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Preliminary studies on zoobenthos communities of rivers and streams of south-west Roztocze (eastern Poland)

Zgrupowania zoobentosu rzek i strumieni południowo-zachodniego Roztocza (wschodnia Polska) – badania wstępne

SUMMARY

Zoobenthos communities of rivers and streams of south-west Roztocze were studied in July 2005. Analysis included 10 sites. Densities and domination structure of studied zoocenosis differed significantly between studied sites, while the number of taxa was rather low and ranged from 1 to 6. The mean densities of zoobenthos ranged from 264 up to 5016 ind. m^{-2}. Zoobenthos communities was dominated by Amphipoda and Chironomidae larvae, the share of amphipods ranged from 20% to 100%, while the larvae of midges amounted from 25% up to 100% of total abundance, dependently on the studied site.

STRESZCZENIE

W lipcu 2005 roku przeprowadzono badania struktury jakościowej i ilościowej fauny bezkręgowej zasiedlającej ekosystemy rzeczne i strumieniowe południowo-zachodniej części Roztocza. Analizą objęto 10 stanowisk. Stwierdzono wyraźne zróżnicowanie zagęszczenia i struktury dominacji zoobentosu pomiędzy poszczególnymi stanowiskami, a liczba taksonów na większości stanowisk była niewielka i wahała się od 1 do 6. Zagęszczenia fauny dennej wahały się od 264 osobn. m^{-2} do 3564 osobn. m^{-2}. Wśród zoobentosu wyraźnie dominowały Amphipoda i larwy Chironomidae. Zależnie od stanowiska udział równonogów wahał się od 20% do 100%, larwy ochotkowatych zaś stanowiły od 25% do 100% ogólnej liczebności zoobentosu.

Key words: zoobenthos, rivers, streams, Roztocze

INTRODUCTION

The information about structure and taxonomic composition of benthic invertebrates of upland rivers of south-eastern Poland is very scarce. The previous studies of bottom fauna have focused on rivers Bystrzyca, Wieprz and their tributaries (Radwan et al. 1988, Radwan et al. 2000, Kornijów & Lachowska 2002) and main rivers of Landscape Park "Lasy Janowskie" (Paleolog et al. 1997). Up till now benthic invertebrates' communities of rivers of Roztocze region are not well recognized.

The present study aims to evaluate the taxonomic structure and density of zoobenthos communities of streams of the south-west part of Roztocze. The running waters of the studied area are unique from the ecological point of view. Most of them resemble mountain streams with high flow and strong deep erosion of beds and river banks which results in creation of deep valleys of abrupt slopes. Tanew, the main river of the south-west part of Roztocze, together with its tributaries: streams Sopot and Szum create gorges of steep and vivid slopes with stony rapids visible on the bottom. On the rapids impressive cascades called "szumy" are formed.

MATERIAL AND METHODS

Zoobenthos communities were studied in summer (July) 2005 at 10 sites situated on the streams of south-west Roztocze. The basic physical and chemical parameters of the studied ecosystems were presented in Table 1.

Table 1. Physical and chemical characteristics of the studied sites in July 2005

Studied site	Temperature [°C]	pH	Conductivity [μS cm^{-1}]	Dissolved oxygen [mg O_2 dm^{-3}]
Stream Świerszcz	18.4	7.8	255	9.1
Stream Szum – Roztoczański National Park	13.5	6.3	253	8.2
Stream Szum – Górecko Kościelne	17.6	6.9	292	8.1
Stream Szum – Sigła	19.5	7.1	265	7.1
Mouth of Stream Szum to River Tanew	20.1	7.4	308	7.1
Springs of Stream Sopot	10.8	7.1	410	4.2
Mouth of Stream Sopot to River Tanew	18.7	7.9	296	7.3
Upper River Tanew – Jacków Ogród	16.7	6.2	323	7.2
River Tanew – Kościół	17.8	7.2	345	7.7
River Tanew – Borowiec	15.9	7.6	323	9.0

Bottom fauna was collected using tube apparatus (surface area 19.6 cm^2). at sites with muddy or sandy bottom At each site three samples were taken (5 cores per one sample). Collected invertebrates were preserved in 4% formaldehyde and identified according to Kołodziejczyk & Koperski (2000) and Wiederholm (1983). The analysis included the number of taxa, density (ind. m^{-2}) and domination structure of zoobenthos communities. Differences between the studied ecosystems were verified by means of ANOVA (SAS 2001).

RESULTS AND DISCUSSION

Bottom fauna of the studied streams has not shown a taxonomic diversity. The total number of taxa ranged from 1 to 6 according to the studied site (Fig. 1). The observed low number of taxa (only 3 on average) confirms the peculiarity of the studied habitats where living organisms should have been extremely specialized and developed unique survival strategies to face environmental constraints (Lencioni & Rossaro 2005). Among benthic taxa chironomids larvae prevail (Table 2). Due to diverse physiological adaptations the larvae of midges are able to colonize different types of water habitats, being then the most productive primary consumers (Grzybkowska 2006).

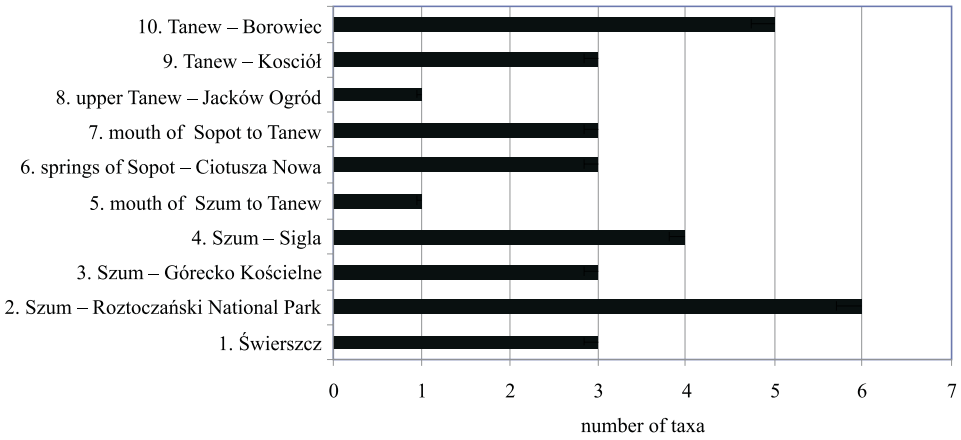

Fig. 1. Number of zoobenthos taxa at the studied sites in July 2005

The density of the bottom fauna differed significantly within the studied streams (ANOVA, $F = 38.23$; $p = 0.003$). The highest density was noted in the upper river Tanew in Jacków Ogród – 5016 ind. m^{-2}, while the lowest in the mouth of Stream Szum to the river Tanew – only 264 ind. m^{-2}) (Fig. 2). Observed densities were comparable to values found by Dukowska et al. (2007) in the river Drzewiczka (Vistula drainage basin).

Zoobenthos was dominated by the two taxa: Amphipoda and Chironomidae (Fig. 3). The share of amphipods ranged from 20% (the river Tanew Kościół) to 100% (the upper river Tanew Jacków Ogród). The larvae of midges amounted from 25% (Stream Szum – Górecko Kościelne) up to 100% (the mouth of Stream Szum to the river Tanew) of total density.

The domination of Chironomidae larvae confirms the role of these insects as a specialized invertebrate fauna well adapted to survive in a variety of envi-

Table. 2. Composition of benthic taxa at the studied sites in July 2005

	1. Świerszcz	2. Szum – Roztoczański National Park	3. Szum – Górecko Kościelne	4. Szum – Sigła	5. mouth of Szum to Tanew	6. springs of Sopot – Ciotusza Nowa	7. mouth of Sopot to Tanew	8. upper Tanew – Jacków Ogród	9. Tanew – Kościół	10. Tanew – Borowiec
Tubificidae				+						
Amphipoda										
Gammarus sp.	+	+	+		+	+		+	+	
Ephemeroptera larvae										
Coleoptera imagines										
Hydrobius fuscipes		+								
Coleoptera larvae	+									
Chironomidae larvae										
Procladius sp.										+
Psectrocladius sp.										+
Chironomus sp.		+								
Cryptochironomus sp.		+		+			+			
Einfeldia sp.										
Endochironomus sp.				+						
Paratendipes sp.		+								+
Polypedilum sp. (gr. *conoictum*)									+	
Cladotanytarsus sp. (gr. *mancus*)			+							
Chironomidae non det.						+				
Simuliidae larvae										
Simulium sp.										+
Trichoptera larvae	+					+				
Diptera non det.			+		+				+	+
Gastropoda										
Galba sp.										
Bivalvia										
Sphaerium sp.		+		+	+					

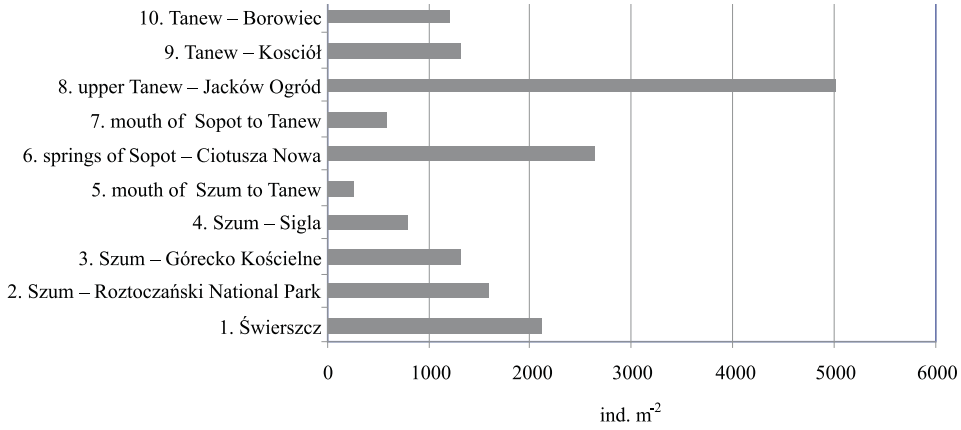

Fig. 2. Mean densities (+SD) of bottom fauna at the studied sites in July 2005

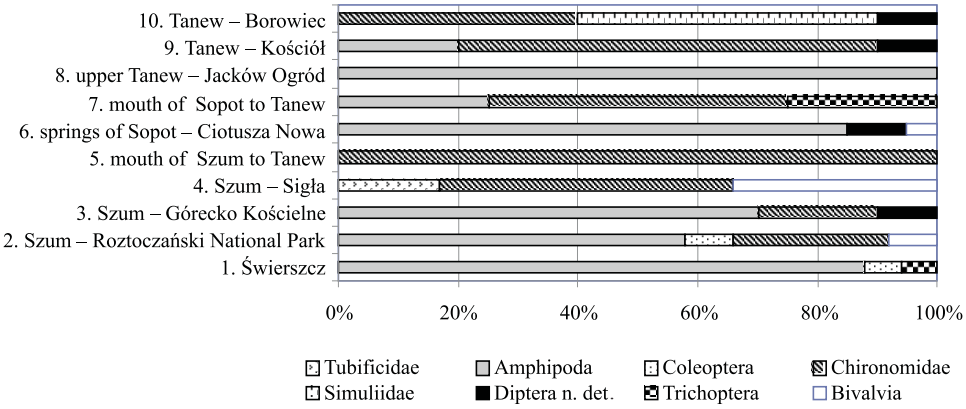

Fig. 3. Relative abundances of benthic taxa at the studied sites in July 2005

ronmental rigors such as low water temperature, scarce food resources, fast water current (Cranston 1995). The presence of Simuliidae larvae and Amphipoda (*Gammarus* sp.) confirm high water quality of the studied streams, these taxa are used as bioindicators of unpolluted waters (De Pauw & Vannevel 1993). In total the diversity of benthic fauna observed at the studied sites was rather low and could be considered as a consequence of substrate type. In the studied streams dominated physically simple substrates (sand or bedrock), whereas complex substrates (wood, leaves, macrophytes, mosses) usually support a more diverse zoobenthic community (Miserendino 2001).

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