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ICHTHYOFAUNA OF SANTOCZNA AND PEŁCZ RIVERS IN THE CATCHMENT AREA OF LOWER NOTEĆ

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Summary. Studies of ichthyofauna were carried out in two tributaries of lower Noteć, in the rivers Santoczna and Pełcz. The catchment areas of these rivers lie in the Myślibórz Lakeland being part of Pomerania Lakeland. Fish samples were obtained by the method of electrofishing in determined sites. Totally, in both water courses, 90 fish individuals representing 7 species were caught and identified. Hydrographic similarity and location in the direct neighbourhood of Santoczna and Pełcz rivers found a reflection in the composition and biomass of ichthyofauna. In both water courses, there occurred five representatives of ichthyofauna including three species occurring in both rivers: brown trout, bullhead and perch. Furthermore, in Santoczna river, the presence of pike and roach was found, while in Pełcz river, gudgeon and rudd were present. In Pełcz, the quantitative dominants included brown trout and perch, while in Santoczna, the dominating fish was perch. Brown trout showed the greatest participation in the biomass of the fish caught in both rivers. Then, a significant share in the ichthyofauna of Santoczna river was shown by pike and perch, while in Pełcz river there dominated rudd and perch. Regarding the affiliation to ecological groups, the ichthyofauna of the studied rivers was differentiated – there occurred both phytophils and lithophils species.

Key words: ichthyofauna, Noteć catchment area, lowland rivers, biodiversity

INTRODUCTION

The basins of Warta and Noteć rivers in their lower courses are characterised by a very rich water-supply network. However, there do not exist many papers referring to water courses found in that area. The catchment area of middle Warta has been ichthyologically investigated already since the end of the 19th century [Grotrian 1896, 1899, 1900]. After the end of world war II, comprehensive inventory studies on ichthyofauna in the tributaries of Warta and Noteć were carried out by Kaj [1958, 1959, 1966], Jaskowski [1962], Iwaszkiewicz [1964, 1966] and Przybył [1976]. Among the tributaries of Noteć, the best investigated river is Drawa because of its unique character [Chełkowski *et al*. 1996] and

Gwda river [Kaj 1953, Koszaliński *et al*. 1989], as well as Bukówka river [Przybył 1976]. The first reference to the Santoczna river appeared in the work by Kaj and Walczak [1954]. Detailed exploration, hydrographic and ichthyologic studies of lower-course Warta tributaries, including Santoczna and Pełcz rivers, were started in the years 1978–1981 by the Department of Inland Fisheries of Agricultural University in Poznań [Madziar and Przybył 1981, Przybył and Madziar 1981]. The latest information about ichthyofauna composition in Noteć appeared in the paper by Penczak *et al*. [1999], however, the studies did not include the tributaries of that river.

Santoczna and Pełcz rivers, because of their unusual character of lowland waters with features characteristic of mountain streams, seem to be particularly interesting objects of studies both in the aspect of general natural science and from the point of view of rheophils ichthyofauna protection.

STUDY AREAS

Studies on ichthyofauna were carried out in two tributaries of lower Noteć river, Santoczna and Pełcz rivers. Catchment area of these rivers lies in the Myślibórz Lakeland which is part of Pomerania Lakeland. The northern border runs along a belt of moraine hills belonging to the main range of Pomerania terminal moraines. In the south, the border line is represented by a flood embankment built along the Polka Canal which runs at the foot of the right hill-side of Noteć river valley flowing into the Toruń-Eberswald Proglacial Valley. The remaining borders of the catchment area (the north-western and the south-eastern ones) are not distinct because they run among afforested hillocks constituting the dominating elements of the landscape. Regarding the terrain sculpture, it represents a slightly wavy plain of ground moraine. Glacial lake gullies and valleys of water courses cut into this plain, from several meters to even more than ten meters deep. In the catchment area of the described rivers, there occur about 60 lakes among which Wielgie lake covers the greatest area (81.9 ha). The elevation of the terrain oscillates between 72 m a.s.l. at the northern border of the catchment area and 21 m a.s.l. at the mouth of the Polka Canal into Noteć [Kondracki 1998].

Table 1. Hydrographic characteristics of investigated rivers

Parameter	Santoczna river	Pełcz river
Drainage basin area, km^2	125	162
Total length, km	28	24
Source, m a.s.l.	70	72
River mouth, m a.s.l.	23	24
Medium slopes, ‰	1.8	1.9

Regarding the hydrographic aspect, both studied rivers are similar (Tab. 1). Both Pełcz and Santoczna rivers are characterised by longitudinal slopes which are partially concentrated on damming up constructions of existing or former water mills. Along the course of the discussed rivers, the slopes of water courses are significantly differentiated in the upper section and in the mouth section where they are greater, while in the central course they become smaller. In spite of the significant slopes (0.3–4‰), almost on the whole length of the water courses there occurs waterside erosion. Single overflows, which in Pełcz river are greater than in Santoczna, are the result of the bigger catchment area and the greater width and depth of Pełcz riverbed [Hydrographic… 1983].

MATERIAL AND METHODS

Ichtyofauna studies in Santoczna and Pełcz rivers were carried out on the 15th of September, 2005. Fishing was done in the water courses by wading upstream along a 100-meter section and using an impulse fishing device IUP-12. The results of electrofishing were recalculated to 500 m of bank line treating 100-meter long localities as if they were localized on one river bank. In the studied water courses, the following sites were determined for sampling:

– Santoczna river, below forester's lodge in Zdojsko,

– Pełcz river, above road bridge in Górki.

At the fishing site, Santoczna river was 3.5 m wide, maximally 59 cm deep, the bottom was sandy and stony, the river banks were afforested. Pełcz river, at the fishing site, was 8.5 m wide, maximally 123 cm deep, the bottom was sandy and muddy with stony sections and a great number of tree trunks lying in water.

Fish species discussed in this paper have been listed according to their affiliation to reproductive groups according to the division proposed by Balon [1990]. Totally, in both water courses, 90 fish individuals were fished and identified.

In the analysis of ichthyofauna, domination indicator (D) was utilised:

$$D\ (\%) = s_i/S \cdot 100$$

where:

s_i – sum of fish number or fish mass of given species,

S – sum of the total fish number or mass.

RESULTS AND DISCUSSION

Hydrographic similarity and location in direct neighbourhood of the catchment area of Santoczna and Pełcz rivers found a reflection in the number and biomass of ichthyofauna (Tab. 2). In both water courses, there occurred five re-

Table 2. Abundance (N), biomass (B) and dominance (% N, % B) of fish species captured in the Santoczna and Pełcz river

Reproductive guild	Species		N	% N	B	% B
Santoczna river						
Non-guarding and open substratum eggs scattering (A.1)						
Phytolithopils (A.1.4)	perch	*Perca fluviatilis* (L.)	15	30,0	1150	16,21
	roach	*Rutilus rutilus* (L.)	10	20,0	462,5	6,52
Phytophils (A.1.5)	pike	*Esox lucius* (L.)	10	20,0	1815,0	25,58
Non-guarding and brood hiding (A.2)						
Lithophils (A.2.3)	brown trout	*Salmo trutta m. fario* (L.)	10	20,0	3630,0	51,16
Guarding and nesting (B.2)						
Speleophils (B.2.5)	bullhead	*Cottus gobio* (L.)	5	10,0	37,5	0,53
Pełcz river						
Non-guarding and open substratum eggs scattering (A.1)						
Phytolithopils (A.1.4)	perch	*Perca fluviatilis* (L.)	12	30,0	394,0	9,16
Phytophils (A.1.5)	rudd	*Scardinius erythrophthalmus* (L.)	5	12,5	413,0	9,6
Psammophils (A.1.6)	gudgeon	*Gobio gobio* (L.)	6	15,0	126,0	2,93
Non-guarding and brood hiding (A.2)						
Lithophils (A.2.3)	brown trout	*Salmo trutta m. fario* (L.)	14	35,0	3332,0	77,43
Guarding and nesting (B.2)						
Speleophils (B.2.5)	bullhead	*Cottus gobio* (L.)	3	7,5	38,0	0,88

presentatives of ichthyofauna including three species which were found in both rivers: brown trout, bullhead and perch. Furthermore, in Santoczna river, pike and roach were present, while in Pełcz river gudgeon and rudd were additionally found. In Pełcz river, the quantitative dominants included brown trout and perch, while in Santoczna river, the most numerous fish was perch. The highest participation in the biomass of the caught fish in both rivers was shown by brown trout. In Santoczna, a sinificant share in the ichthyofauna biomass was represented by pike and perch, while in Pełcz river there dominated rudd and perch (Tab. 2). It must be stressed that in both discussed water courses a strong population of brown trout was maintained and this fact confirms that there still exist waters with „salmonid" character.

Comparison of the obtained results with the last ichthyological studies in Santoczna and Pełcz [Przybył and Madziar 1981] indicates some changes in ichthyofauna composition. In Santoczna, species were found which did not occur there before, i.e. roach, perch, pike. In Pełcz river, there occurred rudd as a new species. On the other hand, some earlier species have not been found: stone loach was absent in both water courses; in Pełcz there was no burbot, and in Santoczna no gudgeon was caught. In spite of the unfavourable effect of anthropogenic factors acting on the ecosystem of the studied rivers (water flow regula-

tion, pollution), a very rich population of brown trout was recorded in both rivers. Also the occurrence of bullhead was found which, together with brown trout, is counted among the stenotopic species which are bioindicators of water purity condition. It must be stressed that Santoczna and Pełcz rivers were described for the first time by Przybył and Madziar [1981] as localities of bullhead. A confirmation of the occurrence of this fish in the lower Noteć catchment area is also supplied in the information by Penczak *et al*. [1999] who reported that one individual of this species was caught in the mouth section of that river.

CONCLUSION

Regarding the affiliation to ecological groups, the ichthyofauna of the studied rivers can be described as a differentiated one. There occur phytophils and lithophils species, indicating a high differentiation of habitats, from rapids with a mineral bottom to lenitive zones with distinct water stagnation.

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ICHTIOFAUNA RZEK SANTOCZNA I PEŁCZ W ZLEWNI DOLNEJ NOTECI

Streszczenie. Badania ichtiofauny przeprowadzono na dwóch dopływach dolnej Noteci: rzekach Santoczna oraz Pełcz. Zlewnie tych rzek leżą na Pojezierzu Myśliborskim, wchodzącym w skład Pojezierza Pomorskiego. Próby ryb pozyskiwano metodą elektropołowów na wyznaczonych stanowiskach. Ogółem w obydwu ciekach odłowiono i zidentyfikowano 90 ryb reprezentowanych przez 7 gatunków. Hydrograficzne podobieństwo oraz położenie w bezpośrednim sąsiedztwie rzek Santocznej i Pełcz znalazło odzwierciedlenie w składzie oraz liczebności i biomasie ichtiofauny. W obydwu ciekach występowało pięć przedstawicieli ichtiofauny, w tym trzy te same gatunki: pstrąg potokowy, głowacz białopłetwy i okoń. W Santocznej stwierdzono ponadto obecność szczupaka i płoci, a w Pełczy kiełbia i wzdręgi. Dominantami ilościowymi w Pełczy były pstrąg potokowy i okoń, natomiast w Santocznej złowiono najwięcej okonia. Najwyższy udział w biomasie odłowionych ryb w obydwu rzekach miał pstrąg potokowy. Poza tym znaczny udział w biomasie ichtiofauny Santocznej miały szczupak i okoń, a w Pełczy wzdręga i okoń. Pod względem przynależności do grup ekologicznych ichtiofauna badanych rzek była zróżnicowana – występowały tutaj zarówno gatunki fitofilne, jak i litofilne.

Słowa kluczowe: ichtiofauna, zlewnia rzeki Noteć, rzeki nizinne, bioróżnorodność