

WOJCIECH PŁASKA

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Preliminary researches on species composition  
of water bugs (*Heteroptera aquatica*) in nine lakes  
of Łęczyńsko-Włodawskie Lakeland

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Wstępne badania nad składem gatunkowym pluskwiaków wodnych (*Heteroptera aquatica*) dziewięciu jezior Pojezierza Łęczyńsko-Włodawskiego

SUMMARY

Investigations of water bugs were carried out in 1998 and 1999 in nine lakes of different trophy in Łęczyńsko-Włodawskie Lakeland. Results show that qualitative and quantitative structure and biodiversity of *Heteroptera* depend on spatial differentiation of habitat and kind of plant communities. The most suitable conditions were created at sedge rushes, places sheltered from waving by the reeds belt. In the lakes where littoral was degraded and very fertile there was observed a great number of eurytopic species and lower value of biodiversity index.

STRESZCZENIE

Badania prowadzono w dziewięciu zróżnicowanych troficznie jeziorach Pojezierza Łęczyńsko-Włodawskiego: Piaseczno, Zagłębozce, Łukie, Zienkowskie, Głębokie Uścimowskie, Uściwierz, Gumienko, Moszne, Długie.

W wymienionych jeziorach stwierdzono występowanie 25 taksonów pluskwiaków wodnych, w tym 6 gatunków należących do rzadkich w faunie Polski. Największą liczbę gatunków (25) pozyskano w Jeziorze Łukie, najsłabiej zróżnicowane gatunkowo były jeziora: Gumienko i Zagłębozce. Najwyższe liczebności notowano w jeziorach: Gumienko oraz Piaseczno. Najuboższe ilościowo było Jezioro Zagłębozce. Wskaźnik różnorodności biologicznej najniższe wartości osiągał w jeziorach: Zagłębozce i Gumienko.

Ze względu na strukturę jakościową wyróżniono dwie grupy jezior. Do pierwszej zaliczono jeziora: Łukie, Piaseczno i Uściwierz, posiadające podobne rodzaje siedlisk szuwarowych, a do drugiej: Moszne, Długie, Zienkowskie, Głębokie Uścimowskie, które dzięki dobrze rozwiniętym siedliskom litoralowym, wśród roślinności zanurzonej, pozwoliły na wykształcenie podobnej faunistycznie, stabilnej struktury z wysokim udziałem procentowym gatunków litoralowych i eurytopowych.

Stwierdzone prawidłowości pozwalają przypuszczać, że w przypadku badanych jezior czynnikiem, który decydował o bioróżnorodności oraz o strukturze jakościowej i ilościowej pluskwiaków był przede wszystkim stopień rozwoju strefy amfifitów i wytworzenie zacisznego i nasłonecznionego siedliska. Najkorzystniejsze warunki stwarzał płytki szuwar turzycowy z dominującymi *Carex sp.* i *Juncus sp.*, osłonięty od strony wody pasem trzcin. W jeziorach o litoralu zdegradowanym lub przeżyźnionym stwierdzono wysokie liczebności gatunków eurytopowych.

**Key words:** water bugs, shallow littoral, peat bog species, species structure, biodiversity index.

## INTRODUCTION

State of knowledge of water bugs in Poland is quite good, but there are some areas that are investigated in not satisfactory scale. East part of Poland is the least examined. Most of the data come from areas: Wielkopolska, Central Poland, Pomorze, Pojezierze Mazurskie, and from mountains (Tatry, Pieniny, Karkonosze). Data concerned water bugs of Łęczyńsko-Włodawskie Lake District and have been mentioned so far only in one study that described 12 species of *Heteroptera* at the peatbog near Jelino in the protection zone of the Polesie National Park (4). The aim of this study was to get to know of quality composition and species structure of bugs in different littoral habitats in lakes of Polesie.

## MATERIAL AND METHODS

Investigations were carried out in the following lakes: mesotrophic — Piaseczno, Zagłębcze, eutrophic — Łukie, Zienkowskie, Głębokie Uścimowskie, Uściwierz, Gumienko and dystrophic — Moszne, Długie (8). In each lake samples were taken in a shallow littoral at the depth from 0.1 to 0.5 m, including water surface, and the main fractions of bottom sediments. Samples were collected among dense macrophytes and places that were sheltered from waving from April to November. Quantitative samples were taken by means of the hand net having a diameter of 0.25 m.

Chemical factors were measured using a "Hydrolab" apparatus. In order to estimate the biological diversity of *Heteroptera aquatica* the index of Shannon-Weaver (5) (Fig. 3) was calculated. To analyse possible reasons for the distribution of the fauna, the faunistic similarities among the sites studied were estimated by means of Marczewski and Steinhaus formula (7). The similarities were arranged using the method of Czekanowski and Renkonen (Fig. 4).

## RESULTS

25 species of *Heteroptera aquatica* were found in the studied lakes. Six of them were rare to the Polish fauna. Most of the species (23) occurred in Lake

Table 1. Hydrobiological characteristics of some lakes of Łęczyńsko-Włodawskie Lakeland

Lake	Mixing		Trophy	Conductivity (µS/cm)			
	Area (ha)	Max depth (m)		15°C	20°C	pH	
Piaseczno	83.2	38.8	dimictic	mesotrophic	80.6	95.5	7.9
Zagłębcze	55.1	25.0	dimictic	mesotrophic	157	103.7	7.9
Łukie	136.7	6.5	polymictic	eutrophic	276.3	97.7	7.6
Zienkowskie	6.2	4.9	polymictic	eutrophic	366	120	7.6
Głębokie							
Uścimowskie	20.3	7.1	dimictic	eutrophic	188	89.9	7.4
Uściwierz	256.3	6.6	dimictic	eutrophic	262.3	109.4	8.3
Gumienko	4.3	4.4	polymictic	eutrophic	315	68.2	7.4
Moszne	17.6	1.1	polymictic	distrophic	195.3	95.8	7.7
Długie	28.7	1.3	polymictic	distrophic	133	88.2	7.0

Łukie in sedge rushes habitat. Five of them were typical of peat bog (*Hesperocorix linnei*, *H. sahlbergi*, *Notonecta lutea*, *Microvelia buenoi*, *Hydrometra gracilentia*) (Fig. 1) and nine typical of small reservoir (1, 3, 9). Peat bog species also appeared in lakes: Moszne, Zienkowskie, Uściwierz, Długie, Gumienko, but only at sparse rate. Their maximum percentage share was up to 10% of total number of bugs in Uściwierz Lake. In all of the investigated lakes the largest group was created by eurytopic and typical of small reservoirs species. The largest numbers of species were in Zagłębcze Lake (7 spec.) and Gumienko Lake (9 spec.) (Fig. 2).

In most of the investigated lakes, the dominant species could be distinguished in Moszne and Długie Lake, *Plea minutissima* was a dominant (20% and 23%, respectively). Other dominant species were: *Sigara striata* (22%) and *S. falleni* (20%) in Zienkowskie Lake, *Sigara falleni* (25%) in Głębokie Uścimowskie Lake, *Plea minutissima* (20%) and *Gerris argentatus* (19%) in Piaseczno Lake, *Sigara striata* (42%) and *Notonecta glauca* (25%) in Gumienko Lake. In Łukie and Uściwierz Lake no clear domination of any particular species was observed. In Zagłębcze Lake also no domination was found, because of low number of *Heteroptera* specimens.

The largest number of individuals (40/m<sup>2</sup>) was caught in temporary flooded sedge at the shore zone at Piaseczno Lake. Pleustonic *Heteroptera* were caught here in large number and made up 51.4% of all material. The great number of individuals was also collected in Łukie Lake. However, in Głębokie Uścimowskie and Gumienko Lakes, eurytopic species were clearly more numerous than other ones. The smaller number of individuals (2/m<sup>2</sup>) was caught in Zagłębcze Lake at the edge of reeds and sandy bottom (Table 2).



Table 2. Number of *Heteroptera aquatica* individuals (per 5 m<sup>2</sup>) in lakes

Taxon/lake	Łukie	Moszczyzna	Zienkowskie	Głuskie	Uściwierz	Piasczno	Uściwierz	Długie	Gumienka	Ziętebocze
<i>Cymatia coleoptera</i>	3	5	0	3	0	0	2	0	2	
<i>Callicorixa praeusta</i>	3	0	2	0	0	0	0	0	0	
<i>Hesperocorixa linnaei</i>	3	0	0	0	0	0	0	0	0	
<i>Hesperocorixa sahlbergi</i>	4	1	0	0	0	0	0	0	0	
<i>Sigara distincta</i>	1	0	0	1	0	0	2	0	0	
<i>Sigara falleni</i>	2	2	6	11	3	0	0	0	0	
<i>Sigara semistriata</i>	0	0	0	1	0	0	0	0	0	
<i>Sigara striata</i>	1	7	8	6	2	0	0	16	0	
<i>Notonecta glauca</i>	8	3	4	6	3	1	0	10	0	
<i>Notonecta lutea</i>	2	0	0	0	0	0	0	0	0	
<i>Notonecta reuteri</i>	0	0	1	0	0	0	0	3	0	
<i>Plea minutissima</i>	5	7	4	7	14	2	7	4	1	
<i>Iliocoris cimicoides</i>	6	6	3	2	6	3	4	7	1	
<i>Nepa cinerea</i>	2	0	0	0	5	3	0	0	0	
<i>Ranatra linearis</i>	2	2	3	0	0	0	3	5	0	
<i>Mesovelia furcata</i>	7	4	4	3	9	3	0	0	0	
<i>Microvelia reticulata</i>	3	0	0	0	11	5	0	0	0	
<i>Microvelia buenoi</i>	1	1	0	0	0	0	0	0	0	
<i>Gerris argentatus</i>	3	0	0	6	15	0	0	0	0	
<i>Gerris lacustris</i>	6	5	6	7	3	3	3	3	2	
<i>Gerris odontogaster</i>	2	2	0	0	0	1	0	0	1	
<i>Gerris rufoscutellatus</i>	1	0	1	0	4	0	3	0	0	
<i>Hydrometra gracilentata</i>	1	0	0	0	0	0	1	0	0	
<i>Corixinae n.d.</i>	3	2	2	4	0	1	3	1	1	
<i>Gerridae n.d.</i>	2	1	1	2	4	3	0	3	1	

## DISCUSSION

On the basis of the faunistic similarities among the analysed lakes using the method of Czekanowski's diagram and the method of Renkonen formula, the lakes can be divided into two groups (Figs 3, 4). The first group consists of the lakes: Łukie, Piasczno, Uściwierz. These are water bodies in different trophity and water chemistry (Table 1), but they have similar habitats, which are the parts of sedge rushes, usually flooded and well isolated and protected from waving. According to Biesiadka and Moroz (2) (who examined Zehlau peatbog), the factor, that particularly affects on *Heteroptera* structure is spatial diversity of habitat. It determines a possibility to active moving, and facilitates the finding

Fig. 2. Number of taxa *Heteroptera aquatica*

of a shelter from predators. At the studied sites sedge occurred at the small depths, making escape possible on marshy bank or they made high clusters. Such conditions enabled bugs to escape and to create stable species structure. High value of biodiversity index (Fig. 3) and low number of eurytypic species can confirm this conclusion. Similar relationships were observed by Kurzątkowska (6) in sedge habitats in peatbogs of Mazurian Lakes, where she collected 97% species occurring on the studied area.

The second group includes the following lakes: Moszne, Długie, Zienkowskie, Głębokie Uścimowskie. These are eutrophic and dystrophic reservoirs with well-developed and dense macrophytes communities. They create good habitat conditions for water bugs, which is confirmed by relatively high biodiversity index (in this group of lake).

Two remaining lakes clearly differ from these two groups. Gumienko Lake shows high similarity to Zienkowskie Lake, but it is characterized by much lower biodiversity index. Habitat conditions allowed to create several-species eurytypic population with high number of individuals. On the studied site of Zagłębcze Lake probably the proper habitats were not formed. It results in low number of individuals, low number of species and low biodiversity index.

At studied sites relations between chemical factors (Table 1) and species composition of *Heteroptera* were not observed, despite that, according to the oxygen deficits have a special influence on larval stages of bugs (9). The high content of biogens can also be a significant factor, limiting the occurrence of many species of *Heteroptera*.

Fig. 3. Shannon-Weaver biodiversity index

Fig. 4. Czekanowski's diagram

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