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HARVESTMEN AND SPIDERS IN THE AUSTRIAN WETLAND "HÖRFELD-MOOR" (ARACHNIDA: OPILIONES, ARANEAE)

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Abstract

Komposch C.: Harvestmen and spiders in the Austrian wetland "Hörfeld-Moor" (Arachnida: Opiliones, Araneae). In Gajdoš P., Pekár S. (eds): Proceedings of the 18th European Colloquium of Arachnology, Stará Lesná, 1999. Ekológia (Bratislava), Vol. 19, Supplement 4/2000, p. 65-77.

Aspects of the fauna of the montane wetland „Hörfeld-Moor" were investigated with regard to taking an inventory of the nature reserve and determining its conservation value. The harvestmen and spider fauna was studied by means of pitfall traps, light-traps, soil-sifter and hand-collecting in nine sample areas representing typical biotope types within the wetland: alder forest, willow shrub, hay meadow, moist meadow, sedge swamp, reed bed, meadowsweet fen, floating mat and raised bog. The following noteworthy arachnids were found: *Nemastoma schuelleri, Opilio dinaricus, Platybunus pinetorum, Enoplognatha caricis, Diplocephalus helleri, Drepanotylus uncatus, Maro lepidus, Pardosa fulvipes, Pirata tenuitarsis, Clubiona germanica* and *Gnaphosa nigerrima.* 19 of the spider species found are new to Carinthia. An interesting result is the attractiveness of light-traps for particular harvestmen and spider species.
The percentage of endangered arachnid species was not related to either the diversity and evenness indices of the investigated biotope types or with the percentage of endangered plant species. Furthermore, the present analysis is a useful approach for applying zoological results obtained in particular places to an entire area.

Introduction

Fens belong to the most endangered biotope types of Central Europe. The Hörfeld-Moor is one of the largest near-natural fens of Austria. It has carried the status of a nature reserve since 1984 (Carinthia) and 1987 (Styria) respectively. In 1996 it became a Ramsar-area and it has been suggested as a Natura 2000-area.

The arachnid fauna from Austrian wetlands is still poorly known; moreover only few data are available from wetlands above 900 metres altitude. The results are part of an integrated monitoring programme of the development of the ecosystem, including fauna and vegetation. Faunistical investigations have been carried out on Opiliones, Araneae, Odonata,

T a b l e 1. Floral characterisation of the investigated biotope-types.

no	abbr.	biotope type	characterisation
1	*Alnus*	Alder forest	*Alnus incana* dominates the tree layer, *Scirpus sylvaticus, Caltha palustris, Filipendula ulmaria*
2	*Salix*	Willow shrub	A late stage of succession of a former hay meadow: *Salix cinerea, S. repens, Betula pendula, B. pubescens* beside a species spectrum similar to the moist meadow (4)
3	s-mead	Hay meadow	Typical species of fresh meadows: *Holcus lanatus, Scirpus sylvaticus, Ranunculus acris, Juncus effusus, Leucanthemum vulgare, Cirsium palustre*
4	m-mead	Moist meadow	The cultivation of this oligotrophic meadow with a high species richness ended a few years ago: *Carex acutiformis, C. paniculata, C. rostrata, Molinia coerulea, Menyanthes trifoliata, Persicaria bistorta, Briza media, Potentilla erecta, Succisa pratensis*
5	*Carex*	Sedge swamp	Formed as a floating mat on an acidic and oligotrophic substrate: *Carex rostrata* in high dominance, partly with hillocks of *Carex elata*
6	*Phrag*	Reed bed	Large reed beds (*Phragmites australis*) with *Carex elata*-hillocks in between
7	fen	Meadowsweet fen	Dominated by *Filipendula ulmaria*
8	float	Floating mat	Dominated by *Menyanthes trifoliata, Potentilla palustris, Carex paniculata, Carex rostrata, Caltha palustris*
9	bog	Raised bog	A very small hummock area with mire spruces (*Picea abies*), *Eriophorum vaginatum, Vaccinium oxycoccos, Drosera rotundifolia, Andromeda polifolia, Vaccinium vitis-idaea*

Auchenorrhyncha, Heteroptera (FRIESS, 1998), Coleoptera (Carabidae, Staphylinoidea) and Lepidoptera (HUEMER, WIESER, 1997) and vertebrates. The aim of the project is to prepare an inventory and evaluation of the nature reserve to derive recommendations for biotope management.

Study area

The area of investigation is the wetland „Hörfeld-Moor“ which extends over 133 hectares at a height of 930 metres in the Gurktaler Alps, a southern part of the Central Alps (S Mühlen, N Hüttenberg, Carinthian and Styrian border, Austria; 47°00‘N, 14°30-31‘E).

Material and methods

The arachnid fauna was studied by means of pitfall traps, light-traps, soil-sifter and hand-collecting in the vegetation period of 1996. Four pitfall traps in each biotope type were exposed from May until October: Data for harvestmen come from the whole period, but spider material was determined only from May/June (1.05.-13.06.1996)., because of the large amount of effort needed to process the samples. Faunistical investigations were carried out in nine representative biotope types (Table 1).

Beside biotopes and vegetation, parameters like soil type, water budget, distance from the ground water, cover of the herb-, shrub- and tree layer, thickness of the litter etc. were mapped in the whole area. The present analysis includes, in total, 13 harvestmen (209 specimens) and 111 spider species (2150 specimens).

Results

Method comparison

It is a well-known fact, that the use of pitfall traps, soil-sifter and hand-collecting leads to a distinct species-spectrum; consequently every zoological inventory of a richly-structured area requires the application of different sampling-methods. The attractiveness of light-traps for particular harvestmen and spider species results in an interesting and characteristic coenosis of phalangiids, theridiids, linyphiids, tetragnathids, araneids, pisaurids, gnaphosids and clubionids. 10 to 25% of the harvestmen and spider species of the Hörfeld-area were caught exclusively by light-traps (the low intensity of hand collecting must be mentioned). In the present case light-traps caught rarely-collected arachnids such as *Opilio dinaricus* Šilhavý, *Enoplognatha caricis* (Fickert), *Cheiracanthium punctorium* (Villers) and *Clubiona germanica* Thorell.

Species assemblages

Regarding the harvestmen-coenosis the dominance of *Nemastoma schuelleri* Gruber et M. in the litter of the alder forests and of *Mitopus morio* (Fabricius) in the raised bog is noteworthy; this phalangiid is a very common species in montane and alpine zones above 1 500 metres but rather sporadic in lower regions of the Eastern Alps. The phenotype of *M. morio* (with its white stripe on the opisthosoma) from the cold bog – the temperature figure sensu Ellenberg (1979) T = 3, – is similar to those of specimens of altitudes above 1 500/2 000 metres.

The spider assemblages are characterised by the occurrence of hygro- and hydrophilous lycosids and linyphiids. The most frequent species in this area is *Pirata hygrophilus* Thorell, and the floating mat seems to be the optimal habitat for *Pirata piscatorius* (Clerck). The sympatric occurrence of *Trochosa terricola* Thorell and *Trochosa spinipalpis* (F. O. P.-Cambridge) forms the spider-coenosis of the raised bog.

Cluster analysis

The hierarchical cluster analysis of harvestmen-coenoses based on species and dominance identity show both the isolated position of the raised bog (9) and a similarity between alder forests (1) and meadowsweet fens (7). Analysis of spider-coenoses led to a similar picture regarding the status of the raised bog. Concerning species identity a cluster of all wet biotope types is noticeable (Fig. 2); the dendrogram based on the dominance identity accentuates the high- and low vegetation associations willow shrub (2) - meadowsweet fen (7) and sedge swamp (5) - floating mat (8) respectively.

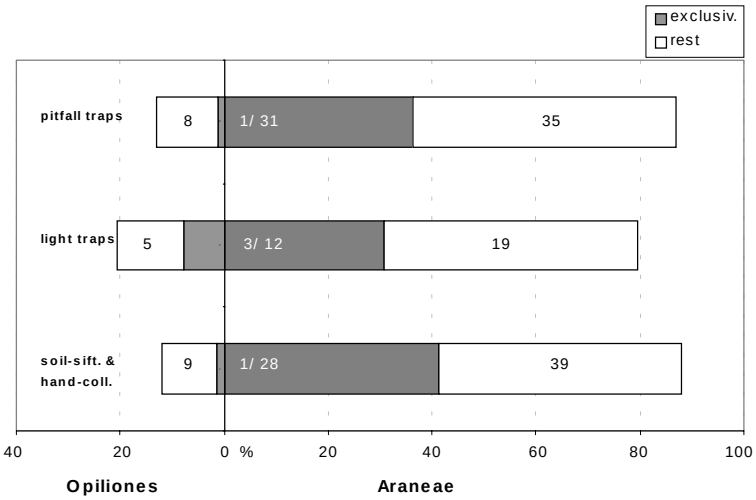

Fig. 1. Comparison of sampling methods: percentage of species recorded exclusively by pitfall traps, light-traps, soil-sifter and hand-collecting.

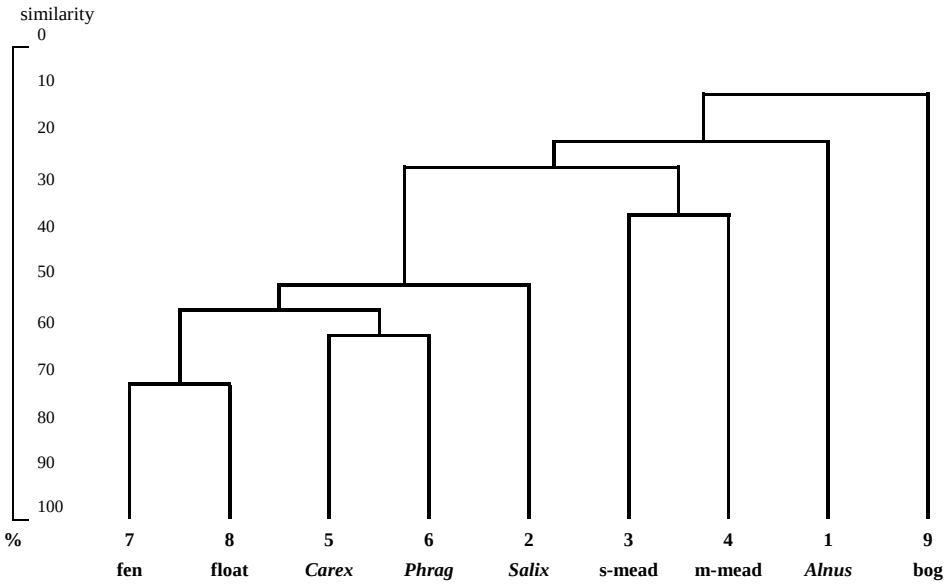

Fig. 2. Hierarchical cluster analysis of spider-coenoses based on species identity. Dendrogram using Average Linkage (between groups) and Sörensen´s quotient of similarity.

The majority of harvestmen recorded are eurytopic species; the single record of the forest-inhabiting phalangiid *Platybunus pinetorum* (C. L. KOCH) in the hay meadow (3) can be regarded as an artefact. A richness of spider species in combination with a high percentage (58-73%) of endangered species is demonstrated for the biotope types floating mat (8), reed bed (6), meadowsweet fen (7) and sedge swamp (5) (Fig. 3); low values are presented for the moist meadow (4) and the small raised bog (9).

High values concerning the evenness of the spider-communities show the alder forests (1), sedge swamps (5) and floating mats (8); the low value of the meadowsweet fen (7) is caused by the dominance of *P. hygrophilus* (51%).

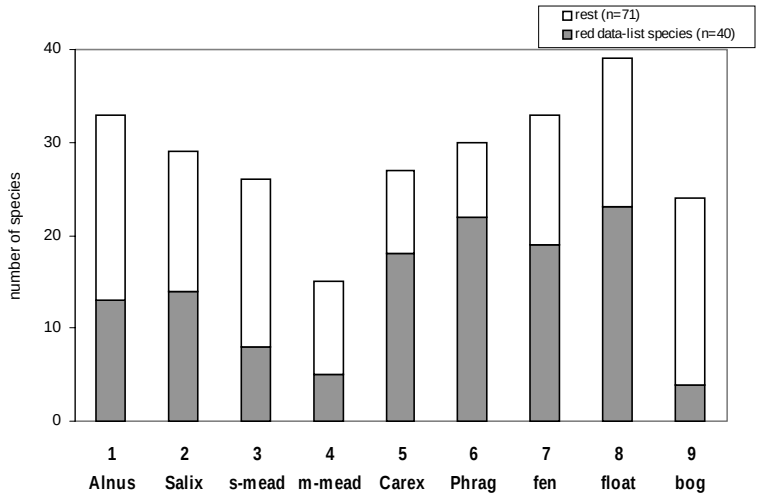

Fig. 3. Number of endangered spider species and total number of species of each sample area/biotope type.

Aspects of nature conservation value

The percentage of endangered arachnid species (Table 5, 6, Fig. 3) shows no relationship with the diversity and evenness indices of the investigated biotope types (Table 5, 6) or with the percentage of endangered plant species (Fig. 4). Fig. 4 shows high divergences in the percentage of endangered species within one sample area between floristic and faunistic aspects, between zoophagous and phytophagous taxa (e.g. Araneae - Auchenorrhyncha) and even within zoophagous groups (e.g. Araneae - Carabidae). Striking differences between zoological and botanical results are obvious if we look at reed beds (6) and the raised bog (9). The *Phragmites australis* - "monoculture" contains a high diversity of carnivorous arthropods, the floristically interesting bog presents a contrary picture. The lack of endan-

T a b l e 2. Ecological characterisation of western Central Europe with regard to distinct environmental factors (ELLENBERG, 1979) and total number of plant species in the specific sample areas.

	1 ***Alnus***	**2** ***Salix***	**3** **s-mead**	**4** **m-mead**	**5** ***Carex***	**6** ***Phrag***	**7** **fen**	**8** **float**	**9** **bog**
Light value (L)	5.6	7.1	6.8	6.8	8.1	6.7	6.6	7.3	8.1
Temperature value (T)	4	3.4	5	3.8	4	4.8	5	5	3
Continentality value (K)	4.4	5.1	3.8	4	*	3.5	4.5	4.5	5.3
Moisture value (F)	7.2	8.3	6.5	7.5	9.8	8.8	7.7	8.7	6.9
Reaction value (R)	6.6	4.5	5.7	5.7	4	6.3	6	6	1.2
Nitrogen value (S)	4.9	3.7	4.7	3.8	4.1	5.4	5.5	4.1	1.1
number of plant species	20	14	24	31	4	10	14	13	11

T a b l e 3. List of collected harvestmen species. The number of specimens in each biotope type is given. The total number of specimens and number caught by different collecting methods (pt: pitfall trap, ss: soil-sifter, hc: hand-collecting, lt: light-trap) are also given. Systematics after MARTENS (1978).

	Alnus	***Salix***	**s-mead**	**m-mead**	***Carex***	***Phrag***	**fen**	**float**	**bog**		**method**			
family / species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**total**	**pt**	**ss**	**hc**	**lt**
NEMASTOMATIDAE														
Nemastoma schuelleri GR. ET M.	29						1			**30**	12	16	2	
Nemastoma triste (C. L. K.)									3	**3**		3		
Paranemastoma quadripunctatum (PANZ.)	4		1	1			2		9	**17**	10	4	3	
PHALANGIIDAE														
Amilenus aurantiacus (SIMON)									12	**12**				12
Lacinius ephippiatus (C. L. K.)	4									**4**	3	1		
Lophopilio palpinalis (HERB.)	4		1				2		1	**8**	4	1	2	1
Mitopus morio (FABR.)			1						39	**40**			4	36
Nelima semproni SZAL.						1				**1**				1
Oligolophus tridens (C. L. K.)	28		1		1	3	5	3		**41**	11	11	16	3
Opilio dinaricus ŠILH.									3	**3**				3
Phalangium opilio L.		4	7	2	2	1		11		**27**	14		3	10
Platybunus pinetorum (C. L. K.)			1							**1**	1			
Rilaena triangularis (HERB.)	7	5			2		5	2	1	**22**	7	5	7	3
Total	**76**	**9**	**12**	**3**	**5**	**5**	**15**	**16**	**68**	**209**	**62**	**41**	**37**	**69**

gered arachnids and insects in the raised bog could be caused by the very low size and isolation of this area. NEET (1996) shows a significant correlation between the number of tyrphobiont spider species influenced by habitat-size.

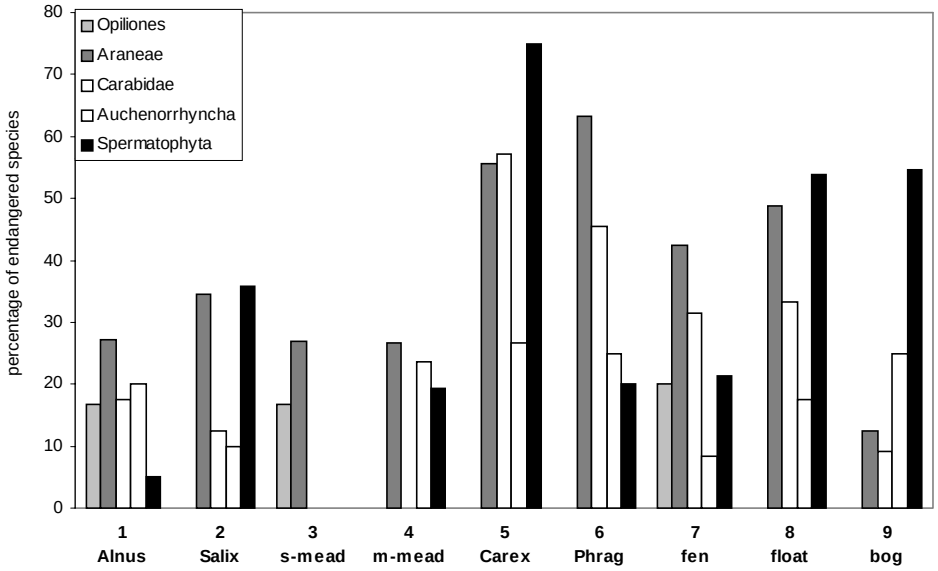

Fig. 4. Percentage of endangered species of Carinthia of each sample area/biotope type: Opiliones, Araneae, Carabidae, Auchenorrhyncha, Spermatophyta.

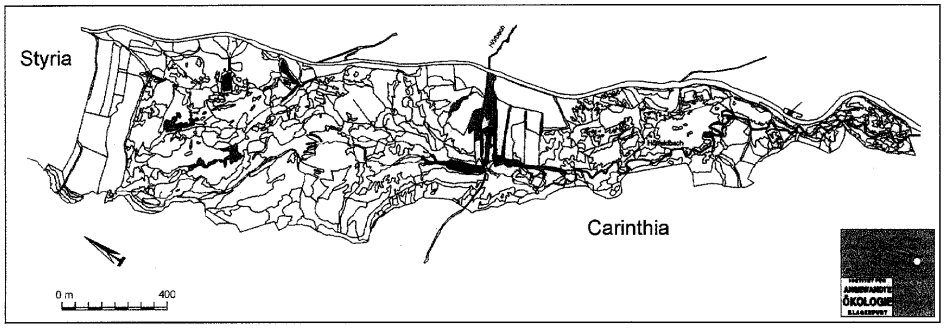

Fig. 5. Potential map of distribution of *Nemastoma schuelleri* (dark areas), a litter inhabiting harvestman of alder forests in the "Hörfeld-Moor".

Low-scale mapping versus high-scale evaluation?

Due to the large amount of time and effort involved, faunistical data concerning arthropods in general are derived from point sampling. A detailed zoological and botanical analysis of representative biotope types combined with mapping of biotopes

and relevant structural parameters for the whole area can be calculated by modern software (GIS) to map the potential distribution of selected stenotopic and sensitive bioindicators (Fig. 5). This method should be regarded as an instrument of estimating distribution and apparent abundance as well as evaluating divisions and biotopes of large areas.

Further investigations would be worthwhile to check the similarities between potential maps of distribution of the particular species with the actual one.

Notes on selected species

Nemastoma schuelleri - This endemic species of the Eastern Alps is very numerous in alder forests.

Opilio dinaricus - This rarely collected phalangiid shows that crepuscular and not epigeic animals seem to be under-represented in the majority of arachnological studies; there are multiple records from Carinthia by means of light-traps.

Platybunus pinetorum - This forest inhabiting species is one of the rarest harvestmen of southern Austria (KOMPOSCH, 1999) whereas in the Bavarian Alps it is much more common (MUSTER, in litt.).

Enoplognatha caricis - The third record for Austria (KOMPOSCH, 1995a; ROTH, 1999: sub *E. tecta*) of this endangered theridiid was made (using a light-trap) on the 10th June with one male in the sedge swamp. The nomenclature follows RŮŽIČKA, HOLEC (1998).

Diplocephalus helleri (L. KOCH) - Constant occurrence in the high-alpine and nival zone (THALER, 1992; THALER, KNOFLACH, 1997); the author knows of two further records on the Styrian rivers Enns and Teigitsch between 520 and 635 m. In the Hörfeld-Moor one male was found in the litter of the alder forest.

Drepanotylus uncatus (O. P.-CAMBRIDGE) and *Maro lepidus* CASEMIR - Tyrphobiont species of the alder forest and reed bed (compare NEET, 1996).

Pardosa fulvipes (COLLET) - „Perhaps *fulvipes* has in some degree been overlooked within its area of distribution“ (HOLM, KRONESTEDT, 1970: 423). This seems to be confirmed by another record in Carinthia west of Spittal a.d. Drau (STEINBERGER, in litt.).

Pirata tenuitarsis SIMON - The few records from Austria (Northern Tyrol, Vorarlberg, Styria) are probably due to confusion with the sibling species *P. piraticus* (BUCHAR, THALER, 1997).

Clubiona germanica - A rare (collected ?) clubionid with an Eurosiberian distribution (MIKHAILOV, 1992).

Gnaphosa nigerrima L. KOCH - In the Hörfeld-Moor this endangered species shows a high habitat preference for the *Menyanthes* - floating mat. A recent record in the Wörschacher Moor in Styria/Austria shows it occurs on hummocks in a former peat cutting area (RUPP, 1999).

Discussion

The species spectrum of the Hörfeld-Moor is far from a complete inventory, but it could be regarded as a representative survey of the arachnocoenoses of this area. In comparison THALER (in LÖSER et al., 1982) published 158 spider species from the Bavarian nature reserve „Murnauer Moos", RUPP (1999) recorded 119 spider species from the Styrian bog area "Wörschacher Moor" in Eastern Austria. 19 species are new to Carinthia (see Table 4) - so the total number of currently known species of this southern federal country of Austria is 610 (KOMPOSCH, STEINBERGER, 1999). This high number of first recorded species is due to the insufficient knowledge about southern Austrian wetlands - the Hörfeld-Moor is the third investigated wetland of Carinthia after the Sablatnigmoor (KOMPOSCH, 1995b) and the Bleistätter Moor/Ossiacher See (KOMPOSCH, unpubl.) - as well as to the location of species rare all over Central Europe.

Modern conservation work needs both stenotopic and sensitive bioindicators as conservation tools and striking flagship species, which may even become symbols and leading elements of entire conservation campaigns (compare MILASOWSZKY, ZULKA, 1998). Potential flagship species of the Hörfeld area are the spiders *Araneus alsine* (WALCKENAER), *Pirata piscatorius*, *Dolomedes fimbriatus* (CLERCK) and *Gnaphosa nigerrima*. Close cooperation between botanists and zoologists seems to be a basic requirement for effective nature conservation work. Inventories of selected arthropod groups lead to precise and detailed statements on small-scale areas in general. Connected with results of vertebrate investigations, geological, botanical, vegetational and structural mappings, a comprehensive picture and conservation value for the whole area can be given. A conservation value and derived recommendations for biotope management taking the complexity and patch connectivity of ecosystems into consideration has to be based on adequate data of a representative spectrum of investigated taxa - both zoophagous and phytophagous indicator groups.

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T a b l e 4. List of collected spider species. An asterisk (*) denotes species which are new to the fauna of Carinthia. The number of specimens in each biotope type is given. The total number of specimens and number caught by different collecting methods (pt: pitfall trap, ss: soil-sifter, hc: hand-collecting, lt: light-trap) are also given. Systematics after KOMPOSCH, STEINBERGER (1999).

	Alnus	*Salix*	s-mead	m-mead	*Carex*	*Phrag*	fen	float	bog		method			
family / species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**total**	**pt**	**ss**	**hc**	**lt**
THERIDIIDAE														
Crustulina guttata (WIDER)				1						**1**	1			
Enoplognatha ovata (CL.)	1	2								**3**				3
Enoplognatha caricis (FICK.)					1					**1**				1
Episinus angulatus (BL.)									1	**1**				1
Euryopis flavomaculata (C. L. K.)									2	**2**	1	1		
Robertus lividus (BL.)	1									**1**		1		
Robertus scoticus JACK.									6	**6**		6		
Robertus truncorum (L. K.)	1									**1**		1		
Theridion sisyphium (CL.)		1								**1**				1
LINYPHIIDAE														
Agyneta cauta (O. P.-C.)	2			1			1	1		**5**	4	1		
Araeoncus crassiceps (WEST.)*			1		25	1	6	38		**71**	71			
Bathyphantes approximatus (O. P.-C.)*	1	1			4	3	2	2		**13**	4	2	7	
Bathyphantes nigrinus (WEST.)	11					1	1		3	**16**	7	7	2	
Bathyphantes gracilis (BL.)						1				**1**	1			
Bolyphantes alticeps (SUND.)	1									**1**				1
Centromerus arcanus (O.P.-C.)*									4	**4**	2	2		
Centromerus levitarsis (SIMON)*		1	1	1		1	1	1		**6**	4		2	
Centromerus pabulator (O. P.-C.)									1	**1**			1	
Centromerus sylvaticus (BL.)	1					1				**2**		2		
Ceratinella brevipes (WEST.)			4				1			**5**	5			
Ceratinella brevis (WIDER)	1									**1**		1		
Cnephalocotes obscurus (BL.)*									1	**1**	1			
Dicymbium brevisetosum LOCK.			1							**1**			1	
Diplocephalus helleri (L. K.)	1									**1**		1		
Diplocephalus latifrons (O. P.-C.)	2									**2**		2		
Diplostyla concolor (WIDER)	2									**2**	1	1		
Dismodicus bifrons (BL.)		1					1			**2**	1			1
Drepanotylus uncatus (O. P.-C.)*	2					7				**9**	1	5	3	
Entelecara congenera (O. P.-C.)	1									**1**		1		
Erigone atra BL.			3							**3**	3			
Erigone dentipalpis (WIDER)			5					4		**9**	9			
Erigonella hiemalis (BL.)	1									**1**		1		
Erigonella ignobilis (O. P.-C.)*			1			9		8		**18**	18			
Floronia bucculenta (CL.)					1	1				**2**			1	1
Gnathonarium dentatum (WIDER)*						5				**5**	2	2	1	
Helophora insignis (BL.)	16									**16**		4	5	7
Hypomma bituberculatum (WIDER)					1	1		9		**11**	8		3	
Linyphia triangularis (CL.)	4								9	**13**			9	4
Lophomma punctatum (BL.)*	2				4	7		4		**17**	9		8	
Maro lepidus CASE.*	2									**2**		2		
Maso sundevalli (WEST.)	1									**1**		1		
Neriene clathrata (SUND.)								1		**1**			1	
Oedothorax apicatus (BL.)								1		**1**		1		
Oedothorax fuscus (BL.)							1			**1**	1			
Oedothorax gibbosus (BL.)		21				28	43	15		**107**	106		1	
Oedothorax retusus (WEST.)	1									**1**	1			
Pelecopsis elongata (WIDER)		5								**5**		5		
Pocadicnemis pumila (BL.)									2	**2**	2			
Porrhomma oblitum (O. P.-C.)*	1									**1**		1		
Silometopus elegans (O. P.-C.)*			1		2	2	3	44		**52**	52			
Tallusia experta (O. P.-C.)*		1			1	2				**4**		2	2	
Tapinocyba insecta (L. K.)		4								**4**		4		
Walckenaeria alticeps (DENIS)									4	**4**	4			
Walckenaeria atrotibialis (O. P.-C.)							1			**1**	1			
Walckenaeria kochi (O. P.-C.)		1				1	8	2		**12**	10		2	
Walckenaeria nudipalpis (WEST.)*	1						2			**3**	2	1		
TETRAGNATHIDAE														
Metellina segmentata (CL.)									2	**2**			2	
Pachygnatha clercki SUND.		8	2		1	44	2	2		**59**	17	1	5	36
Pachygnatha degeeri SUND.			37							**37**	37			
Pachygnatha listeri SUND.		4		21			1			**26**	21		2	3

T a b l e 4./Cont.

family / species	*Alnus* 1	*Salix* 2	s-mead 3	m-mead 4	*Carex* 5	*Phrag* 6	fen 7	float 8	bog 9	total	method pt	ss	hc	lt
Tetragnatha extensa (L.)		3	2		2		1	3		**11**			5	6
Tetragnatha montana SIMON	1	1			1					**3**		1	1	1
Tetragnatha pinicola L. K.									1	**1**				1
ARANEIDAE														
Aculepeira ceropegia (WALC.)					1					**1**			1	
Araneus alsine (WALC.)	1		1							**2**			1	1
Araneus diadematus CL.									1	**1**			1	
Araneus marmoreus CL.									1	**1**				1
Araneus quadratus CL.		1		2	1		4	1		**9**			5	4
Araneus sturmi (HAHN)		1								**1**				1
Hypsosinga heri (HAHN)					3	1		1		**5**			4	1
Hypsosinga pygmaea (SUND.)								4		**4**	4			
Larinioides patagiatus (CL.)		1								**1**		1		
LYCOSIDAE														
Alopecosa cuneata (CL.)			1							**1**	1			
Alopecosa pulverulenta (CL.)			75	6						**81**	81			
Alopecosa trabalis (CL.)			1			1				**2**	2			
Pardosa amentata (CL.)	2		21		14	4	68	8		**117**	113		4	
Pardosa fulvipes (COLL.)*			3	1	2	1	21	31		**59**	59			
Pardosa paludicola (CL.)			1							**1**	1			
Pardosa palustris (L.)			138	2				1		**141**	141			
Pardosa prativaga (L. K.)					1	1		7		**9**	8		1	
Pardosa pullata (CL.)			132	1						**133**	133			
Pirata hygrophilus TH.	12	46		5	5	80	236	28	13	**425**	414		10	1
Pirata latitans (BL.)			1				1	1		**3**	3			
Pirata piraticus (CL.)						19	1			**20**	20			
Pirata piscatorius (CL.)		1			3	8		53		**65**	63		2	
Pirata tenuitarsis SIMON*		4			5	47	3	22		**81**	79		2	
Trochosa ruricola (DE GEER)			20			1		1		**22**	21			1
Trochosa spinipalpis (F. O. P.-C.)		13	11	12			2	8	29	**75**	74		1	
Trochosa terricola TH.	1		1						39	**41**	39	1	1	
PISAURIDAE														
Dolomedes fimbriatus (CL.)	2	2			12	3	22	33	3	**77**	57		1	19
Pisaura mirabilis (CL.)		1		3	2			2		**8**			1	7
AGELENIDAE														
Histopona torpida (C. L. K.)									1	**1**			1	
HAHNIIDAE														
Antistea elegans (BL.)								2		**2**	2			
Cryphoeca silvicola (C. L. K.)		2								**2**		2		
AMAUROBIIDAE														
Callobius claustrarius (HAHN)									1	**1**	1			
CLUBIONIDAE														
Cheiracanthium punctorium (VILL.)				2						**2**				2
Clubiona germanica TH.*	1									**1**				1
Clubiona lutescens WEST.	8	1					4			**13**	2	1	1	9
Clubiona phragmitis C. L. K.	1	4			1	25	1			**32**	1		16	15
Clubiona reclusa O. P.- C.	1	8		1			7	1		**18**	3			15
Clubiona stagnatilis KULC.					5			6		**11**	1		7	3
GNAPHOSIDAE														
Gnaphosa nigerrima L. K.*							2	8		**10**	10			
ZORIDAE														
Zora spinimana (SUND.)		2					1	2	2	**7**	3		4	
THOMISIDAE														
Ozyptila trux (BL.)					2		7	4		**13**	11		2	
Xysticus bifasciatus C. L. K.			2	1						**3**	3			
Xysticus cristatus (CL.)			13						1	**14**	13		1	
Xysticus ulmi (HAHN)*					2		6	4		**12**	6		6	
SALTICIDAE														
Evarcha arcuata (CL.)								4		**4**			4	
Evarcha falcata (CL.)									1	**1**			1	
Neon reticulatus (BL.)									2	**2**	2			
Sitticus floricola (C. L. K.)		1			4	3	1	8		**17**	2		15	
Total	**87**	**142**	**479**	**60**	**106**	**309**	**462**	**375**	**130**	**2150**	**1780**	**65**	**157**	**148**

T a b l e 5. Number of species, diversity, evenness (Shannon index), and percentage of endangered species and dominant harvestman species (> 5 specimens) of the specific sample areas, and total number and average for the whole area of investigation.

		No sp.	**div.**	**even.**	**% endang. sp.**	**dominant species**
1	*Alnus*	6	1.42	0.79	17	*N. schuelleri* (38%), *O. tridens* (37%), *R. triangularis* (9%)
2	*Salix*	2	–	–	0	
3	s-mead	6	1.35	0.75	17	*P. opilio* (58%)
4	m-mead	2	–	–	0	
5	*Carex*	3	–	–	0	
6	*Phrag*	3	–	–	0	
7	fen	5	1.45	0.90	20	*O. tridens* (33%), *R. triangularis* (33%)
8	float	3	0.83	0.76	0	*P. opilio* (69%)
9	bog	7	1.29	0.66	0	*M. morio* (57%), *A. aurantiacus* (18%), *P. quadripunctatum* (13%)
	Total	**13**	**–**	**–**	**15**	
	average	**4**	**1.27**	**0.77**	**6**	

T a b l e 6. Number of species, diversity, evenness (Shannon index), percentage of endangered species and dominant spider species of the specific sample areas, and total number and average for the whole area of investigation.

		No sp.	**div.**	**even.**	**% endang. sp.**	**dominant species**
1	Alnus	33	2.93	0.84	39	*H. insignis* (18%), *P. hygrophilus* (14%), *B. nigrinus* (13%)
2	Salix	29	2.52	0.75	48	*P. hygrophilus* (32%), *O. gibbosus* (15%), *T. spinipalpis* (9%)
3	s-mead	26	2.02	0.62	31	*P. palustris* (29%), *P. pullata* (28%), *A. pulverulenta* (16%)
4	m-mead	15	2.09	0.77	33	*P. listeri* (35%), *T. spinipalpis* (20%), *A. pulverulenta* (10%)
5	Carex	27	2.75	0.83	67	*A. crassiceps* (24%), *P. amentata* (13%), *D. fimbriatus* (11%)
6	Phrag	30	2.44	0.72	73	*P. hygrophilus* (26%), *P. tenuitarsis* (15%), *P. clercki* (14%)
7	fen	33	1.89	0.54	58	*P. hygrophilus* (51%), *P. amentata* (15%), *O. gibbosus* (9%)
8	float	39	2.96	0.81	59	*P. piscatorius* (14%), *S. elegans* (12%), *A. crassiceps* (10%)
9	bog	24	2.34	0.74	17	*T. terricola* (30%), *T. spinipalpis* (22%), *P. hygrophilus* (10%)
	total	**111**	**–**	**–**	**36**	
	average	**28**	**2.44**	**0.74**	**47**	

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