

## QUALITATIVE AND QUANTITATIVE STRUCTURE OF *HETEROPTERA AQUATICA* IN THE SHALLOW LITTORAL OF SELECTED WATER BODIES IN ŁĘCZNA-WŁODAWA LAKE DISTRICT

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**Summary.** The investigation of water bugs was carried out in the years 2000–2002 in three lakes and two depression reservoirs of different trophic level in the Łęczna-Włodawa Lake District. The aim of this research was to learn about the quantitative and qualitative structure of water bugs in selected water bodies with the use of quantitative methods. The presence of 30 *Heteroptera* species was observed in the investigated reservoirs. The highest number of species (19) were found in Lake Uściwierz. As to quantitative structure, *Microvelia reticulata*, *Ilyocoris cimicoides*, *Plea minutissima*, *Gerris argentatus*, and *G. lacustris* dominated. The highest average number of water bugs, over 146 ind. m<sup>-2</sup>, was noted in Szczecin depression reservoir, and the lowest number of individuals was observed in lake Rotcze (over 18 ind. m<sup>-2</sup>).

**Key words:** water bugs, shallow littoral, species structure, quantitative methods

### INTRODUCTION

The depth of knowledge about water bugs in Poland is quite high in general, but some regions are not investigated sufficiently. The eastern part of Poland is the least recognized. The goal of this research was to study the quantitative and qualitative structure of water bugs in the littoral of selected water bodies using quantitative methods. The data on quantitative research into *Heteroptera* seem to be problematic. Representative, although scarce, data concern only a part of fauna living under water – *Nepomorpha*. Other data relating to the number of water bugs were obtained with methods based on estimation of the investigated area or penetration with a frame for a specified period of time [Mielewczyk 1983/84, Płaska 2002].

## STUDY AREA, MATERIAL AND METHODS

The studies were conducted in three lakes and two depression reservoirs situated in the Łęczna-Włodawa Lake District, as follows: mesotrophic Lake Piaseczno, slightly eutrophic Lake Uściwierz, eutrophic Lake Rotcze and two eutrophic depression reservoirs – Szczecin and Nadrybie [Radwan and Kornijów 1998] (Tab. 1). The samples were taken between April and November, in the

Table 1. Physical and chemical characteristic of studied water bodies (mean values for studied period)

Water body	Temp., °C	Conductivity, $\mu\text{S cm}^{-1}$	O <sub>2</sub> mg dm <sup>-3</sup>	pH	Suspension, mg dm <sup>-3</sup>	N-NO <sub>3</sub> , mg N dm <sup>-3</sup>	PO <sub>4</sub> , mg PO <sub>4</sub> dm <sup>-3</sup>	Ptotal, mg P dm <sup>-3</sup>
Piaseczno Lake	18.4	117.8	8.3	7.1	7	0.22	0.017	0.19
Uściwierz Lake	16.5	423	8.6	7.3	7.6	0.23	0.04	0.18
Rotcze Lake	17.2	244.7	8.5	7.6	3.7	0.14	0.13	0.14
Szczecin Reservoir	16.4	499.2	8.3	7.4	20.2	0.24	0.29	0.77
Nadrybie Reservoir	17.4	503.8	10.2	8.3	202.6	0.19	0.24	0.53

years 2000 and 2001. Complementary research was done in April, August, and November of 2002. The samples were taken in the shallow littoral, from a depth of 0.1 to 0.5 m. An oblong duralumin frame, which had an area of 0.25 m<sup>2</sup>, was used to gather the samples. The contents were drawn from the inside by a hand net with an oblong rim to take a quantitative sample. In addition, a qualitative sample from an area of approx. 2 m<sup>2</sup> was taken for comparative analysis.

## RESULTS AND DISCUSSION

The presence of 30 *Heteroptera* species was observed in the investigated reservoirs. The highest number of taxa (19) occurred in Lake Uściwierz, the lowest (15) in the depression reservoir Nadrybie and Lake Piaseczno (Tab. 2). Seven species: *Cymatia bonndorffi*, *Corixa dentipes*, *Hesperocorixa moesta*, *Notonecta lutea*, *N. reuteri*, *Microvelia buenoi*, *Hydrometra gracilentia* are rare for the Polish fauna. Most of them prefer peat bog waters. The highest number of peat bog species and their highest density were found in Lake Uściwierz (Tab. 2). As to quantitative structure, *Microvelia reticulata*, *Ilyocoris cimicoides*, *Plea minutissima*, *Gerris argentatus*, and *G. lacustris* dominated. The highest stability of occurrence in the investigated reservoirs characterised *I. cimicoides*, *G. argentatus* and *P. minutissima* (Fig. 1).

Table 2. Density and species composition of water bugs in investigated water bodies (mean values and standard deviation)

Water body	Piaseczno Lake		Uściwierz Lake		Rotcze Lake		Szczecin Reservoir		Nadrybie Reservoir	
Number of samples	n = 130		n = 190		n = 190		n = 130		n = 130	
Species	density	SD	density	SD	density	SD	density	SD	density	SD
	ind. m <sup>-2</sup>		ind. m <sup>-2</sup>		ind. m <sup>-2</sup>		ind. m <sup>-2</sup>		ind. m <sup>-2</sup>	
<i>Micronecta minutissima</i> (L.)	0.42	1.43								
<i>Cymatia coleopterata</i> (Fabr.)			0.32	0.75			77.53	110.42	5	16.13
<i>Cymatia bonsdorffi</i> (Sahlb.)							0.61	1.33		
<i>Callicorixa praeusta</i> (Fieb.)	0.21	0.54					5.84	13.87		
<i>Corixa dentipes</i> (Thoms.)							0.01	0.06		
<i>Corixa punctata</i> (Illig.)							2.11	5.66	0.16	0.50
<i>Hesperocorixa linnaei</i> (Fieb.)			0.01	0.06	0.63	1.64	1.72	7.06	0.16	0.50
<i>Hesperocorixa moesta</i> (Fieb.)			0.01	0.06						
<i>Hesperocorixa sahlbergi</i> (Fieb.)							2.37	7.52		
<i>Paracorixa concinina</i> (Fieb.)			0.01	0.06			0.11	0.32		
<i>Sigara lateralis</i> (Leach)									0.63	1.86
<i>Sigara distincta</i> (Fieb.)	0.05	0.23	0.01	0.06						
<i>Sigara falleni</i> (Fieb.)	2.79	8.48	0.21	0.54	0.16	0.50	1.95	5.57	2.11	2.96
<i>Sigara semistriata</i> (Fieb.)					0.16	1.50				
<i>Sigara striata</i> (L.)	0.16	0.50	0.53	0.96	0.21	0.63	0.79	2.42	3.32	4.76
<i>Notonecta glauca</i> L.	0.95	2.59	1.16	1.26	0.74	1.24	1.53	5.25	0.95	1.35

<i>Notonecta lutea</i> (Müll.)							0.01	0.06		
<i>Notonecta reuteri</i> Hung					0.05	0.23	0.11	0.46		
<i>Plea minutissima</i> Leach	5.16	4.68	2.95	3.89	2.78	3.84	38.21	61.76	3.68	7.87
<i>Iliocoris cimicoides</i> (L.)	4.37	8.45	10.89	22.93	2.37	3.02	3.63	5.77	6.06	10.98
<i>Nepa cinerea</i> L.	0.68	2.14	0.11	0.32						
<i>Ranatra linearis</i> (L.)					0.05	0.23			0.11	0.32
<i>Mesovelgia furcata</i> Musl.	6.47	13.22	1.47	6.19	0.79	2.32	0.05	0.23	0.58	2.06
<i>Microvelia reticulata</i> (Burm.)	2.63	3.34	9.84	15.42	1.22	2.18	0.01	0.06	0.26	1.15
<i>Microvelia buenoi</i> Drake			0.05	0.23						
<i>Gerris argentatus</i> Schumm.	5.21	5.17	7.84	11.70	4.68	7.96			0.53	1.31
<i>Gerris lacustris</i> (L.)	1.89	3.40	4.74	7.42	1.37	2.59	0.53	1.65	0.89	2.60
<i>Gerris odontogaster</i> (Zett.)			0.21	0.92	0.58	1.57			5.47	11.73
<i>Gerris rufoscutellatus</i> (Lat.)	1.00	1.29	0.16	0.37	0.79	2.51				
<i>Hydrometra gracilenta</i> Hor.	0.11	0.32	0.58	1.30	0.11	0.32				
<i>Corixinae</i> n.d.	0.10	0.10	1.17	2.85	1.32	1.20			12.63	19.42
<i>Gerridae</i> n.d.	1.58	5.01	1.05	4.35	0.58	1.26	9.84	20.25	1	3.23
Total mean density	33.78	60.88	43.32	81.63	18.58	34.75	146.95	249.71	43.53	88.73

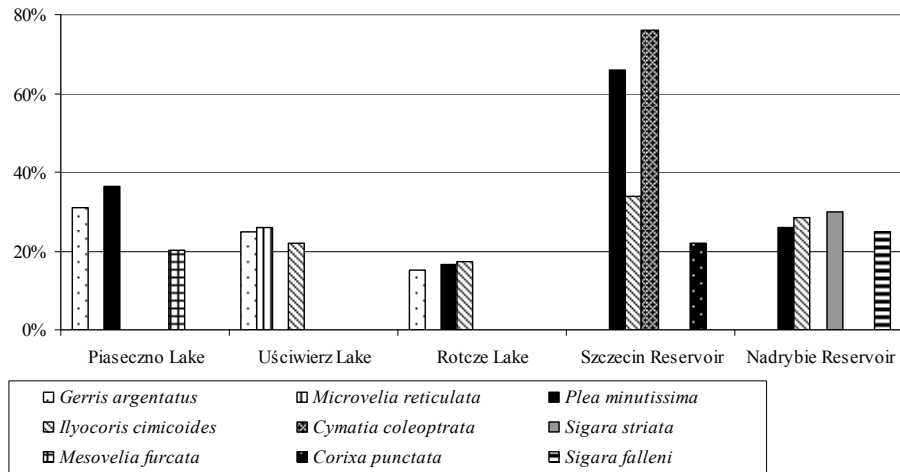


Fig. 1. Frequency (over 15%) of *Heteroptera* in samples from investigated water bodies

The highest average number of water bugs (over 146 ind. m<sup>-2</sup>) was noted in the Szczecin Reservoir, little lower in Lake Uściwierz and Nadrybie Reservoir (over 43 ind. m<sup>-2</sup>). The lowest number of individuals was observed in lakes Piaseczno (over 33 ind. m<sup>-2</sup>) and Rotcze (over 18 ind. m<sup>-2</sup>) (Tab. 2).

*Heteroptera* are characterised by the occurrence of one or a few generations during vegetation period [Jaczewski and Wróblewski 1977, Wróblewski 1980]. In reservoirs where the migrations of water bugs are not intensive i.e. the whole development cycle takes place in one reservoir, there usually appear two density peaks of bugs [Wróblewski 1980]. Distinct decrease in the number of *Heteroptera* in lakes Piaseczno and Rotcze was connected with the lack of refugee habitats for larvae and wintering imagines. The lack of refugees can result in high mortality of the larvae, probably due to fish predation, and favours imagines migrations from such habitats [Macan 1965, Jaczewski and Wróblewski 1977, Wróblewski 1980].

The shallow littoral zone (depth of 0.1 m) of the studied lakes was dominated by *Microvelia reticulata* and *Ilyocoris cimicoides*, and the farther areas by *Plea minutissima*, *Gerris argentatus*, *G. lacustris*. Similar preferences in heteropters distribution relaying on inhabiting zones distant from the shore by bigger *Gerromorpha* were observed in small lakes in the Mazury Lake District [Kurzątkowska 1999]. In old riverbeds of the Pilica river *Heteroptera* were observed at vegetated parts of the banks and their lack in the distant areas [Tończyk 2004], whereas in Lilla Lake in Denmark, without fish, *Corixidae* were observed even at a depth of 9 m [Oscarson 1987]. It proves actual impact of predator presence upon habitat preferences of heteropters.

The evident highest density of two species – *Cymatia coleoptrata* (77,53 ind. m<sup>-2</sup>, 110,42 SD) and *Plea minutissima* (38,21 ind. m<sup>-2</sup>, 61,76 SD) in

the Szczecin Reservoir was observed during the whole studied period. It proves that the habitats created in the reservoir provide good conditions for development of these taxons, described as species living in large populations in durable reservoirs with dense submerged macrophytes [Jaczewski and Wróblewski 1977, Wróblewski 1980].

The domination structure of *Heteroptera* in the Nadrybie Reservoir was unstable and affected by fluctuations. During the studied period only the dominance of *Ilyocoris cimicoides* and *Corixinae* larvae were observed. In Lake Uściwierz the species structure of the littoral fauna was clearly affected by surrounding peatbogs. The fact of inhabitation of stable lake ecosystems by peatbog species from adjacent transitional moors was described for the Mazury Lake District [Kurzątkowska 1994, 1999]. However, those species did not reach a significant share in total density.

## CONCLUSIONS

Heteropters quality structure found in the research was connected with advancement of the degree of habitation of the littoral by macrophytes, such as in Lake Uściwierz. Usually higher density concentrated about the highly eutrophic habitats of depression reservoirs and in the littoral of the eutrophic Lake Uściwierz. Lower numbers of individuals were caught in mesotrophic lakes, at the edge of reeds and near the sandy bottom.

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STRUKTURA JAKOŚCIOWA I ILOŚCIOWA *HETEROPTERA AQUATICA* W LITORALU  
WYBRANYCH ZBIORNIKÓW WODNYCH POJEZIERZA ŁĘCZYŃSKO-WŁODAWSKIEGO

**Streszczenie.** Badania pluskwiaków wodnych prowadzono w latach 2000–2002 w trzech jeziorach różnej trofii (Piaseczno, Uściwierz, Rotcze) oraz w dwóch zbiornikach zapadliskowych: Nadrybie i Szczecin. Celem pracy było poznanie struktury jakościowej i ilościowej pluskwiaków wodnych przy użyciu metod ilościowych. W badanych zbiornikach wodnych stwierdzono występowanie 30 gatunków *Heteroptera*. Najwięcej (19) występowało ich w jeziorze Uściwierz. W strukturze ilościowej najliczniejsze były: *Microvelia reticulata*, *Ilyocoris cimicoides*, *Plea minutissima*, *Gerris argentatus*, *G. lacustris*. Największe średnie zagęszczenie stwierdzono w zbiorniku Nadrybie (ponad 146 osobn. · m<sup>-2</sup>), najmniejsze zaś w jeziorze Rotcze (ponad 18 osobn. · m<sup>-2</sup>).

**Słowa kluczowe:** pluskwiaki wodne, płytki litoral, struktura gatunkowa, metody ilościowe