

## ICHTHYOFAUNA STRUCTURE OF NEAR-SPRING FRAGMENTS OF SELECTED RIVERS IN THE ROZTOCZE ŚRODKOWE REGION

Marcin Kolejko

Department of Landscape Ecology and Nature Conservation, University of Life Sciences in Lublin,  
B. Dobrzańskiego str. 37, 20–269 Lublin, kolejko@op.pl

**Summary.** Analysis of ichthyofauna structure in upper fragment of selected rivers in Middle Roztocze was one of the elements of the project: „Natural and landscape cataloguing of selected water and boggy ecosystems in Middle Roztocze” coordinated by Tadeusz J. Chmielewski. The project was realized in 2005–2008 in 5 rivers: Tanew, Szum, Sopot, Jeleń, and Świerszcz. Studies revealed the occurrence of 5 fish species from 4 families. The fish presence was incidental in the beginning fragments of rivers. At the distance of about 200–300 m from the springs, fish occurred in various micro-habitats types. Brown trout and roach dominated both in the total number and biomass.

**Key words:** ichthyofauna, near-spring fragments, Roztocze Środkowe Region

### INTRODUCTION

The Middle Roztocze is characterised by small amounts of surface waters, which significantly affects the ichthyofauna that colonises them. In practice, most river fragments (Jeleń, Sopot, Szum, Świerszcz, Tanew, Wieprz), according to fishing classification, are classified as trout and grayling land. However, it seems that the set of fish colonising the Tanew river tributaries is relatively poor in reference to its quality [Czarnecka and Janiec 2002]. It is worth emphasizing that there are species (brown trout *Salmo trutta trutta* m. *fario*, spirlin *Alburnoides bipunctatus*, and stone loach *Barbatula barbatula*) requiring clean, cold, swift, and well-oxygenated waters [Radwan *et al.* 2000, Kolejko 2008,]. Nevertheless, the ichthyofauna of flowing waters at Roztocze gorge has not been sufficiently recognized yet [Chmielewski (ed.) 2005]. Only the upper fragment of Wieprz river has had complete documentation on ichthyofauna structure (13 species with brown trout domination), its nutritional resources, and nutritive preferences [Radwan *et al.* 2000].

The research was aimed at presenting the current status of ichthyofauna at upper fragments of main river systems in Middle Roztocze. Characteristics of ichthyofauna set on the studied area is important, because river ecosystems in Middle Roztocze are planned to be included in the protective program Natura 2000 (Tanew river valley, Solska Forests).

# MATERIAL AND METHODS

The studies upon ichthyofauna structure were performed in 2005–2008 in spring–summer seasons. The fishing was made using electricity-generating devices types JUP 12 and Samus 750 MP. After completing the taxonomic analyses applying ichthyo-biological key [Brylińska (ed.) 2000], fish were returned to their natural environment.

To evaluate the general physical and chemical parameters of surveyed rivers, the following items were measured: water temperature, water acidity, electrolytic conductivity, oxygen concentration (%), and dissolved oxygen content ( $\text{dm mg}^{-3}$ ) in water, using pH-meter SP300, conductometer SC3000, and oxygen-meter So3000 (Slandi). Interpretation of achieved results was made in accordance with standard methodology [Hermanowicz *et al.* 1976].

# RESULTS

Values of physical and chemical water parameters varied. Water temperature was low, although characteristic for upper fragments of rivers. Electrolytic conductivity of waters expressed as the amount of dissolved minerals, also varied and it was characteristic both for low (Tanew river – from 70 to 126  $\mu\text{S cm}^{-1}$ ), medium (rivers: Jeleń – 178  $\mu\text{S cm}^{-1}$ , Świerszcz – 247–253  $\mu\text{S cm}^{-1}$ , and Szum – 256  $\mu\text{S cm}^{-1}$ ), and high-mineralised rivers (Sopot – 412–420  $\mu\text{S cm}^{-1}$ ).

Table 1. Physicochemical parameters of waters in the rivers

River	Jeleń	Sopot		Szum	Świerszcz		Tanew		
Parameters Station	Susiec	Ciotusza Nowa	Majdan Sopocki	Górecko Kościelne	Wielkie Bagno	Szerokie Bagno	Narol	Młynki	Paary
Temperature, °C	12.5	12.8	13.2	13.2	11.9	12.8	12.4	12.9	13.5
Conductivity, $\mu\text{S cm}^{-1}$	178	410	412	256	247	253	70	122	126
pH	7.4	7.07	7.2	7.2	7.42	7.5	7	7.1	7.3
Oxygen saturation, % O <sub>2</sub>	84.3	50.3	80.3	86.2	79.7	72.5	86.4	87	88.5

Studied ecosystems of flowing waters were characterised by quite high oxygen saturation oscillating from 80 to 90% O<sub>2</sub>. The water acidity indicated slight differences between measurement points; it was neutral or basic, ranging from 7.0 pH in Tanew river (Narol) to 7.5 pH in Świerszcz river (Szerokie Bagno) (Tab. 1).

The survey revealed 5 fish species representing 3 families: brown trout (*Salmo trutta trutta* m. *fario*), common roach (*Rutilus rutilus*), spirlin (*Alburnoides bipunctatus*), gudgeon (*Gobio gobio*), and stone loach (*Barbatula barbatula*). Among the above fish species, spirlin and gudgeon are under protection (Tab. 2).

Table 2. Species composition of ichthyofauna in the rivers

River	Jeleń	Sopot		Szum	Świerszcz		Tanew		
Species	Station	Susiec	Ciotusza Nowa	Majdan Sopocki	Górecko Kościelne	Wielkie Bagno	Szerokie Bagno	Narol	Młynki Paary
Brook trout <i>Salmo trutta m. fario</i>		+		+	+			+	+
Roach <i>Rutilus rutilus</i>		+	+	+	+	+	+		+
Spirlin <i>Alburnoides bipunctatus</i>									+
Gudgeon <i>Gobio gobio</i>		+		+			+		+
Loach <i>Barbatula barbatula</i>		+	+		+	+	+		+
No. of species		4	2	3	3	2	3	1	5

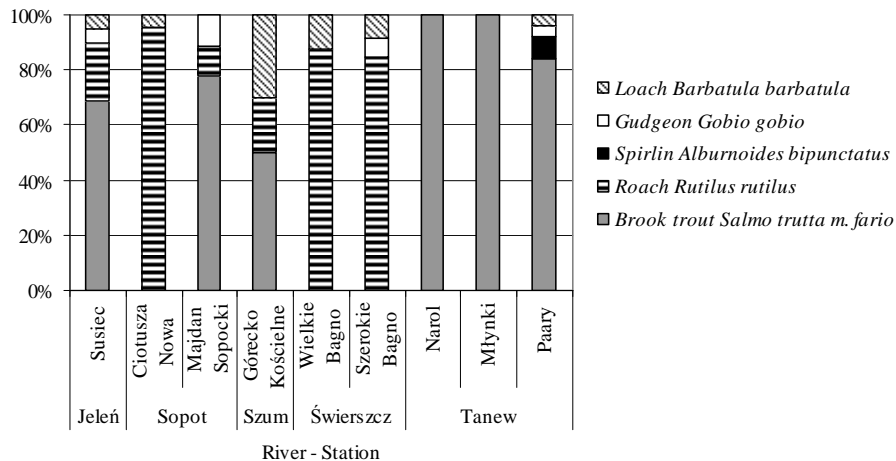


Fig. 1. Fish fauna dominance structure in the rivers

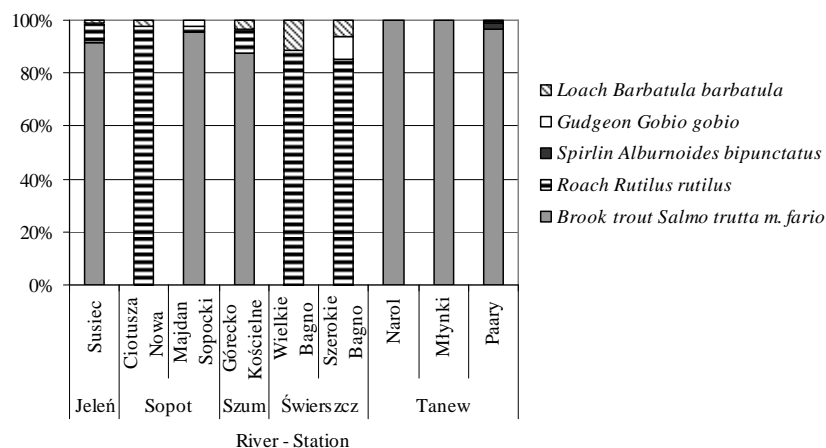


Fig. 2. Fish fauna biomass in the rivers

Brown trout and common roach dominated among all populations. The share of brown trout was very high, reaching up to 50% in Szum river through 70% in Jeleń river to about 100% in Tanew river. Common roach dominated in Świeraszcz river, making up from 80 to 90% of total fish population. Both discussed species dominated in Sopot river. Common roach made up over 95% at Ciotusza Nowa, while about 80% at Majdan Sopocki measurement points. In Szum and Świeraszcz rivers, stone loach showed quite a large percentage (from 10% in Świeraszcz river to 30% in Szum river) in total fish populations. Shares of other fish species were negligible (Fig. 1).

The percentage proportions of particular fish species in their total number reflected their populations and morphological features. At all studied points where brown trout occurred, its share ranged from 90 to 100%. Similarly, the percentage of common roach, only where brown trout was absent, was from 85% in Świeraszcz river to about 100% in Sopot river (Ciotusza Nowa). Shares of other species were very low, except for stone loach in Świeraszcz river that made up from 5% to 10% of total fish population (Fig. 2).

## RESULTS AND DISCUSSION

Water pollution is the most frequent threat for ichthyofauna structure. Values of physical and chemical parameters measured in studied fragments of rivers in Middle Roztocze should not reduce the fish occurrence. However, absolute domination of brown trout with the absence of European bullhead and low numbers of stone loach, spirlin, and gudgeon is not natural. These species disappearance is probably accompanied by trout having been excessively introduced into the Tanew river and its tributaries for many

years. Similar effects – due to *Salmonidae* introduction – have been observed in San river tributaries [Kukuła 2001].

It is worth mentioning that the number of threatened fish species has recently increased. Spirlin, that completely disappeared or is rare in most of Polish rivers, is a critically threatened species. Its stands confirmed during past 15 years are very rare today. It can only be found in northern Poland in Pasłęka river, its tributaries, and in Łyna river [Dębowski 1990]. In Vistula river catchment, it was found, among others, in right tributaries of Narew river: Skrwia Prawa, Sana, and Bukowa rivers [Kukuła 1995, Jarzynowa and Rechulicz 1997]. In Warta river with its catchment, the spirlin is found less and less frequently [Przybylski *et al.* 1993]. Stone loach, despite of the fact that it is also a protected species, remains in waters of many Polish regions and forms quite numerous and stable populations [Borzęcka *et al.* 2002].

Regardless of the low percentages of spirlin and stone loach in the domination structure, their presence significantly improves the natural value of upper rivers fragments in Middle Roztocze.

## CONCLUSION

In the upper courses of the rivers of the Roztocze Środkowe Region was found 5 fish species. Among them were 2 legally protected – stone loach and spirlin and obligatory reophyls – brown trout and spirlin. In the total fish biomass the brown trout and the roach were dominated. Absolute domination of brown trout with the absence of European bull-head and low numbers of stone loach, spirlin and gudgeon is not natural. These species disappearance is probably accompanied by trout having been excessively introduced into the Tanew river and its tributaries for many years.

## REFERENCES

- Czarnecka B., Janiec B., 2002. Roztocze river gorges as model objects in ecological education. Wyd. UMCS, Lublin, 86.
- Borzęcka I., Buras P., Gasiński Z., 2002. Characteristics of fish groups and resources in river Świder catchment. Kom. Ochr. Wód., PZW, 1–11.
- Brylińska M. (ed.), 2000. Freshwater fish in Poland (in Polish). PWN, Warszawa, 521.
- Chmielewski T.J. (ed.), 2005. Preliminary evaluation of the ecological status and need to protection selected water and peat ecosystems in Middle Roztocze and Solska Forest (in Polish). Agriculture Academy in Lublin, Lublin, manuscript, pp. 98.
- Dębowski P., 1990. Ichthyofauna of upper Pasłęka river catchment. Roczn. Nauk PZW, 3, 115–133.
- Hermanowicz W., Dożańska W., Dolido J., Koziorowski B., 1976. Physicochemical determinations of water and sewage (in Polish). Arkady, Warszawa, 96.

- Kolejko M., 2005. Ichthyofauna of Middle Roztocze and Solska Forests rivers (in Polish) [w:] Chmielewski T.J. (ed.) Preliminary evaluation of the ecological status and need to protection selected water and peat ecosystems in Middle Roztocze and Solska Forest. AR Lublin, RPN (manuscript), 1–7.
- Kukuła K., 1995. Ichthyofauna of Bieszczady National Park and problems with its protection. *Rocz. Bieszczadzkie*, 4, 123–142.
- Kukuła K., 2001. Threatened species of fish and lampreys in southeastern Poland. *Rocz. Nauk PZW*, 14, 235–248.
- Margafel R., 1957. Information theory in ecology. *Gen. Sys.* 3, 36–71.
- Przybylski M., Frankiewicz P., Bańbura J., 1993. Ichthyofauna of upper Warta river catchment. *Rocz. Nauk. PZW*, 6, 49–78.
- Radwan S., Girsztowt Z., Kolejko M., 2000. Ichthyofauna of upper middle of the Wieprz River. *Folia Univ. Agric. Stetin. 214, Piscaria (27)*, 183–192.

#### STRUKTURA ICHTIOFAUNY OBSZARÓW PRZYŹRÓDŁOWYCH WYBRANYCH RZEK ROZTOCZA ŚRODKOWEGO

**Streszczenie.** Analiza struktury ichtiofauny górnych biegów wybranych rzek Roztocza Środkowego była jednym z elementów projektu: „Inwentaryzacja przyrodnicza i krajobrazowa wybranych ekosystemów wodnych i torfowiskowych Roztocza Środkowego” koordynowanego przez Tadeusza J. Chmielewskiego. Projekt realizowano w latach 2005–2008 w 5 rzekach: Tanew, Szum, Sopot, Jeleń i Świerszcz. W wyniku przeprowadzonych badań stwierdzono występowanie 5 gatunków ryb należących do 4 rodzin. W początkowym biegu rzek obecność ryb była incydentalna. Dopiero w odległości 200–300 m od niego pojawiały się ryby w różnych typach mikrosiedlisk. Dominującymi gatunkami, zarówno w ogólnej liczebności, jak i biomasie, były pstrąg potokowy i płoć.

**Słowa kluczowe:** ichtiofauna, obszary przyrodnicze, Roztocze Środkowe