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Spider coenoses in strict forest reserves in Hesse (Germany)

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Abstract
The spider fauna of four strict forest reserves in Hesse (Germany) is analysed with respect to characterizations of the recorded species: frequency in Germany, total distribution range, summarised types of habitats. The data are compared with seven (mostly unpublished) projects in SE- and NE-Germany with a comparable species number. The number of species per project ranges from 159 to 205. In the four Strict Forest Reserves in Hesse a total of 278 has been recorded. Higher numbers of species occur on the trunk than on the ground. Rare spiders are more frequent in forests than in open land. Spider species with the most restricted distributions are best represented in forests of low mountain ranges in Hesse and Bavaria. Even a rough classification of preferred habitats yields valuable information. The biodiversity of spiders in commonly occurring types of forests is much higher than expected.

Key words: Araneae, beech, classification, distribution, eclectors, frequency, habitat, rare species, trunk

INTRODUCTION

Strict forest reserves (in Hesse) are forest areas where all forestry operations have ceased. Research into these "primeval forests of tomorrow" is an important basis for nature-orientated forestry and nature conservation (Dorow et al. 2007, 2010, Meyer & Schmidt 2008). In Hesse, strict forest reserves were established from 1988 on. At present there are 31 such reserves in Hesse, which cover a total area of about 1200 ha (average size 40 ha). The common beech (*Fagus sylvatica*) dominates most of them. 22 reserves have a reference area (average size 35 ha), where forestry is continued. This allows direct examination of the influence of forestry on the fauna.

METHODS

Spiders (and six other standard groups: Lumbricidae, Heteroptera, Coleoptera, Hymenoptera: Aculeata, Macrolepidoptera, and Aves) are analysed completely to species level. A broad set of sampling methods is used in each of the four reserve (including their reference areas) over two entire years (including winter). Most important methods for the spiders are: pitfall traps (12–15 sites with 3 traps, about 10 sites with single traps) and different types of eclectors (Figs 1–2): 8 trunk eclectors on standing beech trees (4 alive, 4 dead), 2–4 eclectors on lying dead beeches.

Fig. 1. Trunk eclector on a dead beech tree (photo: W. Dorow).

SITES

The spiders of four reserves (marked with the numbers 2, 3, 6, 8 in Fig. 3; all at 300 to 690 m a.s.l.) have so far been identified. Age of the beech trees: 80–200 years; mean temperature 6.7°–8.0°C; mean precipitation per year 748–776 mm (one exception, reserve no. 6: 1,175 mm) (see http://naturwaelder.de).

Reserve 2: Goldbachs- und Ziebachsrück, sub-montane beech forest (Luzulo-Fagetum) with sessile oak (*Quercus petraea*), Middle Red Sandstone, 300–365 m a.s.l., N 50.93°, E 9.88° (Blick 2009, Dorow et al. 2009). 166 species, 18,000 adults, 31,300 juv.

Reserve 3: Schönbuche/Neuhof, sub-montane beech forest (Luzulo-Fagetum) with sessile oak (*Quercus petraea*), Middle Red Sandstone, 370–455 m a.s.l., N 50.48°, E 9.54° (Malten 2001, Dorow et al. 2001). 202 species, 12,650 adults, 17,300 juv.

Reserve 6: Niddahänge/Schotten, montane beech forest (Hordelymo-Fagetum, Asperulo-Fagetum), basalt, 530–690 m a.s.l., N 50.53°, E 9.21° (Malten 1999, Flechtner et al. 1999). 182 species, 17,700 adults, 11,900 juv.

Reserve 8: Hohestein, sub-montane beech forest (Hordelymo-Fagetum), limestone, 455–565 m a.s.l., N 51.25°, E 10.05° (Malten & Blick 2007, Flechtner et al. 2006). 162 species, 17,000 adults, 15,900 juv.

Data from the strict forest reserves in Hesse are compared with those of selected, predominantly unpublished, projects in Germany with comparable species numbers (i.e. 156–205 species, 3,250–23,000 adult spiders):

FBav: two forests in S. Bavaria, pine, partly with beech or mixed forest, 490–550 m a.s.l., N 48.4°–48.9°, E 10.8°–11.1°, pitfall traps, trunk eclectors, 1995–1996 Mar.–Nov., data publ. by Engel (1999, 2001), det.

Fig. 2. Trunk eclector on lying dead beech (photo: W. Dorow).

for TU Freising-Weihenstephan. 175 species, 19.600 adults, 8,800 juv.

FBrb: three forests in Brandenburg, pine, partly with beech and oak, 70–140 m a.s.l., N 52.3°–52,9°, E 13.9°–14.0°, pitfall traps, trunk eclectors, and various other trap types, 2000–2002, unpubl. data, det. for FH Eberswalde. 194 species, 23,000 adults, 13,900 juv.

FDry: dry forest (mainly) in N. Bavaria with adjacent open land incl. rocks, 400–520 m a.s.l., N 49,7°, E 11,2°, pitfall traps and hand collecting, 2000 May–Oct., unpubl. data, det. for Naturschutzbehörde Regierung von Oberfranken, Bayreuth. 159 species, 3,250 adults, 1,500 juv.

FArt: artificial forest (poplar) and adjacent forest and arable land in N. Bavaria, 415–430 m a.s.l., N 49.8°, E 12.2°, pitfall traps, ground eclectors, extensive hand collecting on bark, April/May–Oct. 1995 & 2000 (Blick & Burger 2002), unpubl. data 2006–2007 (incl. winter), det. for LWF (Bayerische Landesanstalt für Wald und Forstwirtschaft) Freising. 177 species, 8,400 adults, 3,300 juv.

Border: former border between E. and W. Germany, mostly open land, 445–460 m a.s.l., N 50.3°–50.4°, E 12.0°, pitfall traps and hand collecting, 1994 April–Sept., unpubl. data, det. for the former Staatliches Umweltfachamt Plauen. 156 species, 3,500 adults, 980 juv.

Bogs: four bogs, incl. forest habitats, in N.E. Bavaria, 570–970 m a.s.l., N 50.0°–50.2°, E 11.8°–12.2°, pitfall traps, 2000 May–Oct., unpubl. data, det. for Naturschutzbehörde der Regierung von Oberfranken, Bayreuth. 173 species, 12,450 adults, 5,350 juv.

Castle: walls of four castles in N.Bavaria, partly with adjacent forests, 380–520 m a.s.l., N 49.8°–50.2°, E 11.0°–11.4°, wall

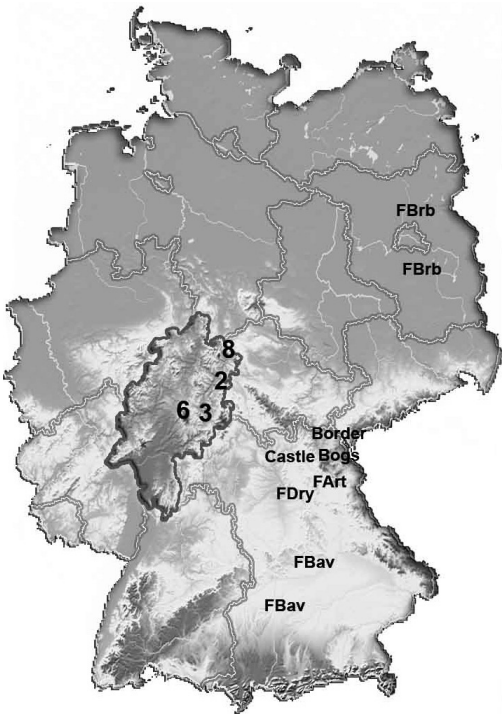


Fig. 3. Strict forest reserves in Hesse, first recording completed (2, 3, 6, 8), sites of compared data (FBav/forests in S. Bavaria, FBrb/forests in Brandenburg, FDry/dry forest in N. Bavaria with adjacent open land, FArt/artificial forest (poplar) and adjacent forest and arable land in N. Bavaria, Border/former border between Eastern and Western Germany, now border between Saxony and Bavaria, mostly open land, Bogs/Bogs in N.E. Bavaria, Castle/walls of castles in N. Bavaria).

traps, pitfall traps, hand collecting, 2006–2007 (incl. winter), unpubl. data, det. for Ökologische Bildungsstätte Oberfranken, Mitwitz. 205 species, 5,300 adults, 2,850 juv.

NUMERICAL RESULTS

A total of 278 spider species has been found in the four strict forest reserves, i.e. 40% of the ca. 700 spider species known from Hesse (Malten 1999, 2001, Malten & Blick 2007, Blick 2008; see Appendix). 162 to 202 spider species were recorded in each reserve (see above and Appendix). 19 species were new records for Hesse (see Appendix). There is as yet no significant difference between the unmanaged and managed patches of forest – due to the short time since forestry ceased.

Key results in sampling the spider diversity were [number of species (no. of the reserve)]:

- eight trunk eclectors on standing trees: 151 (3), 144 (6), 117 (8), 105 (2).
- pitfall traps: 126 (3), 119 (6), 107 (8), 100 (2).

► Diversity on the trunk is higher than on the ground.

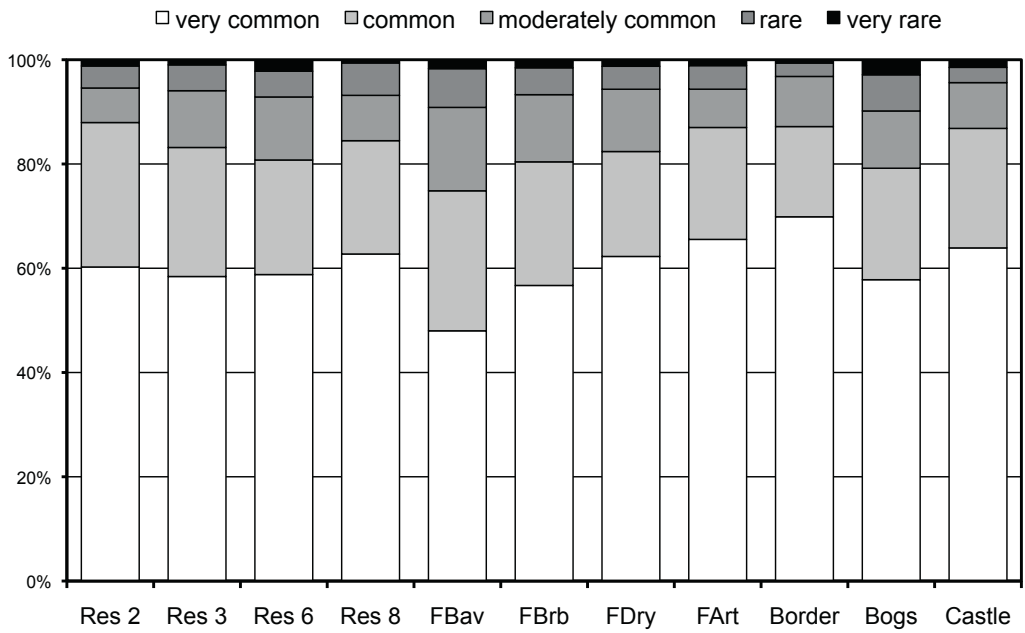
ANALYSIS

The spider fauna has been analysed according to different aspects: **frequency** of occurrence in Germany, **distribution** types, **habitat** types and other criteria such as preference for strata, altitudinal distribution, phenology, body size classes and degree of endangerment in Germany.

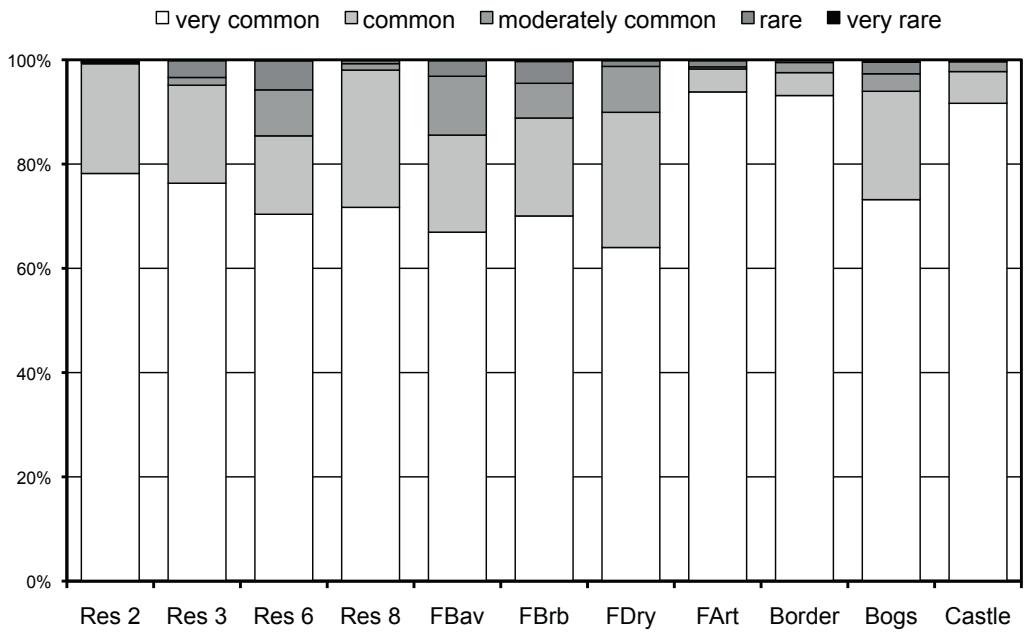
Frequency throughout Germany is divided into six groups (according to the frequency of records at http://spiderling.de/arages, Staudt 2008a): **very common, common, moderately common, rare, very rare,** extremely rare (here not relevant).

Distribution types (compilation based on Mikhailov 1997, Helsdingen 2007, Platnick 2008, Staudt 2008b): **E--**/Europe in part, explicitly less than half of the area of Europe, **E-**/Europe in part, without some western, northern, southern or eastern parts, **E**/Europe, whole of Europe or large parts of it, **E+**/Europe and adjacent parts (e.g. N. Africa, Caucasus, W.Siberia), **P**/Palaearctic, **H**/Holarctic (incl. Cosmopolitan).

Comment: Classical biogeographical classes are not used here, as these are too numerous and an overview and comparison of the sites would be too confusing. In considering the responsibility for conservation of each species, the total distribution area is more important than the biogeographical details of its range (see Gruttke 2004).

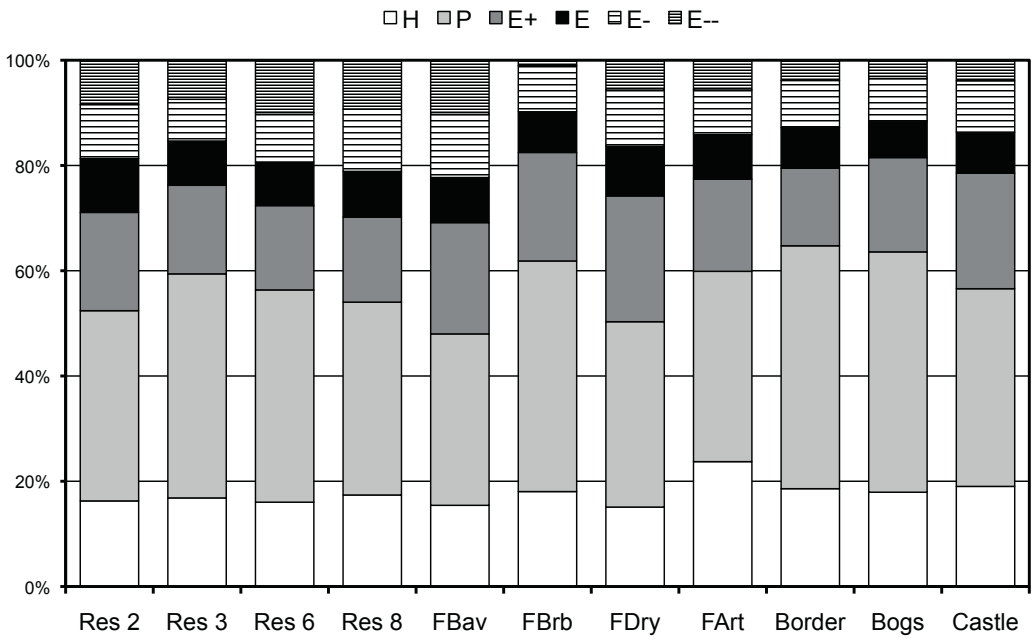


a



b

Fig. 4. Percentages of frequency (very common, common, moderately common, rare, very rare – see text) of spiders in 4 strict forest reserves in Hesse and 7 sites for comparison.
a – species numbers. b – adult specimens.



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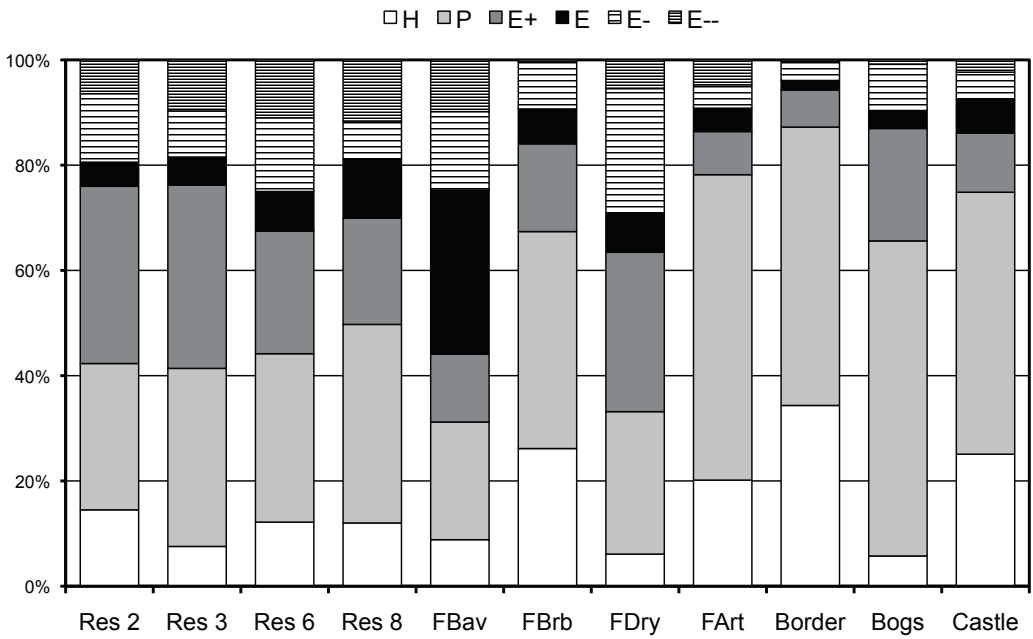
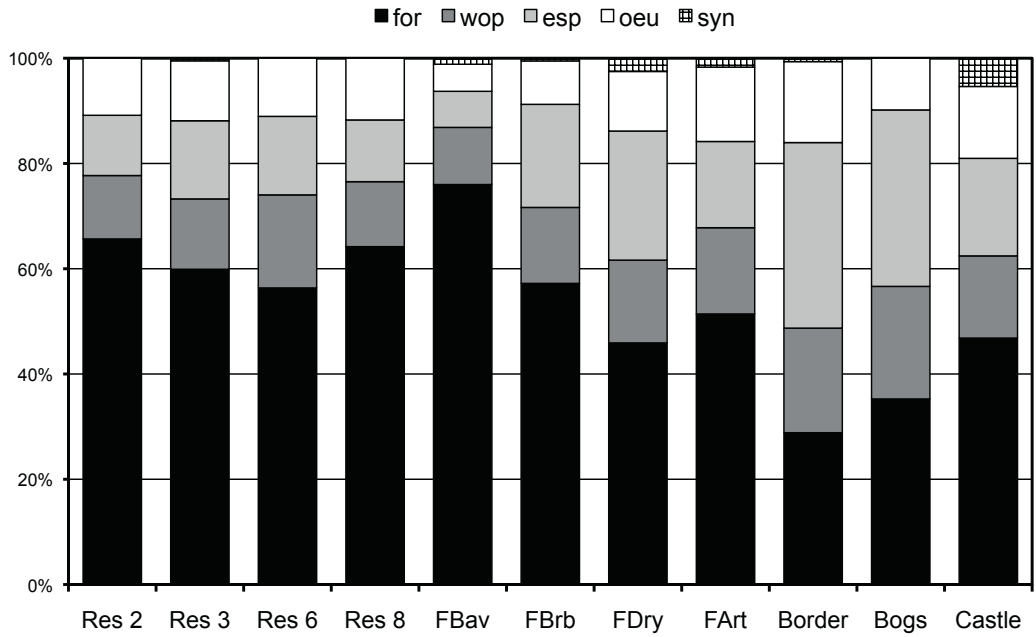


b

Fig. 5. Percentages of distribution types (H, P, E+, E, E-, E--: see text) of spiders in 4 strict forest reserves in Hesse and 7 sites for comparison.
a – species numbers. b – adult specimens.



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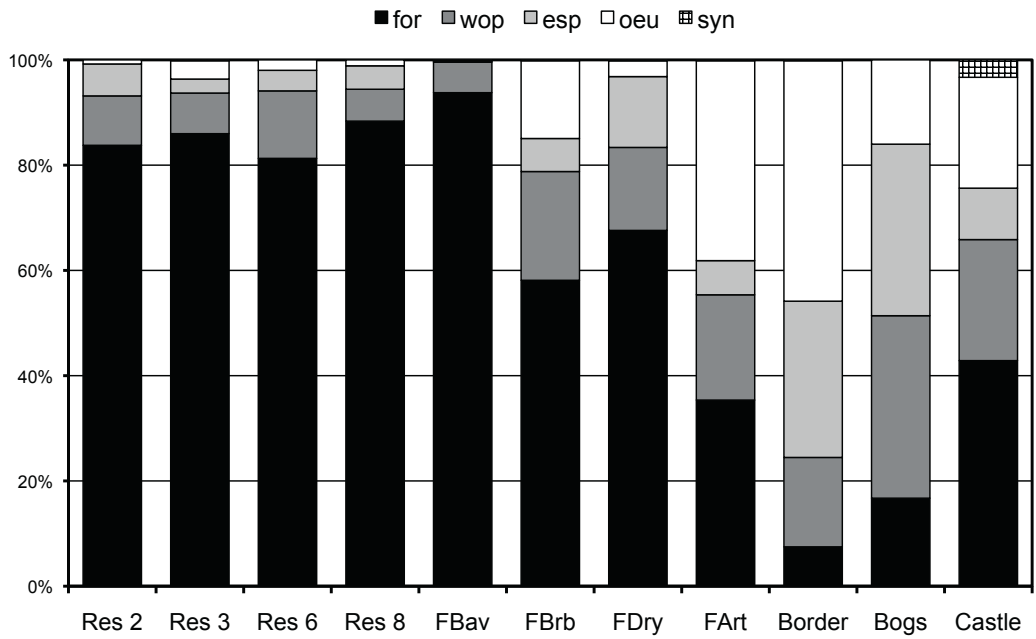

b

Fig. 6. Percentages of habitat types (for, wop, esp, oeu, syn) of spiders in 4 strict forest reserves in Hesse and 7 sites for comparison.
a – species numbers. b – adult specimens.

Habitat types are summarised as: **for**ests, **wop**/wooded and open habitats, **esp**/open habitats (specialised), **oeu**/open habitats (eurytopic), **syn**anthropous (s.lat., incl. cellars, caves, walls). After Hänggi et al. (1995), Platen et al. (1999) and own data. More detailed habitat types would be possible for other approaches.

RESULTS

Frequency (Fig. 4)

Very common spiders have the highest proportion in open habitats (Castle, Border, even in FArt), i.e. species >64%, specimens >92%.

Rare and very rare spiders have the highest percentage in some forests (Res 3–8, FBav, FBrb) and in the bogs (species 7%–10%, specimens 3%–6%).

Distribution (Fig. 5)

The highest proportion (66%–87%) of specimens with Holarctic and Palaearctic distribution is in the open habitats (see frequency), in the bogs and in FBrb (forests at the lowest altitudes).

The forests in Hesse (Res 2–8) and in Bavaria (FBav, FDry, FArt) have the highest proportion of spiders with a restricted distribution (E-, E--) (species 15%–22%, specimens 19%–29%). The same can be stated for those with the most restricted distributions (E--) (species 6%–10%, specimens 5%–12%).

Habitat (Fig. 6)

Forest spiders (for, wop) have the highest quotients in forest habitats in Hesse (Res 2–8) and S. Bavaria (FBav) (species >73%, specimens >93%).

Compared with the normally treated S. Bavarian forests (species 7%, specimens 0%), the four strict forest reserves in Hesse have a remarkable complement of specialised open land spiders (species 11%–15%, specimens 3%–6%).

Remarkable is also the high proportion of forest spiders near and on the walls (species 63%, specimens 66%).

DISCUSSION AND CONCLUSION

It is probable that the higher proportion of 'common' spiders (i.e. specimens, see Fig. 4b) in the forests compared with open land habitats (FArt, Border, Castle), where the 'very common' ones have higher proportions, simply reflects the lesser availability of data for common forest types in Germany compared with many types of open habitats.

Many spiders in the forests of low mountain ranges (in central and southern Germany) have a more restricted distribution than those of lowland forests and open habitats. Examples are: *Cinetata gradata, Formiphantes lephthyphantiformis, Gongylidiellum edentatum, Lepthyphantes nodifer, Oreonetides quadridentatus, Pseudocarorita thaleri* (compare Malten 1999, 2001, Malten & Blick 2007, Blick 2008).

Even a rough classification of preferred habitats of the species delivers interesting results for forests as well as for other types of habitats.

Specimen numbers show greater contrasts between data sets than species numbers.

This method of analysis has to be tested with more sets of data, but it seems to produce valuable results.

Finally: The biodiversity of the spider fauna even in (formerly) normally treated forests is unexpectedly high and it contains more rare and specialised spiders and those with restricted distributions than expected.

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APPENDIX

Spider species recorded in four Strict Forest Reserves in Hesse (see text), nomenclature and families follow Platnick (2008), J = only recorded as juvenile/s, species names in **bold** mark first records for Hesse.

Tenuiphantes mengei/aff. *mengei*: two different 'forms' of *T. mengei* were recorded. 'True' *mengei* sensu Roberts (1987) and Bosmans (1991), 'aff. *mengei*' sensu Wiehle (1956) and Helsdingen et al. (1977).

species	author	frequency	distrib	habitat	Res 2	Res 3	Res 6	Res 8
Segestriidae								
Segestria senoculata	(Linnaeus, 1758)	very common	P	for	20	23		27
Dysderidae								
Harpactea hombergi	(Scopoli, 1763)	very common	E-	for				3
Harpactea lepida	(C.L. Koch, 1838)	common	E--	for	239	25		205
Mimetidae								
Ero furcata	(Villers, 1789)	very common	P	for	2	7	3	1
Theridiidae								
Achaearanea lunata	(Clerck, 1757)	common	P	for	4	6		6
Achaearanea simulans	(Thorell, 1875)	moderately common	P	for		7	1	2
Crustulina guttata	(Wider, 1834)	common	P	esp		5		
Dipoena melanogaster	(C.L. Koch, 1837)	common	E+	for				1
Enoplognatha ovata	(Clerck, 1757)	very common	H	for		14	338	8
Enoplognatha thoracica	(Hahn, 1833)	very common	H	wop	1	2		
Euryopis flavomaculata	(C.L. Koch, 1836)	very common	P	wop		50	1	
Keijia tincta	(Walckenaer, 1802)	very common	H	for	5	11	2	3
Neottiura bimaculata	(Linnaeus, 1767)	very common	H	wop		1	1	
Paidiscura pallens	(Blackwall, 1834)	very common	E+	for	12	163	54	28
Pholcomma gibbum	(Westring, 1851)	common	E+	for	5	1		
Phycosoma inornatum	(O. P.-Cambridge, 1861)	very rare	E-	for		1		
Robertus lividus	(Blackwall, 1836)	very common	H	for	107	31	80	54
Robertus neglectus	(O. P.-Cambridge, 1871)	common	P	wop			8	14
Robertus scoticus	Jackson, 1914	moderately common	P	for		10	551	
Theridion mystaceum	L. Koch, 1870	common	E	for	6	15	4	
Theridion pinastri	L. Koch, 1872	common	P	for		14		
Theridion sisyphium	(Clerck, 1757)	common	P	esp		1		
Theridion varians	Hahn, 1833	very common	H	for	1	9	13	15
Linyphiidae								
Agyneta cauta	(O. P.-Cambridge, 1902)	moderately common	P	wop			1	

species	author	frequency	distrib	habitat	Res 2	Res 3	Res 6	Res 8
Agyneta conigera	(O. P.-Cambridge, 1863)	common	P	for	2	37	202	2
Allomengea vidua	(L. Koch, 1879)	common	H	esp			8	
Araeoncus humilis	(Blackwall, 1841)	very common	E+	esp	22	17	10	32
Asthenargus paganus	(Simon, 1884)	common	E+	for	49	164	165	27
Bathyphantes approximatus	(O. P.-Cambridge, 1871)	very common	E+	wop			1	
Bathyphantes gracilis	(Blackwall, 1841)	very common	H	oeu	12	5	16	15
Bathyphantes nigrinus	(Westring, 1851)	very common	P	for	3		44	4
Bathyphantes parvulus	(Westring, 1851)	very common	E-	oeu	2	6	43	1
Bathyphantes similis	Kulczynski, 1894	rare	E--	wop			1	
Bolyphantes alticeps	(Sundevall, 1833)	moderately common	P	esp		1	40	36
Centromerita bicolor	(Blackwall, 1833)	very common	E	oeu	2	3	18	2
Centromerita concinna	(Thorell, 1875)	common	E	wop	53	7		
Centromerus cavernarum	(L. Koch, 1872)	moderately common	E--	for	3	6	1	17
Centromerus dilutus	(O. P.-Cambridge, 1875)	common	E-	for	528	2		5
Centromerus incilium	(L. Koch, 1881)	common	E	for				1
Centromerus leruthi	Fage, 1933	moderately common	E--	for			10	
Centromerus pabulator	(O. P.-Cambridge, 1875)	very common	E-	for	2	42		5
Centromerus subcaecus	Kulczynski, 1914	very rare	E--	for			9	4
Centromerus sylvaticus	(Blackwall, 1841)	very common	H	wop	715	235	477	358
Ceratinella brevis	(Wider, 1834)	very common	P	for	79	83	4	7
Cinetata gradata	(Simon, 1881)	rare	E--	for	2	12	19	2
Cnephalocotes obscurus	(Blackwall, 1834)	very common	P	oeu	6	22	16	10
Dicymbium nigrum brevisetosum	Locket, 1962	very common	E--	oeu	3	3	8	7
Dicymbium tibiale	(Blackwall, 1836)	common	E-	for	19		52	165
Diplocephalus cristatus	(Blackwall, 1833)	very common	H	esp	1011		1	585
Diplocephalus latifrons	(O. P.-Cambridge, 1863)	very common	E+	for	24	45	1201	10
Diplocephalus permixtus	(O. P.-Cambridge, 1871)	common	E-	wop		7	20	
Diplocephalus picinus	(Blackwall, 1841)	very common	E+	for	92	52	735	90
Diplostyla concolor	(Wider, 1834)	very common	H	wop	208	62	196	169
Dismodicus bifrons	(Blackwall, 1841)	very common	P	wop			2	1
Dismodicus elevatus	(C.L. Koch, 1838)	moderately common	E-	for				1
Drapetisca socialis	(Sundevall, 1833)	very common	P	for	102	1110	1374	725
Entelecara congenera	(O. P.-Cambridge, 1879)	common	E-	for		28	4	1
Entelecara erythropus	(Westring, 1851)	common	P	for	469	129	249	855
Erigone atra	Blackwall, 1833	very common	H	oeu	15	47	85	77

species	author	frequency	distrib	habitat	Res 2	Res 3	Res 6	Res 8
Erigone dentipalpis	(Wider, 1834)	very common	H	oeu	3	15	13	10
Erigonella hiemalis	(Blackwall, 1841)	very common	E-	wop	7	1	9	8
Formiphantes lephthyphantiformis	(Strand, 1907)	rare	E--	for				45
Gonatium hilare	(Thorell, 1875)	rare	E-	for	1	7		9
Gonatium paradoxum	(L. Koch, 1869)	moderately common	E	wop				1
Gonatium rubellum	(Blackwall, 1841)	common	P	for	1		5	878
Gonatium rubens	(Blackwall, 1833)	very common	P	for	4			164
Gongylidiellum edentatum	Miller, 1951	very rare	E--	for	47		3	
Gongylidiellum latebricola	(O. P.-Cambridge, 1871)	very common	E	for	5	27		
Gongylidiellum vivum	(O. P.-Cambridge, 1875)	common	E	wop	4	11	11	
Helophora insignis	(Blackwall, 1841)	moderately common	H	wop			488	129
Hilaira excisa	(O. P.-Cambridge, 1871)	moderately common	E	esp	5		286	
Hypomma cornutum	(Blackwall, 1833)	common	E+	for		1		
Improphantes nitidus	(Thorell, 1875)	rare	E--	for	1			
Jacksonella falconeri	(Jackson, 1908)	moderately common	E--	for	3			
Labulla thoracica	(Wider, 1834)	common	E	for	64	98	89	263
Lepthyphantes minutus	(Blackwall, 1833)	common	H	for	11	17	32	8
Lepthyphantes nodifer	Simon, 1884	rare	E--	for			2	2
Linyphia hortensis	Sundevall, 1830	very common	P	for	6	5	1	5
Linyphia triangularis	(Clerck, 1757)	very common	P	for	12	13	111	186
Lophomma punctatum	(Blackwall, 1841)	common	P	wop	1		34	
Macrargus rufus	(Wider, 1834)	very common	E	for	100	171	110	150
Mansuphantes mansuetus	(Thorell, 1875)	common	E-	for	7	72	1	
Maso sundevalli	(Westring, 1851)	very common	H	for	6	5	1	
Meioneta affinis	(Kulczynski, 1898)	very common	E+	esp				1
Meioneta innotabilis	(O. P.-Cambridge, 1863)	moderately common	E+	for	1	9	2	
Meioneta rurestris	(C.L. Koch, 1836)	very common	P	esp	5	44	106	19
Meioneta saxatilis	(Blackwall, 1844)	very common	E+	wop	2	2	13	
Micrargus herbigradus	(Blackwall, 1854)	very common	P	for	639	390	691	874
Microneta viaria	(Blackwall, 1841)	very common	H	for	117	43	130	164
Mioxena blanda	(Simon, 1884)	common	E-	esp	1			
Moebelia penicillata	(Westring, 1851)	common	E+	for	19	65	12	5
Monocephalus castaneipes	(Simon, 1884)	rare	E--	for		249	862	
Neriene clathrata	(Sundevall, 1830)	very common	H	for	4	8	1	
Neriene emphana	(Walckenaer, 1842)	common	P	for	2	40	118	26
Neriene peltata	(Wider, 1834)	very common	E+	for	4	24	3	
Obscuriphantes obscurus	(Blackwall, 1841)	common	P	for		2	26	
Oedothorax agrestis	(Blackwall, 1853)	common	P	esp		1	1	

species	author	frequency	distrib	habitat	Res 2	Res 3	Res 6	Res 8
Oedothorax apicatus	(Blackwall, 1850)	very common	P	oeu	3		11	11
Oedothorax fuscus	(Blackwall, 1834)	very common	E+	oeu	1	5	12	
Oedothorax gibbosus	(Blackwall, 1841)	very common	P	esp		2	9	
Oedothorax retusus	(Westring, 1851)	very common	P	esp			2	1
Oreonetides quadridentatus	(Wunderlich, 1972)	very rare	E--	for		3	13	
Oryphantes angulatus	(O. P.-Cambridge, 1881)	rare	E+	esp			13	
Ostearius melanopygius	(O. P.-Cambridge, 1879)	common	K	esp	2		5	
Palliduphantes ericaeus	(Blackwall, 1853)	common	E-	oeu	4	15	28	
Palliduphantes pallidus	(O. P.-Cambridge, 1871)	very common	E	wop	24	9	20	66
Panamomops affinis	Miller & Kratochvíl, 1939	rare	E--	for		139		
Panamomops mengei	Simon, 1926	moderately common	E+	for				1
Pelecopsis parallela	(Wider, 1834)	very common	P	esp		1	11	
Pelecopsis radicicola	(L. Koch, 1872)	common	E-	wop	1			11
Pityohyphantes phrygianus	(C.L. Koch, 1836)	moderately common	P	for	J	2	4	
Pocadicnemis pumila	(Blackwall, 1841)	very common	H	esp	8	91	3	2
Poeciloneta variegata	(Blackwall, 1841)	moderately common	P	for		15	7	3
Porrhomma campbelli	F.O. P.-Cambridge, 1894	moderately common	E-	for	17	8	24	
Porrhomma convexum	(Westring, 1851)	moderately common	E+	for			3	
Porrhomma egeria	Simon, 1884	moderately common	E-	for			3	
Porrhomma lativelum	Tretzel, 1956	moderately common	E--	wop			1	2
Porrhomma microphthalmum	(O. P.-Cambridge, 1871)	very common	E	esp	5	24	15	21
Porrhomma montanum	Jackson, 1913	rare	P	for				2
Porrhomma oblitum	(O. P.-Cambridge, 1871)	moderately common	E--	wop		2	2	1
Porrhomma pallidum	Jackson, 1913	common	P	for	15	24	46	11
Porrhomma pygmaeum	(Blackwall, 1834)	very common	P	wop				1
Pseudocarorita thaleri	(Saaristo, 1971)	rare	E--	for	10	1	24	47
Pseudomaro aenigmaticus	Denis, 1966	very rare	E--	esp	1			
Saaristoa abnormis	(Blackwall, 1841)	very common	E-	for			10	
Saaristoa firma	(O. P.-Cambridge, 1905)	rare	E--	for	2	4	8	1
Saloca diceros	(O. P.-Cambridge, 1871)	common	E--	for	3	102	824	462
Semljicola faustus	(O. P.-Cambridge, 1900)	very rare	E-	wop			4	

species	author	frequency	distrib	habitat	Res 2	Res 3	Res 6	Res 8
Silometopus elegans	(O. P.-Cambridge, 1872)	moderately common	P	esp			1	
Silometopus reussi	(Thorell, 1871)	common	P	esp			1	
Stemonyphantes lineatus	(Linnaeus, 1758)	very common	P	esp		1		1
Tallusia experta	(O. P.-Cambridge, 1871)	very common	P	esp	1	1	3	
Tapinocyba affinis	Lessert, 1907	rare	E-	for				1
Tapinocyba insecta	(L. Koch, 1869)	very common	E-	for	338	266	276	6
Tapinocyba pallens	(O. P.-Cambridge, 1872)	common	E+	for	1151			177
Tapinocyba praecox	(O. P.-Cambridge, 1873)	common	E--	wop		1	1	
Tapinopa longidens	(Wider, 1834)	common	E+	for	1	1		
Tenuiphantes alacris	(Blackwall, 1853)	common	P	for	46	85	149	9
Tenuiphantes cristatus	(Menge, 1866)	very common	E+	for	37	82	37	12
Tenuiphantes flavipes	(Blackwall, 1854)	very common	E+	for	10	39	26	7
Tenuiphantes mengei	(Kulczynski, 1887)	very common	P	wop	10	70	253	
Tenuiphantes aff. *mengei*				for				585
Tenuiphantes tenebricola	(Wider, 1834)	very common	E	for	280	184	348	172
Tenuiphantes tenuis	(Blackwall, 1852)	very common	E+	esp		22	65	50
Tenuiphantes zimmermanni	(Bertkau, 1890)	very common	E	for	243	34	352	1111
Thyreosthenius parasiticus	(Westring, 1851)	common	H	for	67		23	241
Tiso vagans	(Blackwall, 1834)	very common	E	esp	14	2	4	
Troxochrus nasutus	Schenkel, 1925	moderately common	E--	for	11	24	26	1
Walckenaeria acuminata	Blackwall, 1833	very common	E+	for	6	7	12	19
Walckenaeria alticeps	(Denis, 1952)	common	E-	wop			1	
Walckenaeria antica	(Wider, 1834)	very common	P	wop		4		
Walckenaeria atrotibialis	(O. P.-Cambridge, 1878)	very common	H	for	27	51	33	2
Walckenaeria corniculans	(O. P.-Cambridge, 1875)	very common	E+	for	48	23	454	217
Walckenaeria cucullata	(C.L. Koch, 1836)	very common	P	for	345	79	105	191
Walckenaeria cuspidata	Blackwall, 1833	very common	P	for	2323		93	1793
Walckenaeria dysderoides	(Wider, 1834)	very common	P	for	3	11	8	53
Walckenaeria furcillata	(Menge, 1869)	very common	E+	wop	1	11		
Walckenaeria nudipalpis	(Westring, 1851)	very common	P	wop		4	20	3
Walckenaeria obtusa	Blackwall, 1836	very common	E-	for	59	22	74	29
Walckenaeria unicornis	O. P.-Cambridge, 1861	very common	E+	esp		1		
Walckenaeria vigilax	(Blackwall, 1853)	very common	H	esp	3	1	4	1
Tetragnathidae								
Metellina mengei	(Blackwall, 1870)	very common	E	for	3	1	5	5
Metellina merianae	(Scopoli, 1763)	very common	E+	for			4	
Metellina segmentata	(Clerck, 1757)	very common	P	wop	22	6	255	8
Pachygnatha clercki	Sundevall, 1823	very common	H	esp			3	1

species	author	frequency	distrib	habitat	Res 2	Res 3	Res 6	Res 8
Pachygnatha degeeri	Sundevall, 1830	very common	P	oeu	24	26	22	24
Pachygnatha listeri	Sundevall, 1830	very common	P	for	1	18	20	2
Tetragnatha obtusa	C.L. Koch, 1837	common	P	for	11	49		
Araneidae								
Aculepeira ceropegia	(Walckenaer, 1802)	very common	P	oeu		J	J	J
Araneus diadematus	Clerck, 1757	very common	H	for	25	68	38	27
Araneus quadratus	Clerck, 1757	very common	P	oeu			J	
Araneus sturmi	(Hahn, 1831)	common	P	for	5	2	1	4
Araniella alpica	(L. Koch, 1869)	rare	E+	for	3	3	5	6
Araniella cucurbitina	(Clerck, 1757)	very common	P	for	5	8	5	11
Araniella displicata	(Hentz, 1847)	rare	H	for		1		
Araniella opisthographa	(Kulczynski, 1905)	common	P	for		5	2	2
Cercidia prominens	(Westring, 1851)	common	H	wop		1		
Cyclosa conica	(Pallas, 1772)	very common	H	for	1	1		
Gibbaranea omoeda	(Thorell, 1870)	rare	P	for		4	3	
Hypsosinga sanguinea	(C.L. Koch, 1844)	common	P	esp		1		
Nuctenea umbratica	(Clerck, 1757)	very common	P	for	J			
Zygiella atrica	(C.L. Koch, 1845)	rare	E+	for				1
Lycosidae								
Alopecosa cuneata	(Clerck, 1757)	very common	P	esp			1	
Alopecosa inquilina	(Clerck, 1757)	moderately common	P	for		7		
Alopecosa pulverulenta	(Clerck, 1757)	very common	P	oeu	2	7	21	3
Alopecosa taeniata	(C.L. Koch, 1835)	moderately common	P	for		11		
Aulonia albimana	(Walckenaer, 1805)	very common	E+	esp	J	J	J	J
Pardosa amentata	(Clerck, 1757)	very common	P	wop			144	
Pardosa lugubris	(Walckenaer, 1802)	very common	P	for	21	300	123	36
Pardosa palustris	(Linnaeus, 1758)	very common	H	oeu	1	J	6	J
Pardosa pullata	(Clerck, 1757)	very common	P	oeu	23	168	12	2
Pardosa saltans	Töpfer-Hofmann, 2000	common	E--	for	349	613		101
Pirata hygrophilus	Thorell, 1872	very common	P	wop	25	2	112	
Pirata uliginosus	(Thorell, 1856)	common	E+	esp			2	
Trochosa ruricola	(De Geer, 1778)	very common	H	oeu		2		4
Trochosa spinipalpis	(F.O. P.-Cambridge, 1895)	very common	P	esp			59	
Trochosa terricola	Thorell, 1856	very common	H	wop	27	185	22	110
Xerolycosa nemoralis	(Westring, 1861)	very common	P	wop		121		
Pisauridae								
Pisaura mirabilis	(Clerck, 1757)	very common	P	oeu	4	5	J	
Zoridae								
Zora nemoralis	(Blackwall, 1861)	common	P	for		1		3
Zora spinimana	(Sundevall, 1833)	very common	P	oeu	33	91	4	15

species	author	frequency	distrib	habitat	Res 2	Res 3	Res 6	Res 8
Agelenidae								
Agelena labyrinthica	(Clerck, 1757)	very common	P	oeu		17		
Histopona torpida	(C.L. Koch, 1837)	very common	E+	for	358	194	110	208
Malthonica ferruginea	(Panzer, 1804)	common	E+	for	1		2	1
Malthonica silvestris	(L. Koch, 1872)	very common	E	for			2	28
Textrix denticulata	(Olivier, 1789)	moderately common	E-	esp				2
Cybaeidae								
Cybaeus angustiarum	L. Koch, 1868	moderately common	E-	wop			21	4
Hahniidae								
Antistea elegans	(Blackwall, 1841)	very common	P	wop	16		4	
Cryphoeca silvicola	(C.L. Koch, 1834)	common	P	for	15	29	127	40
Hahnia helveola	Simon, 1875	common	E-	for	67	11		5
Hahnia pusilla	C.L. Koch, 1841	very common	E	for		46	1	55
Dictynidae								
Cicurina cicur	(Fabricius, 1793)	very common	E+	wop	566	104	19	116
Lathys humilis	(Blackwall, 1855)	common	P	for	34	5	1	
Nigma flavescens	(Walckenaer, 1830)	common	E+	for	1			
Amaurobiidae								
Amaurobius fenestralis	(Ström, 1768)	very common	E+	for	3097	2598	665	1887
Callobius claustrarius	(Hahn, 1833)	common	E+	for		217	216	517
Coelotes terrestris	(Wider, 1834)	very common	E-	for	1257	588	1765	821
Eurocoelotes inermis	(L. Koch, 1855)	very common	E--	for	487	35	31	496
Anyphaenidae								
Anyphaena accentuata	(Walckenaer, 1802)	very common	E+	for	384	19		3
Liocranidae								
Agroeca brunnea	(Blackwall, 1833)	very common	P	for	26	22		24
Agroeca proxima	(O. P.-Cambridge, 1871)	very common	E	esp				1
Apostenus fuscus	Westring, 1851	common	E-	for				77
Clubionidae								
Clubiona brevipes	Blackwall, 1841	common	E+	for	25	8		
Clubiona caerulescens	L. Koch, 1867	moderately common	P	for		3	1	
Clubiona comta	C.L. Koch, 1839	very common	E+	for	32	10	7	7
Clubiona diversa	O. P.-Cambridge, 1862	common	P	wop	9	6	1	3
Clubiona neglecta	O. P.-Cambridge, 1862	very common	P	esp	1			
Clubiona pallidula	(Clerck, 1757)	very common	H	for	85	8	15	5
Clubiona reclusa	O. P.-Cambridge, 1863	very common	P	oeu	1	1	15	1

species	author	frequency	distrib	habitat	Res 2	Res 3	Res 6	Res 8
Clubiona subsultans	Thorell, 1875	moderately common	P	for	10	14		
Clubiona terrestris	Westring, 1851	very common	E-	for	39	26	10	84
Clubiona trivialis	C.L. Koch, 1843	moderately common	H	for		2		
Corinnidae								
Phrurolithus festivus	(C.L. Koch, 1835)	very common	P	oeu		5		7
Gnaphosidae								
Drassodes lapidosus	(Walckenaer, 1802)	very common	P	esp		1		
Drassyllus pusillus	(C.L. Koch, 1833)	very common	P	esp	1			
Haplodrassus signifer	(C.L. Koch, 1839)	very common	H	esp	3	11		1
Haplodrassus silvestris	(Blackwall, 1833)	very common	E	for	11	29		13
Haplodrassus umbratilis	(L. Koch, 1866)	very common	P	wop		1		
Micaria pulicaria	(Sundevall, 1831)	very common	H	oeu		5		1
Zelotes clivicola	(L. Koch, 1870)	common	E	for	10	8		
Zelotes erebeus	(Thorell, 1871)	moderately common	E+	esp		54		
Zelotes latreillei	(Simon, 1878)	very common	P	esp		1		1
Zelotes petrensis	(C.L. Koch, 1839)	very common	P	esp		12		
Zelotes subterraneus	(C.L. Koch, 1833)	very common	P	for	32	166	2	8
Sparassidae								
Micrommata virescens	(Clerck, 1757)	common	P	esp	4	29	J	J
Philodromidae								
Philodromus albidus	Kulczynski, 1911	common	E-	for	2			
Philodromus aureolus	(Clerck, 1757)	very common	P	for	52	196	19	54
Philodromus cespitum	(Walckenaer, 1802)	very common	H	for		2		
Philodromus collinus	C.L. Koch, 1835	very common	E+	for	87	412	53	5
Philodromus fuscomarginatus	(De Geer, 1778)	rare	P	for		2		
Philodromus margaritatus	(Clerck, 1757)	moderately common	P	for	J	1		
Philodromus praedatus	O. P.-Cambridge, 1871	moderately common	P	for		3	3	
Tibellus oblongus	(Walckenaer, 1802)	very common	H	esp	4	J		1
Thomisidae								
Coriarachne depressa	(C.L. Koch, 1837)	moderately common	P	for	1			
Diaea dorsata	(Fabricius, 1777)	very common	P	for	75	150	35	19
Misumena vatia	(Clerck, 1757)	very common	H	oeu		2	1	1
Ozyptila praticola	(C.L. Koch, 1837)	very common	H	for		1		
Ozyptila trux	(Blackwall, 1846)	very common	P	wop			6	17
Xysticus audax	(Schrank, 1803)	common	P	for	44	115	4	3
Xysticus cristatus	(Clerck, 1757)	very common	P	esp		1		
Xysticus lanio	C.L. Koch, 1835	common	P	for	409	264	45	187
Xysticus ulmi	(Hahn, 1831)	very common	P	esp			2	

species	author	frequency	distrib	habitat	Res 2	Res 3	Res 6	Res 8
Salticidae								
Aelurillus v-insignitus	(Clerck, 1757)	very common	P	esp		4		
Ballus chalybeius	(Walckenaer, 1802)	common	E+	for	43	19		
Euophrys frontalis	(Walckenaer, 1802)	very common	P	wop	1	6		6
Evarcha arcuata	(Clerck, 1757)	very common	P	oeu			1	
Evarcha falcata	(Clerck, 1757)	very common	P	wop	4	60		
Heliophanus cupreus	(Walckenaer, 1802)	very common	E+	oeu		6		
Heliophanus dubius	C.L. Koch, 1835	moderately common	P	esp		1		
Neon reticulatus	(Blackwall, 1853)	very common	H	for	154	13	5	48
Pellenes tripunctatus	(Walckenaer, 1802)	common	P	esp		1		
Pseudeuophrys erratica	(Walckenaer, 1826)	moderately common	P	for	12	1		3
Salticus cingulatus	(Panzer, 1797)	moderately common	P	for		4	3	
Salticus zebraneus	(C.L. Koch, 1837)	common	E	for	2	1	1	
Sibianor aurocinctus	(Ohlert, 1865)	common	P	esp		3		
Sitticus pubescens	(Fabricius, 1775)	moderately common	E+	syn		2		
Synageles venator	(Lucas, 1836)	common	P	oeu	1			
Talavera aperta	(Miller, 1971)	rare	E+	esp	6			
adults					**18081**	**12576**	**16762**	**16977**
species					**278**	**278**	**278**	**278**