

ANALYSIS OF STRUCTURE OF ICHTHYOFAUNA
ON THE BACKGROUND OF ENVIRONMENTAL
CONDITIONS IN THE BOCKÓW FLOW RESERVOIR
(LUBELSKIE PROVINCE)

Marcin Kolejko, Joanna Sender

Department of Landscape Ecology and Nature Conservation, University of Life Sciences in Lublin
B. Dobrzańskiego str. 37, 20-262 Lublin, kolejko@op.pl, joanna.sender@up.lublin.pl

Summary. The analysis of structure of fish communities was examined in two-years intervals in each research season: spring–summer and summer–autumn during the years 2008–2012. The study revealed that the studied reservoir inhabited nine fish species representing four families. Species structure was poorly differentiated, but was characterized by quite high values of species diversity index. The dominant species in the abundance structure were roach *Rutilus rutilus*, whereas in the biomass structure dominated pike *Esox lucius*. Among alien species was determined German carp *Carassius auratus gibelio*. Noteworthy is the fact that in the structure of fish communities was determined loach *Misgurnus fossilis*, which is a protected species.

Key words: flow reservoirs, ichthyofauna, long term changes

STUDY AREA

The Bobków reservoir is the flow reservoir on the Por river. It is situated in the Padół Zamoski mecoregion on the border with the West Roztocze (50°53'N 22°37'N). The studied reservoir is anthropogenic; its surface area is 320 ha. However, the surface of water table is about 30 ha. It is resulted from the fact that the reservoir is overgrown by willow bushes, reed and manna rush and sedges. In the summer the reservoir is overgrown *Stratiotes aloides* 1.5 m. The feeding area are extensively used meadows which are the remains of the carbonate bogs. The studied area is approved as a Natura 2000 site called the Bobków pond – code PLB060016 [Chmielewski and Stelmach 2009].

MATERIAL AND METHODS

The analysis of structure of fish communities was investigated in two seasons, spring–summer and summer–autumn, during the years 2008, 2010 and 2012. The analysis of physical and chemical factors of water was carried out using specialized test equipment company Slandi. Fish were collected by means of passive fishing tools: modified traps with one catching cage (frame size 30 × 70 cm; mesh size 0,5 × 0,5 cm) with bait inside and power generator type Samus 725 MP. The net was set in the evening and removed on the daylight of the following day during about 12 hours. The catches of fish by the means of power generator were carried from 2 to 3 hours in the afternoon. All the captured fish were species identified; their total length (up to 1 mm) was measured and body weight (up to 1 g) checked. In the order to compare the abundance and biomass of the captured fish, the results of the catches were converted into CPUE (catch per unit effort), i.e. per 12 hours of fishing with one net.

The biodiversity of the fish assemblages was assessed by Shannon-Wiener index (H') according to the formula:

$$H' = -\sum n_i/N \ln n_i/N$$

where:

- n_i – number of species of the i^{th} species,
- N – number of all individuals of all species.

RESULTS

The values of selected physical and chemical factors of water indicated the eutrophic character of the reservoir with a fairly good oxygen conditions (Tab. 1). In studied reservoir were noted nine fish species in total, represented four families: *Cyprinidae* (6 species), *Percidae*, *Esocidae*, *Cobitidae* (1 species each). The species richness was poorly varied (Tab. 2). In the structure of collected fish was presented only one protected species (loach) and two alien species (carp and German carp).

Particular research dates were distinctly different in the number of captured fish expressing by the value of CPUE. Significantly higher amounts of fish was caught in 2012 (103 ind. per net⁻¹ 12 h⁻¹), the smallest number of fish was recorded in spring–summer season of 2008 and 2000 (46 and 60 ind. respectively, per net⁻¹ 12 h⁻¹) (Fig. 1).

The value of Shannona-Wiener index for each research dates was very diverse. The lowest values was noticed in the summer–autumn season in 2008 and 2000 the highest in the summer–autumn season in 2000 (Fig. 2).

R. rutilus was the dominant species. Its share systematically increased from approximately 55% in the first three research seasons to about 80% in the subsequent. The share of the other species was small (Fig. 3).

Table 1. Selected morphometric and physical parameters of water of studies reservoir

Parameters	Years/sezson						Mean
	2008		2010		2012		
	s-s	s-a	s-s	s-a	s-s	s-a	
Max. depth, m	1.5						
SD, m	1.5	1.3	1.5	1.2	1.5	1.5	1.42
Temperature, °C	13.2	12.1	11.6	13	15.1	14.9	13.3
pH	7.6	7.9	7.7	8.3	7.7	8.2	7.9
Dissolved oxygen, mg dm ³	8.7	8.2	8.1	7.8	9.1	7.1	8.17
Conductivity, µS cm ¹	291	576	295	585	301	580	438

s-s – spring–summer

s-a – summer–autumn

Table 2. Species composition of ichthyofauna in reservoir Boćków

Species Year/Season	2008		2010		2012	
	s-s	s-a	s-s	s-a	s-s	s-a
<i>Esox lucius</i> L.	+	+	+			+
<i>Cyprinus carpio</i> L.		+	+			
<i>Carassius carassius</i> (L.)	+	+			+	+
<i>Carassius auratus gibelio</i> (Bloch)	+	+	+	+	+	+
<i>Tinca tinca</i> (L.)	+	+				
<i>Rutilus rutilus</i> (L.)	+	+	+	+	+	+
<i>Alburnus alburnus</i> (L.)	+	+	+	+	+	+
<i>Misgurnus fossilis</i> (L.)			+			
<i>Perca fluviatilis</i> L.	+	+	+		+	
Number of species in the years and sezson	7	8	7	3	5	5
Total number of species	9					

s-s – spring–summer

s-a – summer–autumn

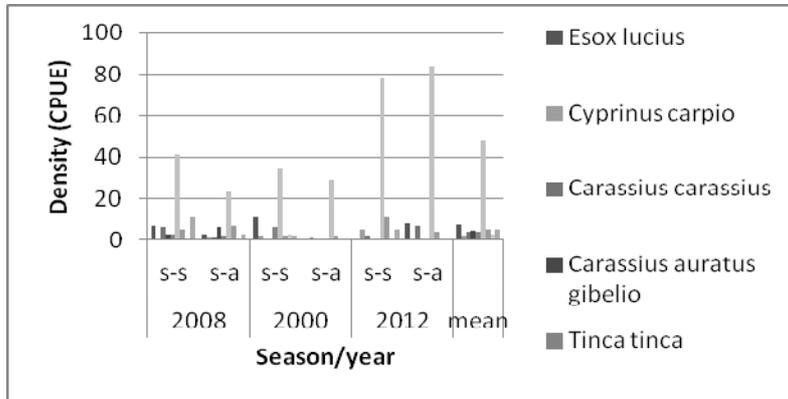


Fig. 1. Fish fauna density structure in reservoir Boćków

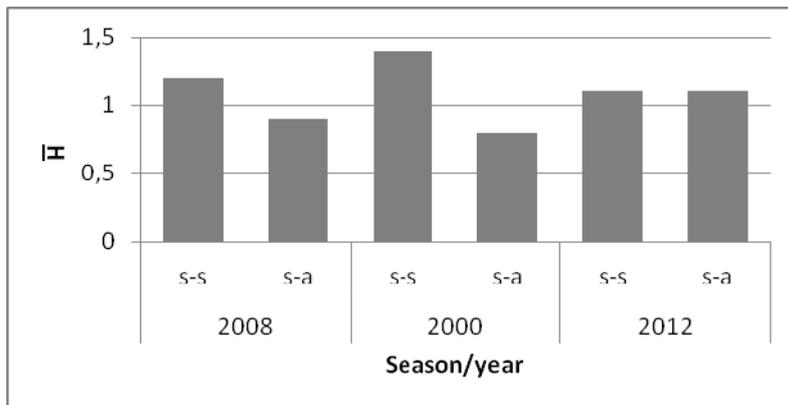


Fig. 2. Values of Shannon-Wiener index of investigated reservoir

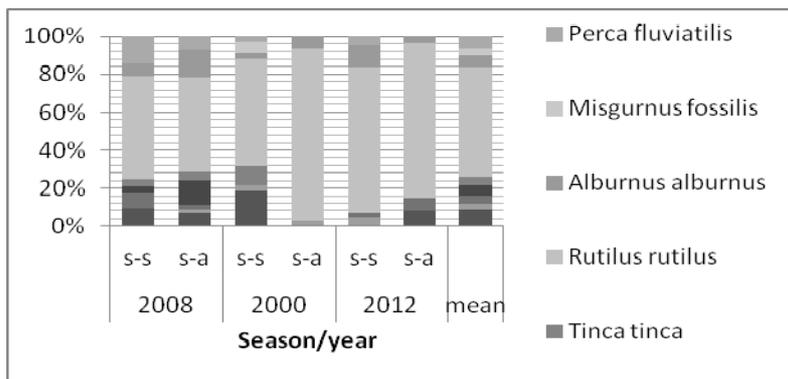


Fig. 3. Fish fauna dominances structure in investigated reservoir

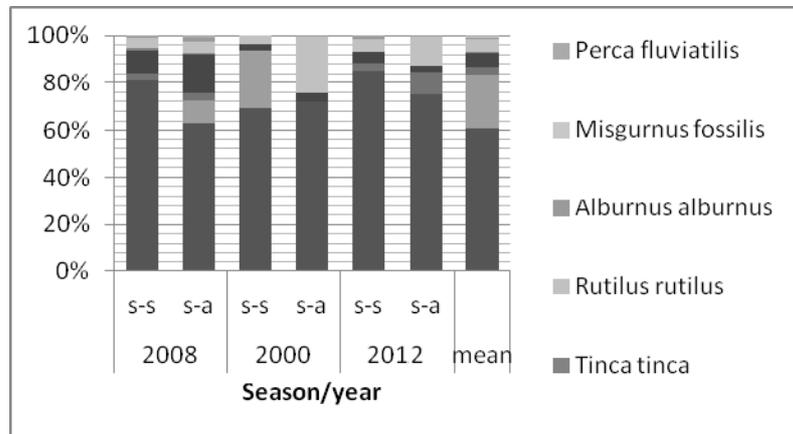


Fig. 4. Fish fauna biomass in investigated reservoir

E. lucius was the dominant species in respect of the total fish biomass. Its proportion was very high, but fluctuating varied in different seasons (Fig. 4).

DISCUSSION

The periodic research conducted during the 10 years revealed that the structure of fish communities is represented by 9 fish species. The number of species in each year and season was changeable which testified to the overwhelming dominance of roach with a small number of other species. In the natural reservoirs of the region investigated the richness of fish species is significantly higher. This is confirmed by results of the last few years in several lakes. This was primarily one of the largest and deepest lakes in the Lakeland with a mesoor eutrophic character [Rechulicz 2006, 2011, Kolejko 2009, 2010]. Whereas, in some small and shallow meso-humic lakes, such as Brzeziczno and Moszne the number of species did not exceed 9 [Kolejko 2009].

The biodiversity assessment based on the Shannon-Wiener index was significantly higher than in most lakes located on the Lakeland.

In the Bobków reservoir *R. rutilus* was the dominant species, which also dominated in the most of the Lakeland reservoirs [Kolejko 2008, Rechulicz 2011]. Noteworthy is the fact that the analyzed reservoir is not inhabited by brown bullhead, which is typical for the water of that region [Kornijów *et al.* 2003, Kolejko 2008].

CONCLUSIONS

1. The species diversity of ichthyofauna in analyzed reservoir is quite low.
2. The highest species similarity was observed in 2008.
3. The dominant species in the structure of population was *R. rutilus*, whereas in the total fish biomass *E. lucius*.

REFERENCES

- Chmielewski S., Stelmach R., 2009. Ostoje ptaków w Polsce – wyniki inwentaryzacji część I. Biuro Urządzania Lasu i Geodezji Leśnej. Poznań.
- Kolejko M., 1998. Sumik karłowaty (*Ictalurus nebulosus* Le Sueur) w wodach Pojezierza Łęczyńsko-Włodawskiego. Przeg. Ryb. 19, (4), 23.
- Kolejko M., 2006. Long-Term Changes of Ichthiofauna Structure in Protected Lake (Exempl from Polesie Lubelskie). Polish J. Environ. Stud. 15, 5d, 582–585.
- Kolejko M., 2009. Analiza zmian zachodzących w ichtiofaunie jezior, na tle procesów wypłykania się zbiorników, eutrofizacji wód oraz sukcesji roślinnej, w: Chmielewski T.J. (red.) Ekologia krajobrazów hydrogenicznych Rezerwatu Biosfery „Polesie Zachodnie”. Wyd. PZN Sp. z o.o., s. 207–219.
- Kolejko M., 2010. Analysis of the structure of ichthyo fauna of two mesotrophic lakes of Łęczyńsko-Włodawskie Lake District. Teka Kom. Ochr. Kszt. Środ. Przyr. OL PAN 7, 138–145.
- Kornijów R., Rechulicz J., Halkiewicz A., 2003. Brown bullhead (*Ictalurus nebulosus* Le Suer) in ichthyo fauna of several Polesie Lakes differing in trophic status. Acta Piscaria, 2 (1), 124–131.
- Rechulicz J., 2006. Effectiveness of fishing in shallow lakes using different methods. Acta Sci. Pol., Piscaria 5, 2, 59–68.
- Rechulicz J., 2011. Różnorodność ichtiofauny wybranych jezior Pojezierza Łęczyńsko-Włodawskiego, w: Ocena i ochrona różnorodności wód, (red.) M. Jankun, M. Furgała-Selezniow, M. Woźniak, A.M. Wiśniewska. Agencja Wyd. „Argi”. WOŚiR UWM w Olsztynie, s.165–178.

ANALIZA STRUKTURY ICHTIOFAUNY NA TLE WARUNKÓW
ŚRODOWISKOWYCH W PRZEPLYWOWYM ZBIORNIKU BOCKÓW
(WOJEWÓDZTWO LUBELSKIE)

Streszczenie. Analizę struktury ichtiofauny prowadzono w latach 2008–2012 w odstępach 2-letnich, w każdym z dwóch sezonów badawczych – wiosna–lato i lato–jesień. W składzie gatunkowym ichtiofauny stwierdzono 9 gatunków ryb należących do 4 rodzin. Struktura gatunkowa ryb była mało zróżnicowana, jednak wykazywała dość wysokie wartości wskaźnika zróżnicowania gatunkowego. W ogólnej liczebności dominującym gatunkiem była płoć *Rutilus rutilus*, zaś w biomacie – płoć *R. rutilus* i szczupak *Esox lucius*. Wśród gatunków obcych stwierdzono występowanie karasia srebrzystego *Carassius auratus gibelio*. Na uwagę zasługuje fakt, iż w składzie gatunkowym ichtiofauny stwierdzono piskorza *Misgurnus fossilis*, który jest gatunkiem chronionym.

Słowa kluczowe: zbiorniki przepływowe, ichtiofauna, zmiany w czasie