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INVERTEBRATES FAUNA OF THE LUBIATOWSKIE LAKES IN THE NORTH-WEST PART OF THE NOTEĆ PRIMEVAL FOREST*

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A b s t r a c t. The lakes included in the research are called the Lubiatowskie Lakes and they are as follows: Solecko, Lubiatówko, Łąkie, Gostomie, Miel, Piersko, Siwino, Glinki, Zdroje, Solczyk, Kliczyna, Rąpino. Most of these lakes are flow lakes. The biggest one is Lubowo (102.5 ha) and Solecko (91 ha). The research was conducted from 2003 to 2004, between May and September. The collected material included 14 species of leeches *Hirudinea*, 22 species of snails *Gaspropoda,* and 11 species of bivalves *Bivalvia* as well as several species of dragonflies and ephemerids, 2 species of sponges and 3 species of the *Bryozoa.* The remote lakes, screened by woods, are often penetrated by poachers with power-generating machines. As a result, invertebrates have become very sparse there. It is an example of a human activity which decreases biological variety in the lakes we have examined.

K e y w o r d s: lakes, invertebrates' fauna

INTRODUCTION

Our research was conducted in the south-west part of the Noteć Primeval Forest by order of the Provincial Nature Conservator in Gorzów Wielkopolski. The research concerned lake catchment basins of Lakes Solecko and Lubiatówko with regard to their nature values, as well as taking Lake Lubiatówko under legal protection. Flora and fauna of dying Lake Jezierce in the Noteć Primeval Forest were thoroughly studied, and as a result a proposal was put forward to establish a reserve that would protect mud turtles*, Emys orbicularis,* and European medical leeches, *Hirudo medicinalis* [4].

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The purpose of our research was a monographic study of "Lubiatowskie Lakes" as regards their flora and fauna in the course of nature stock-taking in Drezdenko commune. There has been some drilling work done in this area by "Polish Oil" in order to locate oil reservoirs. Therefore, in the future, when oil wells appear, our research may gain in importance and monitor changes in the lakes.

THE CHARACTERISTIC OF THE STUDIED AREA

The lakes are located in the south-east part of Zielona Góra and Gorzów Wielkopolski Pronivce, Strzelce-Drezdenko district, Drezdenko commune. With regards to forest nature they are located in the Wielkopolska-Pomorska Region, Noteć Primeval Forest Mesoregion. Physiographically they are situated in a subprovince of the South Baltic Lake District, macroregion of Toruń-Eberswald marginal stream valley, and Gorzów Valley mezoregion [8].

The Noteć Primeval Forest is a great forest complex of 150 000 hectares. The centre of the Noteć Primeval Forest is poor in water reservoirs. There are few small interior lakes. The greatest cluster of lakes can be observed on the right bank of the River Warta near Sieraków and Międzychód. There are a few big lakes located to the south and south-west from Drezdenko near Trzebicz, Gościm, Lubiatów and Grotów (Fig. 1). The lakes are regionally called the "Lubiatowskie Lakes".

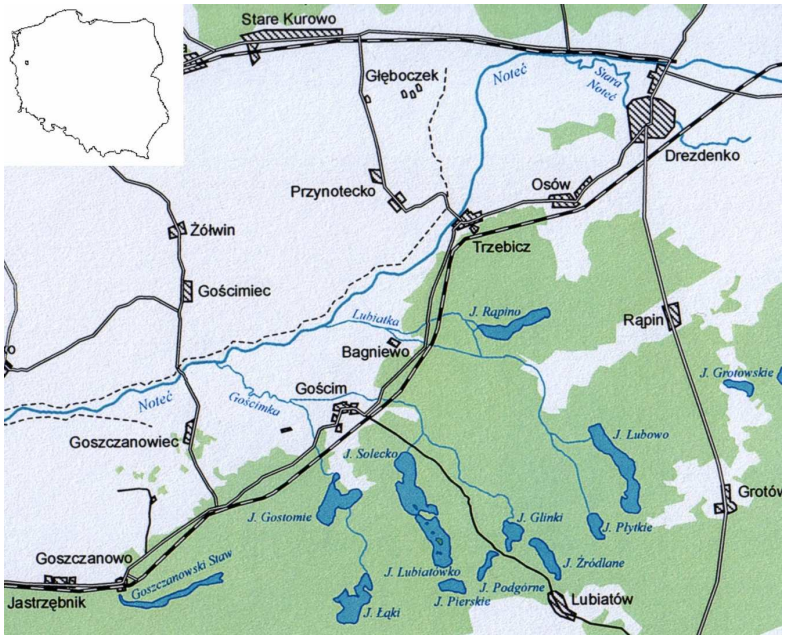

Fig. 1. The studied area "Lubiatowskie Lakes"

The water of most of the studied lakes is of second cleanliness class. They are situated at 25 to 48 m above see level (Tab. 1). The studied lakes are included in a catchment basin of small streams: Lubiatka and Gościmka, and three of the lakes are without flow.

Table 1. Morphometry of Lasek Lubiatowskie

Lake	Area (ha)	Elevation a.s.l.	Max depth (m)	Length max. (m)	Width max. (m)
Lubowo	102.50	35.6	8.0	2750	500
Solecko	91.18	27.3	6.8	1750	690
Lubiatówko	65.79	*27.3*	9.2	1670	550
Łąkie	62.32	37.6	8.8	1375	800
Gostomie	57.76	25.1	16.5	1100	1010
Rąpino	55.25	27.7	4.0	1980	350
Goszczanowski Staw	45.75	27.4	4.5	3150	250
Źródlane	30.96	39.0	9.5	1200	350
Glinki	24.48	36.6	2.8	700	450
Płytkie	20.99	35.1	1.5	730	350
Pierskie	17.59	37.3	-/-	750	310
Podgórne	16.74	37.8	4.7	1100	190
Sołczyk	9.84	46.6	-/-	450	250
Miel	4.44	25.2	-/-	250	210

MATERIAL AND METHODS

The research was conducted from May to September in 2003 and 2004. Twelve lakes (Tabs 1 and 2) were included in the research and forty two research stations (Fig.1) were established there. While selecting the stations the variety of habitats was considered as a main criterion. Samples were taken with the use of a triangle-framed net (25 cm each side), and some observation was conducted on aquatic vegetation, pebbles and shellfish shells, as well as objects found in the water. In order to research a sandy-gravel substratum, metal sieves of 0.2 mm mesh were used.

Overall, there were 126 samples collected which included 3780 *Hirudenea*, 4500 *Gastropoda* and 1250 *Bivalvia* specimens. Other taxa were preserved separately and saved for further research.

In order to evaluate water quality of the Lubiatowskie lakes, a saprophytic index for inland water reservoirs was used [5], while to research *Hirudinea* specimens indices from Šladeck and Košel [16] work were applied.

RESULTS

The collected material helped to identify 14 species of leeches that belong to *Hirudinea* phylum, 22 species of *Gaspropoda* snails, and 11 species of *Bivalvia* bivalves (Tab. 2). In more transparent lakes there were two species of sponges from *Spongillidae Spongilla* lacustris family and *Ephydatia fluviatilis* family, *Bryozoa Plumatella fungosa* and *Cristacella mucedo* bryozoans. They demand very clean water that is not contaminated by sewage. There have been said to exist a lot of invertabrate species like *Oligochaeta* oligochaetes, *Turbellaria* turbellarians, *Isopoda* and *Amphipoda* crustaceans, as well as species of plankton crustaceans, i.e. *Cladocera* and *Copepoda.*

Table 2. List of occurrence of Hirudinea and Mollusca species in the studied lakes

Species	Staw Goszczanowski	Łąkie	Gostomie	Rąpino	Lubowo	Solecko	Lubiatówko	Podgórne	Glinki	Źródlane	Solczyk
1	2	3	4	5	6	7	8	9	10	11	12
Glossiphonia complanata (L.)	+	+	+	+	+	+	+	+	+	+	+
Glossiphonia heteroclita (L.)	+	+	+	+	+	+	+	+	+	+	+
Hemiclepsis marginata (O.F.Müller)	+		+	+	+	+	+	+	+	+	+
Theromyzon tessulatum (O.F.Müller)	+	+	+	+	+	+	+	+	+	+	+
Batracobdella paludosa (Car.)			+	+	+	+	+	+	+	+	+
Hellobdella stagnalis (L.)	+	+	+	+	+	+	+	+	+	+	+
Piscicola geometra (L.)	+	+	+	+	+	+	+	+	+	+	+
Hirudo medicinalis (L.)				+					+		
Erpobdella octoculata (L.)	+	+	+	+	+	+	+	+	+	+	+
Erpobdella nigricollis (Brand.)	+	+	+		+	+	+	+	+	+	+
Erpobdella testacea (Sav.)	+	+	+	+	+	+	+	+	+	+	+
Erpobdella monostriata (Lind. et.Pietr.)	+	+	+	+	+	+	+	+	+	+	+
Anodonta anatina (L.)						+	+				
Anodonta cygnea (L.)	+				+	+	+	+	+	+	+
Unio tumidus (Philipsson)					+	+	+	+	+	+	+
Unio crassus (Phillipsson)					+	+	+				
Unio pictorum (L.)	+	+	+					+	+		
Anodonta complanata			+		+	+	+		+	+	+
Pisidium amnicum (O.F.Müller)			+		+	+	+				+
Pisidium casertanum (Poli.)						+	+	+	+	+	+
Sphaerium corneum (L.)	+			+	+	+	+	+	+	+	+
Dreissena polymorpha (Pallas)	+	+	+	+	+	+	+	+	+	+	+
Theodoxus fiuvialitis (L.)	+				+	+	+	+	+	+	+
Acroloxus lacustris (L.)	+	+	+	+	+	+	+	+	+	+	+
Viviparus contectus (O.F.Müller)	+		+	+	+	+	+	+	+	+	+
Bithynia tentaculata (L.)	+	+	+	+	+	+	+	+	+	+	+
Bithynia leachi (Sheppard)			+		+	+	+				

Table 2. Cont.

1	2	3	4	5	6	7	8	9	10	11	12
Valvata naticina (Menke)				+							
Potamopyrgus antipodarum (Gray)			+	+	+						
Physa fontinalis (L.)				+				+	+	+	+
Lymnea (Galba) corvus					+	+	+				
Lymnea stagnalis (L.)	+	+	+	+	+	+	+	+	+	+	+
Lymnea peregra (O.F.Müller)						+	+				
Lymnea turilicula (Held)						+	+				
Galba truncatula (O.F.Müller)	+	+	+	+	+	+	+	+	+	+	+
Radix ovata (L.)	+	+	+	+	+	+	+	+	+	+	+
Radix (Lymnea) auricularia (L.)	+	+	+	+	+	+	+	+	+	+	+
Myxas glutinosa (O.F.Müller)	+	+	+	+	+	+	+	+	+	+	
Planorbarius corneus (L.)	+	+	+	+	+	+	+	+	+	+	+
Planorbis planorbis (L.)	+	+	+	+	+	+	+	+	+	+	+
Planorbis carinatus (O.F.Müller)					+						
Gyraulus leavis (Alder)								+	+		
Gyraulus albus (O.F.Müller)			+		+	+	+				
Anisus contortus (L.)						+	+				
Anisus vortex (L.)	+	+	+	+	+	+	+	+	+	+	+
Segmentino nitida (O.F.Müller)						+	+				
Anisus spinorbis (L.)						+	+				
Gyraulus crista (L.)						+	+				
Succinea oblonga (Drap.)						+	+				
Succinea putris (L.)						+	+				
Succinea elegans Risso						+	+				

The collected materials provide information that there are groups of 9-12 species of *Hirudinea* leeches in the Lubiatowskie lakes. The most frequent and numerous leech species are *Helobolella Stagnalis*, *Erpobolella nigricollis*, and *E. octoculata*. Their numerical force is about 75%. It has been observed that they are also numerous in the research stations and the samples.

Two species, *Hirudo medicinalis* and *Batrachobella,* are worthy of notice. The European medicinal leech is a protected species and it has been observed in two lakes: Rąpino and Glinki on muddy-lakebed stations rich in aquatic vegetation. Large numbers of the leech appear in Lake Jeziorce, 5 km to the west from Goszczanów [1] and in Drawieński National Park [2]. *Batrocobolella paludosa* is a species hardly observable in Poland, only in the stations of the Polish lowlands [11,14,15,21]. It is an indicative species for the β-mesosaprophytic zone [16]. An interesting species is also *E. monostriata* that is one of bioindicators of water quality [2,3]. Kalbe [7] classifies the species as characteristic for both β and α mesosaprophytic water, while Sladeček and Košel [16] classify them as characteristic only for B-mesosaprophytic water. Bennike [6] recognizes the species as stenotopic lake leeches. There have been recognized a few indicative species in the clusters of *Gasrtopoda* and *Bivalvia*, namely *Dreissena polymorpha Pisidium amicum,* and *P. casertanum*.

Mounthona [10], Stańczykowska [17] are of the opinion that *D. polymorpha* avoids intensively eutrophicated water. Piechocki [12] classifies this bivalve as an indicative species for oligosaprophytic water, and Makruskin [9], Piechocki and Dyduch-Falniowska [13] classify it as indicative for β-mesosaprophytic water.

The species mentioned above, i. e. *P. amnicu* and *P. casertanum*, are frequent but not numerous in oligo- and β-mesosaprophytic water. A species form among *Unionidae*, that prefers eutrophic not contaminated and well-oxygenated water is *Anodonta cygnea* that appears in large numbers in a headstream zone of the eastern part of Goszczanowski Pond which will become a part of a nature reserve called "Goszczanowskie Headstreams". This part of the pond is a fauna habitat that requires plenty of oxygen.

The remote lakes, screened by woods, are often penetrated by poachers who use power-generating machines to kill their prey. As a result, invertebrates have become very sparse there. It is an example of a human activity which decreases the biological variety in the lakes we have examined.

DISCUSSION

The study of water quality of the Lubiatowskie Lakes requires more than physicochemical analysis but also biological analysis. A chemical method is commonly used as it is easier and provides more reliable data than a biological study does [19], however, the analysis results are unilateral because they record water quality in a certain time. The basis for determining water quality with the use of a biological method is live organisms that fully prove water condition in a certain watercourse or water basin [18].

We have carried out some preliminary evaluation of water condition of the Lubiatowskie Lakes on the basis of the saprophytic index that runs from 1.53 to 2.27. Higher evaluation was provided for the lakes: Zdroje (Źródlana), Solczyk, Solecko, and Gostomie. The lowest soprophytic index was estimated for Lake Lubiatówka. According to WIOŚ data [20], the researched lakes are of second cleanliness class. Lake Lubiatówko, that is a bird reserve, was classified under third cleanliness class because of total deoxidation of the lake bed layer and a large amount of organic matter, which is proved by high values of BZT_5 and CHZT.

CONCLUSIONS

Current studies bring the following statements and conclusions:

1. To meet the demand for creating a nature reserve "Goszczanowskie Headstreams".

2. To keep the biodiversity in the lakes, both of invertebrates and of fish, by eliminating poachers who use methods that destroy any live organisms.

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FAUNA BEZKRĘGOWCÓW JEZIOR LUBIATOWSKICH PÓŁNOCNO-ZACHODNIEJ CZĘŚCI PUSZCZY NOTECKIEJ

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S t r e s z c z e n i e. W kompleksie znanym jako Jeziora Lubiatowskie prowadzono badania następujących jezior: Solecko, Lubiatówko, Łąkie, Gostomie, Miel, Piersko, Siwino, Glinki, Zdroje, Solczyk, Kliczyna, Rąpino. Większość z nich to jeziora przepływowe. Największe z nich to jeziora Lubowo (102,5 ha) oraz Solecko (91 ha). Badania prowadzono w latach 2003 do 2004, w okresie maj-wrzesień. Zebrany materiał obejmował 14 gatunków pijawek *Hirudinea*, 22 gatunki ślimaków *Gaspropoda,* 11 gatunków małży *Bivalvia,* oraz kilka gatunków ważek i efemeryd, 2 gatunki gąbek i 3 gatunki *Bryozoa.* Te jeziora, ukryte za zasłoną lasów, są często penetrowane przez kłusowników, wykorzystujących generatory elektryczne do zabijania zdobyczy, co doprowadziło do znacznego ograniczenia populacji bezkręgowców. Stanowi to przykład działalności człowieka, ograniczającej różnorodność biologiczną badanych jezior.

S ł o w a k l u c z o w e: jeziora, fauna bezkręgowców