

Spiders of Gaderská and Blatnická Dolina valleys in the southern part of Veľká Fatra Mts., Slovakia (Araneae)

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Abstract: During the years 1974-1976 and 1986-1990, a research of epigeic spiders of the Gaderská and Blatnická Dolina valleys was carried out in 71 study sites. Altogether, 3295 spiders belonging to 293 species and 28 families were captured in the non-forest, ecotones and forest habitats. Out of the identified species, 32 are listed in the Red List of Spiders of Slovakia and one species (*Centromerus semiater*) has not been previously reported from Slovakia. The occurrence of *Meioneta innotabilis* is faunistically very important because it was considered an extinct species in Slovakia. *Zelotes puritanus* has been reported from Slovakia only from this area. The family Linyphiidae was eudominant in species composition (101 species – D=34.5%). Specimens from the families Linyphiidae, Lycosidae and Cybaeidae were the most abundant (D=23.4%, 17.4% and 12.3%). Eurytopic psychrophilous and mesophilous spiders represented the highest number of species. Species diversity in the research area is rather high, consisting of approximately 32.5% of the Slovak araneofauna. Four of the study forest habitats (relict origin oak, beech, fir-beech and pine forests) and two non-forest habitats (dry calcareous grassland and subalpine meadows) were evaluated as important habitats for spider diversity conservation and conservation of threatened spider species (territories with high diversity of spiders, with the highest proportion of endangered and rare species).

Key words: spiders, faunistics, nature conservation, Veľká Fatra National Park, North Slovakia

Introduction

The Gaderská and Blatnická Dolina valleys form the southern part of the Veľka Fatra Mts., which are important orographical units in Slovakia. In the zoogeographical classification, the area of the Veľka Fatra Mts. represents the Western Carpathian part of the subprovince of the Carpathian Mountains and the Central European Mountains. There occur animals of steppe, forest-steppe, cultural steppe, agricultural land, synantropic species, and also species of wetland and marshy biotopes. The submontanous, montanous, boreoalpine, subalpine and alpine species predominate in the area with many rare species, which occur in Slovakia only here. For some species this is the northern border of their distribution in Europe. The Cosmopolitan, Holarctic, Palearctic, Euro-Siberian, Siberian, European, Caucasian, Pontic, Submediterian, Boreo-alpine and Boreal elements of our fauna are manifested here.

From the point of view of arachnological research, the territory of the Veľká Fatra Mts., as well as the Gaderská and Blatnická Dolina valleys had received only little attention until 2000. Only a few papers (SVATOŇ 1981, 1983, FRANC 2002) describe the spider fauna of the region. The territory was included in the Natura 2000 network in 2003 and this fact initiated an evaluation of the unpublished araneological material collected from 71 localities in this area in the periods 1974-1976 and 1986-1990. The aims of this study are to present the results of this inventory and to propose a classification of the studied habitats according to their importance from a point of view of the spider fauna conservation.

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Material and Methods

Study area

The study area comprises the upper part of the Blatnica and Gader Creek catchments (the area of Gaderská and Blatnická Dolina valleys). These valleys lie in the south western part of Veľká Fatra Mts. In accordance with the orographic division of Slovakia (HROMÁDKA 1956) Veľká Fatra Mts. belongs to a zone of the inner Western Carpathians with crystalline core and Mesozoic cover. A predominant part of its geological base consists of limestone and dolomite rocks. This geological substratum allows the occurrence of high number of species which are bound to rocky limestone and dolomitic biotopes with numerous caves, semi-caves, rock hollows and clefts that create suitable conditions for troglophilous and cavernicolous species. From a biological point of view, the most valuable habitats are inaccessible rock walls, steep slopes and sharp ridges undisturbed by human activities. Natural vertical zoning of the vegetation is here quite often disturbed by following geomorphological factors: inclination, orientation, relief, wideness and depth of both valleys. This causes species inversion, which means occurrence of cryophilic plant and animal species at the bottoms of valleys below the zone of beech and oak forest and occurrence of thermophilous species in the top zone of the hills which surround the Gaderská and Blatnická Dolina valleys.

Due to different climatic, morphological, geological and vegetation conditions in addition to forestry and farming activities in Veľká Fatra Mts, as well as in the adjacent Turčianska Kotlina basin, the valleys support a high plant and animal diversity. Altitudinal zoning ranges from 385 m to 1500 m above the sea level, segmentation of terrain, different terrain expositions and different substratum create a vivid mosaic of contrasting sites, biocoenosis with various animal communities bound to these habitat types.

Sampling

The spider fauna was studied by different methods such as pitfall trapping, sifting detritus and dead leaves, sweeping herbal layer, beating the trees and shrubs, as well as individual collection under stones, in grass and among leaves. Spiders were fixed in 80% ethanol.

Study sites and habitats

Sampling was carried out in 71 study sites of different types of habitats (Appendix 1). The sites were chosen as the most representative habitat types of this region. They represent non-forest habitats (debris and rock formations, caves, dry calcareous meadows, hygrophilous and forest meadows, fen meadows, peat-bogs, subalpine meadows and shrubby habitats) and forest habitats such as alder (*Alnetum incanae*) forests growing on gravel deposits near creeks, pioneer birch habitat, original azonal oak forests (*Quercetum*), virgin and secondary beech forests (*Fagetum typicum*), original fir-beech forests (*Abieto-Fagetum*), secondary mixed beech-spruce forests (*Fageto-Piceetum*), original and secondary pine forests (*Pineetum*), original and secondary spruce forests (*Piceetum*) and original dwarf pine habitat (*Pinion mughii*).

Analysis

The evaluation of the main studied habitats in the Gaderská and Blatnická Dolina valleys was done on the basis of spider species richness and diversity, mainly by the presence of threatened and rare spider species. For analysis of species data the program CANOCO (TERBRAAK, ŠMILAUER 2002) was used. Richness of samples (N^1) related to Shannon entropy statistics (H) using the relation $N^1 = e^H$, Shannon's diversity (H), the maximum achievable value of the diversity (H_{\max}) ($H_{\max} = \log(S)$, S = number of species) in samples and evenness (J) ($J = H/\log(S)$) were calculated (Table 3).

Table 1. List of families: number of captured species and specimens.

Family	Species		Specimens	
	Number	D (%)	Number	D (%)
Atypidae	2	0.68	34	1.03
Pholcidae	1	0.34	1	0.03
Segestriidae	1	0.34	27	0.82
Dysderidae	3	1.02	17	0.52
Mimetidae	1	0.34	6	0.18
Theridiidae	19	6.48	53	1.61
Linyphiidae	101	34.47	772	23.43
Tetragnathidae	9	3.07	141	4.28
Araneidae	19	6.48	125	3.79
Lycosidae	30	10.24	572	17.36
Pisauridae	1	0.34	1	0.03
Agelenidae	9	3.07	69	2.09
Cybaeidae	1	0.34	404	12.26
Hahniidae	5	1.71	15	0.46
Dictynidae	3	1.02	17	0.52
Amaurobiidae	6	2.05	342	10.38
Titanoecidae	1	0.34	17	0.52
Anyphaenidae	1	0.34	9	0.27
Liocranidae	3	1.02	61	1.85
Clubionidae	9	3.07	22	0.67
Corinnidae	1	0.34	19	0.58
Gnaphosidae	13	4.44	180	5.46
Zoridae	5	1.71	20	0.61
Heteropodidae	1	0.34	35	1.06
Zodariidae	1	0.34	42	1.27
Philodromidae	8	2.73	52	1.58
Thomisidae	20	6.83	110	3.34
Salticidae	19	6.48	132	4.01
Total	293	100	3295	100

Table 2. Thermo-preference of the spider fauna in the study area: S – number of species, Sp – number of specimens, D – dominance (after BUCHAR 1983, 1992).

Thermo-preference	S	D (%)	Sp	D (%)
Thermophilous (T)	47	16.04	419	12.72
Psychrophilous (P)	78	26.62	1405	42.64
Mesophilous (M)	78	26.62	374	11.35
Eurytopic (Non-specific) (N)	87	29.69	1081	32.81
Not determined (?)	3	1.02	16	0.49
Total	293	100	3295	100

Table 3. Evaluation of the forest, ecotone and non-forest spider faunas in the study area. Sp – number of specimens, S – number of species, categories of threat: see Appendix 2, (1) – new species for Slovakia, Σ – total number of threatened species, N_1 – richness of species in samples, H_1 – Shannon's diversity of samples, H_{max} – H maximum in samples, J – evenness of samples.

Habitat	S		Categories of threat								Σ	N_1	(H)	H_{max}	J
	Sp	S	EX	CR	EN	VU	LR	DD							
Origin forests (Or.f.)	1336	190	1	1	4	4	8	1	19						
Alder forest (<i>Aln</i>)	161	26					1		1	5.81	1.76	3.26	0.54		
Oak forest (<i>Qu</i>)	307	70		1	1	3	2		7	37.16	3.62	4.25	0.85		
Beech forest (<i>Fag.</i>)	327	69				1	3	1	5	28.06	3.33	4.23	0.79		
Fir-beech forest (<i>AbfF</i>)	190	49	1			1	3		6	26.61	3.28	3.89	0.84		
Spruce forest (<i>Pic</i>)	38	8				1			1	5.13	1.63	2.08	0.79		
Pine forest (<i>Pin</i>)	256	77		1	2		5		8	44.91	3.80	4.34	0.87		
Dwarf pine forest (<i>Pm</i>)	57	18			1				1	8.79	2.17	2.89	0.75		
Secondary forests (Se.f.)	531	92				1	2		3 (1)						
Birch forest (<i>Bet</i>)	96	35				1			1	27.25	3.31	3.56	0.93		
Beech forest (<i>Fag</i>)	30	9							0	6.05	1.80	2.20	0.82		
Spruce forest (<i>Pic</i>)	224	36					2		2	9.37	2.24	3.58	0.62		
Pine forest (<i>Pin</i>)	130	40							(1)	26.47	3.28	3.69	0.89		
Mixed forest (<i>Mix</i>)	51	13							0	8.09	2.09	2.56	0.81		

Table 3. Continued.

Habitat	Sp	S	EX	Categories of threat						Σ	N ₁	(H)	H _{max}	J
				CR	EN	VU	LR	DD						
Ecotones	273	95			1	0	2		3					
O.pine forest	16	12							0	11.31	2.43	2.48	0.98	
S.beech forest	6	6							0	6	1.79	1.79	1	
S.spruce forest	242	81			1		2		3	56.07	4.03	4.39	0.92	
Non-forest habitats	1140	192		1	4	6	9	2	22					
Debris and rock-faces (<i>Deb</i>)	50	26				1	2		3	20.13	3.0	3.26	0.92	
Caves (<i>Cv</i>)	88	13				1	1		2	3.81	1.34	2.56	0.52	
Shrubby habitat (<i>Shr</i>)	31	20					1		1	18.02	2.89	3.0	0.97	
Dry calcareous grassland (<i>Dry</i>)	189	64			3	1	2	1	7	37.15	3.61	4.16	0.87	
Subalpine meadows (<i>S-alp</i>)	338	91		1	2	3	3	1	10	54.44	3.98	4.51	0.89	
Forest meadows and mesophilous meadows (<i>Mes</i>)	283	68				1	2		3	30.87	3.43	4.14	0.83	
Fen meadows (Fen)	103	30							0	17.03	2.84	3.4	0.83	
Peat bog	71	34			1		2	1	4	23.68	3.16	3.53	0.9	

Many habitats were not evaluated because of the low number of captured specimens and species. For evaluation of the thermo preference of captured species Buchar's classification (BUCHAR 1983, 1992) was used. The nomenclature and systematic order of spiders follow PLATNICK (2005).

Results

Species composition

Altogether 3295 spiders belonging to 293 species were captured in non-forest and forest habitats. The species number in the Gaderská and Blatnická valleys is rather high, representing approximately 32.5 % of the Slovak araneofauna. Of the identified species, 32 species are included in The Red List of Spiders of Slovakia (GAJDOŠ *et al.* 1999, GAJDOŠ, SVATOŇ 2001) and one species (*Centromerus semiater*) has not been previously reported from Slovakia. Also the occurrence of the species *Meioneta innotabilis* was documented, which is important from a faunistic point of view, because this species was considered extinct in Slovakia. *Zelotes puritanus* has previously been reported from Slovakia only from this area (GAJDOŠ, SVATOŇ 1993, GAJDOŠ *et al.* 1999, FRANC 2002). The composition of the spider fauna in the habitats depends on the habitat types (Appendix 2).

Family composition

Twenty eight families were recorded in non-forest and forest ecosystems of the Gaderská and Blatnická Dolina valleys. The families Linyphiidae and Lycosidae were eudominant in the species composition (101 species – D-34.5%, 30 species – D-10.2%). Specimens from the families Linyphiidae, Lycosidae, Cybaeidae and Amaurobiidae were the most abundant (D - 23.4%, 17.4% 12.3% and 10.4 %) (Table 1).

Thermo-preference

The psychrophilous component was represented by 78 species (26.62%) and 1405 specimens (42.64%), while the mesophilous component was represented by 78 species (26.62%). The thermophilic fauna was presented in the study area by 47 species (16.04%), occurring mainly in the extremely dry calcareous meadows and azonal oak forests with southern exposition. The largest component of the captured species (87 species) belongs to eurytopic species (29.69%). The remaining few species can not be categorized (1.02%) (Table 2).

Evaluation of the spider fauna of forest habitats and ecotones

In the forest habitats, classified in 7 typological groups (*Alnetum incanae*, *pioneer habitat with Betula pubescens*, *Quercetum*, *Fagetum typicum*, *Abieto-Fagetum*, *Fageto-Piceetum* and *Pinion mughii*), the species diversity was high (216 species or 73.72% of all captured species, Appendix 2). In these ecosystems we also recorded many species that are significant and important from a faunistic-ecological, as well as from a zoogeographical point of view. The most important captures are: *Dasumia carpatica*, *Evansia merens*, *Mecynargus morulus*, *Meioneta innotabilis*, *Tenuiphantes zimmermanni*, and *Trichoncus hackmani*. In the ecotones the most important species are: *Pardosa sordidata*, *Peponocranium praeceps*, *Sitticus zimmermanni*, and *Poeciloneta variegata* (Appendix 2).

On the basis of the criteria chosen for the habitat evaluation, four of the habitats (relict pine forest (*Pinetum dealpinum*), relict azonal oak forest (*Quercetum*), original fir-beech forest, and original beech forest) were considered as important habitats for the spider diversity and also for conservation of threatened species. Of these habitats the relict pine forest has the highest species

richness (N_1 - 44.91) and the highest number of threatened species (8 species). Of the ecotone habitats the margin of the secondary spruce forests presents high species richness (N_1 - 56.07) with occurrence of 3 threatened species (Table 3).

Evaluation of the spider fauna of non-forest habitat

From the non-forest habitats 192 spider species (65.53%) were recorded (Appendix 2). Several spider species bound to the non-forest ecosystems of the Gaderská and Blatnická Dolina valleys, are very important from faunistic-ecological and zoogeographical points of view. Such species are: *Notioscopus sarcinatus*, *Xysticus luctuosus*, *Tapinocyba biscissa*, *Tapinocyba pallens*, etc. *Centromerus capucinus*, *Centromerus serratus*, *Incestophantes crucifer*, *Improphantes improbulus*, *Peponocranium praeceps* and *Zelotes puritanus* were very rare in the collected material. On the basis of the criteria which have been chosen for the habitat evaluation, two of the studied non-forest habitats (dry calcareous grasslands and sub-alpine meadows) were evaluated as important habitats for conservation of both spider diversity and threatened species. From non-forest habitats the sub-alpine meadows present the highest species richness (N_1 - 54.44) and also manifest presence of threatened species (10 species) (Table 3).

Discussion

The recording of 293 spider species from a restricted area indicates the richness of the habitats in the studied area. This makes approximately 32.5 % of the Slovak araneofauna, in spite of the fact that still relatively small part of Slovakia has been studied. The compositions of the spider fauna in the studied habitats were quite different, depending mainly on vegetation structure and various environmental factors, as well as on recent utilisation of the landscape. From the investigated non-forest habitats the spider communities of the open dry calcareous grasslands and sub-alpine meadows are especially interesting from nature conservation point of view (areas with high spider species diversity, with the highest proportion of threatened species). The cover of these habitat types is continually decreasing as a result of natural succession, and there is a urgent need for preparation of management plans for their protection.

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References

- BUCHAR J. 1983. Die Klassifikation der Spinnenarten Böhmens als ein Hilfsmittel für die Bioindikation der Umwelt. - *Fauna Bohemiae septentrionalis*, **8**: 119-135.
- BUCHAR J. 1991. The use of faunistical data for biomonitoring. - *Bulletin de la Société neuchâteloise des Sciences Naturelles*, **116**: 49-57.
- FRANC V. 2002. Contribution to the knowledge on spiders (Araneae) of the Veľká Fatra Mts. - *Matthias Belivs University Proceedings*, Supplement, **2** (1): 155-163.
- GAJDOŠ P., J. SVATOŇ 1993. The red list of spiders of Slovakia. - *Proceedings of the XIV European Colloquium of Arachnology, Catania. Bollettino dell'Accademia Gioenia di Scienze Naturali*, **26** (345): 115-133.
- GAJDOŠ P., J. SVATOŇ 2001. Červený (ekosozologický) zoznam pavúkov (Araneae) Slovenska. [Red (Eco-sozological) List of spiders (Araneae) of Slovakia]. - In: BALÁŽ D., K. MARHOLD, P. URBAN (eds.): Červený zoznam rastlín a živočíchov Slovenska. [Red List of plants and animals of Slovakia Nature Conservation]. - *Ochrana Prírody, Banská Bystrica*, Supplement, **20**: 80-86.
- GAJDOŠ P., J. SVATOŇ, K. SLOBODA 1999. Katalóg pavúkov Slovenska. [Catalogue of Slovakian spiders]. Ústav krajinej ekológie SAV, Bratislava, **1**, 337 p.; Mapy [Maps], **2**, 315 p.
- HROMÁDKA J. 1956. Orografické třídění Československé republiky. - *Sborník Československe společnosti zeměpisné, Praha*, **61** (3): 161-180, 265-299.

- PLATNICK N. I. 2005. The World Spider Catalog. Version 6.5. American Museum of Natural History, Washington, <http://research.amnh.org/entomology/spiders/catalog/INTRO1.html>.
- SVATOŇ J. 1981. Einige neue oder unvollkommen bekannte Spinnenarten aus der Slowakei. - *Biológia (Bratislava)*, **36** (2): 167-177.
- SVATOŇ J. 1983. Weitere neue oder unvollkommen bekannte Spinnenarten aus der Slowakei. - *Biológia (Bratislava)*, **38** (6): 569-580.
- TER BRAAK C. J. F., P. ŠMILAUER 2002. CANOCO Reference manual und CanoDraw for Windows User's guide: Software for Canonical Community Ordination (version 4.5). Microcomputer Power, Ithaca, NY, USA, 500 p.

Паяци (Araneae) от долините Гадерска и Блатница в южната част на планината Велка Фатра (Словакия)

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(Резюме)

В периода 1974-1976 и 1986-1990 г. е проведено изследване на епигейните паяци в 71 станции в долините Гадерска и Блатница, намиращи се в южната част на планината Велка Фатра (Словакия). Уловени са 3295 екземпляра от 293 вида и 28 семейства, установени в екотонни или изцяло горски хабитати. Тридесет и два вида присъстват в Червения списък на паяците на Словакия, а един вид – *Centromerus semiater* – е нов за фауната на Словакия. Видовото разнообразие в долините Гадерска и Блатница е високо и представлява 32.5% от словашката аранеофауна. Важни фаунистични приноси са намирането на *Meioneta innotabilis* – вид, смятан за изчезнал, и *Zelotes puritanus*, който е намиран само в този район на страната. Семейство Linyphiidae е еудоминантно (101 вида – D=34.5%), а най-много екземпляри са уловени от семействата Linyphiidae, Lycosidae и Cybaeidae (съответно D=23.4%, 17.4% и 12.3%). Евритопните, влаголюбивите и мезофилните паяци са представени с най-много видове. Четири от изследваните горски хабитати – реликтни дъбови, букови и борови гори, както и сухите пасища и субалпийските ливади, са важни за опазването на високото видово разнообразие и на големият брой застрашени видове.

Appendix 1. List of the studied sites with habitat types.

Locality	Habitat	Altitude
Original forests		
Blatnická dolina	alder forest (<i>Alnetum</i>)	542
Dedošova dolina	beech forest (<i>Fagetum typicum</i>)	650
Gaderská dolina	alder forest (<i>Alnetum</i>), gravel sediment	512
Horné piesky	flowery beech forest (<i>Fagetum dealpinum</i>)	850
Horné piesky	relict pine forest (<i>Pinetum dealpinum</i>)	987
Chládkove úplazy	relict pine forest (<i>Pinetum dealpinum</i>)	1228
Kamenný úplaz	relict pine forest (<i>Pinetum dealpinum</i>)	725
Mohošov	flowery beech forest (<i>Fagetum dealpinum</i>)	750
Mohošov grúň	flowery beech forest (<i>Fagetum dealpinum</i>)	1136
Nad Ďurdášovou	relict pine forest (<i>Pinetum dealpinum</i>)	997
Nad Mažarnou	relict oak forest with lime trees	890
Ostrá	relict pine forest (<i>Pinetum dealpinum</i>)	1100
Padva	virgin beech-fir forest (<i>Fageto-Abietum</i>)	950
Pod Mažarnou	virgin debris beech forest	780
Smrekov	origin dwarf pine habitat	1441
Široká	beech forest (<i>Fagetum typicum</i>)	950
Veterné	beech forest (<i>Fagetum typicum</i>)	900
Zadná hubná	beech forest (<i>Fagetum typicum</i>)	1003
Secondary forests		
Dedošova dolina	secondary spruce forest	650
Gaderská dolina	secondary spruce forest	574
Lubená	secondary spruce forest	1024
Nad Mažarnou	mixed beech and spruce forest	950
Plešovica	secondary pine forest	685
Pod Rovnou	pioneer birch growth (15-20 year old) after fire	870
Pod vódkami	secondary spruce forest	650
Predná hubná	mixed spruce and pine forest	800
Príkra	secondary spruce forest	795
Široká	secondary spruce forest	902
Škap	secondary spruce forest	770
Žihľavná	secondary pine forest	752
Ecotone habitats		
Dedošova dolina	margin of secondary spruce forest	567
Dolné piesky	margin of beech forest (<i>Fagetum typicum</i>)	594
Gaderská dolina	margin of secondary spruce forest	574
Horné piesky	margin of relict pine forest (<i>Pinetum dealpinum</i>)	1005
Ostrá	margin of relict pine forest (<i>Pinetum dealpinum</i>)	1103
Rovná dolina	margin of beech forest (<i>Fagetum typicum</i>)	595

Appendix 1. Continued.

Locality	Habitat	Altitude
Shrubby habitat		
Mohošov	dry shrubby meadow	1050
Meadow habitats		
Horné piesky	dry calcareous meadow	1003
Horné piesky	xerotherm forest meadow	952
Horný Jasienok	xerotherm forest meadow	948
Kamenný úplaz	dry calcareous meadow	1203
Kozia skala	dry calcareous meadow	1162
Kozia skala	xerotherm forest meadow under summit	1121
Mohošov grúň	dry forest meadow	1136
Mohošovec	dry calcareous meadow	1050
Nad Ďurdášovou	dry calcareous meadows on the foot of rock formations	700
Pod Rovnou	dry shrubby meadow	879
Široká	dry calcareous meadows	950
Veľká Skalná	dry calcareous meadow	1297
Vrátna	dry forest meadow	785
Blatnica: amfiteater	forest meadow along creek	500
Blatnická dolina	forest meadow along creek	550
Dedošová, under summit	complex of forest meadows after fire	670
Dolné piesky	forest meadow	575
Kráľov grúň	subalpine meadow	1360
Kráľova studňa	subalpine meadow	1574
Kráľova studňa	mountain meadow	1574
Krížna	subalpine meadow	1574
Magura	mesophilous forest meadow	1142
Mohošov	peat bog	730
Ostrá, summit	subalpine meadow	1264
Pod Žihlavnou	mesophilous meadow	550
Selenec	mesophilous and wet forest meadows	675
Tlstá, summit	subalpine meadow	1370
Caves, debris and rock formations		
Gaderská dolina	rock formations	574
Konský dol	rock formations	620
Mažarná	cave	850
Nad vôdkami	rock formations	1200
Smrekov	debris in subalpine zone	1441
Široká	debris	951

Appendix 2. Continued.

Red list	TP	FAMILY / Species	Origin forests			Secondary forests				Ecoton Or.		Ecoton Se.		Rocky			Peat			Meadows			Σ	
			Aln.	Fag	Qu	Pic	AbF	Pin	Pm	Bet	Fag	Pic.	Pin	Mix	Fag	Pin	Shr	Deb	Cv	bog	Dry	Mes		Fen
	M	<i>Epispinus angulatus</i> (BLACKWALL, 1836)																1			2			3
	T	<i>Epispinus truncatus</i> LATREILLE, 1809			1			2																3
	M	<i>Euryopsis flavomaculata</i> (C. L. KOCH, 1836)															1							1
	M	<i>Neotitura bimaculata</i> (LINNAEUS, 1767)						1														5		6
	M	<i>Robertus arundineti</i> (O.P.-CAMBRIDGE, 1871)					2																	2
	P	<i>Robertus lividus</i> (BLACKWALL, 1836)			2						1													3
LR (nt)	N	<i>Robertus neglectus</i> (O.P.-CAMBRIDGE, 1871)				2																		3
	P	<i>Robertus truncorum</i> L. KOCH, 1872)				1					1													3
	M	<i>Steatoda albomaculata</i> (DE GEER, 1778)																						1
	N	<i>Steatoda phalerata</i> (PANZER, 1801)																						1
	T	<i>Theridion betteni</i> WIEHLE, 1960																7						8
	N	<i>Theridion impressum</i> L. KOCH, 1881																						1
	M	<i>Theridion mystaceum</i> L. KOCH, 1870																						1
	N	<i>Theridion sisyprium</i> (CLERCK, 1757)																						1
	N	<i>Theridion varians</i> HAHN, 1833												1										1
		LINYPHIDAE (101)																						3
LR (lc)	P	<i>Agyneta subtilis</i> (O.P.-CAMBRIDGE, 1863)				5																		7

Appendix 2. Continued.

Red list	TP	FAMILY / Species	Origin forests				Secondary forests				Ecoton Or.	Ecoton Se.			Rocky			Peat	Meadows			Σ		
			Aln.	Fag	Qu	Pic	ABF	Pin	Pm	Bet		Fag	Pic.	Pin	Mix	Fag	Pin		Shr	Deb	Cv		bog	Dry
	N	<i>Dicymbium nigrum</i> (BLACKWALL, 1834)				6																		7
	N	<i>Diplocephalus cristatus</i> (BLACKWALL, 1833)				4																		6
	N	<i>Diplocephalus latifrons</i> (O.P.-CAMBRIDGE, 1863)		1		6		8						21									34	71
	N	<i>Diplocephalus plicatus</i> (BLACKWALL, 1841)		2																				6
	N	<i>Diplosityla concolor</i> (WIDER, 1834)		1		1														1				3
	P	<i>Dismodictus bifrons</i> (BLACKWALL, 1841)																						1
	P	<i>Drapetisca socialis</i> (SUNDEVALI, 1833)									7													10
	M	<i>Enelecara acuminata</i> (WIDER, 1834)		2																				2
	M	<i>Enelecara congenera</i> (O.P.-CAMBRIDGE, 1879)																						2
	N	<i>Erigone atra</i> BLACKWALL, 1833			1																	1		7
	N	<i>Erigone dentipalpis</i> (WIDER, 1834)		1					1			1												10
LR (nt)	T	<i>Erigonoplus globipes</i> (L. KOEH, 1872)							1															1
VU	P	<i>Evanisia merens</i> (CLERCK, 1757)		1						1														6
	M	<i>Gonatium paradoxum</i> (L. KOCH, 1869)		1																		2		4
	P	<i>Gonatium rubellum</i> (BLACKWALL, 1841)							1													1		3
	P	<i>Helophora insignis</i> (BLACKWALL, 1841)		2																				2

Appendix 2. Continued.

Red list	TP	FAMILY / Species	Origin forests			Secondary forests				Ecoton Or.	Ecoton Se.			Rocky			Peat			Meadows			Σ		
			Fag	Qu	Pic	ABF	Pin	Pm	Bet		Fag	Pic	Pin	Mix	Fag	Pin	Shr	Deb	Cv	bog	Dry	Mes		Fen	S-alp
	N	<i>Meioneta rurestris</i> (C. L. KOCH, 1836)					2	1										1		2			11	22	
	M	<i>Micrargus georgescuae</i> MILLIDGE, 1976																					2	3	
	P	<i>Micrargus herbigradus</i> (BLACKWALL, 1854)					2											1					11	16	
	N	<i>Micrargus subaequalis</i> (WESTRING, 1851)											1											1	
	N	<i>Microlinphia pusilla</i> (SUNDEWALL, 1830)	1	4	5	1																		15	
	N	<i>Microneta viaria</i> (BLACKWALL, 1841)																					1	10	
	N	<i>Mnicia marginella</i> (WIDER, 1834)					1																	1	
	M	<i>Minyriolus pusillus</i> (WIDER, 1834)																						2	2
	P	<i>Mughiphantes mighi</i> (FICKERT, 1875)	1		2		3																	14	
	P	<i>Mughiphantes pulcher</i> (KULCZYŃSKI, 1881)																						1	1
	M	<i>Neritene emphana</i> (WALCKENAER, 1842)					1																5	2	10
	M	<i>Neritene peltata</i> (WIDER, 1834)	1		4	2																	2	8	29
	M	<i>Neritene radiata</i> (WALCKENAER, 1842)																					1	3	
LR (nt)	P	<i>Notioscopus sarcinatus</i> (O.P.-CAMBRIDGE, 1872)																						15	15
	P	<i>Obscuriphantes obscurus</i> (BLACKWALL, 1841)																						2	3
	M	<i>Oedothorax agrestis</i> (BLACKWALL, 1853)					1																		1

Appendix 2. Continued.

Red list	TP	FAMILY / Species	Origin forests			Secondary forests				Ecoton Or.		Ecoton Se.		Rocky			Peat	Meadows			Σ		
			Fag	Qu	Pic	AbF	Pin	Pm	Bet	Fag	Pic	Pin	Mix	Fag	Pin	Shr		Deb	Cv	bog		Dry	Mes
	M	<i>Oedothorax apicatus</i> (BLACKWALL, 1850)	Aln.	1																			1
	P	<i>Oedothorax fuscus</i> (BLACKWALL, 1834)																			1		1
	P	<i>Oedothorax gibbifer</i> (KULCZYŃSKI, 1882)	1																				1
	P	<i>Oedothorax gibbosus</i> (BLACKWALL, 1841)			5																		5
	P	<i>Oedothorax retusus</i> (WESTRING, 1851)																					4
	M	<i>Palliduphantes alutacius</i> SIMON, 1884														1							1
	N	<i>Palliduphantes pallidus</i> (O.P.-CAMBRIDGE, 1871)	2																				2
EN	?	<i>Peponocranium praeceps</i> MILLER, 1943				1																	14
	N	<i>Pelecopsis radicecola</i> (L. KOEH, 1872)																					2
	P	<i>Ptyohyphantes phrygianus</i> (C. L. KOEH, 1836)	1	1	1																		10
	N	<i>Pocadicnemis pumila</i> (BLACKWALL, 1841)																3		1			4
LR (lc)	P	<i>Poecilonea variegata</i> (BLACKWALL, 1841)																					3
	P	<i>Porrhomma pygmaeum</i> (BLACKWALL, 1834)				1																	2
	P	<i>Saloca dicerus</i> (O.P.-CAMBRIDGE, 1871)																				1	1
LR (lc)	P	<i>Saloca kulczyński</i> MILLER, KRATOCHVIL, 1939			2																		4
LR (nt)	P	<i>Sauron rayi</i> (SIMON, 1881)	1	5	1																		8

Appendix 2. Continued.

Red list	TP	FAMILY / Species	Origin forests			Secondary forests				Ecoton Or.		Ecoton Se.			Rocky			Peat			Meadows			Σ		
			Aln.	Fag	Qu	Pic	ABF	Pin	Pm	Bet	Fag	Pic.	Pin	Mix	Fag	Pin	Shr	Deb	Cv	bog	Dry	Mes	Fen		S-alp	
	P	<i>Sintula corniger</i> (BLACKWALL, 1856)			16																			17		
	P	<i>Tapinocyba affinis</i> LESSERT, 1907				1																		1		
DD	M	<i>Tapinocyba bisceissa</i> (O.P.-CAMBRIDGE, 1872)																					1	1		
DD	M	<i>Tapinocyba pallens</i> (O.P.-CAMBRIDGE, 1872)																	1	1				2		
	P	<i>Tenuiphantes ataris</i> (BLACKWALL, 1853)		5	13				4														1	1	27	
	P	<i>Tenuiphantes cristatus</i> (MENGE, 1866)		1				1	2											1	1			1	14	
	N	<i>Tenuiphantes flavipes</i> (BLACKWALL, 1854)		2				1	2															1	6	
	N	<i>Tenuiphantes mingei</i> (KULCZYŃSKI, 1887)																							3	7
	P	<i>Tenuiphantes tenebricola</i> (WIDER, 1834)		4	19		4	12	9	4	1													4	67	
LR (nt)	P	<i>Tenuiphantes zimmermanni</i> (BERTKAU, 1890)		3	1		2	1																1	8	
	P	<i>Thyreosthenius parasiticus</i> (WESTRING, 1851)			1																				1	
	N	<i>Trematocephalus cristatus</i> (WIDER, 1834)					2																		2	
VU	T	<i>Trichoncus hackmani</i> MULLIGE, 1956																							3	
	N	<i>Walckenaeria antic</i> (WIDER, 1834)					1																		1	
	M	<i>Walckenaeria airotibialis</i> (O.P.-CAMBRIDGE, 1878)																							1	1
	P	<i>Walckenaeria cucullata</i> (C. L. KOCH, 1836)			3																				3	

Appendix 2. Continued.

Red list	TP	FAMILY / Species	Origin forests			Secondary forests				Ecoton Or.	Ecoton Se.			Rocky			Peat	Meadows			Σ			
			Aln.	Fag	Qu	Pic	ABF	Pin	Pm		Bet	Fag	Pic.	Pin	Mix	Fag		Pin	Shr	Deb		Cv	bog	Dry
	M	<i>Araneus angulatus</i> CLERCK, 1757														1								1
	N	<i>Araneus diadematus</i> CLERCK, 1757	1	8	1		1										1		3	5	20	9		55
	M	<i>Araneus marmoreus</i> CLERCK, 1757																2	2					9
	N	<i>Araneus quadratus</i> CLERCK, 1757																					1	2
	P	<i>Araneus sturmi</i> (HAIN, 1831)	2															2						5
	P	<i>Aranella alpica</i> (L. KOCH, 1869)																		1	1			4
	N	<i>Aranella cucurbitina</i> (CLERCK, 1757)						1																11
	M	<i>Aranella inconspicua</i> (SIMON, 1874)	1																					1
	T	<i>Aranella opisthograpa</i> (KULCZYŃSKI, 1905)																						1
	N	<i>Cercidia prominens</i> (WESTRING, 1851)																						2
	P	<i>Cyclosa conica</i> (PALLAS, 1772)																						2
	N	<i>Hyposinga sanguinea</i> (L. KOCH, 1844)	2																					4
	M	<i>Larinioides folium</i> (SCHRANK, 1803)						1																1
	N	<i>Mangora acalypha</i> (WALCKENAER, 1802)	1																					4
	M	<i>Nuctenea umbratica</i> (CLERCK, 1757)																						1
	T	<i>Zilla diodia</i> (WALCKENAER, 1802)	1																					3

Appendix 2. Continued.

Red list	TP	FAMILY / Species	Origin forests			Secondary forests				Ecoton Or.	Ecoton Se.	Rocky			Peat			Meadows			Σ				
			Aln.	Fag	Qu	Pic	ABF	Pin	Pm			Bet	Fag	Pic	Pin	Mix	Fag	Pin	Shr	Deb		Cv	bog	Dry	Mes
	P	<i>Pardosa prativaga</i> (L. KOCH, 1870)	2																					2	
	N	<i>Pardosa pullata</i> (CLERCK, 1757)																							3
	N	<i>Pardosa riparia</i> (C.L. KOCH, 1833)			13	1														1					3
	P	<i>Pardosa saltuaria</i> (L. KOCH, 1870)																							1
LR (nt)	P	<i>Pardosa sordidata</i> (THORELL, 1875)																							1
	P	<i>Pirata hygrophilus</i> THORELL, 1872	2		2																				31
	M	<i>Pirata knorri</i> (SCOPOLI, 1763)	1																	1					2
	M	<i>Pirata latitans</i> (BLACKWALL, 1841)	1																						1
	M	<i>Pirata piscatorius</i> (CLERCK, 1757)																							2
	T	<i>Tricca lutetiana</i> (SIMON, 1876)			16	2																			22
	T	<i>Trochosa robusta</i> (SIMON, 1876)				1																			4
	M	<i>Trochosa ruficola</i> (DE GEER, 1778)			1																				7
	P	<i>Trochosa spinipalpis</i> (O.P.-CAMBRIDGE, 1895)																							1
	N	<i>Trochosa terricola</i> THORELL, 1856	1	16	18	2														2					69
	N	<i>Xerolycosa nemoralis</i> (WESTRING, 1861)			3	2	3	9																	49
	N	PISAUROIDAE (1) <i>Pisaura mirabilis</i> (CLERCK, 1757)																							1

Appendix 2. Continued.

Red list	TP	FAMILY / Species	Origin forests			Secondary forests				Ecoton Or.			Ecoton Se.			Rocky			Peat	Meadows			Σ			
			Aln.	Fag	Qu	Pic	AbF	Pin	Pm	Bet	Fag	Pic.	Pin	Mix	Fag	Pin	Fag	Pic		Pin	Shr	Deb		Cv	Dry	Mes
	N	<i>Haplodrassus umbratilis</i> (L. KOCH, 1866)			4																				4	
	T	<i>Micaria fulgens</i> (WALCKENAER, 1802)				1																1			1	3
LR (lc)	T	<i>Phaeocephalus braccatus</i> (L. KOCH, 1866)																								1
	P	<i>Zelotes civicola</i> (L. KOCH, 1870)																								1
	T	<i>Zelotes erbeus</i> (THORELL, 1871)		1			5						1													1
	N	<i>Zelotes latreillei</i> (SIMON, 1878)						1																		1
	T	<i>Zelotes petrensis</i> (C. L. KOCH, 1839)		4	9		22						6													2
CR	T	<i>Zelotes puritanus</i> (CHAMBERLIN, 1922)			2		3																			1
	N	<i>Zelotes subterraneus</i> (C. L. KOCH, 1833)		1	14		4																			1
		ZORIDAE (5)																								1
VU	P	<i>Zora distincta</i> KULCZYNSKI, 1915			1		1																			1
	T	<i>Zora manicata</i> SIMON, 1878			3																					3
	N	<i>Zora nemoralis</i> (BLACKWALL, 1861)		2	1		1																			4
	T	<i>Zora pardalis</i> SIMON, 1878			1																					1
	N	<i>Zora spinimana</i> (SUNDEWALL, 1833)		1																						1
		HETEROPODIDAE (1)																								3
	N	<i>Micromma virescens</i> (CLERCK, 1757)		3	1		5																			1
		ZODARIIDAE (1)																								2
	T	<i>Zodariion germanicum</i> (C. L. KOCH, 1837)			6		7																			1
																										13
																										42

Appendix 2. Continued.

Red list	TP	FAMILY / Species	Origin forests				Secondary forests				Ecoton Or.			Ecoton Se.			Rocky			Peat	Meadows			Σ				
			Alh.	Fag	Qu	Pic	AbF	Pin	Pm	Bet	Fag	Pic.	Pin	Mix	Fag	Pin	Fag	Pic	Pin		Shr	Deb	Cv		Dry	Mes	Fen	S-alp
	M	<i>Evarcha arcuata</i> (CLERCK, 1757)		2				1														2		1	4		12	
	N	<i>Evarcha falcata</i> (CLERCK, 1757)						9														1	14	7	7		42	
	M	<i>Heliothamus aeneus</i> (HAHN, 1831)			5																						5	
	T	<i>Heliothamus cupreus</i> (WALCKENAER, 1802)		1																							3	
	T	<i>Heliothamus flavipes</i> (HAHN, 1832)																									1	
	T	<i>Philaenus chrysops</i> (PODA, 1761)								1																	5	
	T	<i>Phegria fasciata</i> (HAHN, 1826)												1													1	
	M	<i>Pseudeuophrys erratica</i> (WALCKENAER, 1826)												2													4	
	N	<i>Salticus scenicus</i> (CLERCK, 1757)																								1	1	
	N	<i>Salticus zebranus</i> (C. L. KOCH, 1837)																						1			2	
	P	<i>Sitticus floricola</i> (C. L. KOCH, 1837)							1																		1	
	P	<i>Sitticus rapicola</i> (C. L. KOCH, 1837)						5		2				1											1	2	14	
	M	<i>Sitticus saxicola</i> (C. L. KOCH, 1846)																								1	1	
EN	M	<i>Sitticus zimmermanni</i> (SIMON, 1877)																								3	5	
EN	M	<i>Synagelès lepidus</i> KULCZYŃSKI, 1897						2																			2	
	N	<i>Talavera petrensis</i> (C. L. KOCH, 1837)																								1	1	
		Total :	161	327	307	190	256	38	57	96	30	226	130	51	8	16	6	242	1	31	50	88	71	189	283	103	338	3295

