

Spiders of peatland ecosystems of the Horná Orava region (Slovakia)

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Abstract

The authors studied spider communities on ten study sites in the Horná Orava peatland ecosystems. During two years of research (2001-2002), 4 182 adult specimens belonging to 235 species (20 families) were captured. Captures of many very rare and threatened spider species as well as a number of new species for the Slovakian fauna (*Agyneta olivacea*, *Drepanostylus uncatus*, *Maro lehtineni*, *M. lepidus*, *Saariotoa abnormis*, *Clubiona frisia* and *Clubiona kulczynskii*) indicate the high biotic value of the investigated region and habitats. Out of ten study sites, Slaná Voda, Klinské rašelinisko, Sosnina and Mútňanská Pila were found to have the highest diversity of spiders. Many threatened species were recorded in these localities. Based on spider rarity and richness these arachnologically important sites were proposed for inclusion in the NATURA 2000 Network and National Network of Designated Areas.

Key words: Araneae, wetlands, habitat mosaic, threatened species

INTRODUCTION

Bogs, mire fens and fens belong to the most threatened ecosystems in Slovakia. These ecosystems are very rare and unique and create available habitats for many threatened plant and animal species, including spiders. Protection of such habitats became a prime interest of nature conservation recently. Some 40 to 50 years ago there were 578 bogs and fens registered in Slovakia with a total area of 4,459 ha. Most of them were located in the Podunajská nížina lowland, Záhorie, in the Horehronské podolie valley, in the Oravská and Liptovská kotlina basin, as well as in the High Tatras Mts. During the last 50 years, the number and the area of these habitats, with exception of the peatland ecosystems in Horná Orava, have dramatically decreased as a result of intensive agriculture and pollution. All this resulted in a patchy distribution of these habitats (Svatoň

& Pridavka 2000). Although the peatland ecosystems in Horná Orava are the largest in Slovakia and relatively well preserved, from an arachnological point of view very little attention was paid to them. There are only two papers by Svatoň (1981, 1983) that deal with very rare and new species from the Slovak territory, with some data from the Horná Orava peatbogs (Rudné and Klin peatbogs). Results from a brief research of the arachnofauna of the Rudné peatbogs were published by Gajdoš & Majzlan (2001).

In the framework of "Handling of the common program for conservation and management of the Orava catchment peatland" and "Protection and sustainable utilisation of peatland" projects supported by the State Nature Protection Organisation of the Slovak Republic, we started to investigate the spider fauna of the Horná Orava region in 2001 and contin-

ued until October 2002. Besides the spider fauna inventory, the aim of our research was to evaluate spider communities of the investigated peatland localities. Based on spider rarity and richness, the different studied localities were prepared for inclusion of the arachnologically most important areas in the NATURA 2000 network and the National Network of Designated Areas.

MATERIAL AND METHODS

Site

The arachnological investigations were performed on ten study sites of the Orava region. Orava is situated in northern Slovakia, on the border with Poland. Peatlands, as very typical ecosystems of the Horná Orava (Upper Orava) region, are covering more than 800 ha in the northern part of the region. This area overlaps with the Ramsar locality Wetlands of Orava Basin and a part of it (268 ha) is protected as small-scale areas: the National Nature Reserve Sosnina (NNR), NNR Klínske rašelinisko, NNR Spálený grúnik, Nature Reserve (NR) Rudné, NR Tisovnica, NR Mútnianská Píla, NR Beňadovské rašelinisko, NR Ťaskovska (Trnka 2000). It includes fragments of the natural and near-natural peatlands and swamps, and they comprise a diverse mosaic of well-preserved, hydrologically and biologically very important and unique wetlands – from a large complex of forested peatlands to open bogs. The area is characterised by high biodiversity and occurrence of rare and threatened plant and animal species (Slobodník & Kadlečík 2000).

Study sites:

Beňadovské rašelinisko NR (B.r.) – mosaic of alkaline fens, transition mire and phases of their successional development (shrub-grown with solitary trees).

Hraničný Kriváň (H.K.) - habitat with typical alkaline fen communities located at the NE part of the Orava dam, partly overgrown by shrubs.

Klinské rašelinisko NNR (K.r.) – well-preserved unforested raised bogs with rich specific flora and fauna, on the margin of the Reserve with transition mire and groups of birch, willow and aspen trees.

Mútnianská Píla NR (M.P.) – complex of the peat habitats from alkaline fens through transition mires to fragments of the raised bogs, partly overgrown by shrubs.

Poľanový Kriváň (P.K.) – fragments of degraded raised bogs in central part of the Orava basin between Klin and Bobrov villages, partly overgrown by shrubs and ruderal plant communities.

Rabčické bory (R.b.) – alkaline fens with enclaves of active raised bogs and dry sites. Locality is extensively covered by shrubs and trees (70%). Part of this territory is degraded in consequence of its utilization as a passage for cattle in the past.

Rudné NR (Ru) – important fragment of degraded raised bogs with occurrence of many rare and threatened species and habitats.

Slaná voda (S.v.) – complex of the peat habitats from alkaline fens through transition mires to raised bogs, lower part open, other parts are covered by forest with open enclaves.

Sosnina NNR (So) – area with well-preserved forest peat communities of pine and spruce bog woods (*Pino-Ledion* and *Piceion excelsae*) with open enclaves of transition mires.

Surdíky (Su) – peat area situated in forest complex near Orava dam with sedge, sedge-peat and sedge-grass communities of alkaline fens and transition mires, extensively covered by shrubs and birch trees.

Sampling

The spiders were collected at the ten study sites mainly by means of pitfall traps. For trapping, we used plastic beakers (diameter 9 cm). A 4% formalin solution with detergent was used as preservative. Trapping periods were 7 June 2001 - 2 October 2001 for each study site

and 5 May 2002 - 1 October 2002 on each study site, except Poľanový Kriváň and Rabčické bory. Traps were emptied at monthly intervals. On each study site one or more transects with four pitfall traps in line or in square with a distance of ca. 10-15 m were placed (numbers of pitfall traps in individual years are in Appendix). As additional methods of collecting, we also used sweeping, beating of tree branches, sieving and individual collecting on all sites in order to obtain as many species as possible. Species nomenclature is according to Platnick (2002).

Analysis

A comparison of the spider communities of the individual study sites was done by cluster analysis with group average (Unweighted Pair-Group) method using NCSS (Hintze 1997). Based on values of the Cophenetic Correlation=0.968, Delta (0.5)=0.058, Delta (1.0)=0.067329 this method was chosen as the most suitable for this type of data.

Study sites were evaluated on the basis of species diversity and occurrence of very rare, threatened species and species new for Slovakia.

RESULTS

During two years, 4182 adult specimens of spiders belonging to 235 species (20 families) were collected (Appendix). According to Buchar's (1992) classification of thermopreference, 83 species (35.3%) were psychrophilous (P), 57 species (24.3%) were mesophilous (M), 81 species (34.5%) were unspecified (N), and 7 species (3.0%), namely *Entelecara congenera*, *Hylyphantes nigrinus*, *Walckenaeria vigilax*, *Hahnina ononidum*, *Drassodes cupreus*, *Zora armillata* and *Zora silvestris* could not be classified. The occurrence of 7 species (3.0%) which are characterised as thermophilous (T): *Neottiura suaveolens*, *Abacoproces saltuum*, *Araniella opisthograpa*, *Cheiracanthium effossum*, *Ozyptila atomaria*, *Aelurillus v-insignitus*, *Heliophanus patagiatus* is remarkable. From ten study sites,

the Slaná Voda and the Klinské rašelinisko peatbogs were found to be the most diverse in spiders, as 113 (48.1%) and 111 (47.2%) species were recorded there. On all the other sites only 35 to 88 species were found. The poorest species composition (24 and 26 species) was observed on the Hraničný Kriváň and the Rabčické Bory.

From the faunistic point of view, 42 spider species, namely *Agroeca proxima* (EN), *Agyneta cauta* (LR-lc), *Agyneta conigera* (EN), *Agyneta subtilis* (LR-lc), *Achaearanea ohlerti* (VU), *Alopecosa taeniata* (DD), *Anguliphantes tripartitus* (LR-lc), *Aphileta misera* (EN), *Araniella displicata* (LR-lc), *Centromerus levitarsis* (EN), *Diplocephalus permixtus* (LR-lc), *Erigonella ignobilis* (EN), *Gnaphosa microps* (CR), *Gnaphosa nigerrima* (VU), *Hahnina helveola* (LR-lc), *Heliophanus dampfi* (CR), *Heliophanus patagiatus* (LR-nt), *Hygrolycosa rubrofasciata* (EN), *Hylyphantes graminicola* (CR), *Hylyphantes nigrinus* (CR), *Cheiracanthium effossum* (VU), *Lophomma punctatum* (VU), *Meioneta saxatilis* (LR-lc), *Neon valentulus* (CR), *Notioscopus sarcinatus* (LR-nt), *Nuctenea silvicultrix* (CR), *Ozyptila brevipes* (VU), *Pardosa sphagnicola* (EN), *Peponocranium orbiculatum* (CR), *Pirata uliginosus* (EN), *Pocadicnemis juncea* (DD), *Poecilometes variegata* (LR-lc), *Silometopus elegans* (LR-nt), *Sitticus caricis* (VU), *Styloctetor stativus* (LR-lc), *Talavera monticola* (VU), *Taranucnus bihari* (EN), *Walckenaeria kochi* (LR-nt), *Xysticus luctuosus* (LR-lc), *Zora armillata* (EN), *Zora distincta* (VU), are of a remarkable importance because they are known only from few localities in Slovakia and are listed in the Red list of Slovak spiders (Gajdoš et al. 1999; Gajdoš & Svatoň 2001). Eight species, namely *Agyneta olivacea*, *Drepanostylus uncutus*, *Maro lehtineni*, *M. lepidus*, *Saarioa abnormis*, *Clubiona frisia*, *Clubiona kulczynskii* and *Xysticus emertoni*, are new to Slovakia.

Study site evaluation

On the basis of the chosen criteria (biodiversity and occurrence of very rare and threatened species, captures of new spider species for the Slovakian fauna) the study sites have been assigned to three categories (Table 1):

- the most biologically valuable sites - territories with high species diversity, with the highest proportion of endangered, rare species or spiders new to Slovakia - Klínské rašelinisko, Slaná voda, Sosnina, Mútňanská Píla.
- biologically valuable sites - territories with high species diversity, and a high proportion

of threatened and rare species or spiders new to Slovakia – Beňadovské rašelinisko, Rudné.

- sites with lower biological importance - areas with a lower species diversity and a low number of endangered and rare species – Hraničný Kriváň, Poľanový Kriváň, Rabčické bory, Surdíky.

Comparison of the spider communities between the individual study sites

Fig.1 indicates the dissimilarity of spider communities between the individual sites. The majority of the compared spider communities are considerably dissimilar (Fig. 1). From all

Table 1. Study site evaluation. IUCN categories: CR – critically endangered, EN – endangered, VU – vulnerable, DD – data deficient, LR(lc)- lower risk-least concern, LR(nt)- lower risk-near threatened, new sp. – number of species new to Slovakia

Study site	Total No. of species	CR	EN	VU	LR (lc)	LR (nt)	DD	New sp.	No. of threatened & new sp.
Beňadovské rašelinisko	53	2		1	1				4
Hraničný Kriváň	24			1					1
Klínske rašelinisko	111	5	5	2	3	3	1	3	19+3
Mútňanská Píla	83	2		1	5	2	1	1	11+1
Poľanový Kriváň	35			1		1			2
Rabčické bory	26		1		1	1			3
Rudné	80		2	1	2	1			6
Slaná Voda	113	3	1	2	3	2		3	11+3
Sosnina	88	2	3	3	3	2	1	2	14+2
Surdíky	42			1					1

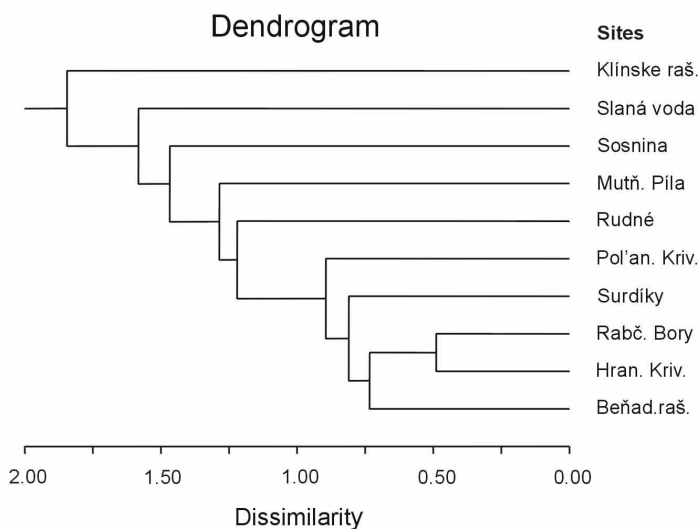


Fig. 1. Hierarchical classification of study sites based on spider composition

the spider communities, the Klinské rašelinisko community is the most distinguished, characterised by the highest species diversity, the highest proportion of the endangered species or spider species new to Slovakia. On the other hand, communities of 5 sites (Surdíky, Beňadovské rašelinisko, Rabčické bory, Poľanový Kriváň, Hraničný Kriváň) are relatively similar (values of their dissimilarity are less than 50%), their spider species compositions are relatively very poor; the communities of the Hraničný Kriváň and Rabčické bory sites are the most similar.

DISCUSSION

Although the peatlands of Horná Orava are very restricted in area, the recording of 235 spider species in two years' research in this territory gives an indication of its very rich fauna. This number is approximately one quarter of all spider species known from Slovakia, in spite of the fact that very special types of habitats were studied. Also the high number of new, rare and threatened species demonstrates a high biological and conservation value of the Horná Orava peatland. The majority of these rarities were captured mainly in Klinské rašelinisko, Slaná voda, Sosnina, Mútnianská Píla - sites. On the basis of this fact, these sites were proposed for inclusion in the NATURA 2000 Network and the National Network of Designated Areas.

It remains unknown whether the peatland fauna of the whole region of Horná Orava is generally this rich and diverse. According to our knowledge and results of our research, the spider fauna composition of the individual peatland sites in the region is considerably different and depends on the state of their habitats. More disturbed sites have lower species richness and diversity. This underscores the need to carry out detailed surveys in the whole region in order to identify the undisturbed peatland sites and to ensure their active protection.

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Appendix. List of species collected from ten study sites of the Horná Orava peatland. Numbers represent male/female. Therm.-pref. stands for thermopreference classification after Buchar (1992). See text for explanation of classification letters.

FAMILIES Species	Study sites										Total	Therm -pref.	Red List
	B.r.	H.K.	K.r.	M.P.	P.K.	R.b.	Ru	S.v.	So	Su			
MIMETIDAE													
<i>Ero furcata</i> (Villers, 1789)	-/1										1	N	
THERIDIIDAE													
<i>Achaearanea lunata</i> (Clerck, 1757)		-/1									1	M	
<i>Achaearanea ohlerti</i> (Thorell, 1870)									-/1		1	P	VU
<i>Crustulina guttata</i> (Wider, 1834)			1/-								1	N	
<i>Enoplognatha ovata</i> (Clerck, 1757)		-/3	-/4				-/2	-/1			10	N	
<i>Episinus angulatus</i> (Blackwall, 1836)									-/1		1	M	
<i>Euryopis flavomaculata</i> (C.L.Koch, 1836)			11/3				6/-				20	N	
<i>Lasaeola tristis</i> (Hahn, 1833)							-/1				1	M	
<i>Neottiura bimaculata</i> (Linnaeus, 1767)			-/1	1/-				-/1			3	N	
<i>Neottiura suaveolens</i> (Simon, 1879)			2/-								2	T	
<i>Robertus arundineti</i> (O.P.-Cambridge, 1871)	4/-		10/1	2/-						1/-	18	N	
<i>Robertus lividus</i> (Blackwall, 1836)				-/1			-/1	1/1			4	P	
<i>Steatoda phalerata</i> (Panzer, 1801)								1/-			1	N	
<i>Theridion impressum</i> L.Koch, 1881							-/1	-/1			2	N	
<i>Theridion pictum</i> (Walckenaer, 1802)	-/3	1/1	1/1	1/-	1/1		6/7			-/2	25	M	
<i>Theridion pinastri</i> L.Koch, 1872			-/1					-/1			2	M	
<i>Theridion sisypium</i> (Clerck, 1757)	-/2	-/1	-/2	1/1		2/2	1/-	11/15	2/-		40	N	
<i>Theridion tinctum</i> (Walckenaer, 1802)	-/1					-/1			1/2	-/3	8	N	
<i>Theridion varians</i> Hahn, 1833	1/-	1/2	1/2	2/3		1/1	4/3	3/4	7/5	5/2	47	N	
LINYPHIIDAE													
<i>Abacoproeces saltuum</i> (L.Koch, 1872)			-/1								1	T	
<i>Agyneta cauta</i> (O.P.-Cambridge, 1902)			-/3	-/1			-/1				5	P	LR(lc)
<i>Agyneta conigera</i> (O.P.-Cambridge, 1863)			1/3								4	P	EN
<i>Agyneta olivacea</i> (Emerton, 1882)			10/22								32	P	
<i>Agyneta subtilis</i> (O.P.-Cambridge, 1863)			65/32	4/-			3/1	12/4			121	P	LR(lc)
<i>Anguliphantes tripartitus</i> Miller & Svatoň, 1978									-/1		1	P	LR(lc)
<i>Aphileta misera</i> (O.P.-Cambridge, 1882)			-/1								1	P	EN
<i>Bathyphantes approximatus</i> (O.P.-Cambridge, 1871)				-/1				1/2		-/1	5	P	
<i>Bathyphantes gracilis</i> (Blackwall, 1841)					-/1						1	A	
<i>Bathyphantes nigrinus</i> (Westring, 1851)		-/1		-/1				-/1			4	A	
<i>Bathyphantes parvulus</i> (Westring, 1851)				-/1							1	A	
<i>Bolyphantes alticeps</i> (Sundevall, 1833)			5/2			-/1		-/1		1/2	12	P	
<i>Centromerita bicolor</i> (Blackwall, 1833)							1/-				1	P	
<i>Centromerus arcanus</i> (O.P.-Cambridge, 1873)				6/2							8	P	
<i>Centromerus levitarsis</i> (Simon, 1884)			-/3								3	P	EN
<i>Centromerus sylvaticus</i> (Blackwall, 1841)			-/2	2/1			-/1	1/-			7	A	
<i>Ceratinella brevipes</i> (Westring, 1851)				1/2							3	P	
<i>Ceratinella brevis</i> (Wider, 1834)			-/4								4	A	
<i>Cnephallocotes obscurus</i> (Blackwall, 1834)			16/20	8/3			3/2	2/1			55	A	
<i>Dicymbium tibiale</i> (Blackwall, 1836)			-/1	-/1							2	A	
<i>Diplocephalus cristatus</i> (Blackwall, 1833)							-/1	1/-			2	A	
<i>Diplocephalus permixtus</i> (O.P.-Cambridge, 1871)									1/2		3	P	LR(lc)
<i>Diplocephalus picinus</i> (Blackwall, 1841)			-/3								6	A	
<i>Diplostyla concolor</i> (Wider, 1834)	-/2		2/5								16	A	
<i>Dismodicus bifrons</i> (Blackwall, 1841)				2/1	-/1			1/3	-/1		9	P	
<i>Dismodicus elevatus</i> (C.L.Koch, 1838)					-/1			-/1	-/1	-/4	7	P	
<i>Drapetisca socialis</i> (Sundevall, 1833)								-/1	1/2		4	P	
<i>Drepanotylus uncatulus</i> (O.P.-Cambridge, 1873)			-/1					-/1			2	P	

FAMILIES Species	Study sites										Total	Therm -pref.	Red List
	B.r.	H.K.	K.r.	M.P.	P.K.	R.b.	Ru	S.v.	So	Su			
<i>Entelegara congenera</i> (O.P.-Cambridge, 1879)								1/1			2	?	
<i>Erigone atra</i> Blackwall, 1833			1/2	-/1			1/-				5	A	
<i>Erigone dentipalpis</i> (Wider, 1834)				-/1							1	A	
<i>Erigonella ignobilis</i> (O.P.-Cambridge, 1871)			-/1								1	P	EN
<i>Floronia bucculenta</i> (Clerck, 1757)										-/1	1	M	
<i>Gnathonarium dentatum</i> (Wider, 1834)					1/3						4	M	
<i>Gonatium paradoxum</i> (L.Koch, 1869)				-/1							1	M	
<i>Gonatium rubellum</i> (Blackwall, 1841)				-/1							1	P	
<i>Gongyliellum latebricola</i> (O.P.-Cambridge, 1871)				1/-			2/-	1/-	1/-		5	P	
<i>Gongylidium rufipes</i> (Linnaeus, 1758)			3/2								5	M	
<i>Hylyphantes graminicola</i> (Sundevall, 1830)			6/1			1/-					8	M	CR
<i>Hylyphantes nigrinus</i> (Simon, 1881)			1/-								1	?	CR
<i>Kaestneria dorsalis</i> (Wider, 1834)	7/25	1/2	2/11	2/1			4/52	5/36	3/16		167	M	
<i>Lepthyphantes pallidus</i> (O.P.-Cambridge, 1871)			-/1								1	A	
<i>Linyphia triangularis</i> (Clerck, 1757)			-/2	-/3		-/1	-/7	1/8	2/38	-/15	77	A	
<i>Lophomma punctatum</i> (Blackwall, 1841)								2/-	1/1		4	P	VU
<i>Mansuphantes mansuetus</i> (Thorell, 1875)							-/1				1	A	
<i>Maro lehtineni</i> Saaristo, 1971								-/1			1	P	
<i>Maro lepidus</i> Casemir, 1961									-/1		1	P	
<i>Meioneta affinis</i> (Kulczyński, 1898)							1/-				1	P	
<i>Meioneta rurestris</i> (C.L.Koch, 1836)			4/1				1/-	-/1			7	A	
<i>Meioneta saxatilis</i> (Blackwall, 1844)			1/-								1	A	LR(lc)
<i>Micrargus herbigradus</i> (Blackwall, 1854)			40/13				1/-	4/1	1/-		60	P	
<i>Microplinyphia pusilla</i> (Sundevall, 1830)								-/1		1/-	2	A	
<i>Minicia marginella</i> (Wider, 1834)			2/-								2	A	
<i>Neriere clathrata</i> (Sundevall, 1830)	-/1										1	A	
<i>Neriere emphana</i> (Walckenaer, 1842)								2/4			6	M	
<i>Neriere peltata</i> (Wider, 1834)				-/1		1/-		1/4	-/4	4/6	21	M	
<i>Neriere radiata</i> (Walckenaer, 1842)								1/-	1/-		2	M	
<i>Notioscopus sarcinatus</i> (O.P.-Cambridge, 1872)			-/27	-/5		-/1	-/2	2/34	2/12		85	P	LR(nt)
<i>Obscuriphantes obscurus</i> (Blackwall, 1841)								-/1			1	P	
<i>Oedothorax agrestis</i> (Blackwall, 1853)			1/-	-/1							2	M	
<i>Oedothorax apicatus</i> (Blackwall, 1850)							1/-				1	M	
<i>Oedothorax fuscus</i> (Blackwall, 1834)									3/1		4	P	
<i>Oedothorax g. Gibbosus</i> (Blackwall, 1841)	3/-			10/12	-/1			3/14	7/10	1/1	62	P	
<i>Oedothorax g. Tuberosus</i> (Blackwall, 1841)			-/1	4/-				3/-	1/2	-/1	12	P	
<i>Oedothorax retusus</i> (Westring, 1851)			-/1	6/-	3/1		1/-				12	P	
<i>Ostearius melanopygius</i> (O.P.-Cambridge, 1879)			1/-								1	M	
<i>Peponocranium orbiculatum</i> (O.P.-Cambridge, 1882)				-/2							2	A	CR
<i>Pityohyphantes phrygianus</i> (C.L.Koch, 1836)	1/-		-/2	1/2		-/1	-/1	1/8	4/9	-/3	33	P	
<i>Pocadicnemis juncea</i> Locket & Millidge, 1953				-/1					-/1		2	A	DD
<i>Pocadicnemis pumila</i> (Blackwall, 1841)	2/-		28/10	11/3		-/1	6/2	11/2	10/12		98	A	
<i>Poecilometes variegata</i> (Blackwall, 1841)				6/-		-/1		-/1			8	P	LR(lc)
<i>Saarestoa abnormis</i> (Blackwall, 1841)								/1			1	P	
<i>Silometopus elegans</i> (O.P.-Cambridge, 1872)					-/1						1	P	LR(nt)
<i>Sintula corniger</i> (Blackwall, 1856)	1/-			1/-				1/-			3	P	
<i>Stemonyphantes lineatus</i> (Linnaeus, 1758)									1/-		1	A	
<i>Styloctetor stativus</i> (Simon, 1881)				1/-							1	P	LR(lc)
<i>Tallusia experta</i> (O.P.-Cambridge, 1871)				-/1			1/-		-/1		3	P	
<i>Taranucnus bihari</i> Fage, 1931				-/1							1	P	EN

FAMILIES Species	Study sites										Total	Therm -pref.	Red List
	B.r.	H.K.	K.r.	M.P.	P.K.	R.b.	Ru	S.v.	So	Su			
<i>Tenuiphantes cristatus</i> (Menge, 1866)			-/1					-/2			3	P	
<i>Tenuiphantes flavipes</i> (Blackwall, 1854)								-/2			2	A	
<i>Tenuiphantes mengei</i> (Kulczyński, 1887)			1/1					-/1	1/2		6	A	
<i>Tenuiphantes tenebricola</i> (Wider, 1834)			1/-						-/1		2	P	
<i>Tenuiphantes tenuis</i> (Blackwall, 1852)			-/1								1	A	
<i>Trematocephalus cristatus</i> (Wider, 1834)							1/-				1	A	
<i>Walckenaeria antica</i> (Wider, 1834)			-/12	1/3			-/3	-/1	1/1		22	A	
<i>Walckenaeria atrotibialis</i> (O.P.- Cambridge, 1878)			1/-				1/1				3	M	
<i>Walckenaeria furcillata</i> (Menge, 1869)	1/-										1	A	
<i>Walckenaeria kochi</i> (O.P.-Cambridge, 1872)			2/4	-/1				6/10	-/1		24	P	LR(nt)
<i>Walckenaeria nudipalpis</i> (Westring, 1851)			1/2					-/1			4	P	
<i>Walckenaeria vigilax</i> (Blackwall, 1853)			1/-					1/-			2	?	
TETRAGNATHIDAE													
<i>Metellina mengei</i> (Blackwall, 1870)						-/1	-/1	3/4	1/3	-/1	14	P	
<i>Metellina segmentata</i> (Clerck, 1757)	1/-		13/29	1/-	2/4			1/2	5/18	1/1	78	P	
<i>Pachygnatha clercki</i> Sundevall, 1823					1/-			1/-			2	M	
<i>Pachygnatha degeeri</i> Sundevall, 1830	-/1		1/-	-/1							3	A	
<i>Pachygnatha listeri</i> Sundevall, 1830	-/2		5/3	5/3	1/1		1/2	-/3	6/5	2/11	50	M	
<i>Tetragnatha extensa</i> (Linnaeus, 1758)	3/1	2/2	-/2	3/8				2/-			23	M	
<i>Tetragnatha montana</i> Simon, 1874								1/-			1	M	
<i>Tetragnatha obtusa</i> C.L.Koch, 1837	-/1		-/1	-/2			-/1	-/4	-/1	-/1	11	M	
<i>Tetragnatha pinicola</i> L.Koch, 1870			-/1	2/1		-/1	-/2	1/-	-/2	-/2	12	A	
ARANEIDAE													
<i>Aculepeira ceropegia</i> (Walckenaer, 1802)	1/1	-/1	1/4	1/2	1/4		2/1	1/2		-/1	23	P	
<i>Araneus alsine</i> (Walckenaer, 1802)				-/1			-/1				2	M	
<i>Araneus diadematus</i> Clerck, 1757				1/2		1/1		1/2	-/2	-/2	12	A	
<i>Araneus marmoreus</i> Clerck, 1757	1/-		-/1				1/-	-/5	-/3	-/2	13	M	
<i>Araneus quadratus</i> Clerck, 1757			-/1		1/3	-/2	3/7	-/1	-/1		19	A	
<i>Araneus sturmi</i> (Hahn, 1831)	1/-			-/2				-/1	-/1		5	P	
<i>Araniella alpica</i> (L.Koch, 1869)				1/-			-/1	-/5	-/1		8	P	
<i>Araniella cucurbitina</i> (Clerck, 1757)	2/-	1/-	1/1	-/3	-/1	-/1	1/-	1/2			14	A	
<i>Araniella displicata</i> (Hentz, 1847)	-/1							-/1			2	A	LR(lc)
<i>Araniella opisthographa</i> (Kulczyński, 1905)				-/1							1	T	
<i>Cyclosa conica</i> (Pallas, 1772)								-/3	1/2		6	P	
<i>Hypososinga pygmaea</i> (Sundevall, 1831)			-/3				-/1	-/1			5	M	
<i>Hypososinga sanguinea</i> (C.L.Koch, 1844)	1/-	-/1			-/1						3	A	
<i>Larinioides patagiatus</i> (Clerck, 1757)			3/-				2/4				9	M	
<i>Larinioides sdopetarius</i> (Clerck, 1757)			-/1								1	A	
<i>Mangora acalypha</i> (Walckenaer, 1802)	1/-										1	A	
<i>Nuctenea silvicultrix</i> (C.L.Koch, 1835)								-/1			1	P	CR
<i>Singa hamata</i> (Clerck, 1757)		-/1	-/2				-/4		-/1		8	M	
LYCOSIDAE													
<i>Alopecosa pulverulenta</i> (Clerck, 1757)	3/-		1/-	28/5	1/1		27/14	10/3	8/5	-/1	107	A	
<i>Alopecosa taeniata</i> (C.L.Koch, 1835)			-/1								1	M	DD
<i>Arctosa leopardus</i> (Sundevall, 1833)					6/7						13	M	
<i>Hygrolycosa rubrofasciata</i> (Ohlert, 1865)									1/3		4	M	EN
<i>Pardosa amentata</i> (Clerck, 1757)	-/1		6/4	2/2	1/3		-/5	1/-			25	P	
<i>Pardosa fulvipes</i> (Collett, 1876)									-/1		1	P	
<i>Pardosa lugubris</i> (Walckenaer, 1802)	2/-		2/2				1/1	1/-			9	A	
<i>Pardosa prativaga</i> (L.Koch, 1870)								2/-			2	P	
<i>Pardosa pullata</i> (Clerck, 1757)	1/1	-/3	140/61	7/2	3/1	-/1	7/7	20/29	20/13		316	A	
<i>Pardosa sphagnicola</i> (F.Dahl, 1908)									87/80		167	P	EN
<i>Pirata hygrophilus</i> Thorell, 1872	9/4		3/4	39/46	7/3	-/1	60/11	51/52	61/38	-/1	390	P	
<i>Pirata latitans</i> (Blackwall, 1841)	1/-	1/1	3/3	3/1	60/3		1/-	14/1			92	M	
<i>Pirata piraticus</i> (Clerck, 1757)					-/1						1	P	
<i>Pirata piscatorius</i> (Clerck, 1757)			-/1		2/2		1/1	31/8	10/1		57	M	

FAMILIES Species	Study sites										Total	Therm -pref.	Red List
	B.r.	H.K.	K.r.	M.P.	P.K.	R.b.	Ru	S.v.	So	Su			
<i>Trochosa spinipalpis</i> (F.O.P.-Cambridge, 1895)	4/-		21/20	9/-	-/1	3/4	2/4	12/10	1/6		97	P	
<i>Trochosa terricola</i> Thorell, 1856			4/9	1/2			7/7	2/1	1/1		35	A	
PISAURIDAE													
<i>Dolomedes fimbriatus</i> (Clerck, 1757)		1/-					1/-	3/6	2/2	1/2	18	P	
OXYOPIDAE													
<i>Oxyopes heterophthalmus</i> (Latreille, 1804)			1/-				2/-				4	M	
CYBAEIDAE													
<i>Gybaeus angustiarum</i> L.Koch, 1868	1/-			4/1		-/1		3/-			10	P	
HAHNIIDAE													
<i>Antistea elegans</i> (Blackwall, 1841)	-/11		17/24	12/17	-/3		5/7	21/7	147/75		346	P	
<i>Cyphoeca silvicola</i> (C.L.Koch, 1834)									-/1		1	P	
<i>Hahnina helveola</i> Simon, 1875				1/-							1	M	LR(lc)
<i>Hahnina ononidum</i> Simon, 1875							-/1				1	?	
<i>Hahnina pusilla</i> C.L.Koch, 1841			4/3	-/1					2/8		18	P	
DICTYNIDAE													
<i>Cicurina cicur</i> (Fabricius, 1793)								1/-			1	A	
<i>Dictyna arundinacea</i> (Linnaeus, 1758)			1/1				14/3	13/11		-/1	44	A	
<i>Dictyna pusilla</i> Thorell, 1856		-/1		3/3				10/2	1/-	6/3	29	P	
<i>Dictyna uncinata</i> Thorell, 1856	1/-			2/-				1/1	1/-		6	A	
AMAUROBIIDAE													
<i>Callobius claustrarius</i> (Hahn, 1833)				1/-				2/-		1/-	4	P	
<i>Coelotes inermis</i> (L.Koch, 1855)								4/2	4/4		14	P	
<i>Coelotes terrestris</i> (Wider, 1834)				2/-				7/-			9	A	
MITURGIDAE													
<i>Cheiracanthium effossum</i> Herman, 1879							-/1				1	T	VU
<i>Cheiracanthium erraticum</i> (Walckenaer, 1802)	-/4	-/2	-/1	2/5	-/2		3/7	4/13			43	M	
LIOCRANIDAE													
<i>Agroeca brunnea</i> (Blackwall, 1833)			1/1								2	A	
<i>Agroeca proxima</i> (O.P.-Cambridge, 1871)							1/5				6	P	EN
<i>Phrurolithus festivus</i> (C.L.Koch, 1835)			3/5				-/1				9	A	
CLUBIONIDAE													
<i>Clubiona comta</i> C.L.Koch, 1839									-/2		2	A	
<i>Clubiona diversa</i> O.P.-Cambridge, 1862			3/-			1/-			-/1		5	A	
<i>Clubiona frisia</i> Wunderlich & Schuett, 1995			-/2								2	M	
<i>Clubiona germanica</i> Thorell, 1871	-/1							-/1			2	M	
<i>Clubiona kulczyński</i> Lessert, 1905									-/2		2	P	
<i>Clubiona lutescens</i> Westring, 1851										-/1	1	M	
<i>Clubiona neglecta</i> O.P.-Cambridge, 1862										-/1	1	A	
<i>Clubiona phragmitis</i> C.L.Koch, 1843					1/-						1	M	
<i>Clubiona reclusa</i> O.P.-Cambridge, 1863	-/15	-/1		3/7	-/1		1/12	1/31		1/5	78	P	
<i>Clubiona stagnatilis</i> Kulczyński, 1897					1/3		-/1		-/1		6	M	
<i>Clubiona subsultans</i> Thorell, 1875			-/1					1/1	-/1	-/1	5	P	
<i>Clubiona trivialis</i> C.L.Koch, 1843	2/9	-/1	9/23	5/9		1/1	5/6	12/6	5/5	2/4	105	A	
GNAPHOSIDAE													
<i>Drassodes cupreus</i> (Blackwall, 1834)			2/-								2	?	
<i>Drassodes pubescens</i> (Thorell, 1856)			3/-				2/1	1/1			8	A	
<i>Gnaphosa microps</i> Holm, 1939									4/1		5	P	CR
<i>Gnaphosa nigerrima</i> L.Koch, 1877	1/1		1/-	2/-				6/3			14	M	VU
<i>Haplodrassus signifer</i> (C.L.Koch, 1839)			9/6	4/1			1/2	1/-			24	A	
<i>Haplodrassus umbratilis</i> (L.Koch, 1866)			1/-								1	A	
<i>Micaria pulicaria</i> (Sundevall, 1831)								-/1			1	A	
<i>Zelotes divicola</i> (L.Koch, 1870)			1/-				12/2	1/-			16	P	
<i>Zelotes latreillei</i> (Simon, 1878)			2/1					1/-			4	A	
ZORIDAE													
<i>Zora armillata</i> Simon, 1878								3/1			4	?	EN
<i>Zora distincta</i> Kulczyński, 1915									3/-		3	P	VU

FAMILIES Species	Study sites										Total	Therm -pref.	Red List
	B.r.	H.K.	K.r.	M.P.	P.K.	R.b.	Ru	S.v.	So	Su			
<i>Zora silvestris</i> Kulczyński, 1897							1/1				2	?	
<i>Zora spinimana</i> (Sundevall, 1833)	-/1	-/1	36/4	-/1	2/-			-/2	-/2		49	A	
HETEROPODIDAE													
<i>Micrommata virescens</i> (Clerck, 1757)	-/2										2	A	
PHILODROMIDAE													
<i>Philodromus aureolus</i> (Clerck, 1757)										1/-	1	M	
<i>Philodromus cespitum</i> (Walckenaer, 1802)			1/4				-/3			-/1	9	M	
<i>Philodromus collinus</i> C.L.Koch, 1835		-/1		5/3		1/1	1/-	5/5	2/1		25	A	
<i>Philodromus emarginatus</i> (Schränk, 1803)	-/1		-/1						2/2	-/1	7	M	
<i>Philodromus margaritatus</i> (Clerck, 1757)						-/1			-/1		2	M	
THOMISIDAE													
<i>Diaea dorsata</i> (Fabricius, 1777)				1/-							1	M	
<i>Misumena vatia</i> (Clerck, 1757)		-/1		2/1	-/1			-/1		-/1	7	A	
<i>Ozyptila atomaria</i> (Panzer, 1801)								-/1			1	T	
<i>Ozyptila brevipes</i> (Hahn, 1826)		-/2								-/1	3	M	VU
<i>Ozyptila trux</i> (Blackwall, 1846)	2/-			2/-			1/1	2/-			8	P	
<i>Xysticus audax</i> (Schränk, 1803)	-/1			-/1			-/1		-/5	1/2	11	A	
<i>Xysticus bifasciatus</i> C.L.Koch, 1837							-/1		-/1		2	A	
<i>Xysticus cristatus</i> (Clerck, 1757)			-/1								1	A	
<i>Xysticus emertoni</i> Keyserling, 1880				-/1							1	P (?)	
<i>Xysticus luctator</i> L.Koch, 1870									1/-		1	A	LR(lc)
<i>Xysticus ulmi</i> (Hahn, 1831)	-/1				-/4			-/2	-/1	-/1	9	M	
SALTICIDAE													
<i>Aelurillus v-insignitus</i> (Clerck, 1757)							1/-				1	T	
<i>Dendryphantès rudis</i> (Sundevall, 1833)						-/1	-/1	2/1	1/5	-/1	12	A	
<i>Euophrys frontalis</i> (Walckenaer, 1802)	1/-		6/1	1/-			6/-	2/-	-/1		18	A	
<i>Evarcha arcuata</i> (Clerck, 1757)	4/5		-/1		2/1		12/4		9/4	5/4	51	M	
<i>Evarcha falcata</i> (Clerck, 1757)				-/4				3/2	4/2	-/4	19	A	
<i>Heliophanus auratus</i> C.L.Koch, 1835			-/1								1	M	
<i>Heliophanus dampfi</i> Schenkel, 1923	-/1		2/6	2/-					-/2		13	P	CR
<i>Heliophanus dubius</i> C.L.Koch, 1835							2/-				2	M	
<i>Heliophanus patagiatus</i> Thorell, 1875			-/1								1	T	LR(nt)
<i>Neon reticulatus</i> (Blackwall, 1853)									1/-		1	M	
<i>Neon valentulus</i> Falconer, 1912			-/1					2/1			4	M	CR
<i>Salticus cingulatus</i> (Panzer, 1797)	-/1							-/1	-/1		3	M	
<i>Sibianor aurocinctus</i> (Ohlert, 1865)			-/1								1	A	
<i>Sitticus caricis</i> (Westring, 1861)					1/-						1	P	VU
<i>Sitticus floricola</i> (C.L.Koch, 1837)							-/2	4/12	3/1	-/2	24	P	
<i>Synageles venator</i> (Lucas, 1836)					1/-				1/-		2	M	
<i>Talavera monticola</i> (Kulczyński, 1884)			-/1								1	P	VU
<i>Talavera westringi</i> (Simon, 1868)	-/1		2/3					1/-			7	P	
Total	168	38	1003	442	160	58	465	793	922	133	4182		
No. of pitfall traps in 2001	8	4	4	8	8	8	4	16	12	4	76		
No. of pitfall traps in 2002	8	4	20	16	-	-	12	16	12	8	96		
No. of species	53	24	111	83	35	26	80	113	88	42	234		