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PHITOMICROBENTHOS OF THE KŁODZKA VALLEY RIVERS

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COMMUNICATION

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FITOMIKROBENTOS RZEK KOTLINY KŁODZKIEJ

Wiosną 2002 roku przeprowadzono badanie jakościowe i ilościowe organizmów fitomikrobentosu rzek Kotliny Kłodzkiej: Nysa Kłodzka, Biała Lądecka, Ścinawka. Oznaczono skład gatunkowy glonów oraz określono liczebność osobników na każdym z 9 stanowisk badawczych. Na podstawie obecności gatunków określono strefę saprobową na badanym odcinku rzeki. Na podstawie liczebności dokonano oceny zdolności samooczyszczania wody rzeki w badanym punkcie. Określone strefy saprobowe pozwoliły na ocenę czystości wody i przydatności rzek do bytowania ryb łososiowatych.

Summary

In the spring 2002 a qualitative and quantitative study of phitomicrobenthos organisms of the Kłodzka Valley rivers: the Nysa Kłodzka, the Biała Lądecka, and the Ścinawka was done. The species composition of algae and the number of specimen were determined on each of 9 research stands. On the basis of the species presence the saprobic area was determined in the examined part of the river. On the basis of the species number, the evaluation of self-purification capacity was carried out. The determined saprobic area allowed evaluating water cleanliness and the usefulness of the rivers as a habitat for salmon fishes.

INTRODUCTION

Kłodzka Valley – a geographical region in the Eastern Sudety Mountains, is surrounded by the Stołowe Mountains, Bardzkie Mountains, Bystrzyckie Mountains, and the Śnieżnik Massif. The notion of Kłodzka Valley is often wrongly extended to denote the whole region of Kłodzko. Its biggest river is the Nysa Kłodzka – a left-bank tributary of the Oder. The river hast its source in the Śnieżnik Massif. The main city of the region – Kłodzko, situated on the Nysa Kłodzka river, is located in the central part of the valley. Above Kłodzko, the right-bank Biała Lądecka flows into the Nysa Kłodzka, and below Kłodzko, on the left – the Ścinawka River. On their banks, Bardo Śląskie (in the north) and Bystrzyca Kłodzka, Długopole and Międzylesie (in the south) are situated. Other cities in Kłodzka Valley include: Stronie Śląskie, Lądek (in the east), Polanica, Duszniki, Szczytna, Kudowa, Radków, and Nowa Ruda (in the west). The urban development of the

valley has an impact on the purity of surface waters. The Nysa Kłodzka and its tributaries are a source of drinking water, hence the quality of surface waters in the Nysa Kłodzka basin ought to be included in the I purity class [2]. The Kłodzka Valley rivers constitute a unique habitat of salmon fishes: the brown trout *Salmo trutta m. pharia* (Linnaeus 1758) and the grayling *Thymallus thymallus* (Linnaeus 1758).

THE RESEARCH AREA

The research material was sampled on nine research stands situated on three rivers: the Nysa Kłodzka and its tributaries: the Biała Lądecka and the Ścinawka. The stands were located below the following localities: Roztoki, Zabłocie, Ścinawica, Przyłęk, Stronie Śląskie, Radochów, Żelazno, Ścinawa, Gołogłowy (Fig. 1).

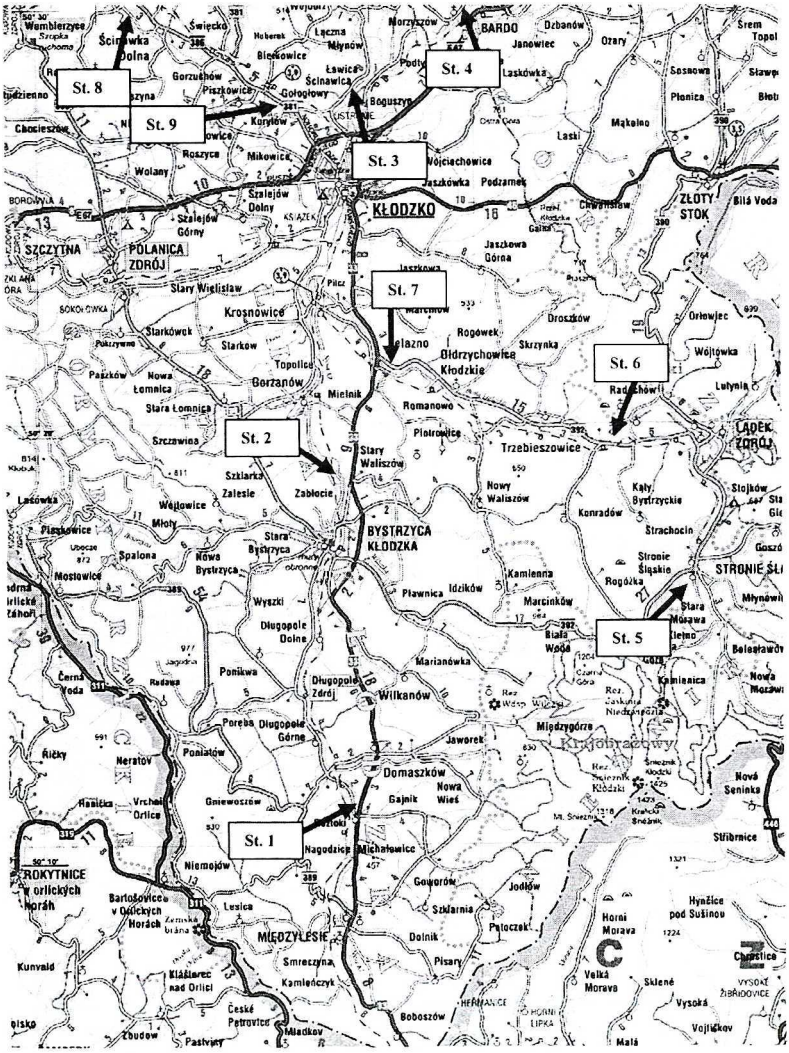

Fig. 1. Map of the study area with marked investigation sites

Samples from the Nysa Kłodzka were collected on four stands: above Kłodzko in Roztoki (stand 1) and Zabłocie (stand 2), and in Ścinawica (stand 3) and Przyłęk (stand 4) below Kłodzko.

For the Biała Lądecka river, three stands for sampling were established: in Stronie Śląskie (stand 5), Radochów (stand 6) and Żelazno (stand 7).

Samples from the Ścinawka river were collected on two research stands located between Ścinawa Górna and Dolna (stand 8) and in Gołogłowy (stand 9).

THE MATERIAL AND METHODOLOGY OF RESEARCH

The research was performed on samples of phitomicrobenthos collected in April and May 2002. Microscopic observations were carried out on fresh material. The samples were stored in the temperature of +3°C for the period of three days after being sampled. The algae species were identified on the basis of the keys of the following authors: [1, 3–5]. On the basis of the microscopic observations, the species composition on each of the stands and the number of algae specimen in 1 cm^3 of water were determined. Based on that, the saprobic area [5] of the examined river part was determined. The number of specimen in 1 cm^3 allowed evaluating the self-purification capacity of the rivers waters.

THE RESULTS OF THE RESEARCH

In the research, the presence of 28 taxa of algae was observed. Their number on particular stands is presented in Table 1, and Figure 2.

The greatest diversity of species was observed on stands 6 and 7–16 species on each (the Biała Lądecka river below Radochów and in Żelazno). A rainbow trout farm is located in Radochów, therefore the increased number of biogens supplied to the river stimulates the more intensive species development of benthos microflora. Stand 3, with 6 species, is the poorest in species (the Nysa Kłodzka river, Ścinawica).

The observed presence of organisms allows to qualify the water of the Nysa Kłodzka river on stands 1 and 2 in β-mesosaprobic area. On stand 1 nine species of algae were identified, and the presence of 35 960 specimen in 1 cm^3 of water was calculated. On stand 2 nine species of algae were identified as well, and the presence of 24 130 specimen in 1 cm^3 of water was calculated. Based on the presence of organisms, the water of the river can be classified in β-mesosaprobic area (saprobity 2.45).

The analysis of organisms allows to classify the waters of the Nysa Kłodzka on stand 3 (below Kłodzko) in α-mesosaprobic area, and on stand 4 – in β-mesosaprobic area. On

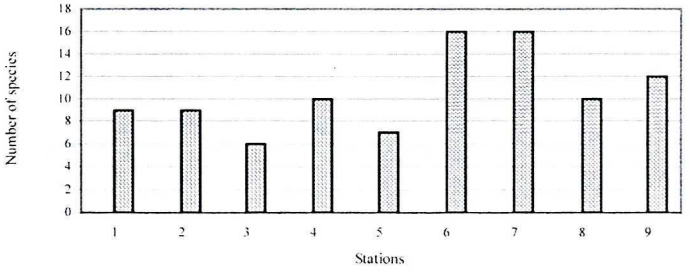

Fig. 2. Number of benthos algae species at research stations of the Kłodzka Valley rivers

Table 1. Phitomicrobenthos at research stands 1–9

	Systematic unit	Ecological unit	Stands								
			1	2	3	4	5	6	7	8	9
I	CYANOPHYCEAE										
	Oscillatoria n. det.		+					+	+		
II	CHLOROPHYTA										
	Ulothrichales										
	Ulotrix tennisime Kützing			+	+	+	+	+	+	+	
	Ulotrix zonata Kütz.	saproxen					+	+	+		
	Chaetophorales										
	Cladophora crispata Kütz.	saproxen						+			
	Conjugatophyceae										
	Closterium n.det.										+
III	CHRYSOPHYCEAE										
	Hydnirus n. det.						+	+	+		
IV	BACILLARIOPHYCEAE										
	Centrophycideae										
	Melosira varians Ag.	saproxen	+		+	+		+	+		+
	Pennatophycideae										
	Achnanthes lanceolata (Bréb.) Grun.	saproxen							+		
	Ceratoneis arcus (Ehr.) Kütz.	saproxen	+	+		+	+	+	+	+	
	Cocconeis placentula Ehr.	saproxen		+				+			
	Cymbella ventricosa Kütz.	saproxen	+	+	+	+	+	+	+	+	
	Cymatopleura solea (Bréb.) W. Smith	saproxen									+
	Caloneis amphisbaena (Bory) Cl.	saproxen									+
	Diatoma vulgare Bory	saproxen							+		
	Fragilaria crotonensis Kitt.	saproxen							+		+
	Gomphonema olivaceum (Lyngb.) Kütz.	saproxen									+
	Gomphonema parvulum (Kütz) Grun.	saproxen								+	
	Meridion circulare Ag	saproxen	+	+				+		+	+
	Navicula cryptocephala Kütz.	saproxen	+	+	+	+	+	+	+	+	+
	Navicula gracilis Ehr.	saproxen	+	+			+	+	+	+	+
	Navicula hungarica Grun., var capitata (Ehr.) Cl.	saproxen			+	+					
	Navicula viridula Kütz.	saprophile	+	+	+			+	+	+	+
	Neidium dubium (Ehr.) Cleve					+					
	Nitzschia acicularis W. Sm.	saprophile				+				+	
	Nitzschia hungarica Grun.	saproxen							+		
	Nitzschia vermicularis (Kütz) Grun.	saproxen	+	+		+		+	+	+	+
	Pinnularia viridis (Nitzsch.) Ehr.	saproxen						+			
	Suriella ovata Kütz.	saproxen				+			+		+

stand 3 six species of algae were identified, and the presence of 15 230 specimen in 1 cm^3 was calculated. On stand 4 ten species of algae were identified, with 63 660 specimen in 1 cm^3, which indicates a significant self-purification capacity of the waters. The analysis of organisms allows to classify the water in β-mesosaprobic area (saprobity 2.38)

The analysis of organisms allows to classify the waters of the Biała Lądecka river on stand 5 in oligosaprobic area (saprobity indicator 1.24), on stand 6 – in β-mesosaprobic area (saprobity indicator 1.85), and on stand 7 – in β-mesosaprobic area as well (saprobity 1.75). On stand 5 seven species of algae were identified, and the presence of 25 430 specimen in 1 cm^3 of water was calculated. On stand 6 sixteen species of algae were identified, and the presence of 55 400 specimen in 1 cm^3 was calculated, which indicates a significant self-purification capacity of the waters. On stand 7 sixteen species of algae were identified, and the presence of 184 200 specimen was calculated, which indicates a high degree of self-purification.

The analysis of organisms allows to classify the waters of the Ścinawka river on stand 8 in β-mesosaprobic area area (saprobity indicator 2.5), on stand 9 – in β-mesosaprobic area (saprobity indicator 2.44). On stand 8 ten species of algae were identified, and the presence of 34 660 specimen in 1 cm^3 was calculated. On stand 9 twelve species of algae were identified, and the presence of 34 880 specimen in 1 cm^3 was calculated, which indicates a significant self-purification capacity of the waters.

The largest population of benthic algae was observed on stand 7. The least abundant phitomicrobenthic flora was observed on stand 3 (the Nysa Kłodzka river in Ścinawica).

Dominant on each of the stands were diatoms (*Baccillariophyceae*) (Fig. 3, 4) from the ecological group of saproxenes, i.e. organisms that avoid waters polluted with organic matter. From the ecological group of saprophiles (organisms typically living in polluted water, but able to live in pure water), three species were identified: *Navicula cryptocephala, Navicula viridula* and *Nitzschia acicularis* (Table 1). Only *Navicula cryptocephala* was present on each of the research stands. It is resistant to small amounts of oxygen, phenols, and, for instance, sewage from paper-mills. It tolerates, to some extent, the presence of hydrogen sulfide and the fluctuation of pH. This diatom is typical for euthrophic waters [5]. *Navicula viridula* was not observed on stands 4 and 5, i.e. in the Nysa Kłodzka river in Przyłęk and in the Biała Lądecka river in Stronie Śląskie. *Navicula viridula* is a diatom resistant to chemical changes, including copper [5]. *Nitzschia acicularis* was present on stands 4 (the Nysa Kłodzka river, Przyłęk) and 8 (the Ścinawka river, Ścinawa).

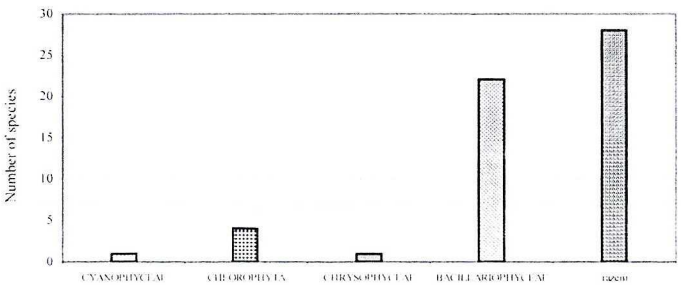

Fig. 3. Number of benthos algae species among higher systematic units of the Kłodzka Valley rivers

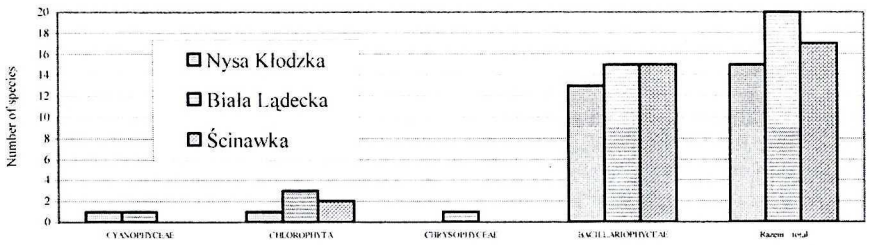

Fig. 4. Higher systematic units at phitomicrobenthos of the Kłodzka Valley rivers

CONCLUSIONS

1. In the spring season, species – diversity of phitomicrobenthos observed in the Kłodzka Valley rivers is small (from 6 to 16 species).
2. *Baccillariophyceae* are dominant in the species composition of benthic algae.
3. The belonging of species to the ecological group of saproxenes proves a good purity level of the waters of the Kłodzka Valley rivers.
4. The good quality of waters of the Valley rivers is favourable for salmon fishes: the brown trout (*Salmo trutta m. pharia*) and the grayling *(Thymallus thymallus*).

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