

STABILITY OF UROPODINA MITES COMMUNITIES (ACARI: MESOSTIGMATA) IN NATURAL RESERVE “CISY STAROPOLSKIE IM. LEONA WYCZÓŁKOWSKIEGO” IN WIERZCHLAS BASED ON LONG-TIME OBSERVATION

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Abstract: Authors present the results of research on Uropodina (Acari: Mesostigmata) conducted in “Cisy Staropolskie im. Leona Wyczółkowskiego” Reserve in Wierzchlas. The aim of the research was not only to present the current species richness of these mites in the reserve, but also indication whether, the mites communities and species richness have been changed after 14 years. The number of species recorded in both periods of studies in the reserve is 31. The studies have shown, that after 14 years the number of species decreased from 28 to 20, wherein the three new unlisted species appeared in the community: *Oplitis sp.*, *Uropoda sp.* and *Ur. orbicularis*. The most frequent and common species in the reserve in both periods of research was *Oodinychus ovalis* (widespread in Europe).

Keywords: soil zoology, Uropodina, acarofauna, yew-tree, biodiversity

INTRODUCTION

The “Cisy Staropolskie” Reserve in Wierzchlas, which is the largest refuge of yew-tree (*Taxus baccata* L.) in Europe, has always inspired Polish naturalists. This is evidenced by numerous studies, particularly those relating to its flora (Myczkowski 1961; Walas 1962; Boiński 1985). In the reserve (as well in the whole area of “Bory Tucholskie” and adjacent areas) occurs unique diversity and biotic specificity which includes soil fauna communities (Błoszyk and Krysiak 2000). The limited area of the reserve and restriction of tourism have a positive effect on the environment, effectively reducing the human impact. Over the last 16 years there haven’t been observed any major changes in the vegetation of the reserve, except for the loss of single specimens of yew.

However, during observations conducted in the last century, an almost complete lack of yew renewal (caused by death of seedlings) has been noticed. In the period from 1910 to 2005, the number of living yew trees decreased nearly in half. The latest inventory revealed that from more than 5 thousand specimens of yew remained only 2,85 thousand.

Based on long-standing observation authors decided to check, whether the communities of soil fauna in the stand of yews in the reserve, are stabilized and permanent, or rather undergo significant changes over time. The model group in this case are mites of the suborder Uropodina, which are one of the most known group of mites in our country (Błoszyk 1999).

THE SITE, MATERIAL AND METHODS

The “Cisy Staropolskie im. Leona Wyczółkowskiego” Reserve in Wierzchlas, is located about 20 km east of Tuchola (UTM: CE0383). Our research were limited to that part of reserve, where yew trees grow (the surface area of about 19 ha.)

In years 1992–1996, 145 soil samples were collected (mostly from the patches of typical subassociation of *Tilio-Carpinetum* Scamoni *et. Pass. em.* Traczyk 1962). During the research in 2010, 208 soil samples were taken from the area of reserve. Soil was sampled either quantitatively (using the soil corer 30 cm² to the depth of 10 cm) or qualitatively (using sieve). The mesofauna were extracted in the Tullgren funnels for 42–60 hours, and the animals were preserved in 75% ethanol. The material including the all documentation has been deposited in the Natural History Collections (Faculty of Biology, Adam Mickiewicz University in Poznan).

RESULTS AND DISCUSSION

The characteristics of the community of Uropodina in “Cisy Staropolskie” Reserve

The community of mites of the suborder Uropodina in “Cisy Staropolskie” Reserve has 31 species and is the richest community in the Bory Tucholskie area (Tab. 1). It is also one of the richest communities of species in whole country (Błoszyk 1999). Apart from common and widespread species, authors found species that are rare and very rare. There are also some interesting species from the zoogeographical point of view. The most frequent and common representative of this group in the reserve was widespread in Europe – *Oo. ovalis*. following species also contributes to the community of soil fauna: *T. aegrota*, *U. tecta*, *D. perforatus*, *O. minima* and *N. splendida*.

Table 1. The list of species of Uropodina recorded in “Cisy Staropolski” Reserve

Species	Total	1994–1996			2010		
		<i>N</i>	<i>D</i> [%]	<i>F</i> [%]	<i>N</i>	<i>D</i> [%]	<i>F</i> [%]
<i>Oodinychus ovalis</i> (C.L. Koch, 1839)	998	342	15.71	29.36	656	38.91	40.87
<i>Trachytes aegrota</i> (C.L. Koch, 1841)	614	273	12.54	27.66	341	20.23	35.58
<i>Urodiaspis tecta</i> (Kramer, 1876)	584	445	20.44	32.34	139	8.24	17.31
<i>Dinychus perforatus</i> Kramer, 1882	378	292	13.41	19.15	86	5.10	12.50
<i>Olodiscus minima</i> (Kramer, 1882)	308	190	8.73	27.23	118	7.00	26.44
<i>Neodiscopoma splendida</i> (Kramer, 1882)	201	93	4.27	9.79	108	6.41	9.13
<i>Urodiaspis pannonica</i> Willmann, 1952	129	107	4.92	14.47	22	1.30	4.81
<i>Oodinychus karawaiewi</i> (Berlese, 1903)	129	84	3.86	7.66	45	2.67	4.81
<i>Oodinychus obscurasimilis</i> (Hirschmann et Z.-Nicol, 1961)	107	61	2.8	9.36	46	2.73	11.06
<i>Trachytes lamda</i> Berlese, 1903	92	72	3.31	5.11	20	1.19	2.40
<i>Dinychus arcuatus</i> (Tragardh, 1922)	77	41	1.88	2.98	36	2.14	2.40
<i>Dinychus inermis</i> (C.L. Koch, 1841)	71	71	3.26	4.26			
<i>Trachytes pauperior</i> (Berlese, 1914)	58	24	1.1	5.11	34	2.02	5.29
<i>Trematurella elegans</i> (Kramer, 1882)	42	31	1.42	5.53	11	0.65	1.92
<i>Janetiella pulchella</i> (Berlese, 1904)	15	13	0.6	0.85	2	0.12	0.96
<i>Cilliba cassideasimilis</i> Błoszyk et al. 2009	14	8	0.37	1.7	6	0.36	1.92
<i>Leiodinychus orbicularis</i> (C.L. Koch, 1839)	8	8	0.37	0.85			
<i>Dinychus woelkei</i> Hirschmann et Zirngiebl-Nicol, 1961	7				7	0.42	0.48
<i>Iphiduropoda penicillata</i> (Hirschmann et Z.-Nicol, 1961)	5	5	0.23	0.85			
<i>Discourella modesta</i> (Leonardi, 1889)	4	1	0.05	0.43	3	0.18	1.44
<i>Olodiscus kargi</i> (Hirschamann et Z.-Nicol, 1969)	3	3	0.14	0.43			
<i>Dinychus carinatus</i> Berlese, 1903	3	3	0.14	0.85			
<i>Olodiscus misella</i> (Berlese, 1916)	2	2	0.09	0.85			
<i>Phaulodiaspis rackei</i> (Oudemans, 1912)	2	2	0.09	0.85			
<i>Dinychura cordieri</i> (Berlese, 1916)	2	2	0.09	0.43			
<i>Oplitis</i> sp.	2				2	0.12	0.48
<i>Polyaspis patavinus</i> Berlese, 1881	1	1	0.05	0.43			
<i>Pseudouropoda</i> sp.	1	1	0.05	0.43			
<i>Uropoda orbicularis</i> (Muller, 1776)	1				1	0.06	0.48
<i>Urobovella obovata</i> (Canestrini et Berlese, 1884)	1	1	0.05	0.43			
<i>Dinychus woelkiei</i> Hirschmann et Zirngiebl-Nicol, 1969	1	1	0.05	43			
<i>Uropoda</i> sp.	1				1	0.60	0.48
TOTAL	3861	2177	100		1684	100	
Number of species	31	28			20		

N – number of specimens, *D* [%] – the percentage participation in the community (dominance), *F* – the percentage participation in the samples (frequency)

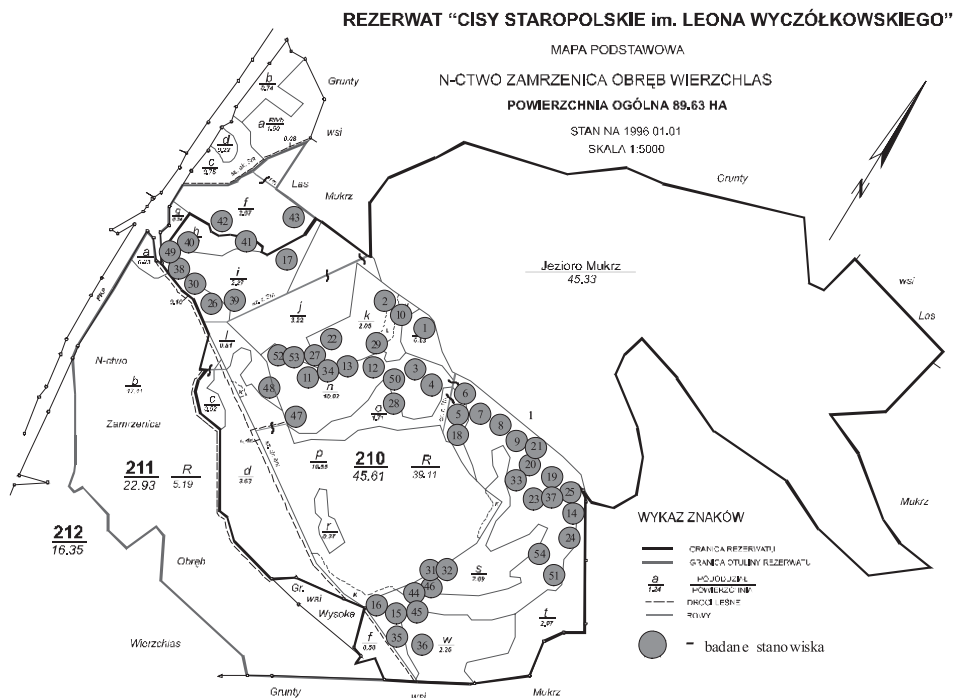


Fig. 1. Distribution of sites in the reserve during the research in years 1993–1996

The next numerous group of mites occurring in the reserve consists of species such as: *U. pannonica*, *Oo. karawaiewi*, *Oo. obscurasimilis* and *T. lamda*. The rare species observed in the reserve are: *P. patavinus*, *U. orbicularis*, *Ur. obovata* and *D. woelkei*.

The occurrence of *T. lamda*, *N. splendida* and *Oo. obscurasimilis* with relatively high participation of these species in the community in the reserve is also noteworthy. The first of these species is one of the rarest representatives of Uropodina in Poland. It's known only from a few scattered sites, usually occurs in old deciduous forests, to a lesser extent changed by human activity (Błoszyk 1999; Błoszyk, Krysiak 2000). *N. splendida* is a species with disjunctive distribution, abundant and frequent in southern Poland, rare and infrequent in north-eastern Poland (Błoszyk 1999; Błoszyk et al. 2003). *Oo. obscurasimilis* is a Carpathian species, which migratory route runs north along the watercourse (Błoszyk 1999; Błoszyk, Krysiak 2000; Błoszyk et al. 2003). Moreover, a few other scarce species were found in the reserve, such as: *Tr. elegans*, *I. pennicillata*, *O. kargi* and *P. patavinus*.

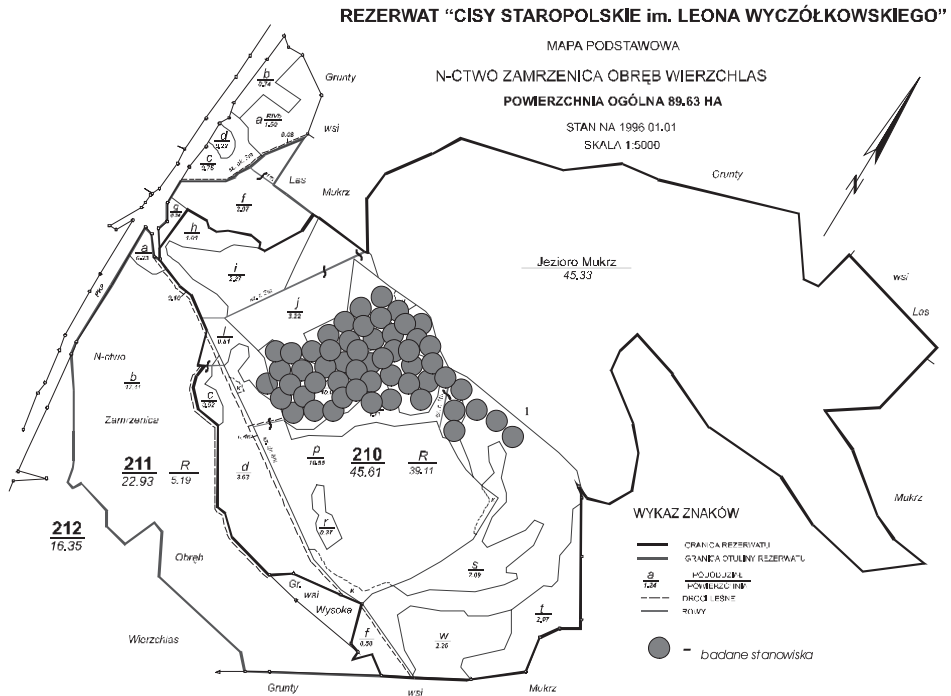


Fig. 2. Distribution of sites in the reserve during the research in 2010

The changes in species composition and assemblage structure of Uropodina over time

The first inventory of mites of the suborder Uropodina took place in the last decade of the last century, in 1994–1996. In the reserve, 28 mite species were recorded (Błoszyk, Krysiak 2010).

Comparing the species composition of communities, observed 14 year ago and now, it can be seen, that they differ in number of species, which forming the assemblage. The contemporary assemblage represents about 71% of species composition from the 90s of the last century. There hasn't been found species such as: *Dinychus inermis*, *Leiodynychus orbicularis*, *Iphiduropoda penicillata*, *Olodiscus kargi*, *Olodiscus misella*, *Phaulodiaspis rackei*, *Dinychura cordieri*, *Polyaspis patavinus*, *Pseudouropoda* sp. and *Uroobovella obovata*. The three new unrecorded species appeared: *Oplitis* sp., *Uropoda* sp. and *Uropoda orbicularis*.

The structure of dominance were also different (Table 1).

In the 90s of the last century the most frequent and common species in the reserve was *Urodiaspis tecta*. However, its participation haven't exceed 20.5%. The other three dominant species in the communities were: *Oo. ovalis*, *D. perforatus* and *T. aegrota*. These four were the most frequent species constituted still 62.1% of the community. At present, the most common species in the reserve is *Oo. ovalis*. It forms nearly 40% of the community, which shows some distortion in the dominance structure. The second most frequent species is *T. aegrota*. These two species contributes up to 60% of the community, which is characteristic for labile soil systems and merocoenose (Napierała, Błoszyk 2011 – in print). The most striking results comparing former and present studies is that nowadays the abundance of *Oo. karawaiewi* (species regarded as zoindicator of strong human impact) is lower than 14 years ago, and also the absence of *D. cordieri*, which was previously recorded. The latter occurs in degraded and transformed by human habitats changed into parks (Błoszyk 1999). It might suggest a less anthropopressure than it used to be.

CONCLUSION

The current research on soil fauna in “Cisy Staropolskie im. Leona Wyczółkowskiego” Reserve in Wierzchlas confirm the unique value of this area. Comparission of investigation performed within last decades shows relatively constant character of the soil fauna community structure. Authors recognize two main factors that influence the stability of considered communities: natural conditions of the reserve and restriction in movement area for visitors (by the fence and limited tourism). The limitation of the tourist route in the reserve reduced the negative influence of treading on soil fauna limited to a minimum. The other important factor, which prevent the expansion of invasive or synanthropic species is maintenance of environment in near-natural state. Systematically regulated and monitored tourist traffic makes possibility of keeping the tourist path in right order, and this enables that some species can settle in the reserve. The monitoring of soil fauna should be performed at least once every 5 years, to determine the changes.

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STABILNOŚĆ ZGRUPOWAŃ ROZTOCZY Z PODRZĘDU UROPODINA W REZERWACIE „CISY STAROPOLSKIE IM. LEONA WYCZÓŁKOWSKIEGO” W WIERZCHLESIE NA PODSTAWIE WIELOLETNIICH OBSERWACJI

Streszczenie

Głównym celem badań przedstawionych w artykule jest wieloletnia analiza zmian składu gatunkowego i struktury zgrupowania roztoczy z podrzędu Uropodina (Acari: Mesostigmata) w rezerwacie „Cisy Staropolskie im. Leona Wyczółkowskiego” w Wierchlesie, położonego około 20 km wschód od Tucholi (UTM: CE0383). Rezerwat ten jest największym skupiskiem cisa (*Taxus baccata* L.) w Europie. Badania prowadzono w dwóch okresach – w latach 1992–1996 z terenu rezerwatu zebrano 145 prób glebowych, a w roku 2010 – 208 prób.

Zgrupowanie Uropodina w rezerwacie liczy 31 gatunków. Najliczniej i najczęściej spotykanym na terenie rezerwatu gatunkiem był *Oodinychus ovalis*. Do licznie reprezentowanych i odgrywających istotną rolę w zgrupowaniu gatunków zaliczamy także: *T. aegrota*, *U. tecta*, *D. perforatus*, *O. minima* oraz *N. splendida*. Na terenie rezerwatu występuje bardzo rzadki w Polsce, związany z mało przekształconymi ekosystemami leśnymi, *T. lamda* oraz dwa gatunki (*N. splendida*, *Oo. obscurasimilis*) mające interesujące rozmieszczenie w Europie. Udział tych gatunków w zgrupowaniu jest stosunkowo wysoki.

Podczas pierwszej inwentaryzacji przeprowadzonej w latach 1992–1996 stwierdzono występowanie 28 gatunków, podczas gdy w roku 2010 tylko 20. Po 14 latach nie odnotowano obecności takich gatunków, jak: *D. inermis*, *L. orbicularis*, *I. penicillata*, *O. kargi*, *O. misella*, *Ph. rackei*, *Di. cordieri*, *P. patavinus*, *Pseudouropoda* sp. and *U. obovata*. Z kolei trzy inne gatunki – *Oplitis* sp., *Uropoda* sp. and *Ur. orbicularis* – zostały zarejestrowane po raz pierwszy. W latach 90. ubiegłego wieku najliczniejszym gatunkiem był *U. tecta* (20,5%). Obecnie struktura dominacji uległa zmianie i gatunkiem dominującym stał się *Oo. ovalis* (40%). Warto również zauważyć niski udział w zgrupowaniu *Oo. karawaiewi* oraz brak *Di. cordieri*. Obydwa gatunki są dobrymi bioindykatorami antropopresji, ich liczebność rośnie bowiem wyraźnie w środowiskach przekształconych przez człowieka (parkach, nasadzanych zaroślach).

Przedstawione wyniki badań wskazują na stosunkowo stabilną strukturę zgrupowania Uropodina na terenie rezerwatu „Cisy Staropolskie”, co dodatkowo podkreśla jego unikatowe wartości przyrodnicze.