

ZOOPLEUSTON OF SMALL WATER BODIES IN POLESIE NATIONAL PARK AND ITS PROTECTION BUFFER ZONE

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Summary. Researches was conducted in four areas on natural floodplains located in the Polesie National Park and its protection zone. The material was collected from April to November 2006, with intervals of one month.

The aim of of this study was to determine the qualitative and quantitative composition of zoopleuston in four small water bodies and to determine the dynamics of seasonal changes in quantitative and qualitative structure. In examined water bodies 23 taxa of zoopleuston were found. The occurrence of two rare species of polish fauna bugs: *Notonecta lutea* and *Microvelia buenoi* found in the Krugłe Bagno in PPN buffer zone. The dynamics of seasonal changes in the qualitative and quantitative proceeded as in lakes in Polesie, while numbers remained at a much lower level.

Key words: zoopleuston, species composition, small water bodies, Polesie National Park

INTRODUCTION

Zoopleuston is a group of organisms characteristic of small water bodies. There are many pioneer species in this group which determine the taxonomy of the fauna inhabiting astatic water bodies. Small water reservoirs have unique physical and chemical properties. Their specificity is closely related to the type of catchment and the stability of the water level. Water bodies of this type differ

in certain abiotic factors and are in various stages of ecological succession. They often have a variable pH and water conductivity, and some of them dry out periodically in the absence of precipitation. Small water reservoirs are typical elements of the landscape Polesia Lublin, so the area was chosen to this study [Radwan and Kornijów 1998].

The aim of this study was to determine the qualitative and quantitative composition of zoopluston in four small reservoirs in Polesie National Park and its protection zone and to determine the dynamics of seasonal changes in the quantitative and qualitative structure of this animal community.

STUDY AREA, MATERIAL AND METHODS

The study was carried out in four small natural water bodies located in Polesie National Park and its protection zone. The investigated water bodies were surrounded by bogs or located on the edge. The reservoirs had small surface areas (max. 50 m²) and were shallow (max 0.7 m, min 0.1 m). In summer, the reservoirs were significantly reduced in size, forming small pools of shallow water.

The water bodies were astatic and prone to drying out. In the entire period studied, the reservoirs Krugłe Bagno and Bagno Bubnów retained relatively high water levels. The reservoirs Blizionki and Durne Bagno were unstable and had low water levels in the second half of the growing season.

Most of the studied water reservoirs were characterized by a low pH and low conductivity. Only the Bagno Bubnów reservoir, located in a fen, had different water properties (Tab. 1).

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

Water body	Temp., °C	Conductivity μS · cm ⁻¹	O ₂ mg · dm ⁻³	pH
Krugłe Bagno	15.2	52	61	4.8
Bagno Bubnów	15.5	520	72	7.2
Durne Bagno	14.4	120	58	4.6
Blizionki	14.8	85	65	4.2

The material for the present work was collected from April to November 2006 at one-month intervals. Samples were collected at a depth of 0.3 m using a hand net and a metal frame with an area of 0.25 m².

RESULTS AND DISCUSSION

In the studied water bodies, a total of 23 taxa of zoopluston were identified. Among them, there were two species of water bugs rarely encountered among the Polish fauna: *Notonecta lutea* and *Microvelia buenoi* [Jaczewski and Wróblewski 1977, Wróblewski 1980]. The collected fauna belonged to the following taxonomic groups: Heteroptera aquatica – 19 species, Diptera – two taxa, Collembola – and one species of Coleoptera (Fig. 1).

All four taxonomic groups representing zoopluston were found in the water reservoirs Krugłe Bagno, Bagno Bubnów and Durne Bagno. Blizionki was an exception as no pleustonic Collembola was observed in its waters.

The largest number of taxa were found in the reservoir Krugłe Bagno – 15 taxa, and one fewer in Bagno Bubnów (14 taxa). The communities of the reservoirs Blizionki and Durne Bagno consisted of 10 and 11 taxa, respectively. The highest number of taxa (of up to 9) was recorded in April in the water reservoir Krugłe Bagno; in the other reservoirs, the size of the zoopluston communities reached 7 taxa in the spring and early summer. In the following months, there was a marked decline in the number of taxa in all of the reservoirs studied (Fig. 1).

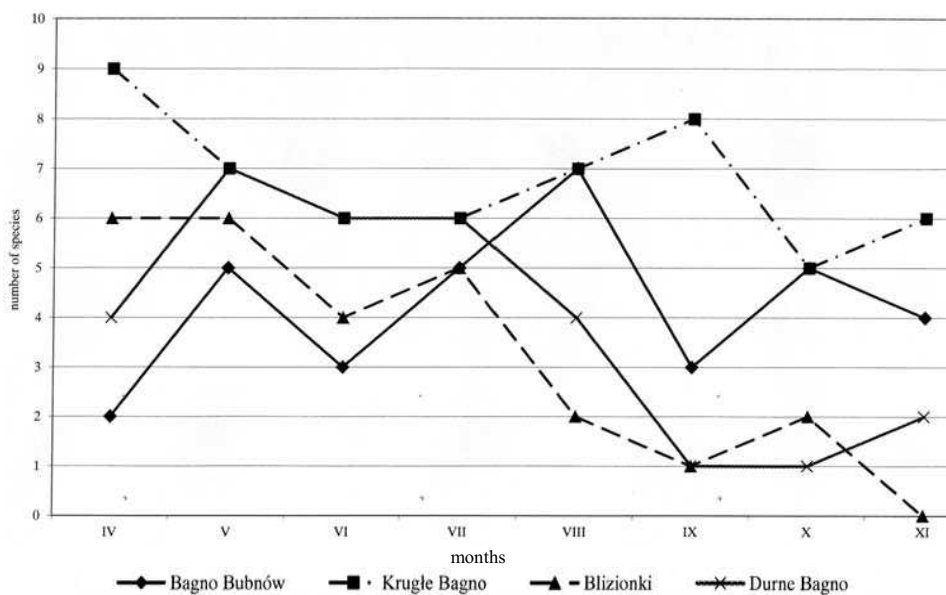


Fig. 1. Number of taxa zoopluston in investigated water bodies

Previous studies of other small bodies of water in Poland have generally reported a larger number of species of Heteroptera [Kurzątkowska 1999, Płaska 2002, 2010]. This has primarily been due to the qualitative methodology used, which makes it possible to catch a larger number of species, but does not allow to determine the number of fauna tested. In comparison to the quantitative re-

search conducted in the littoral lakes of the Łęczna-Włodawa Lakeland, the lower number of taxa in the water reservoirs discussed in the present article can be associated with factors limiting the occurrence of many species typical of such habitats, as well as the spatial structure of the habitat [Mielewczyk 1983–1984, Płaska 2002, 2009]. Research conducted in subsequent years in peat excavations on the moors of PPN showed similar dynamics of the number of taxa [Płaska 2010].

Research conducted in the subsequent years in peat excavations on the moors of PPN showed a similar dynamics of the number of taxa [Płaska 2010]. The nature of the investigated astatic water bodies and the periodic lack of water in them may have been the cause of the temporary changes in the taxonomic composition of their fauna. Seasonal changes in the number of taxa are usually related to the development cycle of insects. However, they are also often associated with winter survival or the possibility of colonization by migrating species [Kurzątkowska 1994, 2002b, Płaska 2009]. In those reservoirs which were less susceptible to changes in the water level, the profile of the seasonal dynamics of the number of taxa points to the stability of the population and the possibility of migration from other habitats.

The quantitative composition of zoopléuston showed a clear seasonal variation. Two peaks of development were usually observed in the population dynamics: the first, spring peak in the month of May, and a second peak in August and September. The early-summer peak in population numbers was typical of the more stable habitat of the marshy ponds of Krugle Bagno and Bagno Bubnów, which were less susceptible to fluctuations in the water level. The low water level in the reservoirs Durne Bagno and Blizionki led to the disappearance of the latter in November which, in turn, caused a complete collapse of the zoopléustonic population (Fig. 2).

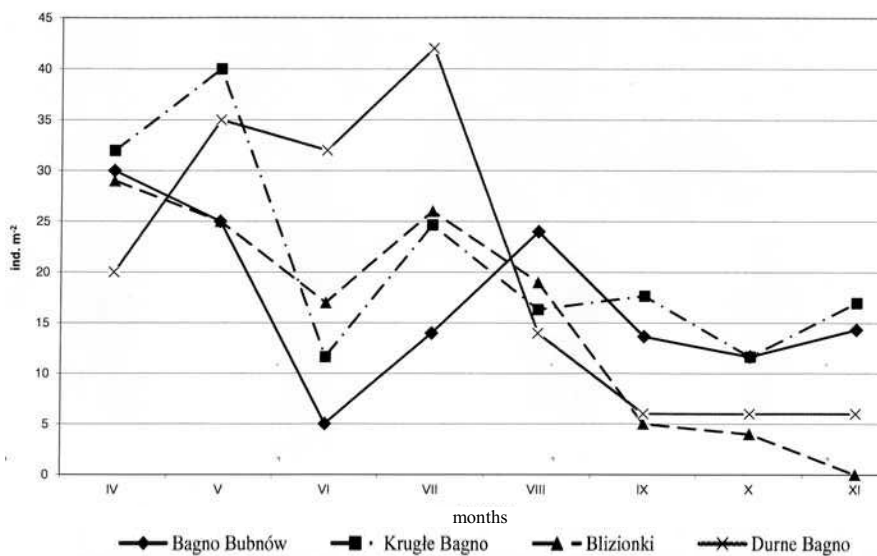


Fig. 2. Density of zoopléuston in investigated water bodies

The spring peak in the seasonal dynamics of the zoopluston of Bagno Bubnów was associated with the peak of development of Culicidae, which are typical of waters without fish or large invertebrate predators [Płaska 2007]. The summer peak of development led to the emergence of numerous peatland and small-waterbody species typical of more stable habitats [Kurzątkowska 1999, Płaska 2010].

The fact that water bugs reached their peak density in Krugłe Bagno was due to the presence of Culicidae which were the main component of the zoopluston in this reservoir in the early spring. Their presence, in turn, was probably a result of the proximity of peat pits located at a nearby bog. Peat excavations are characterized by a high species richness of aquatic bugs [Płaska 2010].

The marshes at the edges of Durne Bagno and Blizionki were initially quickly colonized mainly by Culicidae, Gerridae, and *Hesperocorixa sahlbergi*. These pioneering taxa are known to intensively colonize spring floodings near bogs [Płaska 2010]. However, the low water level caused a deterioration in the living conditions which led to the gradual decline of all taxonomic groups.

The results indicate that fauna density in the investigated reservoirs was slightly lower than in the littoral lakes [Płaska 2002, 2009] and peat areas of Poleski National Park [Płaska 2010]. This was probably due to the fact that small bodies of water offer a less favorable habitat than littoral lakes, particularly because of the unstable water level [Macan 1965, Oscarson 1987, Tolonen *et al.* 2001, 2003]. The seasonal dynamics of zoopluston in Krugłe Bagno and Bagno Bubnów was similar to the trends observed in littoral lakes [Płaska 2002, 2009]. However, there was an atypical peak in density of zoopluston in early spring, which is characteristic of peatbog habitats. It can be determined by significant specimen survivability wintering in moss.

In most of the sites explored, water bugs (Heteroptera aquatica) were clearly the dominant group of zoopluston. A second group, dominating in the spring, were Culicidae, which reached peak numbers at that time of the year. However, the total percentage of Culicidae reached in the Bagno Bubnów 19%, 17% of the Durne Bagno and 14% of a reservoir Blizionki. Another group of taxonomic dominants were water beetles which made up 17% of the zoopluston in Krugłe Bagno, 16% in Blizionki, and 15% in Durne Bagno. The majority of Collembola specimens were found in the reservoirs Krugłe Bagno and Bagno Bubnów where they represented up to 9% of the zoopluston population (Fig. 3).

Water bugs were generally the dominant species in the reservoirs studied. They included *Ilyocoris cimicoides* 19%, *Plea minutissima* 14%, *Cymatia coleoptrata* 8% (Krugłe Bagno); *Hesperocorixa sahlbergi* 13%, *Gerris lateralis* 12%, *Notonecta glauca* 11% (Bagno Bubnów); *Hesperocorixa sahlbergi* 18%, *Notonecta glauca* 12%, *Gerris lateralis* 10% (Durne Bagno); *Hesperocorixa sahlbergi* 16%, *Notonecta glauca* 14%, and *Gerris odontogaster* 14% (Blizionki) (Fig. 3).

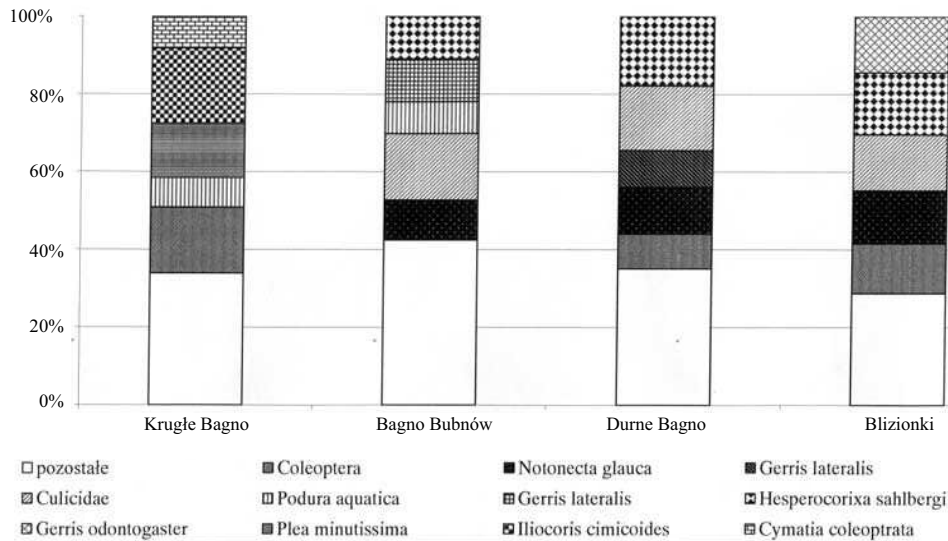


Fig. 3. Percentage share of species zoopléuston in investigated water bodies

Most of the species had a high number of hypopléuston representatives. Probably, the fact that the zone of rushes in the studied water bodies was underdeveloped meant that species moving along the surface of water had a lower share in the general population.

The dominant taxa in the investigated localities are characteristic of this type of habitat and have also been reported in other regions of Poland [Biesiadka and Moroz 1996, Kurzątkowska 1999]. A very low share of Collembola and Diptera is also typical, due to the variable size of the water bodies.

The investigated water bodies can be divided into two groups according to their dominant species and progress of development: (1) stable, populated by small-reservoir species and (2) peatland with two peaks of development. The second group is inhabited by pioneer taxa and peatland species, which occurred by collapse of the population in the second half of the growing season due to the low water level.

CONCLUSIONS

1. Twenty three taxa of zoopléuston were found in the investigated water bodies. They were divided into four taxonomic groups, with two species very rarely encountered in the fauna of Poland: *Notonecta lutea* and *Microvelia buenoi*.

2. The highest species richness was observed in the reservoir Krugle Bagno, and the lowest in the water reservoir Blizionki. This was due to habitat conditions in the studied water bodies.

3. The dynamics of the population of the water reservoirs with stable water levels was characterized by two peaks: a spring peak in May and a late summer peak in August and September. The observed dynamics was related to the seasonal cycle of development of pleuston insects.

4. In the reservoirs with unstable water levels, the number of zooplustonic organisms increased only in spring, after which a collapse of the population was observed.

5. In all the reservoirs, water bugs were the dominant taxonomic group. In the seasonal reservoirs, a significant share of Culicidae was also found.

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**STRUKTURA GATUNKOWA ZOOPLEUSTONU DROBNYCH ZBIORNIKÓW
WODNYCH POLESKIEGO PARKU NARODOWEGO I JEGO OTULINY**

Streszczenie. Badania prowadzone były w czterech drobnych zbiornikach wodnych o charakterze astatycznym, położonych na terenie Poleskiego Parku Narodowego oraz jego otuliny. Materiał do pracy pobierano od kwietnia do listopada 2006 roku, w odstępach jednomiesięcznych.

Celem niniejszej pracy było określenie składu ilościowego i jakościowego zoopleuston w badanych zbiornikach wodnych oraz określenie dynamiki sezonowych zmian struktury ilościowej. W badanych zbiornikach wodnych stwierdzono występowanie 22 taksonów zoopleuston. Wykazano obecność dwóch gatunków pluskwiaków rzadkich dla fauny Polski: *Notonecta lutea* oraz *Microvelia buenoi*. Dynamika sezonowa przebiegała podobnie jak w jeziorach na Polesiu, natomiast liczebność utrzymywała się na niższym poziomie.

Słowa kluczowe. zoopleuston, struktura gatunkowa, astatyczne zbiorniki wodne, Poleski Park Narodowy

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