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HELMINTH FAUNA OF WHITE BREAM (*BLICCA BJOERKNA*) (LINNAEUS, 1758), FROM THE SREBARNA BIOSPHERE RESERVE, BULGARIA

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Abstract

The aim of the study was to reveal the helminth diversity and the parameters of infection of white bream (Blicca bjoerkna) from Srebarna Biosphere Reserve, North-East Bulgaria. This is the first study of helminth fauna of white bream from Srebarna lake. The hosts were examined by standard techniques. Five species of helminths were found: trematodes (metacercariae of Diplostomum paraspathaceum, Diplostomum pseudospathaceum, Posthodiplostomum cuticola, Tylodelphys clavata) and monogenean (Paradiplozoon homoion). All helminth species identified in the present study are new host-records for the white bream in the Srebarna Lake. Blicca bjoerkna was reported as a new host record for digeneans, namely Diplostomum paraspathaceum, D. pseudospathaceum, T. clavata and T. monogenean, P. homoion from the territory of Bulgaria. Blicca bjoerkna was reported as a new host record for D. paraspathaceum, D. pseudospathaceum and monogenean P. homoion from Balkan Peninsula. In the present study, was reported for the first time the trematodes for D. paraspathaceum, D. pseudospathaceum as parasite of white bream from Basin of Danube River.

Key words*: parasite, helminths, Blicca bjoerkna, Srebarna Lake, Bulgaria.*

INTRODUCTION

Srebarna Lake is a hyper-eutrophic lake, located on the Bulgarian right bank of the Danube River between r.km 391 and r.km 393, near the village Srebarna, 18 km west of town Silistra. Srebarna Lake is connected via an artificial canal with the Danube. Srebarna Reserve is included in the List of Wetlands of International Importance (Ramsar Convention) and among Important Bird Areas (BirdLife International) and being listed as a site of the Natural Heritage and a Biosphere reserve under the Programme on Man and the Biosphere (UNESCO). This reserve is characterised by a significant diversity of highly protected species, including fish-eating birds; it is one of the major European nesting sites of the Dalmatian pelican (*Pelecanus crispus*) (Michev et al., 1998; Uzunov et al., 2012). The fish populations are the main participant in the circulation of helminths in lake ecosystem.

This is the first study of helminth fauna of *B. bjoerkna* (Linnaeus, 1758) from Srebarna Lake, although there are several studies of helminths of fish from Srebarna Lake (Chunchukova et al., 2016; Kirin et al, 2013; Kirin et al., 2014; Margaritov,1959; Shukerova, 2005; Shukerova, 2006; Shukerova, 2010; Shukerova and Kirin, 2008; Shukerova et al., 2010, Shukerova and Kirin, 2012).

MATERIALS AND METHODS

During period May-September 2013, sixteen (total length of body 85 -150 mm) specimens of white bream *Blicca bjoerkna* were collected from Srebarna Lake (Figure1).

Figure 1. Srebarna Lake

The hosts were examined for helminth parasites using standard techniques. Fish were captured by local fishermen or technical staff members using various methods (netting, angling or electrofishing). The fish were weighed and measured. The parasites were counted and identified by Bauer, 1987; Gusev, 1985; Moravec, 1994, 2001; Niewiadomska, 1986, 1996; Scholz, 1999; Scholz Hanzelová, 1998; Shigin, 1986. The parasites were fixed and preserved in 70% ethanol (Bauer et al., 1981; Moravec, 1994). Trematodes and monogeneans of the genus Paradiplozoon were stained in iron acetocarmine, dehydrated in ethanol series with increasing concentrations, cleared in eugenol (metacercariae of Diplostomum spp. were cleared in dimethylphthalate) and mounted in Canada balsam (Bykhovskaya-Pavlovskaya, 1985; Georgiev et al., 1986; Shigin, 1986).
The ecological terms prevalence (P%), mean abundance (MA) and mean intensity (MI) are used here based on the terminology of Bush et al. (1997) and Marcogliese (1999). Mean abundance (MA) and mean intensity of infection (MI) were calculated using Microsoft Excel and STATISTICA 6.0 program.

RESULTS AND DISCUSSIONS

Fish communities

The white bream *B. bjoerkna* is an European freshwater fish of the Cyprinid family. The white bream occurs in a wide variety of shallow, warm lowland lakes and slow-flowing lower reaches of large rivers and canals. *B. bjoerkna* is freshwater, brackish, demersal and potamodromous fish. Frequently very abundant on bottom of large sandy rivers. The juvenile fish live in still water bodies. *B. bjoerkna* feeds on benthic invertebrates (Kottelat and Freyhof, 2007).
The white bream is estimated as least concern species (LC=Least Concern; IUCN Red List Status).

Helminth diversity and parameters of infection

The present study revealed the presence of five helminth species: *Diplostomum paraspathaceum* (Shigin, 1965), larvae, *Diplostomum pseudospathaceum* (Newiadomska, 1984), larvae, *Tylodelphys clavata* (von Nordmann, 1832), larvae, *Posthodiplostomum cuticola* (von Nordmann, 1832), larvae, *Paradiplozoon homoion* (Bychowsky et Nagibina, 1959) (Table 1).
The white breams from Srebarna Lake were infected from one to three helminth species, 20.08 % of hosts were infected with only one helminth species, 69.23 % with two species and 7.69% with three helminth species. The total number of helminths varies from 1 to 17 specimens per host (4.63 on average).

Table 1. Species diversity of helminth parasites in the white bream *B. bjoerkna* from Srebarna Lake

Helminth species	P%	MA±SD	MI±SD range	Site
Diplostomum paraspathaceum	62.5	2.06±3.43	3.3±3.89 1-14	lens
Diplostomum pseudospathaceum	6.25	0.38±1.5	6±0 6	lens
Tylodelphys clavata	12.5	0.38±1.02	3±0 3	vitreous humour
Posthodiplostomum cuticola	43.75	1.50±3.22	3.43±4.28 1-13	skin, fins muscu-lature
Paradiplozoon homoion	25.00	0.31±0.60	1.25±0.5 1-2	gills

The first intermediate hosts of trematoda *P. cuticola* are freshwater snails (*Planorbis planorbis*, *P. carinatum*), second intermediate hosts are fish and the definite host are birds of genus *Ardea* and *Nycticorax*. The first intermediate hosts of trematoda *T. clavata* are freshwater snails *Radix ovata*, second intermediate hosts are fish and the definite host are grebes - *Podicipes cristatus, P. griseigena* etc. The first intermediate hosts of for *D. paraspathaceum*, *D. pseudospathaceum* are freshwater snails from genus *Lymnea* (*Lymnea ovata, L. fortinalis*, *L. bactriana*) and *Radix (Radix auricularia, R. ovata*), second intermediate hosts are fish and the definite host are different fish-eating birds (*Larus munutus*, *L. canus*, *L. ridibundus*, *L argentatus*, *Chlidonias hybrida*, *Sterna albifrons*, *Pelecanus crispus*, etc.) (Bauer, 1987; Bykhovskaya-Pavlovskaya, 1985; Shigin, 1986).
The monogenean *P. homoion* is with a direct life cycle without intermediate hosts (Gusev, 1985). All trematoda species are endoparasites and monogenean is ectoparasite. Four helminth species were determined as allogenic parasites

the trematode species, *D. paraspathaceum*, *D. pseudospathaceum, P. cuticola* and *T. clavata*. Their life-cycle includes fish as intermediate host and fish-eating birds as final hosts. The monogenean *P. homoion* was determined as autogenic parasite for the examined lake ecosystem, it uses fish as definite host in its life-cycle (Esch et al., 1988). All allogenic helminth of white bream were at larval stage and an autogenic was in an adult form.

The species *Diplostomum paraspathaceum* is showed the highest prevalence and mean abundance (P% = 62.5, MA = 2.06 ± 3.43), followed by *P. cuticola* (P% = 43.75, MA=1.50±3.22). However, both species were showed low mean intensity (3.3±3.89 and 3.43±4.28, respectively). Other species form a descending order of prevalence, mean intensity and mean abundance: *P. homoion* (P%=25, MI=1.25±0.5, MA=0.31±0.60) and *T. clavata* (P = 12.5%, MI = 3 ± 0, MA=0.38±1.02). The species *D. pseudospathaceum* is showed the lowest prevalence (P%=6.25) and the highest mean intensity (MI=6±0).

The species *D. pseudospathaceum* was reported of *Perca fluviatilis* (Linnaeus, 1758) from dam Jrebchevo (reported as *D. volvens*) (Nedeva and Grupcheva, 1996), of *Scardinius erythrophthalmus* (L., 1758) from Black Sea Lakes (Kostadinova, 1993), of *Abramis brama* (L., 1758), *Blicca sapa* (Pallas, 1811), *Leuciscus aspius* (Lineus, 1758), *Barbus barbus* (L., 1758), *Carassius gibelio* (Bloch, 1782), *Chondrostoma nasus* (L., 1758), *Cyprinus carpio* (L., 1758), *Rutilus rutilus* (L., 1758), *S. erythrophthalmus*, *Pelecus cultratus* (L., 1758), *Vimba vimba* (L. 1758), *Esox lucius* (L., 1758), *P. fluviatilis*, *Gimnocephalus schraetser* (L., 1758), *Sander lucioperca* (L., 1758), *Silurus glanis* (L., 1758) from Bulgarian part of Danube river (Atanasov, 2012).

D. pseudospathaceum was found of *Alburnus alburnus* (L., 1758), *L. aspius, S. erythrophthalmus* (reported as *Diplostomum chromatophorum*), *P. fluviatilis*, *Lepomis gibbosus* (L., 1758), from Srebarna Lake (Shukerova, 2010; Shukerova and Kirin, 2008; Shukerova et al., 2010; Shukerova and Kirin, 2012).

Metacercariae of *P. cuticola* were recorded of *B. bjoerkna, Pelecus cultratus, Leucaspius delineatus, S. erythrophthalmus, C. chalcoides, C. carpio, S. cephalus* and *R. rutilus* from Danube River, Provadiiska River, Mandra Lake and Durankulak Lake (Margaritov, 1959; Margaritov, 1992; Kakacheva–Avramova et al., 1978; Kostadinova, 1993) of *Pelecus cultratus* (L., 1758), *L. cephalus*, *C. nasus* from Danube River Bulgarian part (Atanasov, 2012). The species *P. cuticola* was established of *P. fluviatilis, C. gibelio, Cyprinus carpio, S. erythrophthalmus, A. alburnus* and *L. aspius* from Srebarna Lake (Margaritov, 1959; Shukerova, 2005; Shukerova, 2006; Shukerova, 2010; Shukerova and Kirin, 2008; Shukerova et al., 2010).

The species *T. clavata* was found in *Misgurnus fossilis* from Danube river (Kakacheva – Avramova, 1977), of *B. petenyi* from Palakariya and Shipolnica River (Kakacheva and Menkova, 1978; Menkova, 1977); of *S. cephalus* from Shipolnica River (Menkova, 1977); of *P. fluviatilis* from dam Jrebchevo (Nedeva and Grupcheva, 1996), in *P. fluviatilis*, *S. erythrophthalmus* and *R. rutilus* from Durankulak Lake (Kostadinova, 1993). The species *T. clavata* was found in *P. fluviatilis, A. alburnus, L. aspius* and *L. gibbosus* (Shukerova**,** 2010; Shukerova et al., 2010; Shukerova and Kirin, 2012).

The acantocephalan *P. homoion* was recorded on gills of *R. rutilus* from Palakaria River and Danube River (Kakacheva–Avramova, 1977; Kakacheva and Nedeva, 1978), of *C. carpio*, *S. cephalus*, *C. nasus* and *B. barbus* from dam Pchelina and rivers Maritsa, Danube Tundza, Struma and Gradevska (Nedeva, 1991), of *C. gibelio* from dam Jrebchevo (Grupcheva and Nedeva, 1999) and of *Abramis brama* from Danube River (Chunchukova et al., 2016).

In Bulgaria as parasite of *Blicca bjoerkna* are established the following species *Nicolla skrjabini* (Iwanitzky, 1928), *Asymphylodora imitans* (Muhling, 1898), *Cotylurus pileatus* (Rudolphi 1802), *P. cuticola, Rhipidocotyle campanula* (Dujardin, 1845), *Dactylogyrus cornu* (Linstow, 1878), *D. distinguendus* Nybelin 1937, *D. similis* (Wagener, 1909), *D. sphyrna* Linstow, 1878, *Gyrodactylus prostae* (Ergens, 1963), *Diplozoon gussevi* Glaser and Glaser, 1964, *Caryophyllaeides fennica* (Schneider 1902), *Pomphorhynchus laevis* (Müller, 1776), *Acanthocephalus anguillae* (Müller, 1780)

(Margaritov, 1959, 1964, 1966; Kakacheva-Avramova, 1973, 1977, 1983). All parasites were reported of white bream from Danube River, Bulgaria part, with exception of *D. similes* (from Kamchia River).

In the countries of the catchment area of Danube River under *B. bjoerkna* were also established the following parasites: Trematoda – *Aspidogaster limacoides, Tylodelphys clavata*, *Phyllodistomum folium, Apophallus muehlingi*, *Palaeorchis unicus*, *Sphaerostomum bramae, Opisthorchis felineus* (Djikanović et. al., 2012; Gelnar et al., 1994; Hering-Hagenbeck and Schuster, 1996; Ozcelik and Deufel, 1989, Reimer, 2002). Monogenea – *Dactylogyrus cornoides, D. crucifer*, *D. difformis*, *D. nanus*, *Diplozoon paradoxum*, *Paradiplozoon bliccae, Gyrodactylus elegans*, *G. vimbi* (Gelnar et al., 1994; Kritscher, 1988; Matejusova et al., 2001; Matskasi and Sey, 1993; Ozcelik and Deufel, 1989; Reimer, 2002). Cestoda – *Archigetes sieboldin, Caryophyllaeus laticeps*, *Neogryporhynchus cheilancristrotus*, *Ligula intestinalis*, *Proteocephalus torulosus* (Barus and Prokes, 1994, 1995; Hanzelova and Rysavy, 1999; Kritscher, 1988; Macko et al., 1993; Scholz, 1989). Nematoda – *Anguillicola crassus*, *Philometra ovata*, *Philometra rischta, Rhabdochona denudata*, *Schulmanela petruschewskii* (Djikanović et. al., 2012; Moravec, 2001; Moravec et al., 1997; Szekely 1994). Acanthocephala - *Neoechinorhynchus rutili*, *Acanthocephalus lucii*, *Acanthocephalus tenuirostris*, *P. laevis*, *Pomphorhynchus bosniacus* (Djikanović et. al., 2012; Kiskarolj and Cankovic, 1969).

Common helmitnh species for helminth fauna of white bream from Lake Srebarna and previous studies from Bulgaria is *P. cuticola* from Danube River. Mean intensity of *P. cuticola* is with lower in white bream from Srebarna Lake than from this host from Danube River.

CONCLUSIONS

This is the first study of helminth fauna of *B. bjoerkna* (Linnaeus, 1758) from Srebarna Lake. All helminth species identified in the present study are new host-records for the white bream in the Srebarna Lake. *Blicca bjoerkna* was reported as a new host record for digeneans, namely *Diplostomum paraspathaceum*, D. *pseudospathaceum, T. clavata* and monogenean *P. homoion* from the territory of Bulgaria. *Blicca bjoerkna* was reported as a new host record for *D. paraspathaceum*, *D. pseudospathaceum* and *D. monogenean, P. homoion* from Balkan Peninsula. In the present study, was reported for the first time the trematodes for *D. paraspathaceum*, *D. pseudospathaceum* as parasite of white bream from Basin of Danube River.

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