of fish with parasites caught in particular months, their mean length and mass along with the characterisation of the parasites and their location are given in Table 2.

In August, October and December no sunfish infected with parasite was caught. The greatest number of fish infected with parasites was caught in June and April. The fish with nematodes were from 9.8 cm to 17.5 cm long (mean length of 13.27 cm). In total the number of nematodes found was 319, the mean intensity of infection was 6.64. The most frequently noted species was *S. petruschewskii*. In 40 fish the number of adult parasites was 305 localised in different organs: in the liver 204 nematodes in 25 fish, in the stomach 56 nematodes in 14 fish, in the intestine 22 nematodes in 10 fish and in the peritoneum 23 parasites in 3 fish. In 12 individuals the parasites were found only in the liver, while in the others the parasites were found in the liver and in the stomach, the intestine or in the peritoneum. The intensity of invasion varied from 1 to 43, the mean number of parasites in one fish was 7.7. In the fish with nematodes only in the liver the mean number of parasites was 4.9 and the intensity of infection varied from 1 to 16. In 9 individuals the larvae of *S. petruschewskii* were found. In three of them the larvae were found in the liver along the adult forms, in two fish the larvae were found in the stomach and in one fish in the intestine (in the latter three no adult forms were noted). From the three fish left of the above mentioned nine, in one the larvae were in the peritoneum and adult forms in the liver, and in the other two fish the larvae and adult forms were in the intestine and in the liver.

Table 1. Characterisation of the fish studied

Months	Fish no. examined	Length (cm)			Weight (g)		
		range	mean	SD	range	mean	SD
I	22	8.6–15.1	13.40	1.31	12.3–74.2	48.10	14.61
II	13	12.2–15.5	14.05	1.07	34.7–78.1	59.89	15.19
III	25	11.3–15.8	13.34	1.41	26.3–88.2	49.70	19.36
IV	11	9.9–17.5	14.50	2.09	16.8–124.7	65.44	29.29
V	24	7–16.6	12.60	2.86	6.9–96.9	49.3	27.72
VI	25	6.8–16.5	13.97	1.84	5–110.2	64.34	23.55
VII	32	10.6–18.1	14.14	2.07	25.1–128.4	43.76	18.58
VIII	10	10.1–14.6	12.29	1.64	21.4–73.7	43.76	18.58
IX	29	7.3–16.1	13.11	1.80	9.6–90.8	52.07	18.54
X	27	9.4–15.5	12.59	1.22	15.4–73.7	44.45	13.52
XI	43	8.1–17.2	13.38	1.82	9.7–90.2	51.5	20.96
XII	12	11.2–16.3	13.11	1.72	28–100.1	57.04	23.64
Total	273	6.8–18.1	13.35	1.88	5–128.4	53.56	22.69

SD – standard deviation

* The specimen of *Spiroxyx contortus* found was deposited in the Museum of Nature at the University of Wrocław

Table 2. The extent of infection of pumpkinseed sunfish with nematodes in particular groups studied (months)

Months	Fish no. infected	Prevalence (%)	Intensity range	Intensity mean	Abundance	No. of parasites	Length mean	Weight mean
I	7	31.80	1–25	8.71	2.77	61	13.21	44.46
II	2	15.40	1–7	4.00	0.62	8	13.95	70.05
III	4	16	1–20	8.25	1.32	33	12.20	38.80
IV	4	40	1–21	8.00	2.91	32	14.08	58.80
V	2	8.33	1–3	2.00	0.17	4	13.40	57.10
VI	11	44	1–23	5.64	2.48	62	14.61	77.48
VII	7	21.90	1–43	8.42	1.84	59	13.47	57.20
IX	5	17.20	1–2	1.60	0.27	8	11.91	36.84
XI	6	13.90	1–16	8.66	1.21	52	12.17	39.30
Total	48	17.58	1–43	6.64	1.17	319	13.27	53.75

Encysted larvae of *R. acus* were found in 8 fish: in the stomach (in 5 fish), in the peritoneum (in 2 fish), in the liver in one and in the intestine in one fish. Only in one fish the larvae were found in the stomach and in the peritoneum. The intensity of invasion was low; 1–2 larvae. In three individuals only one nematode belonging to the genus *Contracaecum* sp., was found. The encysted larvae were detected in the liver, the stomach and the peritoneum. Two larvae of *S. contortus* were found in two fish specimens caught in January and July.

Usually one fish was invaded by one species of nematodes. In 36 fish individuals only *S. petruschewskii* was noted, in 5 individuals – only *R. acus*, in 2 individuals – only *Contracaecum* sp. and in one fish – only *S. contortus*. In 4 fish the invasion of two species of nematodes was observed; in two of them *S. petruschewskii* and *R. acus*, in one *S. petruschewskii* and *Contracaecum* sp. and in one *S. petruschewskii* and *S. contortus*.

Discussion

The parasite nematodes were found in 17.58% of pumpkinseed sunfish. The most frequent and most numerous were the adult representatives of *S. petruschewskii*. In the pumpkinseed caught from the discharge channel of “Pomorzany” Power Plant in Szczecin [8] found representatives of this species in the liver of 15 from among 103 fish. It occurred in larger fish, of 11–15 cm long, in particular in the fish 13–13.9 cm long. In the population sample we studied the infected fish were from 9.8 to 17.5 cm long, on average 13.31 cm. The presence of this nematode in sunfish from European waters was also reported [12, 13, after 8]. In our study representatives of *S. petruschewskii* were found not only in the liver (52.1% of infected fish) but also in the stomach

(29.1%), the intestine (20.8%) and in the peritoneum (6.25%). Besides the adult forms, in the liver parenchyma numerous cysts with larvae or larvae were detected. It is the species of nematodes commonly met in many species of freshwater fish, e.g. in Percidae, Salmonidae, Cobitidae and others [14, 15, own study].

In ruffe from Szczecin Lagoon [16] the presence of the nematode in the liver of 96% of the population was reported [16]. Also, the presence of this nematode species in one perch from Lake Miedwie was noted [17].

The other species of nematodes were much less frequent in the sunfish from the warm water channel in the Dolna Odra Power Plant. The second most frequent was *R. acus* found mainly in predatory fish from the families Percidae, Salmonidae, Gadidae or Anguillidae, in which it occurs in the stomach. Larvae of this species are found in the tissues and organs of many freshwater fish species [14, 15]. The presence of this nematode species was reported in pikes from Lake Miedwie, in which 43.8% of the population was infected and the intensity of infection was 1–15 [17]. The next species in the sequence of frequency was *Contracaecum* sp. It was identified only as the genus because the larvae of the species in fish are very similar and identification of the species was impossible. The parasites from this genus occur in freshwater and marine fish [15]. The least frequent was *S. contortus*. It is a common parasite in the stomach of water turtles, in particular in North America [18–21]. In Europe it is met in mud turtles [14]. In freshwater fish being paratenic host of this species the encysted third larvae stage is found in the peritoneum and the intestine. The intermediate hosts are copepods gulping the eggs with larvae. In Poland representatives of this species have been hitherto found only in *Eupallasella perenurus* [22].

Conclusions

1. In the pumpkinseed sunfish individuals caught in the warm water channel in the Dolna Odra Power Plant, the presence of four species of nematodes was found: *Schulmanella petruschewskii*, *Raphidascaris acus*, *Spiroxys contortus* and *Contracaecum* sp.

2. The most frequent was *S. petruschewskii*, found in the adult form and as larvae in the liver, the intestine and the peritoneum of the fish.

3. The presence of *Spiroxys contortus* was noted in the sunfish species for the first time.

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