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WATER MITES (ACARI, HYDRACHNIDIA) OF THE ECHO PONDS IN THE ROZTOCZAŃSKI NATIONAL PARK BEFORE HYDROTECHNICAL RESTRUCTURING*

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A b s t r a c t. Two ponds were studied in the Echo pond complex – one large and one small. A total of 3011 water mite specimens belonging to 44 species were collected. The fauna of the large pond was much more abundant – 2956 specimens belonging to 40 species were collected, while 55 specimens from 12 species were collected from the small pond. Lake forms clearly predominated in the large pond, while in the small pond crenophile and rheophile species were found. The differences in the fauna of the two ponds indicate that hydrotechnical restructuring involving elimination of smaller water bodies will contribute to a decrease in Hydrachnidia biodiversity.

K e y w o r d s: water mites, Hydrachnidia, fish ponds, habitat diversity, species diversity

INTRODUCTION

The Echo ponds are the only large water body complex in the Roztoczański National Park. Their large combined surface area (about 40 ha), age (they were created in 1934), extensive utilization, and situation within a national park all make them an interesting subject for hydrobiological research. In spite of these characteristics, there are few data on invertebrates inhabiting these water bodies. This also applies to water mites; the only data on Hydrachnidia of the Echo ponds can be found in Kowalik [4].

In 2003 restructuring of the ponds was begun. This will involve combining several of the smaller ponds into larger ones. It can be assumed that this will cause a decrease in water mite biodiversity. The data presented here document the current

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state of Hydrachnidia fauna and will also make it possible to assess how the restructuring of the Echo ponds will affect the water mite populations inhabiting them.

STUDY SITES, MATERIAL AND METHODS

The studies were conducted within the Echo pond complex. Samples were taken from the largest, northern pond and from a small pond by the winter fishponds.

The area of the large pond is about 16 ha. Samples were taken with a hand net near the shore, and with a dredge at some distance from the shore. The shores of the pond were covered with rushes consisting mainly of *Typha angustifolia* with some *Phragmites australis*, *Glyceria maxima* and *Carex*. The bottom was sandy and covered with coarse detritus. Further from the shore the bottom was muddy and covered with aggregations of *Chara*. In the summer blue-green algae bloom was observed.

The smaller pond had a variable area of a few dozen square meters. It was a shallow pond (maximum depth 0.4 m) where permanent water flow was present. The bottom was covered with flooded grasses; in the middle of the pond it was muddy and without vegetation. For most of the season abundant growth of filamentous algae was noted, and algae mats formed near the surface.

Hydrobiological sampling was done once a month, from March to October in 2001 and 2002 from the larger pond, and from April to October, 2003, from the smaller pond. Semi-quantitative samples were taken using a hand net (in both ponds) and a dredge (in the larger one). The following standard indices commonly applied in ecology were used to analyse the material collected: domination structure (D), stability of occurrence (C), ecological importance ($Q = \sqrt{D \cdot C}$) and faunal similarity (Jaccard's formula). Quantitative faunal similarity was calculated according to Biesiadka's formula [2].

RESULTS

In the Echo pond complex 3011 Hydrachnidia specimens belonging to 44 species from 11 families were collected (Tab. 1). The *Pionidae* family dominated both quantitatively and qualitatively in the material (D=36.3%, 17 species). Also numerous were the families *Arrenuridae* (23.4%, 8 species), *Unionicolidae* (17.1%, 5 species) and *Mideopsidae* (13.2%, 1 species).

In the large pond 2956 water mite specimens were collected (2642 adults and 314 deutonymphs) from 40 species (Tab. 1). *Arrenurus crassicaudatus* (D=18.9%) was dominant. This species was found each time samples were taken (C=100%). Its large numbers and permanent presence gave this species the greatest ecological importance

among the Hydrachnidia populations of this pond (Q=43.5%). Other numerous species were *Unionicola crassipes* (15.9%), *Mideopsis orbicularis* (13.4%) and *Piona paucipora* (12.8%). Except for *U. crassipes* (C=73.3%), these species were found each time samples were taken. They also play an important role in the water mite fauna of this pond – their ecological importance index ranged from 34.1 to 36.6.

Table 1. Species composition and numbers of water mites collected in the Echo ponds

No.	Taxon	Ecological character	Large pond	Small pond
1.	*Hydrachna globosa* (Geer)	S	1	1
2.	*Eylais extendens* (Müller)	S	1	
3.	*Eylais rimosa* Piers.	S		7
-	*Eylais* sp.	-		8
4.	*Hydrodroma despiciens* (Müll.)	S	13	
-	*Lebertia* sp. (deutonimfy)	-		1
5.	*Frontipoda musculus* (Müll.)	L	8	
6.	*Oxus ovalis* (Müll.)	L	10	
7.	*Oxus strigatus* (Müll.)	L	6	
8.	*Limnesia koenikei* Piers.	O		4
9.	*Limnesia maculata* (Müll.)	L	59	2
10.	*Limnesia polonica* Schecht.	L	45	
11.	*Limnesia undulata* (Müll.)	L	57	
-	*Limnesia* sp. (deutonymphs)	-	56	
12.	*Hygrobates longipalpis* (Herm.)	O	7	12
13.	*Hygrobates nigromaculatus* Leb.	O	1	
14.	*Unionicola crassipes* (Müll.)	L	471	
15.	*Unionicola gracilipalpis* (Viets)	L	10	
16.	*Unionicola minor* (Soar)	L	12	
-	*Unionicola* sp. (deutonymphs)	-	6	
17.	*Neumania deltoides* (Piers.)	L	14	
18.	*Neumania vernalis* (Müll.)	S	2	
19.	*Piona alpicola* (Neum.)	T		1
20.	*Piona carnea* (Koch)	T	2	
21.	*Piona coccinea* (Koch)	L	63	
22.	*Piona conglobata* (Koch)	S	30	
23.	*Piona longipalpis* (Krend.)	L	5	
24.	*Piona paucipora* (Thor)	L	378	
25.	*Piona pusilla* (Neum.)	L	131	1
26.	*Piona rotundoides* (Thor)	L	36	
27.	*Piona stjoerdalensis* (Thor)	L	36	
28.	*Piona variabilis* (Koch)	S	27	
-	*Piona* sp. (deutonymphs)	-	215	
29.	*Wettina podagrica* (Koch)	O		3
30.	*Hydrochoreutes krameri* Piers.	L	24	1
-	*Tiphys* sp. (deutonymphs)	-	1	1
31.	*Pionopsis lutescens* (Herm.)	S	23	

Table 1. Cont.

No.	Taxon	Ecological character	Large pond	Small pond
32.	*Pionacercus norvegicus* Thor	O	3	
33.	*Forelia brevipes* (Neum.)	L	6	
34.	*Forelia spatulifera?* (Marucci)	L	83	
35.	*Forelia variegator* (Koch)	O	5	
-	*Forelia* sp. (deutonymphs)	-	20	
36.	*Mideopsis orbicularis* (Müll.)	L	398	
37.	*Arrenurus albator* (Müll.)	L	8	
38.	*Arrenurus bruzelii* Koen.	S	2	
39.	*Arrenurus crassicaudatus* Kram.	L	559	1
40.	*Arrenurus cuspidator* (Müll.)	S	1	
41.	*Arrenurus cylindratus* Piers.	O	1	10
42.	*Arrenurus globator* (Müll.)	S	29	1
43.	*Arrenurus sinuator* (Müll.)	L	43	
44.	*Arrenurus tubulator* (Müll.)	S	32	
-	*Arrenurus* sp. (deutonymphs)	-	16	1
	Total individuals		2956	55
	species		40	12

Explanations: L – lake species; S – small water body species; T – peat-bog water body species; O – others

Many more water mites were collected farther from the shore – 2078 specimens (70.3%) were collected with a dredge, and 878 (29.7%) with a hand net. All the dominant species preferred the deeper regions of the pond where the bottom was muddy with aggregations of stonewort. Particularly large differences in habitat distribution were found in *Unionicola crassipes* (446 specimens caught with a dredge in the middle of the pond and 25 caught with a hand net near the shore) and *Arrenurus crassicaudatus* (416 and 143 respectively).

Among the water mites collected in the large pond 23 lake species were noted (Tab. 1), constituting 93.2% of the material collected. The proportion of small water body species was much smaller (6.1%, 11 species.). Other ecological groups of species occurred in insignificant numbers.

In the small pond 55 specimens (52 adults and 3 deutonymphs) belonging to 12 species were collected (Tab. 1). Only *Hygrobates longipalpis* (12 specimens) and *Arrenurus cylindratus* (10 specimens) were relatively numerous; other species were represented only by isolated specimens. The number of specimens found was too small for analysis using ecological indices.

The largest number of species and specimens (4 species, 29 specimens) were included in the category "others" (Tab. 1). This group included crenophile species (*Wettina podagrica, Arrenurus cylindratus*), one species occurring in both stagnant and running water (*Hygrobates longipalpis*), and one whose habitat requirements are

undetermined (*Limnesia koenikei*). Small water body species (3 species, 9 specimens) and lake species (4 species, 5 specimens) occurred in smaller numbers.

Low faunal similarity was found between the large and small ponds. Qualitative similarity was only 0.18 (18%), and quantitative similarity only 0.04 (4%).

DISCUSSION

The 44 water mite species and 3011 total specimens found in the Echo ponds must be considered to be significant numbers. In other fish ponds of the Lublin region smaller numbers of both species and specimens have been noted [6,8]. The results of this study place the Echo ponds among the most valuable anthropogenic water bodies of the Lublin region. At the same time they confirm the important role of fish ponds as a habitat for diverse Hydrachnidia fauna.

The Echo ponds have a rich water mite fauna in comparison with fish ponds in other parts of Poland. Bazan [1], Narloch [5], and Biesiadka and Kowalik [3] collected smaller numbers of both species and specimens of water mites in fish ponds in different parts of Poland.

The only data in the literature on water mites of the Echo ponds can be found in Kowalik [4]. This author collected 273 specimens belonging to 18 species. The significant increase in the number of specimens and species found was probably due to more frequent sampling in the current study, but the possibility that changes in the ponds' Hydrachnidia populations have taken place over the years cannot be ruled out. The new study confirmed 16 of the 18 species found in the earlier study; *Sperchon setiger* and *Limnesia fulgida* were not noted.

A clear difference in domination patterns was also found in comparison with the older data. The currently dominant species were previously represented only by isolated specimens (*Arrenurus crassicaudatus*) or were not found at all (*Unionicola crassipesa* and *Mideopsis orbicularis*). On the other hand, species previously dominant in the pond currently occurred in much smaller numbers than other taxa.

It is worth noting the clear domination of lake species in the large pond (93.7%). This was probably due to the large surface area of the ponds, their extensive utilization, and their age. Similarities can be found to another valuable water body of the Lublin area, the pond Imielty Ług [7,8].

Very low faunal similarities were found between the large and small ponds. The differences in the fauna resulted from the completely different ecological characteristics of the two ponds. The large pond was a typical standing water body, and thus contained fauna characteristic of this type of water body – eurythermic stagno-

biontic and stagnophile species. The small pond was shallow and overgrown with vegetation, with a constant flow of water present. The water flow was an essential factor influencing the composition of the fauna – the pond contained rheophile and crenophile species occurring in large numbers in the feeder channel to the Echo ponds. These data indicate that habitat diversity within the Echo ponds translates directly into water mite species diversity. Elimination of the smaller ponds characterized by different fauna will contribute to a decrease in the biological diversity of Hydrachnidia populations in the entire Echo pond complex.

CONCLUSION

Significant differences in species composition between the large and small ponds indicate that habitat diversity within the echo ponds translates directly into water mite species diversity. Eliminating the smaller ponds characterized by different fauna will contribute to a decrease in the biological diversity of Hydrachnidia populations in the entire echo pond complex.

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WODOPÓJKI (ACARI, HYDRACHNIDIA) STAWÓW ECHO W ROZTOCZAŃSKIM PARKU NARODOWYM PRZED ICH PRZEBUDOWĄ HYDROTECHNICZNĄ

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S t r e s z c z e n i e. Badano dwa stawy (duży i mały) w kompleksie stawów Echo. Złowiono łącznie 3011 osobników wodopójek należących do 44 gatunków. Fauna dużego stawu była znacznie bogatsza – złowiono 2956 osobników należących do 40 gatunków. W małym stawie zebrano 55 osobników z 12 gatunków. W dużym stawie wyraźnie dominowały formy jeziorne natomiast w stawie małym łowiono gatunki krenofilne i reofilne. Różnice faunistyczne między stawami pozwalają przypuszczać, iż likwidacja mniejszych zbiorników w ramach przebudowy hydrotechnicznej wpłynie na obniżenie się różnorodności biologicznej Hydrachnidia.

S ł o w a k l u c z o w e: wodopójki, Hydrachnidia, stawy rybne, różnorodność siedliskowa, bioróżnorodność