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WATER MITES (HYDRACHNIDIA) OF SMALL WATER RESERVOIRS IN THE NEIGHBOURHOOD OF ŚWINOUJŚCIE (NW POLAND)

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SYNOPSIS

In 5 small reservoirs were collected 1588 specimens of 28 water mite species. The water mite fauna had typical astatic character. Eudominants, dominants and subdominants, as well as the most frequent species were represented solely by species characteristic of spring astatic waters. Species that belonged to other synecological groups were either recedents or species characterized by low frequency. Higher species diversity observed in large reservoirs (Reservoirs 1, 2 and 5) resulted from the higher diversity of habitats encountered in these reservoirs. The largest group of species was associated with submergent plants. A small group of species associated with the most shallow reservoir zone included solely the species characteristic of periodical waters, while in rushes both the species characteristic of astatic waters and the small body reservoir species were encountered.

INTRODUCTION

Water mites have already been extensively studied. Many studies have been devoted to the presence of water mites in particular lake zones. The autecological characteristics of water mites inhabiting permanent and astatic small water bodies has also been largely investigated. However, there is no available data on habitat-dependent distribution of water mites in small water bodies, neither permanent nor astatic ones. The present study aims to partially fill this gap. What is more, since the area of Pobrzeże Szczecińskie has been scarcely studied regarding water mites, the present study also provides new zoogeographic data.

MATERIAL AND METHODS

The study on water mites inhabiting small water reservoirs in the neighbourhood of Świnoujście was conducted in 2006, from April to September. During this period there were collected 1588 specimens representing 28 water mite species (Table. 1). They were collected from all types of habitats encountered in the area and the number of samples collected from particular habitats reflected the share of these habitats in the total investigated area. Th samples were collected with a hyrdrobiological sweep net with a triangular ring, making about 20 sweeps in a row, covering the area of ca. 1 m^2. There was conducted the RDA analysis to establish associations between the encountered species of water mites and the size of the reservoir, the extent of its astaticity and habitat types found in it. Indicators of dominance were adopted from BIESIADKA (1972).

The investigated area is situated in Pobrzeże Szczecińskie (Kondracki, 2000), on Przytor peninsula, and in the east directly adjoins the Świnoujście seaport area.

RESERVOIR 1. A small dystrophic reservoir situated in a depression covered with a riparian forest and fragments of an alder swamp. Its shoreline is considerably covered with trees and bushes. The reservoir is rather shallow (not deeper than ca. 0.5 m), with silt banks containing elements of organic waste. A layer of silt covers also the reservoir's bottom. Emergent plants, represented mainly by reeds, are scarcely present and can be encountered mainly in the western part of the reservoir, which has better access to light. Submergent plants are definitely more abundant and represented mainly by *Sparganium*, i.e. "grasses", and *Lemna trisulca*, which grows lushly in the summer. Water levels fluctuate considerably. Within Reservoir 1 there were established four sites: 1.1 – water-land ecotone, silt bottom with large amounts of leaves and small grass tufts; 1.2 – silt bottom with large amounts of leaves, up to 0.5 m deep; 1.3 – silt bottom with submerged grasses growing on it, up to 0.4 m deep; 1.4 – silt bottom with submerged plants growing on it, mainly *Sparganium emersum* with the addition of *Lemna trisulca*, up to 0.5 m deep.

RESERVOIR 2. A small dystrophic reservoir situated in the same depression as Reservoir 1. Its shoreline is covered with trees and bushes. In comparison to Reservoir 1, the water table of Reservoir 2 is more shaded, and the reservoir is smaller and slightly deeper, i.e. up to ca. 0.7 m deep. The bottom is covered with silt loam, and a light, colloid suspension is periodically present above it. The upper water layers are clear, and in the shore zone of the reservoir there are sedge tufts. A considerable area of the reservoir is covered with sparse reeds. Submergent plants are not as abundant here as in Reservoir 1. They are mainly represented by the shoots of *Sparganium emersum*, *Lemna trisulca*, *Callitriche* sp., and very few shoots of *Sphagnum* sp. Four sites were established within Reservoir 2: 2.1 - water-land ecotone, silt bottom with large amounts of leaves and small grass tufts; 2.2 – silt bottom covered with sparse submergent plants, mainly *Sparganium emersum*

with the addition of *Lemna trisulca*, up to 0.5 m deep; 2.3 – reeds, *Galium palustre*, silt bottom, up to 0.4 m deep; 2.4 – reeds, sedges, up to 0.3 m deep.

RESERVOIR 3. Situated in a small depression in a lowland peat bog, Reservoir 3 is very small and its shores are covered with grasses and sedges. Its depth does not exceed 0.5 m and the bottom is silty. The fluctuations of water level were very strong during the period of study, but the reservoir never dried out. There were established two sites: 3.1 – *Sparganium emersum*, *Spirogyra* sp., large amounts of leaves at the bottom, 0.5 m deep; 3.2 – flooded grasses, silt bottom, up to 0.3 m deep.

RESERVOIR 4. A periodically drying out pool situated in the same lowland peat bog as Reservoir 3. It is surrounded by sedges, reeds and alders, as well as periodically flooded osiery. In the flooded area there are grasses *Hottonia palustris*, *Riccia fluitans*, some rush, *Lemna trisulca*, *L. minor*. The reservoir is shallow (0.3 m) and the water level fluctuations are very strong. Two sites were established within Reservoir 4, namely: 4.1 – water-land ecotone, silt bottom with large amounts of leaves; 4.2 – silt bottom, flooded grasses, *Hottonia palustris*, *Riccia fluitans*, 0.3 m deep.

RESERVOIR 5. A small dystrophic reservoir situated in a depression covered with a riparian forest and an alder swamp. The reservoir is shaded and rather shallow, as its depth does not exceed 1m. It is characterized by considerable fluctuations of water level, silt bottom and the shores covered with alders, willows and some sedges. The reservoir hosts a significant population of mud plants, mainly *Sparganium emersum*, *Lemna trisulca*, *Riccia fluitans*, *Glyceria aquatica*. Five sites have been established in Reservoir 5: 5.1 – water-land ecotone, silt bottom with large amounts of leaves and small grass tufts; 5.2 – silt bottom with large amounts of leaves, up to 0.7 m deep; 5.3 – silt bottom covered with *Sparganium emersum*, *Lemna trisulca*, *Riccia fluitans*, up to 0.5 m deep; 5.4 – silt bottom covered with *Sparganium emersum* and *Glyceria aquatica*, up to 0.4 m deep; 5.5 – sedges, up to 0.2 m deep.

RESULTS

In total, there have been collected 1588 specimens representing 28 water mite species (Table 1). Among these, three species were eudominants (*Hydryphantes ruber*, *H. planus* and *Piona nodata*), three were dominants (*Arrenurus bisulcicodulus*, *Piona clavicornis* and *Hydryphantes tenuipalpis*), three were subdominants (*Tiphys ornatus*, *Pionopsis lutescens* and *Hydrachna incognita*), and nineteen were recedents (Table 1). The following species, ordered from the most frequent to the least frequent, were characterized by the highest frequency in the investigated sites: *Hydryphantes ruber*, *H. planus* and *Piona nodata*, *Tiphys ornatus*, *Hydryphantes*

Table 1. Water mites (Hydrachnidia) from researched reservoirs A – males, B – females, C – deutonymphs, D – total, E domination (%), F – frequention in samples (%), G – frequention in localities (%).

No	Species	A	B	C	D	E	F	G	reservoirs				
									1	2	3	4	5
1	*Hydrachna globosa* (Geer)	1			1	0,1	2,0	5,9		1			
2	*Hydrachna leegei* Koen.	1	2		3	0,2	3,9	11,8	2	1			
3	*Hydrachna incognita* Wainst.	26	14		40	2,5	9,8	23,5	1	32	1		6
4	*Hydrachna crassipalpis* Piers.	6	1		7	0,4	3,9	5,9	1	4	1		1
5	*Hydryphantes crassipalpis* Koen.	2	1		3	0,2	3,9	5,9				3	
6	*Hydryphantes dispar* (Schaub)	4	1	4	9	0,6	3,9	11,8	2	7			
8	*Hydryphantes octoporus* Koen.	3	1		4	0,3	7,8	23,5	1			2	1
9	*Hydryphantes placotionis* Thon	2			2	0,1	2,0	5,9		2			
10	*Hydryphantes ruber* (Geer)	139	94	164	397	25,0	70,6	88,2	147	87	5	18	86
11	*Hydryphantes planus* Thon	63	63	166	292	18,4	43,1	76,5	75	125		28	64
12	*Hydryphantes tenuipalpis* Thon	56	36	18	110	6,9	23,5	41,2	9	57		3	41
	Hydryphantes sp.			1	1	0,1	2,0	5,9					1
13	*Parathyas barbigera* Viets	13	11	2	26	1,6	29,4	52,9	17	2		2	5
14	*Parathyas pachystoma* Koen.	5	2	1	8	0,5	3,9	11,8				7	1
	Parathyas palustris Koen.	1			1	0,1	3,9	11,8				1	
	Parathyas sp.			1	1	0,1	2,0	5,9					1
15	*Euthyas truncata* (Neum.)	1			1	0,1	2,0	5,9				1	
16	*Piona alpicola* (Neum.)		1		1	0,1	2,0	5,9	1				
17	*Piona carnea* (Koch)		1		1	0,1	2,0	5,9		1			
18	*Piona clavicornis* (O. F. Müll.)	13	103		116	7,3	19,6	52,9	90	20			6
19	*Piona nodata* (O. F. Müll.)	147	88	14	249	15,7	43,1	76,5	73	68	1	11	96
20	*Piona pusilla* (Neum.)	4			4	0,3	3,9	11,8	2	2			
	Piona sp.			63	63	4,0	2,0	5,9	29	6	2	2	24
21	*Tiphys ornatus* Koch.	30	16		46	2,9	27,5	70,6	8	23	9	3	3
22	*Pionopsis lutescens* (Herm.)	2	42		44	2,8	5,9	17,6	35	6	3		
23	*Arrenurus affinis* Koen.	1			1	0,1	2,0	5,9					1
24	*Arrenurus crassicaudatus* Kram.	1			1	0,1	2,0	5,9					1
25	*Arrenurus claviger* Koen.	1			1	0,1	2,0	5,9	1				
26	*Arrenurus papillator* (O. F. Müll.)	5	4		9	0,6	3,9	11,8	1		8		
27	*Arrenurus bisulcicodulus* Piers.	117	24		141	8,9	37,3	52,9	81	13	2	37	8
28	*Arrenurus integrator* (O. F. Müll.)	2			2	0,1	3,9	11,8				1	1
29	*Arrenurus truncatellus* (O. F. Müll.)	1			1	0,1	2,0	5,9	1				
	Arrenurus sp.			2	2	3,9	11,8	5,9			1		1
	Total	**647**	**505**	**436**	**1588**				**577**	**457**	**33**	**119**	**348**

hellichi, as well as *Parathyas barbigera*, *Piona clavicornis* and *Arrenurus bisulcicodulus*. The following species, ordered from the most frequent to the least

frequent, were characterized by the highest frequency in the collected samples: *Hydryphantes ruber*, *H. planus* and *Piona nodata*, and *Arrenurus bisulcicodulus* (Table 1).

The most abundant were the species characteristic of spring astatic waters followed by small body reservoir species, acidophilus species and lake species (Fig. 1).

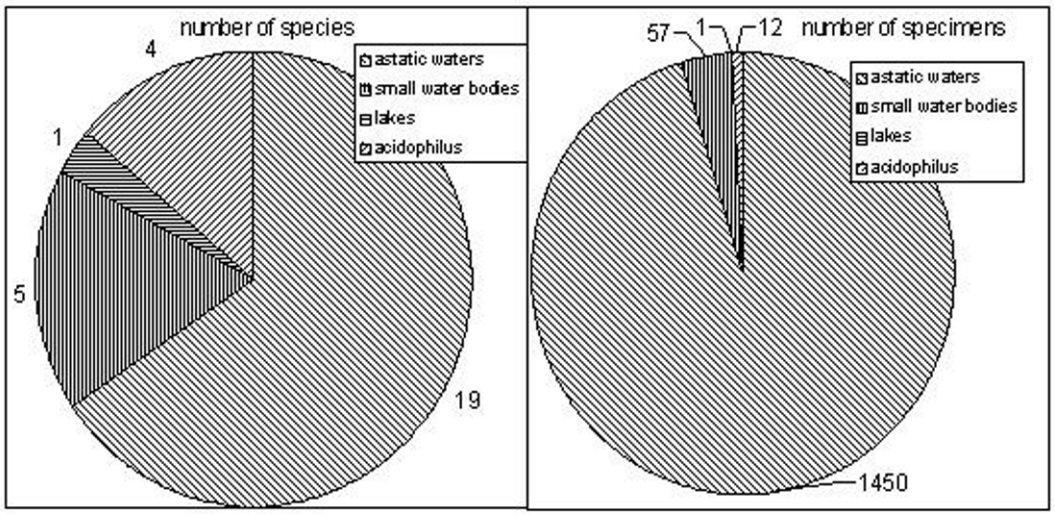

Figure 1: Participating of each synecological group in the whole faunistic data.

The largest number of species, which were also the most abundant, were collected in April and May. The differences between species abundance observed during these two months and the other months amounted to 75%. The highest abundance was recorded in the case of such species as *Hydryphantes planus*, *H. ruber*, *Piona nodata*, *P. clavicornis* and *Hydryphantes tenuipalis* (Fig. 2).

The largest species diversity and abundance of water mites was encountered in Reservoir 1, followed by Reservoirs 2, 5, 4 and finally Reservoir 3 (Table 1). At the same time, the RDA analysis did not show any connection between the water mite fauna and the size of a reservoir or the degree of its astaticity.

The most water mite species were found in the habitat of submergent plants, followed by rushes, the ecotone and finally the bottom detritus. As for water mite abundance, they were the most numerous in rush habitats followed by submergent plants, the reservoir bottom with organic waste and finally the ecotone (Table 2).

The canonical analysis showed that a large group of water mite species was associated with submergent plants. This group included the following species: *Hydrachna globosa*, *H. incognita*, *Euthyas truncata*, *Parathyas pachystoma*, *P. palustris*, *Hydryphantes crassipalpis*, *H. ruber*, *H. tenuipalpis*, *Piona alpicola*, *Arrenurus claviger*, *A. papillator*, *A. bisulcicodulus*, *A. crassicaudatus*, *A. integrator*,

A. truncatellus. A smaller group was associated with the ecotone, and included such species as *Hydrachna crassipes*, *Parathyas barbigera*, *Hydryphantes octoporus*, *Piona carnea*, *Arrenurus affinis*. Another group of species was associated both with rushes and submergent plants and included the following: *Hydrachna leegei*, *Hydryphantes placotionis*, *H. planus*, *H. dispar*, *Pionopsis lutescens*, *Piona clavicornis*, *P. nodata*, *P. pusilla*, *Tiphys ornatus* (Fig. 3).

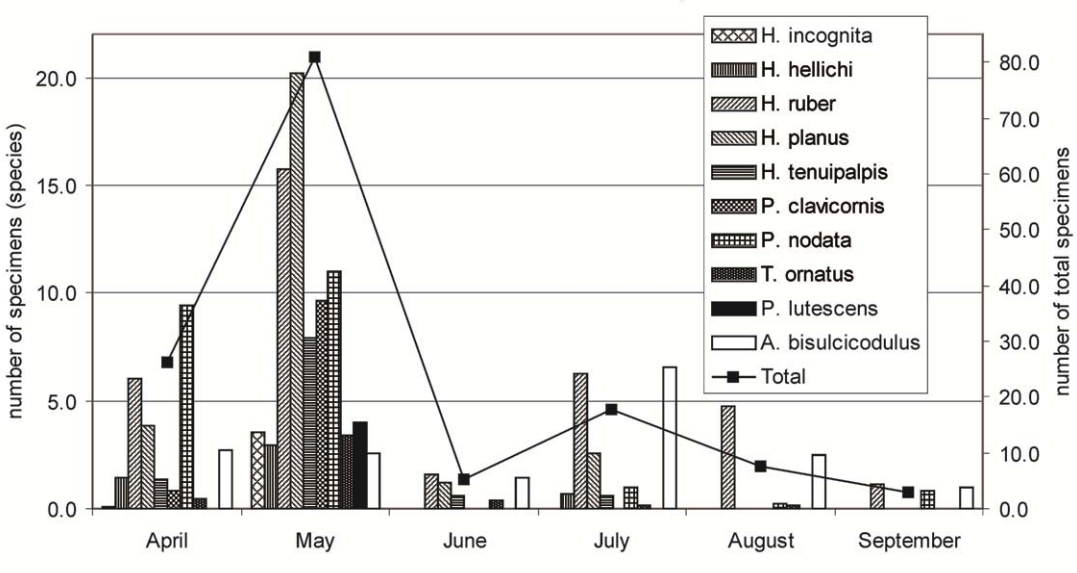

Figure 2. Number of water mites in during investigated period.

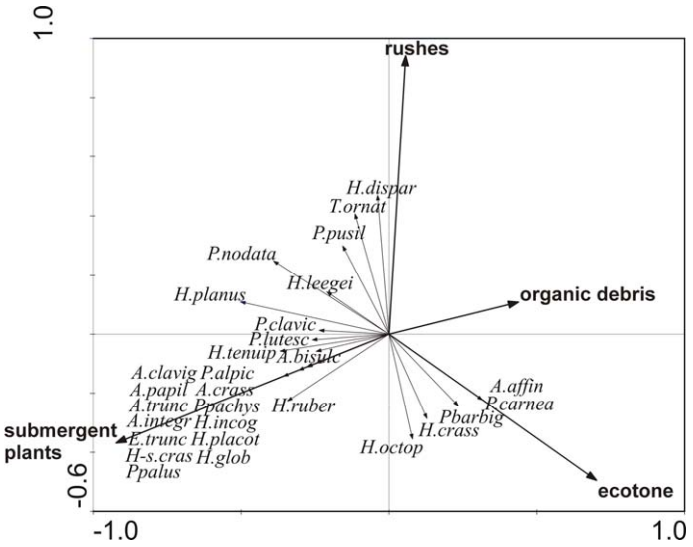

Figure 3. Plot of RDA analysis.

DISCUSSION

The studied reservoirs were permanent ones with a considerable level of astaticity. In the course of the study their area decreased by 75%. Two of the studied reservoirs (1 and 5) were slightly dystrophic. The characteristics of water mite fauna encountered in the reservoirs confirmed their astatic character (Table 1, Fig. 1). Eudominants, dominants and subdominants, as well as the most frequent species were represented solely by species characteristic of spring astatic waters. Species that belonged to other synecological groups were either recedents or species characterized by low frequency (Table 1). The number of water mite species associated with spring astatic waters equalled 65.5%, and the total number of specimens equalled 91.3% (Fig. 1). This fact highlighted the astatic character of the studied reservoirs, even though they never completely dried out throughout the year. Similar species composition was observed by BIESIADKA (1972) and KOWALIK (1984).

Table 2. Average number of specimens in different habitats.

Species	rushes	submerged plants	organic debris	ecotone
Hydrachna globosa		0,04		
Hydrachna leegei	0,3	0,1		
Hydrachna incognita		1,5		
Hydrachna crassipalpis		0,1		0,3
Hydryphantes crassipalpis		0,1		
Hydryphantes dispar	2,3	0,1		
Hydryphantes octoporus		0,1		0,1
Hydryphantes placotionis		0,1		
Hydryphantes ruber	14,3	9,0	4,5	4,0
Hydryphantes planus	20,3	9,0	8,0	0,6
Hydryphantes tenuipalpis	3,7	3,5	2,0	
Hydryphantes sp.				0,1
Parathyas barbigera	0,3	0,4	2,5	0,6
Parathyas pachystoma		0,3		
Parthyas sp.				0,1
Euthyas truncata		0,04		
Piona alpicola		0,04		
Piona carnea				0,1
Piona clavicornis	6,7	3,4	1,5	0,1
Piona nodata	23,3	5,7	5,0	0,9

Piona pusilla	0,7	0,1		
Piona sp.		1,4		1,6
Tiphys ornatus	7,0	0,7	2,0	0,1
Pionopsis lutescens	2,0	1,4		
Arrenurus affinis				0,1
Arrenurus crassicaudatus		0,04		
Arrenurus claviger		0,04		
Arrenurus papillator		0,3		
Arrenurus bisulcicodulus	3,7	3,8	11,0	0,3
Arrenurus integrator		0,1		
Arrenurus truncatellus		0,04		
Arrenurus sp.		0,1		
Total	**84,7**	**41,4**	**36,5**	**8,9**

The water mite fauna encountered in the investigated sites was comparatively diversified (Table 1). In similar reservoirs KOWALIK (1984) recorded the presence of 36 water mite species, BIESIADKA (1972) – 57 species, and ZAWAL (2007) – 23 species. However, the first two of these authors studied a much larger number of reservoirs, and thus the 28 species recorded in the neighbourhood of Świnoujście could be considered as a comparatively large faunistic diversity.

The phenology and composition of the species was typical for water mite fauna encountered in periodical waters (Fig. 2), where water mites are the most abundant in spring months.

In spite of a clearly higher faunistic diversity observed in the case of larger reservoirs (Table 1), the RDA analysis did not show a connection between the number of water mite species and the size of a reservoir. Higher species diversity observed in large reservoirs (Reservoirs 1, 2 and 5) resulted from the higher diversity of habitats encountered in these reservoirs, which was confirmed by the RDA analysis (Fig. 3). The largest group of species was associated with submergent plants. Species associated with astatic waters prevailed, but small body reservoir species, acidophilus species and a lake species were also encountered. A small group of species associated with the most shallow reservoir zone included solely the species characteristic of periodical waters, while in rushes both the species characteristic of astatic waters and the small body reservoir species were encountered (Fig. 3).

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