

Ichthyofauna of the rivers in the Romincka Forest (Pregola River basin, northeastern Poland)

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Received – 11 April 2008/Accepted – 03 January 2009; ©Inland Fisheries Institute in Olsztyn, Poland

Abstract. The composition and structure of the ichthyofauna of the rivers of the Romincka Forest (Pregola River basin, northeastern Poland) was investigated. Twenty-two fish species were confirmed to occur, four of which are protected: bullhead, *Cottus gobio* L.; spined loach, *Cobitis taenia* L.; bitterling, *Rhodeus sericeus* (Pall.); stone loach, *Barbatula barbatula* (L.). Species richness was the highest in the Bludzia River, in which 17 fish species belonging to 6 ecological reproductive guilds were confirmed. The ichthyofauna of the other rivers in the forest generally comprised 6-10 fish species belonging to 4-5 ecological reproductive guilds. The number of fish occurring at sampling sites decreased with increased river gradient, while the number of rheophilic species increased.

Keywords: Romincka Forest, fish, river, species richness

Knowledge of the ichthyofauna of the rivers in the Warmia, Mazury, and Suwałki regions is fragmentary (Terlecki et al. 2001). Fundamental ichthyofauna studies have only been conducted in the basins of a few rivers, as follows: Łyna (Szczerbowski et al. 1968, Szczerbowski 1972, Terlecki et al. 2004), Pasłęka (Radtke and Dębowski 1996, Dębowski et al. 2004), Pisa (Penczak et al.

1998), and Czarna Hańcza (Mironiuk and Babietyńska 1979, Białokoz and Chybowski 1997, 1999). While a few publications refer generally to the rivers of the Warmia, Mazury, and Suwałki regions as supporting various fish species (Rembiszewski and Rolik 1975, Bnińska and Leopold 1987, Błachuta and Witkowski 1997), the ichthyofauna of many of these regions' rivers has yet to be investigated. This also refers to the rivers of the Romincka Forest. There are references though to the occurrence of grayling, *Thymallus thymallus* (L.) in the Błędzianka (St. 1915, Witkowski et al. 1984) and the Bludzia River (Witkowski et al. 1984).

The Romincka Forest is an extensive, naturally varied forest complex in the Lithuanian Lakeland in the mesoregion of the Romincka Forest (Kondracki 1998). Thanks to its rich mosaic of habitats that have been little disturbed by human activity, the Romincka Forest is an important natural area. It is listed as a special habitat protection area within the framework of the Natura 2000 program (PLH280005). The Romnicka Forest Landscape Park was established there, and the most valuable areas are protected as nature preserves. The aim of the current study was to present the composition and structure of the ichthyofauna of the rivers in the Romincka Forest against the backdrop of environmental conditions.

The studies were conducted on the following rivers: Jarka, Błędzianka, Bludzia, Czerwona Struga,

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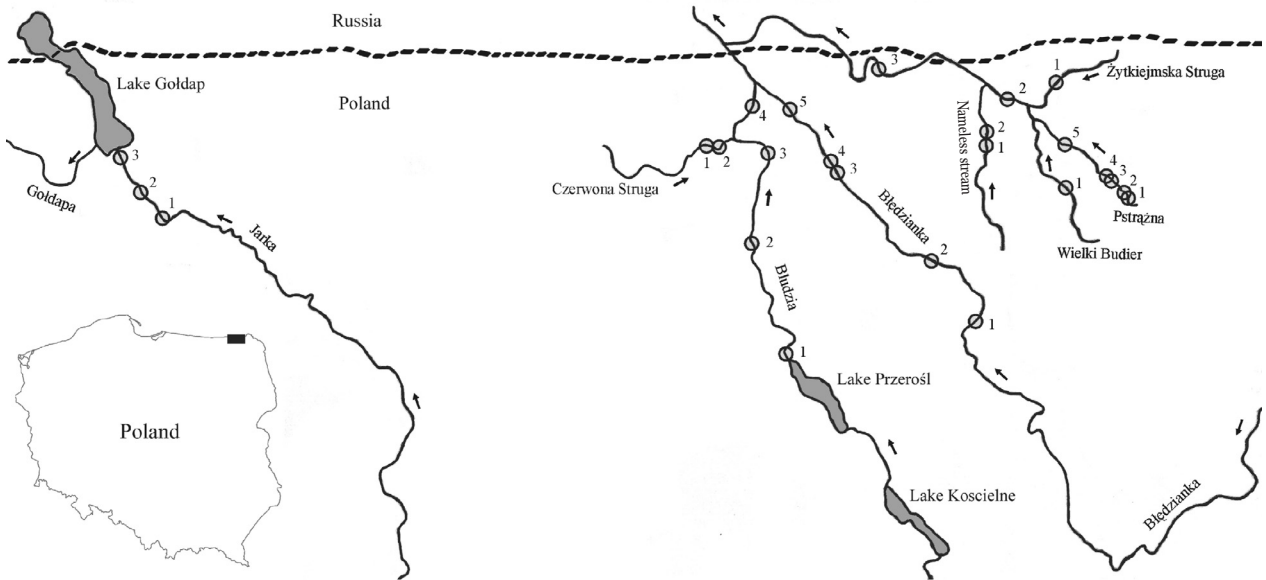


Figure 1. Distribution of sampling sites in the rivers of the Romincka Forest.

Żytkiejmska Struga, Pstrężna, Wielki Budier, and a Nameless stream (Fig. 1, Table 1).

Twenty-five sampling sites were designated, of these 21 were located on running waters and four were in ponds that had formed from either natural or artificial damming.

In June and July of 2004, electrofishing was conducted at the designated sites. Fish were caught along segments of 150-200 m from the whole width of the river beds either by wading against the current or from boats. The fish were identified to the species (Brylińska 2000). The species richness of the ichthyofauna was analyzed and expressed in the number of fish species occurring at individual stations (Ngat), the relative share of rheophilic species (reo), and the number of ecological reproductive guilds (Holčík et al. 1989). The following species were classified as rheophilic: brown trout, *Salmo trutta* m. *fario* L.; grayling; minnow, *Phoxinus phoxinus* (L.); stone loach, *Barbatula barbatula* (L.), bullhead, *Cottus gobio* L.; chub, *Leuciscus cephalus* (L.). The other species were classified as eurytopic.

Ten species of fish were confirmed in the Jarka River (Tables 2, 3). They belonged to five ecological reproductive guilds, and one species was classified

as rheophilic (Fig. 2). The dominant species were minnows or bleak, *Alburnus alburnus* (L.). The share of the other fish species was not great. Eight fish species were identified in the Błędzianka River. They belonged to five ecological reproductive guilds, among which four species were rheophilic (Table 2, Fig. 2). Minnows dominated at all of the sampling sites, and their share fluctuated from 70.6 to 92.8% (Table 3). Although less abundant, brown trout and stone loach were also noted at all the sampling sites. The other species occurred less frequently, and some were only noted sporadically. The ichthyofauna of the Bludzia comprised 17 fish species (Table 3). These belonged to six ecological reproductive guilds, among which six species were classified as rheophilic (Table 2, Fig. 2). Except at station 1, the dominant species was the minnow at a share ranging from 55.6 to 92.4%. Eight species were noted in the Czerwona Struga (Tables 2, 3). These belonged to five ecological reproductive guilds, among which there was one rheophilic species (Fig. 2). The dominant species were Prussian carp, *Carassius gibelio* (Bloch), and sunbleak, *Leucaspis delineatus* (Heckel). Six species of fish were noted in Żytkiejmska Struga (Table 2, 3). These belonged to four ecological reproductive guilds,

Table 1

Characteristics of sampling sites of the rivers in the Romincka Forest. Bottom substrate: r-rocks, g-gravel, s-sand, m-mud. Aquatic vegetation: s-slight, d-dense, - none

River	Station	Geographic co-ordinates	Mean (range) width (m)	Mean (range) depth (m)	Mean slope (‰)	Bottom substrate	Aquatic vegetation
Jarka	1	N 54°18.6' E 22°22.1'	4.0 (3.0-7.0)	0.6 (0.4-1.5)	2.8	r, g, s, m	s
	2	N 54°18.5' E 22°21.7'	4.0 (3.0-7.0)	0.6 0.4-1.2	1.2	s, m	s
	3	N 54°19.3' E 22°20.7'	5.0 (4.0-7.0)	1.5 (0.8-2.0)	0.8	s, g	s
	1	N 54°18.2' E 22°39.5'	5.0 (4.0-8.0)	0.6 (0.1-1.5)	5.3	r, g, s	s
Błędzianka	2	N 54°18.6' E 22°38.3'	2.5 (1.5-5.0)	0.9 (0.6-1.6)	4.8	g, s	s
	3	N 54°19.7' E 22°36.1'	2.0 (2.0-3.0)	0.6 (0.2-1.0)	2.5	s, m	s
	4	N 54°19.7' E 22°36.1'	2.0 (2.0-3.0)	0.6 (0.2-1.5)	2.5	s, m	s
	5	N 54°20.4' E 22°35.1'	2.5 (2.0-3.0)	0.7 (0.3-0.8)	1.8	s, m	d
	1	N 54°19.4' E 22°20.6'	4.0 (3.0-6.0)	1.2 (0.2-1.5)	0.9	g, s, m	s
Bludzia	2	N 54°19.0' E 22°34.5'	2.0 (1.0-4.0)	1.0 (0.2-1.0)	3.1	r, g	s
	3	N 54°20.0' E 22°33.7'	6.0 (4.0-10.0)	0.5 (0.2-1.2)	2.9	r, g, s	s
	4	N 54°20.6' E 22°34.2'	3.0 (2.5-4.5)	0.6 (0.2-1.5)	0.7	g, s, m	s
	1	N 54°19.5' E 22°31.9'		<2.0	0 (pond)	m	d
Czerwona Struga	2	N 54°20.0' E 22°33.7'	2.0 (1.0-3.0)	0.3 (0.1-0.6)	14.3	r, g, s	-
	1	N 54°20.9' E 22°40.5'	1.4 (1.0-1.5)	0.2 (0.1-0.2)	3.1	r, g, s	s
Żytkiejmska Struga	2	N 54°20.9' E 22°39.3'	2.2 (2.0-2.5)	0.6 (0.6-1.0)	1.6	s	d
	3	N 54°21.2' E 22°36.7'	2.5 (2.0-4.0)	1.3 (0.6-2.0)	1.4	s, m	d
	1	N 54°19.9' E 22°41.9'		<1.0	0 (pond)	m	d
Pstrężna	2	N 54°19.9' E 22°41.9'	1.2 (1.0-2.0)	0.2 (0.2-0.4)	12.5	g, s	s
	3	N 54°20.1' E 22°41.7'		<1.0	0 (pond)	m	d
	4	N 54°20.1' E 22°41.7'	1.5 (1.5-2.5)	0.3 (0.3-0.4)	10.0	g, s	s
	5	N 54°20.4' E 22°40.7'	1.2 (1.0-1.5)	0.3 (0.2-0.4)	12.5	r, g, s	s
Wielki Budier	1	N 54°19.8' E 22°40.8'	1.4 (1.0-2.0)	0.2 (0.1-0.5)	22.1	r, g, s	-
	1	N 54°20.7' E 22°39.1'		<1.0	0 (pond)	m	d
Nameless stream	2	N 54°20.7' E 22°39.1'	1.8 (1.5-2.0)	0.2 (0.2-0.3)	3.5	g, s	s

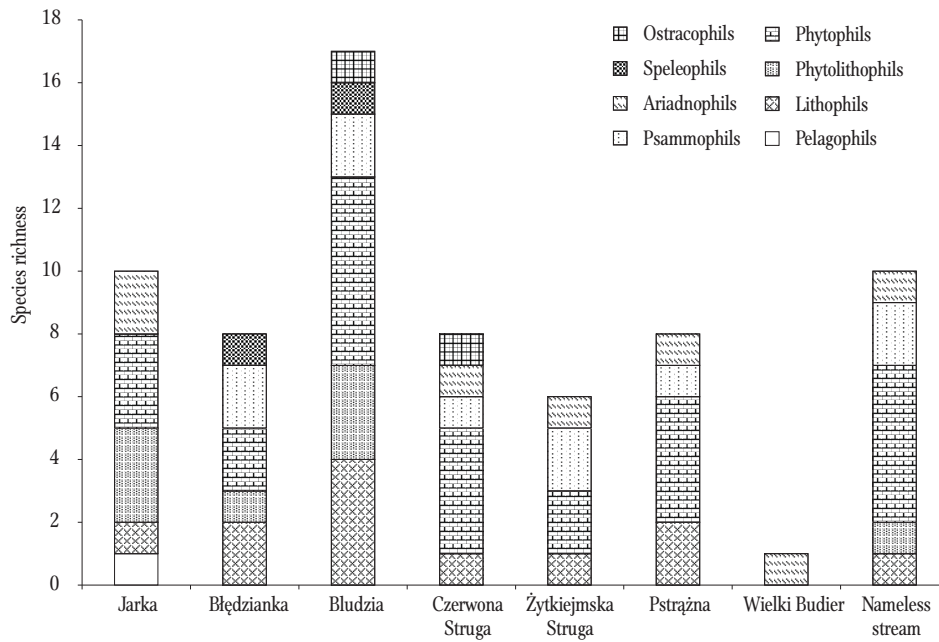


Figure 2. Number of fish species belonging to each ecological reproductive guild confirmed in the rivers of the Rominka Forest.

Table 2

General characteristics of the ichthyofauna at sampling stations in the rivers of the Rominka Forest

River	Station	Number of specimens	Species richness	Number of rheophilic species	Number of eurytopic species	Number of ecological reproductive guilds
Jarka	1	271	5	1	4	4
	2	100	7	0	7	4
	3	3	3	0	3	2
Błędzianka	1	170	6	4	2	5
	2	74	3	3	0	2
	3	225	5	4	1	4
	4	153	6	4	2	4
	5	166	5	4	1	3
Bludzia	1	160	10	1	9	5
	2	325	11	4	7	4
	3	162	7	4	3	4
	4	275	9	4	5	4
Czerwona Struga	1	159	4	0	4	1
	2	192	6	1	5	5
Żytkiejmska Struga	1	46	5	2	3	4
	2	10	3	1	2	2
	3	23	3	1	2	2
Pstrężnia	1	20	2	0	2	1
	2	11	1	0	1	1
	3	22	4	1	3	3
	4	25	4	1	3	3
	5	8	4	3	1	3
Wielki Budier	1	4	1	0	1	1
Nameless stream	1	35	3	0	3	1
	2	84	10	2	8	5

among which there were two rheophilic species (Fig. 2). Station 1 was dominated by stone loach (73.9%), station 2 by gudgeon (80.0%), and station 3 by Prussian carp (56.5%) and pike, *Esox lucius* L. (39.1%). The ichthyofauna of the Pstrężna River comprised eight species of fish (Tables 2, 3), belonging to four ecological reproductive guilds, including one rheophilic fish species (Fig. 2). Station 1 was inhabited exclusively by Crucian carp, *Carassius carassius* (L.) and Prussian carp. Nine-spined stickleback, *Pungitius pungitius* (L.), dominated at stations 2 and 4, while sunbleak did so at station 3 (59.1%), and minnow at station 5 (62.5%) (Table 3). Ten fish species were noted in the Nameless stream. These belonged to five ecological reproductive guilds, two of the species were classified as rheophilic (Table 2, Fig. 2). Prussian carp or stone loach dominated (Table 3). Only nine-spine stickleback was noted in the Wielki Budier (Table 3).

The number of fish species occurring at particular stations generally decreased as the river gradient decreased (Fig. 3). The best equation for illustrating this dependency was statistically significant and was as follows:

$$\ln(\text{Ngat}) = 1.8894 - 0.06895 \times S$$

$$r^2 = 0.3655, P = 0.0037, SE = 0.53$$

where: Ngat – number of fish species, S – decreases in river gradient (%), r^2 – determination

coefficient, P – significance of the regression coefficient, SE – standard error.

The percentage of rheophilic species in the composition of the ichthyofauna was also dependent on the decrease in river gradient and increased as the gradient increased within the range of 0 to about 6 ‰ (Fig. 4). The best equation for illustrating this dependency was as follows:

$$\text{reo} = 23.462 + 30.6298 \times \ln(S)$$

$$r^2 = 0.4007, P = 0.0113, SE = 24,3$$

where: reo – share of rheophilic fish species (%).

Twenty-two fish species were confirmed in the rivers of the Romincka Forest, among which four (bullhead, spiny loach, bitterling, stone loach) are under protection. The greatest species richness, expressed as the number of fish species, was noted in the Bludzia River, in which 17 species belonging to six ecological reproductive guilds were noted. The ichthyofauna of the forest's remaining rivers and streams usually comprises from six to ten species belonging to four to five ecological reproductive guilds.

The species richness of the Romnicka Forest rivers is similar to that of other rivers in the same region with analogous hydrographic conditions. The number of species occurring in the Romnicka Forest rivers (22) was similar to that in the upper segment of the Czarna Hańcza River (20) (Białokoz and Chybowski 1997), as well as in its middle reaches and tributaries (22)

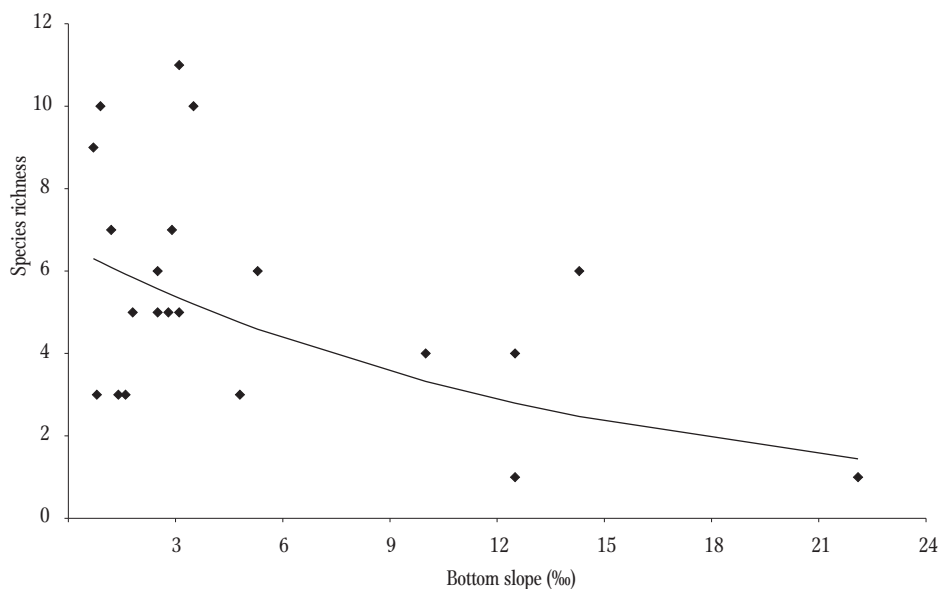


Figure 3. Dependence of species richness of fish assemblages (Ngat) confirmed at sampling stations and river bottom slope (S).

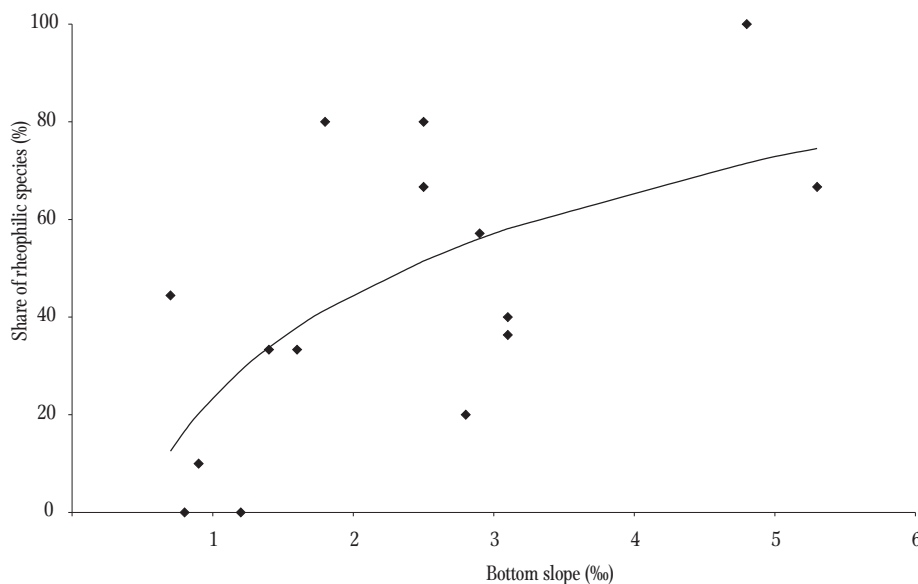


Figure 4. Dependence between the share of rheophilic species (reo) and river bottom slope (S).

(Białokoz and Chybowski 1999). A larger number of species was noted in the upper Łyna River and its tributaries (26) (Szczerbowski 1972), and in its middle reaches (27) (Terlecki et al. 2004).

The species richness of the Romincka Forest rivers was significantly dependent on the river gradient and the associated current speeds. The number of species decreased as the gradient increased; this was likely because it was difficult for species that avoid rapid currents to find the appropriate ecological niches. The same negative correlation between these parameters was also noted in the Czarna Hańcza and its tributaries (Białokoz and Chybowski 1999).

The dominant species in most of the forest's rivers were rheophilic. In the Jarka, Bludzia, and Błędzianka rivers, the most frequent dominant was the minnow. In the nameless stream and the Żytkiejmska Struga, the most frequent dominant was the stone loach. The streams with the highest gradients, but still small in size (Pstrężna and Wielki Budier), were not dominated by rheophilic species, but rather by fish that can inhabit various environments, most frequently by nine-spine stickleback. Because of this, the link between the percentage of rheophilic species and the river gradient was only significant when the latter did not

exceed 6 ‰, which was the gradient noted in the larger streams and rivers with well-developed beds.

References

- Białokoz W., Chybowski Ł. 1997 – Ichthyofauna of the Czarna Hańcza river-lake system – In: Integrated monitoring of the natural environment, Wigry Base Station (Ed.) L. Krzysztofiak, PIOŚ, Biblioteka Monitoringu Środowiska, Warszawa: 123-130 (in Polish).
- Białokoz W., Chybowski Ł. 1999 – Composition of the river ichthyofauna in Wigry National Park – In: Functioning and conservation of aquatic ecosystems in protected areas (Eds) Zdanowski B., Kamiński M., Martyniak A. Wyd. IRS Olsztyn: 527-534 (in Polish).
- Błachuta J., Witkowski A. 1997 – Issues in recreational fisheries management on rivers – Conference proceedings: Recreational fisheries and the protection of waters and fish resources. Łódź, 26-27 V 1997, Supplemental materials to the Scientific Annual of PZW, Wyd. PZW, Warszawa: 11-28 (in Polish).
- Brylińska M., Leopold M. 1987 – General analysis of recreational fisheries pressure on various types of waters – *Rocz. Nauk Rol.* 101-H-2: 7-26 (in Polish).
- Brylińska M. 2000 – Freshwater fish of Poland – Wyd. PWN Warszawa: 524 p. (in Polish).

- Dębowski P., Radtke G., Cegiel K. 2004 – The ichthyofauna of the Pasłęka River drainage basin – *Rocz. Nauk. PZW* 17: 5-34 (in Polish).
- Holčík J., Banareescu P., Evans D. 1989 – General introduction to fishes – In: *The freshwater fishes of Europe*. Aula Verlag Wiesbaden, Vol. 1, Part 2: 58-62.
- Kondracki J. 1998 – Polish regional geography – Wyd. PWN Warszawa, 470 p. (in Polish).
- Mironiuk W., Babietyńska E. 1979 – Changes in the fauna of the Czarna Hańcza River resulting from pollution and threats to Lake Wigry – In: *Lake Wigry, the cradle of Polish hydrology* (Ed.) B. Czeczuga. Ośr. Bad. Nauk. w Białymstoku, Wyd. PWN, Warszawa: 115-133 (in Polish).
- Penczak T., Kruk A., Koszaliński H. 1998 – Conservation status of rheophilic fish based on examples from chosen rivers – In: *Cyprinid rheophilic fish* (Eds) H. Jakucewicz and R. Wojda. Wyd. PZW, Warszawa: 7-15 (in Polish).
- Radtke G., Dębowski P. 1996 – Ichthyofauna composition of selected small streams in northern Poland – *Rocz. Nauk. PZW* 9: 123-132 (in Polish).
- Rembiszewski M., Rolik H. 1975 – Catalogue of Polish fauna. Part 38. Jawless fish and fish. Cyclostomata et Pisces – Wyd. PWN Warszawa, 252 p. (in Polish).
- St. 1915 – Die Äsche in Ostpreussen – *Fisch. Zeit.* 18: 537.
- Szczerbowski J. A. 1972 – Fishes in the Łyna River system – *Pol. Arch. Hydrobiol.* 19: 421-435.
- Szczerbowski J.A., Grudniewski Cz., Draganik B. 1968 – Effectiveness of catches using electrofishing in Košno Stream – *Zesz. Nauk. WSR* 24: 509-520 (in Polish).
- Terlecki J., Białokoz W., Chybowski Ł., Kozłowski J., Martyniak A. 2001 – Current state of knowledge of the ichthyofauna of rivers in the Warmia and Mazury and Suwałki regions – *Rocz. Nauk. PZW* 14: 129-136 (in Polish).
- Terlecki J., Kozłowski J., Dostatni D., Hliwa P., Jozsa V., Martyniak A., Przybylski M., Wziątek B. 2004 – Ichthyofauna of the Łyna, Gubra, Dajna, and Sajna rivers – *Rocz. Nauk. PZW* 17: 35-54 (in Polish).
- Witkowski A., Kowalewski M., Kokurewicz B. 1984 – Grayling – Wyd. PWRiL, Warszawa, 214 p. (in Polish).

Streszczenie

Ichtyofauna rzek Puszczy Rominckiej (zlewnia rzeki Pregoly, północno-wschodnia Polska)

Celem pracy było określenie składu i struktury ichtyofauny rzek polskiej części Puszczy Rominckiej na tle warunków środowiskowych. Badania przeprowadzono w 2004 roku, na rzekach: Jarce, Błędziance, Błudzi, Czerwonej Strudze, Żytkiejmskiej Strudze, Pstrężnej, Wielkim Budierze i cieku bez nazwy. Na wyznaczonych stanowiskach przeprowadzono elektropułowy, łowiąc ryby na całej szerokości koryta rzeki, na odcinkach o długości 150-200 m, brodząc pod prąd wody lub spływając łodzią. W rzekach Puszczy Rominckiej stwierdzono występowanie 22 gatunków ryb, spośród których 4 gatunki (głowacz białopłetwy *Cottus gobio* L., koza *Cobitis taenia* L., różanka *Rhodeus sericeus* (Pall.) i ślíz *Barbatula barbatula* (L.)) podlegają ochronie gatunkowej. Największym bogactwem ichtyofauny wyróżniała się rzeka Błudzia, w której

stwierdzono występowanie 17 gatunków ryb, należących do 6 ekologicznych grup rozrodczych. Ichtyofauna pozostałych rzek Puszczy składała się zwykle z 6-10 gatunków ryb, należących do 4-5 ekologicznych grup rozrodczych. Bogactwo gatunkowe ichtyofauny było istotnie zależne od spadku dna i związanej z nim szybkości nurtu. W większości rzek dominującymi gatunkami były ryby reofilne. W rzekach: Jarce, Błudzi i Błędziance, najczęstszym dominantem była strzebla potokowa *Phoxinus phoxinus* (L.), a w cieku bez nazwy i Żytkiejmskiej Strudze zwykle dominował ślíz. Na części stanowisk, szczególnie z wodą stojącą, dominował karaś srebrzysty *Carassius gibelio* (Bloch). Stwierdzono istotny statystycznie, dodatni związek względnego udziału gatunków reofilnych w składzie ichtyofauny ze spadkiem rzek o wyraźnie ukształtowanym korycie.