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Diversity and distribution of spiders (Arachnida: Araneae) in dry ecosystems of North Rhine-Westphalia (Germany)

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Abstract: The present study provides a robust data set for ecological planning and conservation of dry ecosystems in western Germany in general and North Rhine-Westphalia in particular. We summarised all available data from recent publications that dealt with spiders in dry ecosystems of North Rhine-Westphalia. Additionally, so far unpublished results of a detailed investigation regarding spiders in sand habitats of the Westphalian Bay that was conducted between 2006 and 2008 are presented. The analysis focussed on the habitat types according to Annex I of the EU Habitats Directive and related habitats. The investigation areas were scattered in the federal state of North Rhine-Westphalia. The data set comprised a total of 84436 individuals from 371 species and 28 families. Overall, an endangerment status is assigned to 68 species. Of these, 12 spiders are in imminent danger of becoming extinct. Two species, *Erigonoplus globipes* and *Meioneta simplicitarsis,* are believed to be extinct in North Rhine-Westphalia. Seven species (*Dictyna major, Mastigusa arietina, Micaria formicaria, Styloctetor romanus, Thanatus striatus, Theridion uhligi* and *Xysticus ferrugineus*) are new to the arachnofauna of North Rhine-Westphalia.

Keywords: biodiversity research, dry grassland, Flora-Fauna-Habitat directive, heathland, *Juniperus communis* heath, semi-dry grassland

In Germany, dry ecosystems, such as nutrient-poor sandy grasslands, dry heaths and semi-natural dry grasslands and scrubland facies on calcareous substrates are highly endangered (RIECKEN et al. 2006) and are listed in Annex I of the European Habitats Directive as priority habitat types (BALZER & SSYMANK 2005). Due to increasing cultivation, especially during the past 50 years, and the lack of disturbance (drifting sand, grazing, fire) the area of dry ecosystems has decreased considerably in northern and western Germany (DRACHENFELS 1996, VERBÜCHELN & JÖBGES 2000, JENTSCH et al. 2002, KRATOCHWIL 2004, PARDEY 2004).

Within the framework of conservation and ecological planning, updated and effective data sets concerning species inventories of endangered habitat types as well as distribution and ecology of habitat specialists are imperative. For example, stenotopic species are useful for the evaluation of the nature conservation status of a habitat and biotic communities and may render profuse management guidelines (cf. SCHNITTER et al. 2003). Furthermore, diversity studies and in particular diversity studies of arthropods generally provide a wide spectrum of biogeographical and ecological probes for use in monitoring challenges (GARDNER 1991, KREMEN et al. 1993). In this context, spiders can play an important role since they are abundant, easy to record, occupy a wide array of spatial and temporal niches and respond immediately to habitat changes. Spiders provide robust data sets and statistical rigor within various kinds of ecological surveys (e.g. NEW 1999, SKERL 1999, SCHARFF et al. 2003, SCHMIDT et al. 2005, 2008, FINCH et al. 2007).

Information about the diversity and distribution of spiders in dry ecosystems of western Germany is poor (KREUELS et al. 2008). Thus, the aim of this study is to present a first complete catalogue of spiders that occur in dry ecosystems of North Rhine-Westphalia. For this purpose, we have summarised all available data from the recent literature and added previously unreleased results of detailed investigations concerning the ecology of spiders in sand habitats of the Westphalian Bay.

Study area

The investigation areas were scattered in the federal state of North Rhine-Westphalia that makes up part of the west and north-west of Germany (Fig. 1). The longest distance between areas was about 210 km (W-E) and 220 km (N-S). Most of the study areas were situated in the lowlands of North Rhine-Westphalia (Lower Rhine Valley, Westphalian Bay) with altitudes between 40 and 100 m a.s.l.. The climate

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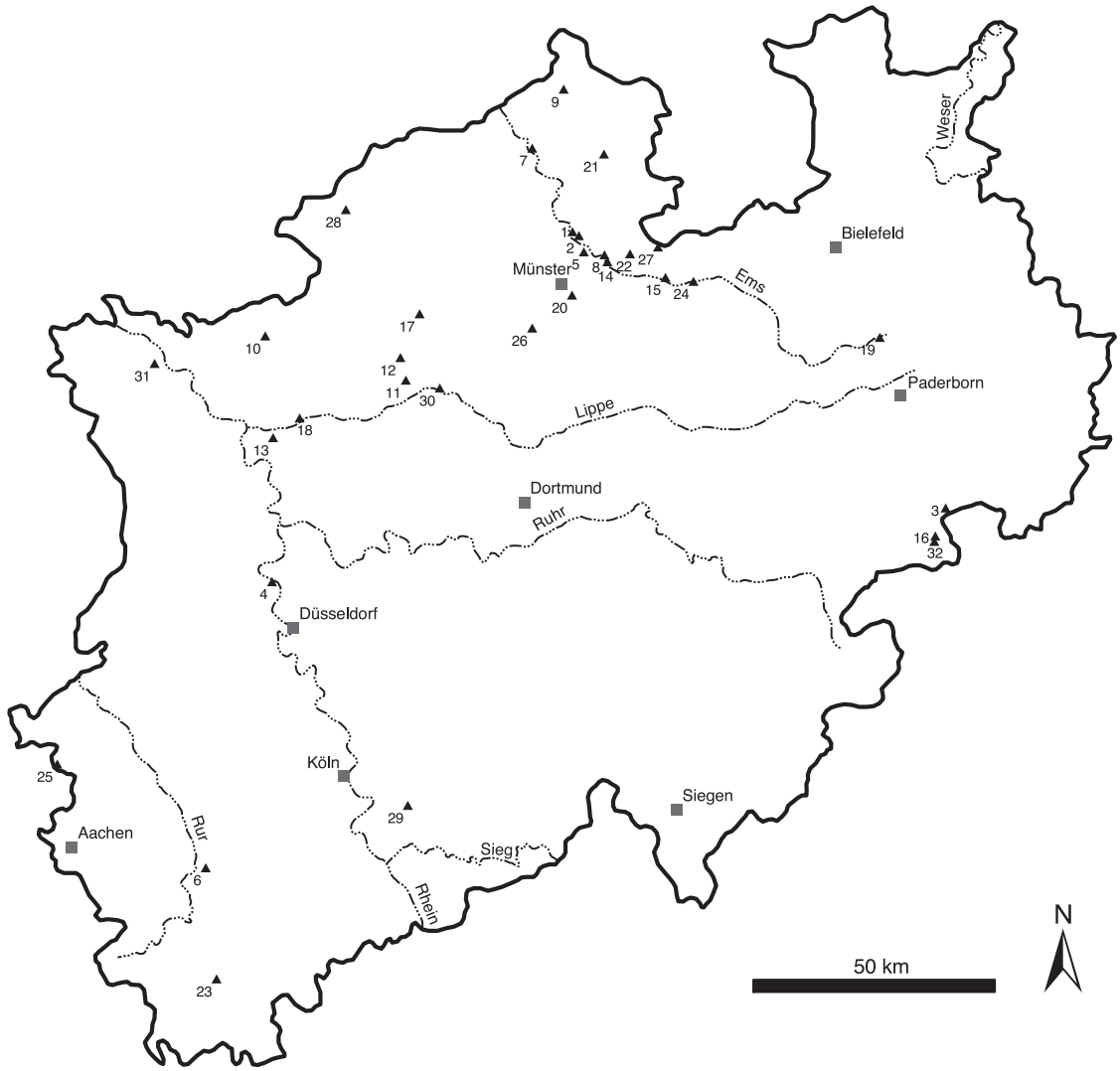

Fig. 1: Location of the investigation areas in North Rhine-Westphalia Geographical explanations: 1 = Bockholter Berge (TK25 3912-1), 2 = Boltenmoor (3912-1), 3 = Dahlberg (4419-3), 4 = Die Spey (4606-3), 5 = Dorbaum (3912-3); 6 = Drover Heide (5205-3), 7 = Elter Sand (3711-3), 8 = Emsaue (3912-4), 9 = Heiliges Meer (3611-2), 10 = Hohenhorster Berge (4105-4), 11 = Holtwicker Wacholderheide (4208-2), 12 = Hülstener Wacholderheide (4208-2), 13 = Kaninchenberge (4306-3), 14 = Klatenberge (3912-4), 15 = Kooksheide (4013-2), 16 = Kregenberg (4519-3), 17 = Letter Wacholderheide (4109-1), 18 = Loosen Berge (4306-2), 19 = Moosheide (4118-1/3), 20 = Münster (4011-4), 21 = Osterklee (3712-4), 22 = Schirlheide (3913-3), 23 = Stolzenburg (5405-3), 24 = Talgraben (4014-1), 25 = Teverener Heide (5002-1/3), 26 = Venner Moor (4111-1), 27 = Vinnenberg (3913-4), 28 = Wacholderheide Hörsteloe (3907-1), 29 = Wahner Heide (5108/5109-1), 30 = Westruper Heide (4209-3), 31 = Wisseler Dünen (4203-2), 32 = Wulsenberg (4519/3).

is sub-Atlantic with a mean annual temperature of 9.5 to 10 °C and mean annual precipitation of 700 to 750 mm. Further study areas were located in the geographic region of the Eifel (Stolzenburg) and the Süder mountains (Hochsauerland: Dahlberg, Kregenberg, Wulsenberg) at an elevation of 450 m a.s.l. and about 345 m a.s.l., respectively. Both regions are characterised by mean annual temperatures below 7 °C and more than 1000 mm of annual precipitation. For further detailed information on the landscape and natural regions of North Rhine-Westphalia see DINTER (1999) and LÖBF (2005).

Methods

All available data from recent publications that dealt with spiders in dry ecosystems of North Rhine-Westfalia were condensed into this study. Here, we analyse mainly the investigation sites representing the habitat types according to Annex I of the EU Habitats Directive (2310 - Dry sand heaths with *Calluna* and *Genista*; 2330 - Inland dunes with open *Corynephorus* and *Agrostis* grasslands; 4030 - European dry heaths; 5130 - *Juniperus communis* formations on heaths or calcareous grasslands; 6210 - Semi-natural dry grasslands and scrubland facies on calcareous substrates) (cf. BALZER & SSYMANK 2005) and related habitats like semi-dry grasslands, dry *Avenella*-grasslands as well as ruderalised dry grasslands and heathlands. Investigation sites that could not be clearly assigned to one of the above listed habitat types were excluded from the analysis. Furthermore, so far unpublished results of a detailed investigation of spiders in sand habitats of the Westphalian Bay that was conducted between 2006 and 2008 are presented. A detailed overview of the investigated sites, study periods and methods is given in Tab. 1. Due to the differences in methodology, sampling intensity and investigation period, this study should only provide a qualitative description of the species inventories. All information on distribution and status of endangerment spiders of North Rhine-Westphalia were taken from KREUELS & BUCHHOLZ (2006) and KREUELS et al. (2008).

Results

A total of 84436 individuals from 371 species and 28 families were summarised (Table 2). Altogether, for 67 species a status of endangerment is given. Apart from 22 species of category V (endangerment may be assumed), 22 endangered (category 3) and 9 highly endangered (category 2) species, 12 spiders are in imminent danger of becoming extinct (category 1). Furthermore, the linyphiid spiders *Erigonoplus globipes* and *Meioneta simplicitarsis* are now considered extinct in North Rhine-Westphalia (category 0). The records of seven species (*Dictyna major*, *Mastigusa arietina*, *Micaria formicaria*, *Styloctetor romanus*, *Thanatus striatus*, *Theridion uhligi* and *Xysticus ferrugineus*) new to the arachnofauna of North Rhine-Westphalia are noteworthy. Further faunistically interesting species discovered during this study were *Agnyphantes expunctus*, *Diplocephalus connatus*, *Halorates reprosus*, *Hypselites jacksoni* and *Linyphia tenuipalpis*, all of which are extremely rare in North Rhine-Westphalia and Germany.

Discussion

Seven species have been recorded for the first time for the arachnofauna of North Rhine-Westphalia:
According to STAUDT (2009), the rare *Dictyna major* is mainly distributed in northern Germany, for example in dune habitats (HEYDEMANN 1964, SCHULTZ & PLAISIER 1995) and dry grasslands (BOCHMANN 1941, MERKENS 2002). This species also seems to inhabit dry *Pinus* forests (SCHAEFER 1980, SIMON 1995).

Mastigusa arientina has so far only been recorded in southern and eastern Germany (STAUDT 2009). The biology and ecology of this rare species is rather unclear. According to MARTIN (1983) *Mastigusa arientina* is a myrmecophil spider that occurs exclusively in nests of *Formica rufa* ants. However, SIMON (1995) and KIELHORN & BLICK (2007) found this species at trees and on treetops, respectively. These records may explain the scarcity of this spider since pitfall traps seem to be an inappropriate method to study these strata.

The gnaphosid *Micaria formicaria* is classified as a xerophilous species that inhabits mainly dry and semi-dry grasslands and *Juniperus* heaths (HAUK 1996, PLATEN et al. 1999) but also occurs in open pastures (HÄNGGI & BAUR 1998) and dry forest edges (BAUCHHENSS 2002). According to BAUCHHENSS (1995) and BAUR et al. (1996), *Micaria formicaria* inhabits sandy substrates as well as calcareous soils. This species is distributed mainly in the south-western regions of Germany (LEIST 1978, BAEHR & BAEHR 1984, HAUK 1996) but is also found in eastern Germany (PLATEN et al. 1999, STAUDT 2009).

The linyphiid *Styloctetor romanus* was recorded mainly in southern and eastern Germany (STAUDT 2009) but also seems to be distributed in northern Germany (MERKENS 2002). According to MARTIN & UHLIG (1986), SACHER & BREINL (1999), PLATEN et al. (1999), RATSCHKER (2001), SACHER (2001) and SCHNITTER et al. (2003), this species is a typical inhabitant of dry grasslands or dry ecosystems in general (for example dry fallow land), respectively. In contrast, GÖTZE (1992) found a single individual in a salt marsh of northern Germany.

On the other hand, up to now, *Thanatus striatus* has been found in a variety of different habitat types, such as dry and semi-dry grassland (HÖREGOTT 1958, HEYDEMANN et al. 1994, KUSCHKA 2004, AL HUSSEIN & LÜBKE-AL HUSSEIN 2007), heathlands (SCHMIDT & MELBER 2004), humid habitats (NENTWIG 1983, PLATEN et al. 1999, STAUDT 2000), salt

Tab. 1: Overview of investigated sites, study periods and study designs. (*1) = 20 % glycerin and 1% thymol added. (*2) = according to RENNER (1982): ethanol + acetic acid + glycerin + water. (*3) = hitherto unpublished data. Habitat types: A = bare sand, B = dry sand heaths with *Calluna* and *Genista* (FFH-code 2310), C = inland dunes with open *Corynephorus* and *Agrostis* grasslands (FFH-code 2330), D = European dry heaths (FFH-code 4030), E = *Juniperus communis* formations on heaths or calcareous grasslands (FFH-code 5130), F = semi-natural dry grasslands and scrubland facies on calcareous substrates (FFH-code 6210), G = *Avenella* dominated dry grassland, H = semi-dry grassland, I = ruderalised semi-dry and dry grassland.

no	area	Habitat types	TK25	N	E	M asl	sites	traps per site	Investigation period	Preservation fluid	reference
1	Bockholter Berge	C	3912-1	52°03'30.21''	07°39'39.05''	50	3	4	08.2006-07.2008	4% formalin	coll. Buchholz (*3)
2	Boltenmoor	C	3912-1	52°01'18.58''	07°41'10.12''	55	2	4	08.2006-07.2008	4% formalin	coll. Buchholz (*3)
3	Dahlberg	F	4419-3	51°30'10.76"	08°54'19.24"	275	2	5	04.1991-10.1996	4% formalin	Kreuels (1998a)
4	Die Spey	I	4606-3	51°20'10.01"	06°42'03.49"	25	4	3	06.1992-09.1992	80% ethanol (*1)	Grigo (1997) (*3)
5	Dorbaum	B, C, H	3912-3	52°01'23.06"	07°42'48.17"	50	5	5	04.2002-04.2003	3% formalin	Buchholz & Hartmann (2008)
6	Drover Heide	D	5205-3	50°43'58.07"	06°31'41.08"	205	5	1	05.2006-05.2007	unknown	coll. Kreuels (*3)
7	Elter Sand	A, B, C, E	3711-3	52°13'27.45''	07°32'02.04"	55	5	3	05.2005-10.2005	4% formalin	Buchholz (2008)
8	Emsaue	C	3912-4	52°010'3.87"	07°46'22.35"	45	1	4	08.2006-07.2008	4% formalin	coll. Buchholz (*3)
9	Heiliges Meer	A, B	3611-2	52°21'12.11''	07°38'02.91"	45	4	4	08.2006-07.2008	4% formalin	coll. Buchholz (*3)
10	Hohenhorster Berge	C	4105-4	51°49'55.52"	06°39'17.98"	30	1	4	08.2006-11.2006	4% formalin	coll. Buchholz (*3)
11	Holtwicker Wacholderheide	E	4208-2	51°45'00.04"	07°07'36.68"	90	1	4	08.2006-07.2008	4% formalin	coll. Buchholz (*3)
12	Hülstener Wacholderheide	E	4208-2	51°47'52.03''	07°06'30.24"	80	1	4	08.2006-07.2008	4% formalin	coll. Buchholz (*3)
13	Kaninchenberge	A, B	4306-3	51°37'39.13"	06°41'46.52"	25	4	3	06.1992-09.1992	80% ethanol (*1)	Grigo (1997) (*3)
14	Klatenberge	C	3912-4	52°00'16.73''	07°47'02.70"	60	1	4	08.2006-07.2008	4% formalin	coll. Buchholz (*3)
15	Kooksheide	A	4013-2	51°58'13.99"	07°59'03.28"	60	1	5	05.1992-08.1992	unknown	Kreuels et al (2008)
16	Kregenberg	F	4519-3	51°26'25.64"	08°51'51.45"	330	4	5	04.1991-10.1996	4% formalin	Kreuels (1998a)
17	Letter Wacholderheide	B, C	4109-1	51°53'12.09''	07°10'05.81"	75	1	4	08.2006-07.2008	4% formalin	coll. Buchholz (*3)
18	Loosen Berge	A, I	4306-2	51°40'07.82"	06°46'40.70"	35	3	3	06.1992-09.1992	80% ethanol (*1)	Grigo (1997) (*3)
19	Moosheide	A, B, C, H	4118-1/3	51°51'18.71''	08°40'58.69"	130	5	4	08.2006-07.2008	4% formalin	coll. Buchholz (*3)
20	Münster	A, C, I	4011-4	51°55'59.75"	07°39'48.13"	60	7	3	04.2000-07.2000	brine	Kreuels et al (2008)
21	Osterklee	F	3712-4	52°13'17.86"	07°45'38.81"	110	1	4	04.2008-07.2008	4% formalin	coll. Buchholz (*3)
22	Schirlheide	D	3913-3	52°00'37.30"	07°51'14.58"	60	1	5	06.2008-10.2008	Renner (*2)	coll. Kreuels (*3)
23	Stolzenburg	F	5405-3	50°30'55.82"	06°34'00.57"	450	1	10	04.1971-09.1971	4% formalin	Becker (1977)
24	Talgraben	A	4014-1	51°57'15.53"	08°01'36.96"	50	1	5	05.1992-08.1992	unknown	Kreuels et al (2008)
25	Teverener Heide	A, C, D	5002-1/3	50°57'35.05"	06°04'08.22"	90	5	5	2004	5% acetic acid	Kreuels (2006)
26	Venner Moor	D	4111-1	51°51'51.16"	07°32'14.25"	65	1	4	05.2007-10.2007	4% formalin	coll. Buchholz (*3)
27	Vinnenberg	I	3913-4	52°01'33.96"	07°58'01.35"	55	1	5	05.1992-08.1992	unknown	Kreuels et al (2008)
28	Wacholderheide Hörsteloe	C, E	3907-1	52°05'45.50''	06°54'43.20"	50	2	4	08.2006-07.2008	4% formalin	coll. Buchholz (*3)
29	Wahner Heide	A, C, D	5108/5109-1	50°52'19.48"	07°10'06.46"	100	4	5	01.1994-10.1994	70% ethanol	Jäger (1996)
30	Westruper Heide	B, E, G	4209-3	51°44'07.03''	07°14'16.47"	45	7	4	08.2006-07.2008	4% formalin	coll. Buchholz (*3)
31	Wisseler Dünen	A, C	4203-2	51°46'03.44"	06°17'57.39"	15	3	3	06.1992-09.1992	80% ethanol (*1)	Grigo (1997) (*3)
32	Wulsenberg	F	4519-3	51°26'44.13"	08°51'59.72"	345	4	5	04.1991-10.1996	4% formalin	Kreuels (1998a)

meadows (SPARMBERG & SACHER 1997, BARNDT 2007, FINCH et al. 2007) and dunes (HEYDEMANN 1964, SCHULTZ 1992). *T. striatus* is distributed all over Germany (STAUDT 2009).

MARTIN (1973a) described the theridiid spider *Theridion uhligi*. He found specimens during an investigation of the nature reserve Rietzer See (cf. MARTIN 1973b). Since then, this species has only been recorded in very few studies in dry grasslands of eastern Germany (PLATEN et al. 1999, JAKOBITZ 2003, STAUDT 2009). Conversely, *T. uhligi* was recorded in dry grasslands and heathlands in the Netherlands and Belgium (JOCQUÉ 1977, KEER & VANUYTVEN 1993, PRINSEN 1996, HELSDINGEN 1999) so that the distribution gap is closed now. One further record refers to DUMA (2008) who found *T. uhligi* in a dry and sandy place of south-eastern Romania. According to HERZOG (1968), BAUCHHENSS (1995), PERNER (1997), PLATEN et al. (1999) and SACHER (2002), the thomisid *Xysticus ferrugineus* is stenotopic of dry and calcareous grasslands. This species is known from only few locations in central and eastern Germany (STAUDT 2009).

The linyphiid spiders *Erigonoplus globipes* and *Meioneta simplicitarsis* are now considered to be extinct in North Rhine-Westphalia:
E. globipes was last recorded by KREUELS (1998b). Due to destruction of the former locations caused by land-use, this population has disappeared. Since then, this species has been considered to be extinct in North Rhine-Westphalia (KREUELS & BUCHHOLZ 2006). *E. globipes* is distributed mainly in higher altitudes of central and southern Germany (BRAUN 1960, BAEHR & BAEHR 1984, BAUCHHENSS & SCHOLL 1985, JOGER 1997) and seems to be absent in the lowlands (STAUDT 2009). According to all the previous records, this species is stenotopic for dry calcareous grasslands (BAEHR 1988, KÖHLER et al. 1989, PERNER 1997). *Meioneta simplicitarsis* is a rare species that has until now been found in eastern Germany (e.g. SACHER & BREINL 1999), Rhineland-Palatinate (WEBER 1999) and North Rhine-Westphalia (CASEMIR 1982). It seems to prefer dry grasslands (BRAUN 1969, BUCHAR & RŮŽIČKA 2002) but also occurs in wet meadows and pastures (HEIMER & NENTWIG 1991, KREUELS & BUCHHOLZ 2006).

Agnyphantes expunctus, *Diplocephalus connatus*, *Halorates reprosus*, *Hypselites jacksoni and Linyphia tenuipalpis* are rarely distributed to North Rhine-Westphalia in particular and Germany in general (KREUELS et al. 2008, STAUDT 2009). *Agnyphantes expunctus* seems to be restricted to humid habitats in low mountain ranges and mountains, e.g. in the Eifel (CASEMIR 1976, 1982), Harz (HEIMER 1980, SACHER 1997, 1998) and the Alps (KREUELS & LÜCKMANN 1998, MUSTER 2001). *Diplocephalus connatus* apparently prefers humid habitats as well (HÄNGGI et al. 1995, KREUELS & BUCHHOLZ 2006) and was hitherto sporadical recorded in western and central Germany (MORITZ 1973, ALBRECHT et al. 1994, ESSER 1997). Furthermore, *Halorates reprosus* was rarely found in the northern part of North Rhine-Westphalia (BUCHHOLZ & KREUELS 2005) and single locations along the Rhine (BRAUN 1960) and the North Sea coast (HELSDINGEN 2003, STAUDT 2009). Apart from southern Germany, *Hypselites jacksoni* was sampled in northern (SCHAEFER 1970, 1972), western (CASEMIR 1960, 1976, RASKIN 2000) and eastern (HERZOG 1974, HIEBSCH 1985, OTTO et al. 2001) parts of the country. According to previous records, both, *Halorates reprosus* and *Hypselites jacksoni* apparently prefer humid habitats (cf. HÄNGGI et al. 1995). Finally, *Linyphia tenuipalpis* is mainly distributed to the lowlands (e.g. NW-Germany: MERKENS 2002, SCHMIDT & MELBER 2004; NE-Germany: PLATEN et al. 1999, SCHNITTER et al. 2003, BARNDT 2005; Netherlands: TUTELAERS 2000, 2001) with southernmost records in Thuringia (MALT & PERNER 2002).

When working with the present data one has to consider several taxonomical problems. For example, *Alopecosa accentuata* and *Alopecosa barbipes* are closely related species that were once considered to be synonyms. However, several studies have confirmed the separation of both species (DAHLEM et al. 1987, CORDES & HELVERSEN 1990, CORDES 1995, VINK & MITCHELL 2002). On the other hand, at least the identification of female specimens is very difficult, while males can be clearly distinguished by the hair coat on Tibia I. Furthermore, both species show a different phenology and distribution (CORDES & HELVERSEN 1990, STAUDT 2009). Nevertheless, SCHMITT (2008) stated that several authors might have ignored the differences between both species found during previous studies, which makes the current status of *A. accentuata* and *A. barbipes* questionable. Consequently, we checked specimens from most of the lowland sites (2, 5, 7, 9, 10, 19, 21, 30) and one highland site (16). As a result of this, we state that all lowland records belong to *Alopecosa barbipes* while individuals from the low mountain ranges belong

to *A. accentuata*. Thus, former data on *A. accentuata* that were published by BUCHHOLZ & HARTMANN (2008) and BUCHHOLZ (2008) have to be transferred to *A. barbipes*.

Further taxonomic questions arise concerning *Dicymbium nigrum brevisetosum* which was first described by LOCKET (1962) and WIEHLE (1965) as a form and recognised as a species by LOCKET et al. (1974). Later, THALER (1986) discussed the existence of further forms of *Dicymbium nigrum* s. str. in the southern Alps. Finally, ROBERTS (1987) downgraded *D. n. brevisetosum* back to a form. This taxonomical problem is not completely solved yet, but differences in the hair coat of Tibia I which is considerably shorter in *D. n. brevisetosum* might justify the separation of both as valid species. Both have been recorded from Germany (WIEHLE 1965, HARMS 1987) but it is assumed that numerous records of *Dicymbium nigrum* s. str. might belong in fact to *D. n. brevisetosum* since, for example, drawings of the first one given in the reference guide of NENTWIG et al. (2003) in truth refer to *D. n. brevisetosum* (cf. WIEHLE 1960, 1965). Hence, we checked all available material and exclusively found specimens with short hair coats on Tibia I which according to ROBERTS (1987) indicated the occurrence of only *Dicymium nigrum brevisetosum* within the study area. Consequently, records for *Dicymbium nigrum* published by BUCHHOLZ & HARTMANN (2008) and BUCHHOLZ (2008) have to be adjusted to *D. n. brevisetosum.*

Finally, we have to keep in mind the fact that several parts of North Rhine-Westphalia are hitherto poorly investigated. Especially for the eastern und southern parts of the federal state (e.g. Sauerland, Weserbergland), as well as for the mountains of the Eifel, faunistic records are almost entirely missing (KREUELS et al. 2008). This is a drawback for this study since large parts of the semi-natural dry grasslands and scrubland facies on calcereous substrates are situated in these regions and thus remained undersampled yet. As opposed to this, the coverage level for dry and sandy heathlands and grasslands has been thoroughly improved within detailed studies during the last years.

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References

ALBRECHT C., T. ESSER & J. WEGLAU (1994): Untersuchungen zur Wiederbesiedlung unterschiedlich strukturierter Feldraine durch ausgewählte Arthropodengruppen (Araneae, Isopoda, Carabidae, Heteroptera, Lepidoptera und Saltatoria) im landwirtschaftlichen Rekultivierungsgebiet des Braunkohletagebaus `Zukunft-West` bei Jülich. – Entomologische Mitteilungen Löbbecke-Museum Aquazoo Düsseldorf 7: 1-222

AL HUSSEIN I.A. & M. LÜBKE-AL HUSSEIN (2007): Faunistisch-Ökologische Erhebungen zu Webspinnen (Arachnida: Araneae) und Laufkäfern (Coleoptera: Carabidae) im ehemaligen Braunkohlentagebau Nachterstedt. – Entomologische Mitteilungen Sachsen-Anhalt 15: 43-45

BAEHR B. (1988): Die Bedeutung der Araneae für die Naturschutzpraxis, dargestellt am Beispiel von Erhebungen im Landkreis Weißenburg-Gunzenhausen (Mittelfranken). – Schriftenreihe des Bayerischen Landesamt für Umweltschutz 83: 43-59

BAEHR B. & M. BAEHR (1984): Die Spinnen des Lautertales bei Münsingen (Arachnida, Araneae). – Veröffentlichungen für Naturschutz und Landschaftspflege in Baden-Württemberg 57/58: 375-406

BALZER S. & A. SSYMANK (2005): Natura 2000 in Deutschland. Naturschutz und biologische Vielfalt 14 [CD Rom]

BARNDT D. (2005): Beitrag zur Arthropodenfauna des Naturparks Schlaubetal und Umgebung. - Faunenanalyse und Bewertung (Coleoptera, Heteroptera, Saltatoria, Araneae, Opiliones u.a.). – Märkische Entomologische Nachrichten 7 (2): 45-102

BARNDT D. (2007): Beitrag zur Arthropodenfauna der Binnensalzwiesen von Storkow und Philadelphia (Brandenburg/Landkreis Oder-Spree) - Faunenanalyse und Bewertung - (Coleoptera, Heteroptera, Auchenorrhyncha, Saltatoria, Araneae, Isopoda u. a.). – Märkische Entomologische Nachrichten 9 (1): 1-54

BAUCHHENSS E. (1995): Die epigäische Spinnenfauna auf Sandflächen Nordbayerns (Arachnida: Araneae). – Zoologische Beiträge N.F. 36: 221-250

BAUCHHENSS E. (2002): Die Spinnenfauna eines thermophilen Waldrandes in Mittelfranken (Bayern). – Arachnologische Mitteillungen 23: 1-21

BAUCHHENSS E. & G. SCHOLL (1985): Bodenspinnen einer Weinbergsbrache im Maintal (Steinbach, Lkr. Haßberge). Ein Beitrag zur Spinnenfaunistik Unterfrankens. – Abhandlungen des Naturwissenschaftlichen Vereins Würzburg 23/24 (1982/83): 3-23

BAUR B., J. JOSHI, B. SCHMID, A. HÄNGGI, D. BORCARD, J. STARY, A. PEDROLI-CHRISTEN, G.H. THOMMEN, H. LUKA, H.-P. RUSTERHOLZ, P. OGGIER, S. LEDERGERBER & A. ERHARDT (1996): Variation in species richness of plants and diverse groups of invertebrates in three calcareous grasslands of the Swiss Jura mountains. – Revue suisse de zoologie 103: 801-833

BECKER J. (1977): Die Trockenrasenfauna des Naturschutzgebietes Stolzenburg (Nordeifel). – Decheniana 130: 101-113

BOCHMANN G. VON (1941): Die Spinnenfauna der Strandhaferdünen an den deutschen Küsten. – Kieler Meeresforschung 4: 38-69

BRAUN R. (1960): Neues zur Spinnenfauna des Rhein-Main-Gebietes und der Rheinpfalz. – Jahrbücher des Nassauischen Vereins für Naturkunde 95: 28-89

BRAUN R. (1969): Zur Autökologie und Phänologie der Spinnen (Araneida) des Naturschutzgebietes „Mainzer Sand". – Mainzer naturwissenschaftliches Archiv 8: 193-288

BUCHAR J. & V. RŮŽIČKA (2002): Catalogue of spiders of the Czech Republic. Peres Publisher, Praha. 349 pp.

BUCHHOLZ S. (2008): Spider assemblages in an inland dune complex of Northwest Germany. – Drosera 2008: 63-76

BUCHHOLZ S. & V. HARTMANN (2008): Spider fauna of semi-dry grasslands on a military training base in Northwest Germany (Münster). – Arachnologische Mitteilungen 35: 51-60

BUCHHOLZ S. & M. KREUELS (2005): Die Spinnen (Arachnida: Araneae) im Naturschutzgebiet "Heiliges Meer" - eine vorläufige Artenliste. – Natur und Heimat 65 (4): 97-112

CASEMIR H. (1960): Beitrag zur Kenntnis der Niederrheinischen Spinnenfauna. – Decheniana 113: 239-264

CASEMIR H. (1976): Beitrag zur Hochmoor-Spinnenfauna des Hohen Venns (Hautes Fagnes) zwischen Nordeifel und Ardennen. – Decheniana 129: 38-72

CASEMIR H. (1982): Zweiter Beitrag zur Spinnenfauna des Bausenberges (Brohltal, östl. Vulkaneifel). – Decheniana 27: 47-55

CORDES D. (1995): *Alopecosa accentuata* and *A. barbipes* (Araneae, Lycosidae) in Central and Northern Europe. – Proceedings of the 15th European Colloquium of Arachnology: 213

CORDES D. & O. V. HELVERSEN (1990): Indications for the existence of *Alopecosa barbipes* (Sundevall 1832) as a sibling species to *Alopecosa accentuata* (Latreille 1817). Results of morphological, ethological and biogeographical studies. – Bulletin de la Société Européenne d'Arachnologie (H.S.) 1: 70-74

DAHLEM B., C. GACK & J. MARTENS (1987): Balzverhalten von Wolfspinnen der Gattung *Alopecosa* (Arachnida: Lycosidae). – Zoologische Beiträge N. F. 31: 151-164

DINTER W. (1999): Naturräumliche Gliederung. In: Landesanstalt für Ökologie, Bodenordnung und Forsten NRW (ed.): Rote Liste der gefährdeten Pflanzen und Tiere in Nordrhein-Westfalen, 3. Fassung. – LÖBF-Schriftenreihe 17: 29-36

DRACHENFELS O. V. (1996): Rote Liste der gefährdeten Biotoptypen in Niedersachsen – Bestandsentwicklung und Gefährdungsursachen der Biotop- und Ökosystemtypen sowie ihrer Komplexe – Stand Januar 1996. – Naturschutz und Landschaftspflege in Niedersachsen 34: 1-148

DUMA I. (2008): *Theridion uhligi* Martin, 1974 (Araneae: Theridiidae) new to Romania. – Entomologica Romanica 13: 297-299

ESSER T. (1997): Artenvielfalt in der modernen Agrarlandschaft: Der Feldrain rekultivierter Anbauflächen als Lebensraum für Spinnen (Arachnida, Araneae) und Asseln (Isopoda, Oniscoiidea). – Acta Biologica Benrodis Supplement 6: 1-131

FINCH O.-D., H. KRUMMEN, F. PLAISIER & W. SCHULTZ (2007): Zonation of spiders (Araneae) and carabid beetles (Coleoptera: Carabidae) in island salt marshes at the North Sea coast. – Wetlands Ecology and Management 15: 207-228

GARDNER S. M. (1991): Ground beetle (Coleoptera: Carabidae) communities on upland heath and their association with heathland flora. – Journal of Biogeography 18: 281-289

GÖTZE W. (1992): Beweidung und Vertritt als Belastungsfaktoren der Spinnenfauna in Sandsalzwiese und Graue-Dünen-Formation. – Supplement zu Faunistisch-Ökologische Mitteilungen 13: 45-67

GRIGO M. (1997): Vergleichende Untersuchungen zur Spinnenfauna (Araneae) verschiedener Sandbiotope am Niederrhein. Diploma thesis University of Cologne. 134 pp.

HÄNGGI A. & B. BAUR (1998): The effect of forest edge on ground-living arthropods in a remnant of unfertilized calcareous grassland in the Swiss Jura mountains. – Mitteilungen der Schweizerischen Entomologischen Gesellschaft 71: 343-354

HÄNGGI A., E. STÖCKLI & W. NENTWIG (1995): Lebensräume mitteleuropäischer Spinnen. – Miscellanea Faunistica Helvetiae 4: 1-460

HARMS K.H. (1987): Spinnen und Weberknechte aus Grünlandbrachen des südlichen Pfälzerwaldes. In: ROWECK H. (ed.): Beiträge zur Biologie der Grünlandbrachen im Südlichen Pfälzerwald. – Pollichia-Buch 12: 169-205

HAUK B. (1996): Die Spinnenfauna ausgewählter Wacholderheiden im Landkreis Calw. – Veröffentlichungen für Naturschutz und Landschaftspflege in Baden-Württemberg / Beiheft 88: 259-288

HEIMER S. (1980): Eine bemerkenswerte Kugelspinne aus dem Harz. – Faunistische Abhandlungen Museum für Tierkunde Dresden 7: 179-181

HEIMER S. & W. NENTWIG (1991): Spinnen Mitteleuropas: ein Bestimmungsbuch. Parey, Berlin. 543 pp.

HELSDINGEN P. J. VAN (1999): Catalogus van de Nederlandse Spinnen (Araneae). – Nederlandse faunistische mededelingen 10: 1-191

HELSDINGEN P.J. VAN (2003): *Halorates reprobus* (O.P.-Cambridge, 1879) Nieuw voor Nederland. – Nieuwsbrief Spined 18: 10-11

HERZOG G. (1968): Beiträge zur Kenntnis der Spinnenfauna der südlichen Mark. – Veröffentlichungen des Bezirksheimatmuseums Potsdam 16: 5-10

HERZOG G. (1974): Zur Spinnenfauna der westlichen Niederlausitz und benachbarter Gebiete. – Biologische Studien Luckau 3: 20-27

HEYDEMANN B. (1964): Die Spinnenfauna des Naturschutzgebietes `Bottsand`, der Kohlberger Heide und des Schönberger Strandes (Araneae). – Faunistische Mitteilungen aus Norddeutschland 2: 133-141

HEYDEMANN B., W. GÖTZE & U. RIECKEN (1994): Ökologische Analyse der Fauna des NSG `Barker Heide`. In: VOIGT, N. (ed.): Bedeutung von Heideökosystemen für die Wirbellosenfauna. – Supplement zu Faunistisch-Ökologische Mitteilungen 16: 13-47

HIEBSCH H. (1985): Beitrag zur Spinnenfauna der Moore im NSG `Serrahn`. – Zoologischer Rundbrief für den Bezirk Neubrandenburg 4: 15-33

HÖREGOTT H. (1958): Arachnologische Studien auf den Sandfluren bei Kleinsaubernitz/Oberlausitz. – Natura lusatica 4: 20-35

JÄGER P. (1996): Spinnen (Araneae) der Wahner Heide bei Köln. – Decheniana 35: 531-572

JAKOBITZ J. (2003): Neue und besonders gefährdete Spinnenarten (Araneae) für Brandenburg im NSG Pimpinellenberg. – Naturschutz und Landschaftspflege in Brandenburg 12(2): 51-53

JENTSCH A., W. BEYSCHLAG, W. NEZADAL, T. STEINLEIN & W. WELSS (2002): Bodenstörung – treibende Kraft für die Vegetationsdynamik in Sandlebensräumen - Konsequenzen für Pflegemaßnahmen im Naturschutz. – Naturschutz und Landschaftsplege 34: 37-44

JOCQUÉ R. (1977): Contribution à la connaissance des araignées de Belgique, V. Description de *Theridion hublei* n. sp. – Revue Arachnologique 1: 59-63.

JOGER H.G. (1997): Untersuchungen zur epigäischen Fauna von Halbtrockenrasen: Anpassungen von Spinnen und Insekten an einen Extrem-Lebensraum. Cuvelier, Göttingen. 210 pp.

KEER J. VAN & H. VANUYTVEN (1993): Catalogus van de Spinnen van Belgie. Del XI. Theridiidae, Anapidae en Theridiosomatidae. – Studiedocumenten van het Koninklijk Belgisch Instituut voor Natuurwetenschappen 71: 7-44

KIELHORN K.-H. & T. BLICK (2007): Erstfund von *Hahnia picta* (Araneae, Hahniidae) in Deutschland – mit Angaben zu Habitatpräferenz und Verbreitung. – Arachnologische Mitteilungen 33: 7-10

KÖHLER G., V. VOPEL & R. BALLMANN (1989): Untersuchungen zum Einfluß der Verbuschung auf die Vegetations- und Faunenstruktur von Muschelkalksteilhängen - ein Beitrag zur Sukzessionsforschung. – Archiv für Naturschutz und Landschaftsforschung 29 (3): 129-142

KRATOCHWIL A. (2004): Sand-Ökosysteme im Binnenland: Dynamik, Restitution und Beweidungsmanagement – das Beispiel: Emsland. In: Westfälischer Naturwissenschaftlicher Verein (ed.): Dünen und trockene Sandlandschaften – Gefährdung und Schutz. Verlag Wolf & Kreuels, Havixbeck-Hohenholte. pp. 13-21

KREMEN C., R.K. COLWELL, T.L. ERWIN, D.D. MURPHY, R.F. NOSS & M.A. SANJAYAN (1993): Terrestrial arthropod assemblages: their use in conservation planning. – Conservation Biology 7: 796-808

KREUELS M. (1998a): Zur Frage strukturbezogener und phänologischer Anpassungen epigäischer Spinnen (Araneae) auf Kalkmagerrasen im Raum Marsberg. PhD thesis University of Münster. 108 pp.

KREUELS M. (1998b): Erstnachweis von *Erigonoplus globipes* (L. Koch, 1872) (Araneae: Linyphiidae) in Nordrhein-Westfalen und eine Verhaltensbeobachtung. – Arachnologische Mitteilungen 15: 77-80

KREUELS M. (2006): Die Webspinnen (Arachnida: Araneae) aus Beifängen des NSG Teverener Heide (NRW, Kreis Heinsberg). – Acta Biologica Benrodis 13: 185-193

KREUELS M. & S. BUCHHOLZ (2006): Ökologie, Verbreitung und Gefährdungsstatus der Webspinnen Nordrhein-Westfalens. Verlag Wolf & Kreuels, Havixbeck-Hohenholte. 116 pp.

KREUELS M., S. BUCHHOLZ & V. HARTMANN (2008): Atlas der Webspinnen Nordrhein-Westfalens. Verlag Wolf & Kreuels, Bösensell. 135 pp.

KREUELS M. & J. LÜCKMANN (1998): Arachnologische und koleopterol. Ergebnisse der zoologischen Alpenexkursionen der Westfälischen Wilhelms-Universität Münster nach Österreich in das Kl. Walsertal und in die Silvretta 1993-1997. – Jahrbuch Vorarlberger Landesmuseumsverein 1998: 9-17

KUSCHKA V. (2004): Ackerbrachen als Chance für den Naturschutz? Struktur und Dynamik von Spinnenzönosen der Bodenoberfläche als Indikatoren der Habitatqualität. ökom Verlag, München. 200 pp.

LEIST N. (1978): Die Spinnen des Rußheimer Altrheins. In: Der Rußheimer Altrhein, eine nordbadische Auenlandschaft. – Die Natur- und Landschaftsschutzgebiete Baden-Württembergs 10: 365-398

LOCKET G.H. (1962): Miscellaneous notes on linyphiid spiders. – Annals and Magazine of Natural History (13) 5: 7-15

LOCKET G.H., A.F. MILLIDGE & P. MERRETT (1974): British Spiders 3. Ray Society, London. 315 pp.

LÖBF (Landesanstalt für Ökologie, Bodenordnung und Forsten NRW) (2005): Natur und Landschaft in Nordrhein-Westfalen 2005. LÖBF-Mitteilungen 4/2005: 1-282

MALT S. & J. PERNER (2002): Zur epigäischen Arthropodenfauna von landwirtschaftlichen Nutzflächen der Unstrutaue im Thüringer Becken. Teil 1: Webspinnen und Weberknechte (Arachnida: Araneae et Opiliones). – Faunistische Abhandlungen Museum für Tierkunde Dresden 22: 207-228

MARTIN D. (1973a): *Theridion uhligi* nov. spec., eine bisher unbekannte Kugelspinne (Araneae: Theridiidae). – Deutsche Entomologische Zeitschrift (N.F.) 22: 113-115

MARTIN D. (1973b): Zur Kenntnis der Spinnenfauna des Naturschutzgebietes Rietzer See. Brandenburgische Naturschutzgebiete 16. – Naturschutzarbeit in Berlin und Brandenburg 9: 1-4

MARTIN D. (1983): Die Spinnenfauna des Naturschutzgebietes 'Ostufer der Müritz'. – Zoologischer Rundbrief für den Bezirk Neubrandenburg 3: 1-40

MARTIN D. & M. UHLIG (1986): Die Spinnen- und Kurzflüglerfauna (Araneae et Staphylinidae) der Silbergrasrasen (Corynephoreten) des Buhnenwerder, Stadtkreis Brandenburg, Bezirk Potsdam (Arachnida; Insecta, Coleoptera). – Faunistische Abhandlungen Museum für Tierkunde Dresden 14: 31-35

MERKENS S. (2002): Epigeic spider communities in inland dunes in the lowlands of Northern Germany. – Proceedings of the 19th European Colloquium of Arachnology: 215-222

MORITZ M. (1973): Neue und seltene Spinnen (Araneae) und Weberknechte (Opiliones) aus der DDR. – Deutsche Entomologische Zeitschrift (N.F.) 20: 173-210

MUSTER C. (2001):Biogeographie von Spinnentieren der mittleren Nordalpen (Arachnida: Araneae, Opiliones, Pseudoscorpiones). – Verhandlungen des Naturwissenschaftlichen Vereins in Hamburg (N.F.) 39: 5-196

NENTWIG W. (1983): Die Spinnenfauna (Araneae) eines Niedermoores (Schweinsberger Moor bei Marburg). – Decheniana 136: 43-51

NENTWIG W, A. HÄNGGI, C. KROPF & T. BLICK (2003): Spinnen Mitteleuropas / Central European Spiders. An internet identification key. Internet: http://www.araneae.unibe.ch, version 8.12.2003

NEW T.R. (1999): Untangling the web: spiders and the challenges of invertebrate conservation. – Journal of Insect Conservation 3: 251-256

OTTO B., T. SÜSSMUTH & F. MEYER (2001): Zur Schutzwürdigkeit und -bedürftigkeit von Verlandungsmooren in der Mittleren Mark - dargestellt am Naturschutzgebiet "Rauhes Luch" bei Luckenwalde. – Naturschutz und Landschaftspflege in Brandenburg 10 (2): 62-70

PARDEY A. (2004): Dünen und Sandlandschaften in Nordrhein-Westfalen unter besonderer Berücksichtigung der Situation in Westfalen. In: WESTFÄLISCHER NATURWISSENSCHAFTLICHER VEREIN (ed.): Dünen und trockene Sandlandschaften – Gefährdung und Schutz. Verlag Wolf & Kreuels, Havixbeck-Hohenholte. pp. 3-11

PERNER J. (1997): Zur Arthropodenfauna der Kalktrockenrasen im Mittleren Saaletal (Ostthüringen). Teil 1: Coleoptera, Diptera, Auchenorrhyncha, Saltatoria, Araneae (Insecta et Arachnida). – Faunistische Abhandlungen Museum für Tierkunde Dresden 21: 53-90

PLATEN R. , B. v. BROEN, A. HERRMAN, U.M. RATSCHKER & P. SACHER (1999): Gesamtartenliste und Rote Liste der Webspinnen, Weberknechte und Pseudoskorpione des Landes Brandenburg (Arachnida: Araneae, Opiliones, Pseudoscorpiones) mit Angaben zur Häufigkeit und Ökologie. – Naturschutz und Landschaftspflege in Brandenburg 8 (2): 1-79

PLATNICK N.I. (2009): The world spider catalog, version 10.0. – American Museum of Natural History, Internet: http:// research.amnh.org/entomology/spiders/catalog/index.html (16.11.2009)

PRINSEN J.D. (1996): *Theridion uhligi* Martin, 1974 (Araneae: Theridiidae), een zeldzame kogelspin van heideterreinen. – Nieuwsbrief Spined 10: 4-7

RATSCHKER U.M. (2001): Die Zönose der Spinnen und Weberknechte in der Agrarlandschaft des Biosphärenreservates Schorfheide-Chorin. PhD thesis TU Dresden. 218 pp.

RASKIN R. (2000): Renaturierung eines Heidemoores im Hohen Venn. Ergebnisse einer fünfjährigen ökologischen Effizienzkontrolle. – Naturschutz und Landschaftsplanung 32: 212-221

RENNER K. (1982): Coleopterenfänge mit Bodenfallen am Sandstrand der Ostseeküste - ein Beitrag zum Problem der Lockwirkung von Konservierungsmitteln. – Faunistisch-Ökologische Mitteilungen 5: 127-146.

RIECKEN U., P. FINCK, U. RATHS, E. SCHRÖDER & A. SSYMANK (2006): Rote Liste der gefährdeten Biotoptypen Deutschlands. Zweite fortgeschrieben Fassung 2006. – Naturschutz und Biologische Vielfalt 34: 1-318

ROBERTS M.J. (1987): The spiders of Great Britain and Ireland. Volume 2: Linyphiidae and checklist. Harley Books, Colchester. 204 pp.

SACHER P. (1997): Webspinnen (Arachnida: Araneae) im Nationalpark Hochharz. – Berichte der Naturhistorischen Gesellschaft Hannover 139: 259-276

SACHER P. (1998): Spinnen (Araneae) an Fichten im Moorbereich - Ergebnisse von Klopffängen im Hochharz. – Abhandlungen und Berichte aus dem Museum Heineanum Halberstadt 4: 87-97

SACHER P. (2001): Beiträge zur Wirbellosenfauna des NSG "Harslebener Berge und Steinholz" im Nordharzvorland/Sachsen-Anhalt. Teil 1: Webspinnen (Arachnida: Araneae). – Abhandlungen und Berichte aus dem Museum Heineanum 5: 105-124

SACHER P. (2002): Webspinnen (Arachnida: Araneae). In: LANDESAMT FÜR UMWELTSCHUTZ SACHSEN-ANHALT (ed.): Management von FFH-Lebensraumtypen: Untersuchungen zu den Auswirkungen von Maßnahmen zur Heide-Pflege (Flämmen, Mahd) auf Gliederfüßer (Arthropoda). – Berichte des Landesamtes für Umweltschutz Sachsen-Anhalt Sonderheft 3/2002: 15-17

SACHER P. & K. BREINL (1999): Neue Spinnenarten für Thüringen aus dem Kyffhäuser. (Arachnida: Araneae). – Thüringer Faunistische Abhandlungen 6: 51-60

SCHAEFER M. (1970): Einfluß der Raumstruktur in Landschaften der Meeresküste auf des Verteilungsmuster der Tierwelt. – Zoologische Jahrbücher Systematik 97: 55-124

SCHAEFER M. (1972): Beitrag zur Kenntnis der Spinnenfauna Schleswig-Holsteins (Araneae: Linyphiidae und Micryphantidae). – Schriften des Naturwissenschaftlichen Vereins für Schleswig-Holstein 42: 94-103

SCHAEFER M. (1980): Sukzession von Arthropoden in verbrannten Kiefernforsten. II. Spinnen und Weberknechte. – Forstwissenschaftliches Centralblatt 99: 341-356

SCHARFF N., J. A. CODDINGTON, C. E. GRISWORLD, G. HORMIGA & P. DE PLACE BJORN (2003): When to quit? Estimating spider species richness in a northern european deciduous forest. – Journal of Arachnology 31: 246-273

SCHMIDT L. & A. MELBER (2004): Einfluss des Heidemanagements auf die Wirbellosenfauna in Sand- und Moorheiden Nordwestdeutschlands. – NNA-Berichte 17: 145-164

SCHMIDT M. H., I. ROSCHEWITZ, C. THIES & T. TSCHARNTKE (2005): Differential effects of landscape and management on diversity and density of ground-dwelling farmland spiders. – Journal of Applied Ecology 42: 281-287

SCHMIDT M.H., S. ROCKER, J. HANAFI & A. GIGON (2008): Rotational fallows as overwintering habitat for grassland arthropods: the case of spiders in fen meadows. – Biodiversity and Conservation 17: 3003-3012

SCHMITT M. (2008): Erstnachweis der Wolfspinne *Alopecosa barbipes* (Araneae: Lycosidae) in Nordrhein-Westfalen. – Arachnologische Mitteilungen 36: 1-3

SCHNITTER P.H., M. TROST & M. WALLASCHEK (eds.) (2003): Tierökologische Untersuchungen in gefährdeten Biotoptypen des Landes Sachsen-Anhalt. I. Zwergstrauchheiden, Trocken- und Halbtrockenrasen. – Entomologische Mitteilungen Sachsen-Anhalt, Sonderheft 2003: 1-216

SCHULTZ W. (1992): Beitrag zur Spinnenfauna (Arachnida, Araneida) der Tertiärdünen der ostfriesischen Insel Norderney. – Verhandlungen des naturwissenschaftlichen Vereins Hamburg (N.F.) 33: 239-245

SCHULTZ W. & F. PLAISIER (1995): Zum gegenwärtigen Besiedlungsstand der Strandinsel Minsener Oog durch Spinnen (Arachnida, Araneida) und Laufkäfer (Coleoptera, Carabidae). – Drosera 95: 85-100

SIMON U. (1995): Untersuchung der Stratozönosen von Spinnen und Weberknechten an der Waldkiefer. Wissenschaft und Technik Verlag, Berlin. 142 pp.

SKERL K.L. (1999): Spiders in conservation planning: a survey of US natural heritage programms. – Journal of Insect Conservation 3: 341-347

SPARMBERG H. & P. SACHER (1997): Webspinnen an Binnensalzstellen Thüringens. – Thüringer Faunistische Abhandlungen 4: 44-55

STAUDT A. (2000): Neue und bemerkenswerte Spinnenfunde im Saarland und angrenzenden Gebieten in den Jahren 1996-99. – Abhandlungen der Delattinia 26: 5-22

STAUDT A. (2009): Nachweiskarten der Spinnentiere Deutschlands. – Internet: http://www.spiderling.de/arages

THALER K. (1986) Über wenig bekannte Zwergspinnen aus den Alpen, VII. – Mitteilungen der Schweizerischen Entomologischen Gesellschaft 59: 487-498

TUTELAERS P. (2000): Spinnen uit Cranendonck. – Nieuwsbrief Spined 15: 5-21

TUTELAERS P. (2001): Herfstspinnen bij onze Hunebedden. – Nieuwsbrief Spined 16: 7-9

VERBÜCHELN G. & M. JÖBGES (2000): Verbreitung und aktueller Zustand der Heide, Sandtrockenrasen und Borstgrasrasen in Nordrhein-Westfalen. – NUA-Hefte 6: 6-23

VINK C.J. & A. D. MITCHELL (2002): 12S DNA sequence data confirms the separation of *Alopecosa barbipes* and *Alopecosa accentuata* (Araneae: Lycosidae). – Bulletin of the British Arachnological Society 12: 242-244

WEBER M. (1999): Artenliste der Spinnen (Araneae) aus der Stadtbiotopkartierung Mainz. – Arachnologische Mitteilungen 17: 51-71

WIEHLE H. (1960): Spinnentiere oder Arachnoidea, XI. Micryphantidae - Zwergspinnen. Tierwelt Deutschlands 47. Fischer, Jena. 615 pp.

WIEHLE H. (1965): Beiträge zur Kenntnis der deutschen Spinnenfauna IV. – Mitteilungen aus dem Zoologischen Museum in Berlin 41: 11-57

Tab. 2: Species list (nomenclature follows Platnick 2009). Abbreviations: End = status of endangerment in North Rhine-Westphalia (according to KREUELS & BUCHHOLZ 2006): * = not endangered, V = endangerment may be assumed, R = extremely rare, not declining species, 3 = endangered, 2 = highly endangered, 1 = in imminent danger of becoming extinct, 0 = extinct, nr = new record for North Rhine-Westphalia, ? = hitherto not assessed; Dis = Distribution: C = species that exclusively occurred on calcareous substrates.

familiy [no species] / species	End	Dis	study area [no of sites]																																sum
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
			[3]	[2]	[2]	[4]	[5]	[5]	[5]	[1]	[4]	[1]	[1]	[1]	[4]	[1]	[1]	[4]	[1]	[3]	[5]	[7]	[1]	[1]	[1]	[1]	[5]	[1]	[1]	[2]	[4]	[7]	[3]	[4]	
Atypidae [2]																																			
Atypus affinis	*												32							2															**34**
Atypus piceus	1																					4													**4**
Segestriidae [1]																																			
Segestria senoculata	*		1				2										1	1				4				2									**11**
Dysderidae [3]																																			
Dysdera erythrina	*				12						6							146				1		2									89	**256**
Harpactea hombergi	*																	4															11	**15**
Harpactea rubicunda	*																					1													**1**
Mimetidae [1]																																			
Ero furcata	*							1	1		1		1	1				2							3										**10**
Nesticidae [1]																																			
Nesticus cellulanus	*	C																																2	**2**
Theridiidae [20]																																			
Asagena phalerata	*			19	39		28		30		51			9	1	5		55	22	6	42					3			5		99		15	**429**
Crustulina guttata	V		1											4				6																**11**
Dipoena coracina	2				6													46													3		77	**132**
Enoplognatha latimana	3			1			1																												**2**
Enoplognatha ovata	*																			1		2										1			**4**
Enoplognatha thoracica	*		40	7	4		111		13		21		13	17		4	2	17	6		15	4	9				1			9		11		9	**313**
Episinus angulatus	*	C						1																											**1**
Episinus truncatus	*								1									2																	**3**
Euryopis flavomaculata	*		4	1	4				13		1		5	33			3	29	1	1		1							2						**98**
Neottiura bimaculata	*						6																												**6**
Paidiscura pallens	*	C																7																17	**24**
Pholcomma gibbum	*							1						1																1			1	**4**
Phylloneta impressa	*																													2				**2**
Phylloneta sisyphia	*	C																															1	**1**
Robertus arundineti	*			1			9						1																					**11**
Robertus lividus	*		2		6		15	27	6		1			7				1		1		7					1			7			2	**83**
Robertus neglectus	*	C			1													1															2	**4**
Seycellocesa vittatus	*						1																										1	**2**
Steatoda albomaculata	3																				48					3					4			**55**
Theridion uhligi	nr																				1										1			**2**
Linyphiidae [160]																																			
Abacoproeces saltuum	R								3																										**3**
Acartauchenius scurrilis	2										1																								**1**

familiy [no species] / species	End	Dis	study area [no of sites]																																sum
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
			[3]	[2]	[2]	[4]	[5]	[5]	[5]	[1]	[4]	[1]	[1]	[1]	[4]	[1]	[1]	[4]	[1]	[3]	[5]	[7]	[1]	[1]	[1]	[1]	[5]	[1]	[1]	[2]	[4]	[7]	[3]	[4]	
Agnyphantes expunctus	*												1																						**1**
Agyneta cauta	3																					1										1			**2**
Agyneta conigera	*																					1													**1**
Agyneta decora	*										2																								**2**
Agyneta subtilis	*						1							4																					**5**
Allomengea vidua	*					14																													**14**
Anguliphantes angulipalpis	R	C																							1										**1**
Araeoncus crassiceps	*												1																						**1**
Araeoncus humilis	*		36	98	11		20		58	13	17	1				44		10	12		37	4						3		17		206		4	**591**
Asthenargus paganus	*																											1			5			4	**10**
Baryphyma pratense	*																						1												**1**
Bathyphantes approximatus	*		10	1		5			3					1					2		1														**23**
Bathyphantes gracilis	*		13	9	42	27	7	1	7	2	10			2		1	1	62	3		10	1		1				2		2	2	13	2	73	**293**
Bathyphantes nigrinus	*					7												6													5			4	**22**
Bathyphantes parvulus	*		13	9									1			10		1													2				**36**
Bolyphantes alticeps	*	C																1																	**1**
Centromerita bicolor	*		31	27	52		4		10		78		1	1		1		11	34		91	50								3		210		9	**613**
Centromerita concinna	*		8	16	589		20	2	3		126		2			23	1	963	8		70	19		1			1			1	423	140		665	**3081**
Centromerus brevivulvatus	*												1	1							1														**3**
Centromerus cavernarum	R	C																1																	**1**
Centromerus dilutus	*		3					3			2		1	4		1					1										1	1			**17**
Centromerus incilium	*		12	17	4			2	22		67					11		21			58									1		4		210	**429**
Centromerus levitarsis	R															3															1			**4**
Centromerus pabulator	*		40	1	5				6		7		1	4				465	5		10		3							5		2		238	**792**
Centromerus prudens	*												1																			1			**2**
Centromerus sylvaticus	*		65	19	11		2		16		15		49	48		2		38	5		16	8								6	9	12		62	**383**
Ceratinella brevipes	*						1											1			1										1			1	**5**
Ceratinella brevis	*			1			1							1								1									1	3			**8**
Ceratinella scabrosa	*				6																	1										1			**8**
Cnephalocotes obscurus	*						44				3			18				9		2	2		97								13	19		5	**212**
Collinsia distincta	*					152																													**152**
Collinsia inerrans	*			2					3	1	1					2					3									1		1			**14**
Dicymbium nigrum brevisetosum	V		1	1	10	1	3		1		2		8					8	1			3	10								6	2		21	**78**
Dicymbium tibiale	*		2				4						27	7			9															1			**50**
Diplocephalus connatus	R																															1			**1**
Diplocephalus cristatus	*					6							2					6															152	**166**
Diplocephalus latifrons	*																	9				1									32			1	**43**
Diplocephalus picinus	*					2			1																						6	1			**10**
Diplostyla concolor	*		1	2		177	2		4				1			1	5	2			2	1									6			1	**205**
Dismodicus bifrons	*						1											3				3									2				**9**
Entelecara congenera	*	C																																3	**3**

familiy [no species] / species	End	Dis	study area [no of sites]																															sum
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
			[3]	[2]	[2]	[4]	[5]	[5]	[5]	[1]	[4]	[1]	[1]	[1]	[4]	[1]	[1]	[4]	[1]	[3]	[5]	[7]	[1]	[1]	[1]	[1]	[5]	[1]	[1]	[2]	[4]	[7]	[3]	[4]	
Entelecara erythropus	*					1								1																					**2**
Erigone arctica maritima	3					2			21	46	2																								**71**
Erigone atra	*		155	68	66	75	81	3	122	306	59			2	1	111	1	29	10		69	2	2	1			9	2		328	9	347	3	11	**1872**
Erigone dentipalpis	*		973	236	6	41	110		437	602	125			2	3	531	8	4	65		106	47	3	1			13	8			6	420	3	4	**5290**
Erigone longipalpis	*			1			1		19	4											1										1			**27**
Erigonella hiemalis	*														1		1	1					2							6			23	**34**
Erigonoplus globipes	0	C																					96												**96**
Floronia bucculenta	*			1																															**1**
Gnathonarium dentatum	*						3																												**3**
Gonatium paradoxum	*	C																																1	**1**
Gonatium rubellum	*												3									1													**4**
Gonatium rubens	*			1				3			16		4	3				25							13					8	2		68	**143**
Gongylidiellum latebricola	*		1	3	2		1		8		3		9	3		1				3	2	1								1	1	1		**40**
Gongylidiellum vivum	*			1			54							4			1				1						1		1	1	2	4	3		**73**
Gongylidium rufipes	*					7											1																		**8**
Halorates reprosus	R			2																															**2**
Hypomma bituberculatum	*					19																													**19**
Hypselistes jacksoni	R																										1								**1**
Jacksonella falconeri	*				1													6															20	**27**
Lepthyphantes minutus	*						1																								1		2	**4**
Leptorhoptrum robustum	*					52																													**52**
Lessertia dentichelis	R			1																															**1**
Linyphia hortensis	*																													1					**1**
Linyphia tenuipalpis	R																														1				**1**
Linyphia triangularis	*			2	2														1																**5**
Lophomma punctatum	*			2																															**2**
Macrargus rufus	*		23	38				1	8		8			2		1			5		3									3		1		2	**95**
Maso gallicus	R																														1				**1**
Maso sundevalli	*			1		2	2	2					1																						**8**
Meioneta affinis	3																			1	2											52			**55**
Meioneta innotabilis	*																															1			**1**
Meioneta mollis	*						2																												**2**
Meioneta rurestris	*		50	48	94		16		52	7	20		1	1	35	23	1	166	8	17	34	1				2	9	17	1	92	7	107	8	111	**928**
Meioneta saxatilis	*						2						2				1														3	2			**10**
Meioneta simplicitarsis	0						7																												**7**
Mermessus trilobatus	*		3	1												2			1		5		1				1			2		10			**26**
Metopobactrus prominulus	*		1						3																									10	**14**
Micrargus apertus	*						1																												**1**
Micrargus herbigradus	*		7	3	2		11		2		4		7	1		5	3	9	1		3	2	1							1	6	3		31	**102**
Micrargus subaequalis	*				16	4	7		1									4																2	**34**
Microlinyphia pusilla	*		1	1	8		17		1		1						1	2				1	2							1				1	**37**

familiy [no species] / species	End	Dis	study area [no of sites]																																sum
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
			[3]	[2]	[2]	[4]	[5]	[5]	[5]	[1]	[4]	[1]	[1]	[1]	[4]	[1]	[1]	[4]	[1]	[3]	[5]	[7]	[1]	[1]	[1]	[1]	[5]	[1]	[1]	[2]	[4]	[7]	[3]	[4]	
Microneta viaria	*		2				5	4			1						1	2	1						3						9				**28**
Minyriolus pusillus	*			1			2		12				3	9			1			1										1					**30**
Mioxena blanda	V				4				2	1								1																48	**56**
Monocephalus fuscipes	*							2																											**2**
Neriene clathrata	*					1		1									1														8				**11**
Neriene furtiva	R																						1									1			**2**
Neriene montana	*												1															2							**3**
Neriene peltata	*																1						3					12							**16**
Nusoncus nasutus	*												1																						**1**
Oedothorax agrestis	3																													1					**1**
Oedothorax apicatus	*		1	1	3	4	3		3	313	19				2	7		6	1		3	1								42			8	4	**421**
Oedothorax fuscus	*					21	3			17						2		1				1								2	1	1	1		**50**
Oedothorax gibbosus	*																											2							**2**
Oedothorax retusus	*		17	5		1141		2	103	20	3					11			5		1									290			1		**1599**
Ostearius melanopygius	*																		1															1	**2**
Palliduphantes ericaeus	*							1					2																			10	1	1	**15**
Palliduphantes pallidus	*		1		2	1	1		2		1						1	12			1	22	11								2			38	**95**
Panamomops inconspicuus	2	C			2													373																192	**567**
Parapelecopsis nemoralis	R						2																												**2**
Pelecopsis elongata	R																				1		6								3				**10**
Pelecopsis mengei	R						1						1									1														**3**
Pelecopsis parallela	*			334	10		55	1	34	83	22				1	5	1		1		72	9	72							82	31	3	1		**817**
Peponocranium ludicrum	*	C						1																											**1**
Peponocranium orbiculatum	*	C																9																38	**47**
Pocadicnemis juncea	V																																1		**1**
Pocadicnemis pumila	*		2	1	5		2	15	37		25		64	91			1	12	3	2	1	1		1	15		1		1	7	20	3		79	**389**
Porrhomma campbelli	*									3																					2				**5**
Porrhomma microcavense	R																														1				**1**
Porrhomma microphthalmum	*			3	6										2			1				1					9				15	2	4	**43**
Prinerigone vagans	*									2	2																								**4**
Saaristoa abnormis	*								3				1	3			1											1							**9**
Saaristoa firma	R								1																										**1**
Silometopus bonessi	1				12													26																84	**122**
Silometopus elegans	*	C																1																	**1**
Silometopus reussi	*	C																																27	**27**
Sintula corniger	*	C			2																														**2**
Stemonyphantes lineatus	*		2	5	7		11			1	5			1		6	1	7			4	2									6	7			**65**
Styloctetor romanus	nr																				3														**3**
Styloctetor stativus	*																				21														**21**
Syedra gracilis	R																				1		5												**6**
Tallusia experta	*		5					2					1								1	1								4					**14**

familiy [no species] / species	End	Dis	study area [no of sites]																														sum
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
			[3]	[2]	[2]	[4]	[5]	[5]	[5]	[1]	[4]	[1]	[1]	[1]	[4]	[1]	[1]	[4]	[1]	[3]	[5]	[7]	[1]	[1]	[1]	[1]	[5]	[1]	[1]	[2]	[4]	[7]	[3]	[4]	
Tapinocyba insecta	*																	1													23			3	**27**
Tapinocyba praecox	V			9	68		28		1		6		3			1		48			10										5	75	1	45	**300**
Tapinocyboides pygmaeus	2				5												1	23						2									322	**353**
Tapinopa longidens	*		1															2	2															**5**
Tenuiphantes cristatus	*																													1				**1**
Tenuiphantes flavipes	*		2					4					8	5		2	1			1			2					7		3			7	**42**
Tenuiphantes mengei	*		1				1		2		3		19	10			1			2	1	1			8		1		2	6	1			**59**
Tenuiphantes tenebricola	*							1					2	1		1																		**5**
Tenuiphantes tenuis	*		74	30	134	203	43	13	15	4	12			12	1	10	1	395	7	4	6	3		1	2		1		1	9		29	46	149	**1205**
Tenuiphantes zimmermanni	*						3				3		1							1				1							1				**10**
Thyreosthenius parasiticus	*	C																															1	**1**
Tiso vagans	*		8	2			125		1		23		126		1		2	1	1	15	32	2								1	1	32	5	3	**381**
Trichoncus affinis	1	C																							1									2	**3**
Trichoncus saxicola	1	C			4																														**4**
Trichopterna cito	2								10						2					8	96		1								123	13		**253**
Trichopterna thorelli	*													1							1													**2**
Troxochrus scabriculus	*		2		8	81					1						1	17															37	**147**
Typhochrestus digitatus	2										2										2									6	318			**328**
Walckenaeria acuminata	*		7	1			1		5		26		1				2	52	2		3	1	1						1		8	2		35	**148**
Walckenaeria alticeps	*		2	1			2							3				1			6								1	16	10		6	**48**
Walckenaeria antica	*			4	5		12						3	6				46			3	5								23	10		53	**170**
Walckenaeria atrotibialis	*		18	1			6		37		3		67	51			1	3	6	30	2			2				6	1	25	13		2	2	**276**
Walckenaeria capito	*										1																								**1**
Walckenaeria corniculans	*										1			1		1							63					2			21			**89**
Walckenaeria cucullata	*		5					7	5				2	10				1			1				3									**34**
Walckenaeria cuspidata	*				2												1								8								2	**13**
Walckenaeria dysderoides	*		1		1		12		1		5		6		2		1	1			1				1					2	1	19		21	**75**
Walckenaeria furcillata	*		13		2				8		7		7	3		1		5	6		1				3					15		3		35	**109**
Walckenaeria mitrata	*		1						1														5												**7**
Walckenaeria monoceros	*										1							24			4	2	4								11		40	**86**
Walckenaeria nodosa	*																														1			**1**
Walckenaeria nudipalpis	*						1	2			3			1				1												3	1			**12**
Walckenaeria obtusa	*		3						2		16		3	3					3		1								2	3				**36**
Walckenaeria unicornis	*					2		1																										**3**
Walckenaeria vigilax	*			1						1						1															2			**5**
Tetragnathidae [7]																																		
Metellina mengei	*						2																							1				**3**
Metellina segmentata	*														1																		1	**2**
Pachygnatha clercki	*		1	3		98	3		2		1		1						1		3			1						1	8		1	**124**
Pachygnatha degeeri	*		63	33	16	1	131		38	18	15		53	28		16	4	7	9		215	94		4					5	13	2	19	2	8	**794**
Pachygnatha listeri	*		2			1							1													2				31				**37**

familiy [no species] / species	End	Dis	study area [no of sites]																																sum
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
			[3]	[2]	[2]	[4]	[5]	[5]	[5]	[1]	[4]	[1]	[1]	[1]	[4]	[1]	[1]	[4]	[1]	[3]	[5]	[7]	[1]	[1]	[1]	[1]	[5]	[1]	[1]	[2]	[4]	[7]	[3]	[4]	
Tetragnatha montana	*					1																													**1**
Tetragnatha pinicola	*						1																												**1**
Araneidae [12]																																			
Agalenatea redii	3						2											2			1														**5**
Araneus diadematus	*		1	5	1		1				2						1														1				**12**
Araneus quadratus	*																				1										1				**2**
Araniella opisthographa	*		1				1																												**2**
Argiope bruennichi	*																				1													1	**2**
Cercidia prominens	*		1				22				3			6				1												4	1				**38**
Hypsosinga albovittata	3														1			38			2		2								11		12	**66**
Hypsosinga pygmaea	*						17														2														**19**
Hypsosinga sanguinea	*		1		6													28												1			5	**41**
Larinioides cornutus	*					1	1																												**2**
Mangora acalypha	*				1		12											1													1				**15**
Neoscona adianta	*								1																										**1**
Lycosidae [36]																																			
Alopecosa accentuata	V	C			59													46															26		**131**
Alopecosa aculeata	*																														23				**23**
Alopecosa barbipes	?			46			16		10		277	2			2		3				1	6	1								298	1		**663**
Alopecosa cuneata	*		5		253		798		44	2	12					1	1	212			604	130	11	27	3		25	2	1	1		18	1	70	**2221**
Alopecosa fabrilis	*														15																		4		**19**
Alopecosa inquilina	1	C																							2										**2**
Alopecosa pulverulenta	*		64	29	175		308	13	285	2	272		50	58			8	117	6	11	21	388	136	12			6		13	51	103	36		234	**2398**
Alopecosa striatipes	3	C																19															65	**84**
Alopecosa trabalis	3				1										1			465							31						1			**499**
Arctosa figurata	1																	5							5						2			**12**
Arctosa leopardus	*						1			13														24			5								**43**
Arctosa lutetiana	*				30						1			2				21					16							2	1		129	**202**
Arctosa perita	*			73		1			57	21	256				2	41	1	1	22	2	170	4					2		1	66	2	12	2		**736**
Aulonia albimana	*				133			1										1635							5		1				35			1670	**3480**
Hygrolycosa rubrofasciata	*													13																	23				**36**
Pardosa agrestis	*			1			174		4						6					2	17										4	4		**212**
Pardosa amentata	*					81	9			1	7						15	2				12	2	1				3		2			1	**136**
Pardosa hortensis	3						283																				6								**289**
Pardosa lugubris s. str.	*		394	174	10		149	117	125		39		199	128		3	2	4	27	2	2	147	50		10		10		16	27	178	3		60	**1876**
Pardosa monticola	*			1		3	3341		18		1				2						93				7		133					5168		2	**8769**
Pardosa nigriceps	V				3			65	9		58			2				193			5	1		6	30		5					38		195	**610**
Pardosa palustris	*		10	9	417		1675		22	49	19		1		3	23		50	22	1	173	87		579			112			113		452	2	17	**3836**
Pardosa prativaga	*		8	6		16	69	6	9	2	15		2						15			34		19						1		1			**203**
Pardosa proxima	R																													18					**18**
Pardosa pullata	*		2	1	693	1	172	6	2	1	335		381	195		2	2	521	86	35	175	97		233	1		270			85	12	112	7	653	**4080**

familiy [no species] / species	End	Dis	study area [no of sites]																															sum
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
			[3]	[2]	[2]	[4]	[5]	[5]	[5]	[1]	[4]	[1]	[1]	[1]	[4]	[1]	[1]	[4]	[1]	[3]	[5]	[7]	[1]	[1]	[1]	[1]	[5]	[1]	[1]	[2]	[4]	[7]	[3]	[4]	
Pardosa saltans	*							3																											**3**
Pirata hygrophilus	*		34	16			1	1	21		24		86	76		2	2		2	1				1			1		1		36	1			**306**
Pirata latitans	*					1					2						1										1				1				**6**
Pirata piraticus	*					1	1				1											1	2				2						1		**9**
Pirata tenuitarsis	R																										2								**2**
Pirata uliginosus	*			3				3	9				38	54		5														1					**113**
Trochosa ruricola	*			2		20	196	2		10	3		1				1	1			3	23	1	14			3	5		8	2	2			**297**
Trochosa spinipalpis	*										1																								**1**
Trochosa terricola	*		246	162	400		263	59	171	9	453		116	199	1	96	22	210	35	20	512	139		15	34	14	30		12	97	255	247		632	**4449**
Xerolycosa miniata	V		236	338			219		125		4				16	59	1			3	20	633					113			12	185	3			**1967**
Xerolycosa nemoralis	*		320	7	2						3		3		1	35	11	6	60			11	4				5		26	33				27	**554**
Pisauridae [2]																																			
Dolomedes fimbriatus	*																														1				**1**
Pisaura mirabilis	*		7	4			6		6		20		8	1	1		1		1	1	6			1			1	1	1	2	8	10		1	**87**
Agelenidae [6]																																			
Agelena labyrinthica	*		7		2									1	13			49			22	1		2			3			2		3		52	**157**
Histopona torpida	*										1		4	12				6		2										2		1		23	**51**
Malthonica picta	*							10																			5								**15**
Malthonica silvestris	*		3	1	3		1										2	1															99	**110**
Tegenaria agrestis	*						2		7		1				12	9	1			3	3		26				1				3	4	5	8	**85**
Tegenaria atrica	*								1		3							8														1			**13**
Hahniidae [6]																																			
Antistea elegans	*			2						1	9																2	5							**19**
Hahnia helveola	*		15	7					5		3		1	8		18	1	1			21						1			16		10		7	**114**
Hahnia montana	*		9	5					7		1			34	4				1	5	2		1							4			1		**74**
Hahnia nava	*		1		54		378	4					1	1				262					1								6	9		269	**986**
Hahnia ononidum	*						49		2																							7			**58**
Hahnia pusilla	*						3		2				4	16				4			8		17				9				3	30		142	**238**
Dictynidae [7]																																			
Altella biuncata	1	C																																1	**1**
Argenna subnigra	1																				5										3				**8**
Cicurina cicur	*		7	21	16				10		2		1	2				149	2		2	2					1			6	4	10		51	**286**
Dictyna major	nr																				1														**1**
Dictyna pusilla	*						1														1														**2**
Lathys humilis	*		1						2																							1			**4**
Mastigusa arientina	nr			1																															**1**
Amaurobiidae [3]																																			
Amaurobius fenestralis	*						1		2																										**3**
Coelotes terrestris	*				13								5	6				26			1				6		1						48	**106**
Eurocoelotes inermis	*												51	70																	4	3		7	**135**

familiy [no species] / species	End	Dis	study area [no of sites]																															sum
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
			[3]	[2]	[2]	[4]	[5]	[5]	[5]	[1]	[4]	[1]	[1]	[1]	[4]	[1]	[1]	[4]	[1]	[3]	[5]	[7]	[1]	[1]	[1]	[1]	[5]	[1]	[1]	[2]	[4]	[7]	[3]	[4]	
Titanoecidae [1]																																		
Titanoeca quadriguttata	3	C																4															24	**28**
Miturgidae [1]																																		
Cheiracanthium erraticum	*				2			1										2						1									1	**7**
Cheiracanthium oncognathum	R																1																	**1**
Cheiracanthium virescens	3		3	4	2		6	1	3		5							6		1	2						1			1		2			**37**
Anyphaenidae [1]																																		
Anyphaena accentuata	*		3														1																	**4**
Liocranidae [6]																																		
Agroeca brunnea	*		48	12			2	29	22		20		1	18		8	1	2	4		5	1			2				1	9	29	6		1	**221**
Agroeca cuprea	3				1													54			1				16								85	**157**
Agroeca lusatica	1																				22														**22**
Agroeca proxima	*				4			53	23		9		13	15		3	2	16		2	6			1			2			26	3	16		26	**220**
Apostenus fuscus	*	C			3													77					1											800	**881**
Scotina celans	*				33													75																94	**202**
Clubionidae [14]																																			**0**
Clubiona brevipes	*																			1														1	**2**
Clubiona comta	*		5	1			3		2					2							1						1			1					**16**
Clubiona diversa	*				3				7					5				6			2				1					3	1		4	**32**
Clubiona frutetorum	3							1																							2			**3**
Clubiona lutescens	*					3																									1			**4**
Clubiona neglecta	*				6		6		1		3							1		1		1									6	1			**26**
Clubiona pallidula	*						1																												**1**
Clubiona phragmitis	*					5																													**5**
Clubiona pseudoneglecta	R										1																								**1**
Clubiona reclusa	*		2	3		2	2		1				2																						**12**
Clubiona subsultans	*		1																													2			**3**
Clubiona subtilis	*							1																							2				**3**
Clubiona terrestris	*		1					1						2			2																		**6**
Clubiona trivialis	*							3																				1		1					**5**
Corinnidae [2]																																		
Phrurolithus festivus	*		10	2		5	21	23	3		2		2	18	3	2	3	4	1	5	2	5		3			3			11	10			164	**302**
Phrurolithus minimus	*		1	3	39				3									74							9									209	**338**
Zodariidae [1]																																		
Zodarion italicum	1																					9													**9**
Gnaphosidae [26]																																		
Callilepis nocturna	*							3														5					1				7				**16**
Drassodes cupreus	*		1		83			7	9									109				1	1								1			135	**347**
Drassodes lapidosus	*		3						1					3	2			55		4	1	3	9							3				15	**99**
Drassodes pubescens	*			12	60		39	1	3		6			3	3			114		3		2			3		2				14	1		93	**359**
Drassyllus lutetianus	*						17																				2				1				**20**

familiy [no species] / species	End	Dis	study area [no of sites]																															sum
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
			[3]	[2]	[2]	[4]	[5]	[5]	[5]	[1]	[4]	[1]	[1]	[1]	[4]	[1]	[1]	[4]	[1]	[3]	[5]	[7]	[1]	[1]	[1]	[1]	[5]	[1]	[1]	[2]	[4]	[7]	[3]	[4]	
Drassyllus praeficus	V				258													387															82	**727**
Drassyllus pusillus	*		12	51	84		296	4	21	2	23		2	4		1		197	9	1	133	2	6	6			59	14		2	9	127		66	**1131**
Drassyllus villicus	1	C																1																	**1**
Haplodrassus dalmatensis	R																										13								**13**
Haplodrassus signifer	*		38	37	83		149	4	22		28		1	20	3	1	2	164	8	4	14	20					3	7	1	10		70		123	**812**
Haplodrassus silvestris	*																		1			2			1										**4**
Haplodrassus soerenseni	R								4																1										**5**
Haplodrassus umbratilis	*		3		21		2		5							1		163			1		3	2	6									65	**272**
Micaria formicaria	nr																														2			**2**
Micaria fulgens	V		25						14				1	12	2			108	2	4													8	**176**
Micaria guttulata	R	C																															7	**7**
Micaria pulicaria	V		7				3	31	1				17	10			1	1		1										14	10	2		1	**99**
Micaria silesiaca	3																	1									10					9			**20**
Trachyzelotes pedestris	3							4	1																		1								**6**
Zelotes aeneus	V				4	3												128		1															**136**
Zelotes apricorum	*												1						1			1													**3**
Zelotes electus	V		5	25			41		12		29		3		5	1			2	5	28	119					8			1	29	99	8		**420**
Zelotes latreillei	*			24	37		68	7			28		12	34				54		2	3	12		5			2			12	14	39		173	**526**
Zelotes longipes	V						2								131		3				19		21				79	3		1		3	35		**297**
Zelotes petrensis	*		24		73		35	2	85		81		2	11	6	22	1	205	5	28	183	62	59	10			44		5		11	48		319	**1321**
Zelotes subterraneus	*		42	2			1	4	3				17	11	1		1	6	3		2	1			2	1	1		4	4				103	**209**
Zoridae [3]																																			
Zora nemoralis	*	C																							2										**2**
Zora silvestris	*		1				3		1						1			28		15											1		26	**76**
Zora spinimana	*		13	1	2		1	26	15		13		16	70		2	1	14	2	2	2	5	11	3	3		2			1	47		2	32	**286**
Sparassidae [1]																																			
Micrommata virescens	3																								1						1				**2**
Philodromidae [8]																																			
Philodromus aureolus	*		2																																**2**
Philodromus cespitum	*				2		1	2							1			1		1	2		272					100				1			**383**
Philodromus collinus	*															1	1				1				1				1						**5**
Philodromus dispar	*		1																											1					**2**
Philodromus histrio	*										5										4		15									2			**26**
Philodromus margaritatus	R																				1														**1**
Thanatus formicinus	1	C																							7										**7**
Thanatus striatus	nr																														2				**2**
Thomisidae [18]																																			
Coriarachne depressa	R								2																										**2**
Diaea dorsata	*		1																																**1**
Ozyptila atomaria	*		24		36													140					1		3									28	**232**
Ozyptila claveata	V	C			3													1022							20									2	**1047**

familiy [no species] / species	End	Dis	study area [no of sites]																																sum
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
			[3]	[2]	[2]	[4]	[5]	[5]	[5]	[1]	[4]	[1]	[1]	[1]	[4]	[1]	[1]	[4]	[1]	[3]	[5]	[7]	[1]	[1]	[1]	[1]	[5]	[1]	[1]	[2]	[4]	[7]	[3]	[4]	
Ozyptila praticola	*		2			5		4					2	2										1						1					**17**
Ozyptila pullata	V				428													271					6								1		110	**816**
Ozyptila scabricola	2	C			14													3																**17**
Ozyptila trux	V			3																								2						**5**
Xysticus acerbus	3		1	3			15			1																								**20**
Xysticus audax	*				3		2											1								2								**8**
Xysticus bifasciatus	*				12													57							4								41	**114**
Xysticus cristatus	*		8	1	18		67	3	36		191		3	10	2	6	1	20	31		41	36		16	1		2		2	20	4	43		22	**584**
Xysticus erraticus	*				95						1							214		1	22				3							111		46	**493**
Xysticus ferrugineus	nr																										27					5			**32**
Xysticus kempeleni	*		2																																**2**
Xysticus kochi	*		74	40			32		51	17	35		1			103			26		57	89	1	1			2			3	3	109			**644**
Xysticus robustus	2	C																36															34	**70**
Xysticus ulmi	*												1											1											**2**
Salticidae [20]																																			
Aelurillus v-insignitus	V		12						82		16				14			1		9	2	13								1			21		**171**
Ballus chalybeius	*		3													1																			**4**
Euophrys frontalis	*		13	5	5		2	5	18		6		5	10	1	1	1	80	4	5	8	2		1			1		1	2	6	5		132	**319**
Evarcha arcuata	3												1																		2				**3**
Evarcha falcata	*		1				1		2		2		1	2	1			5	3	3	1	1					1			1		6		2	**33**
Evarcha laetabunda	R				4													7													2			**13**
Heliophanus auratus	3					1																													**1**
Heliophanus cupreus	*		3										1		1			8															9	**22**
Heliophanus flavipes	*						7		1		1		1	1	1			5	1		3												1	**22**
Myrmarachne formicaria	3																													1				**1**
Neon reticulatus	*		2	1					1				1	1	1			4		1													27	**39**
Pellenes tripunctatus	V								16		25				1			14			13	51		8			7	6		2		10		7	**160**
Phlegra fasciata	V		3	9	4		12		2					2	5			13			9	7		4			1			1	6	1		2	**81**
Pseudeuophrys lanigera	*	C																1																	**1**
Salticus scenicus	*	C																2																1	**3**
Sibianor aurocinctus s. str.	*								1		2							1																	**4**
Sitticus pubescens	*																1	3																	**4**
Sitticus saltator	2																				2										2	1	3		**8**
Talavera aequipes	V				42		2				4				3	1		148		5	6	9									1	5	1	124	**351**
Talavera petrensis	V		1					1	1							4	1		1		1	43					3					5			**61**