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## The effect of forest edge on ground-living arthropods in a remnant of unfertilized calcareous grassland in the Swiss Jura mountains

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The width of the edge zone is critical to the existence of interior habitat in any type of remnant. We used pitfall trapping to examine the effect of a sharp and a gradual forest edge on the distribution of ground-living arthropod species (spiders, staphylinid and carabid beetles and diplopods) on a forest-grassland transect in the northwestern Jura mountains, Switzerland. The grassland and forest habitats support distinct species assemblages. Both forest edge zones were found to have an elevated species richness of spiders and staphylinid beetles. However, species richness of carabid beetles and diplopods was not increased in the forest edge zones. At the habitat interface, the communities were composed of a mixture of open field and forest species and species that occur exclusively in the ecotone. Individuals of several species associated with forest were found to penetrate into the grassland. However, the arthropods did not move more than 3–6 m into the grassland at the sharp forest edge, and 6-12 m at the gradual forest edge. This indicates that even relatively small remnants of unfertilized calcareous grassland may contain a functional interior area for ground-living arthropods, which is not influenced by penetrating forest species.

# INTRODUCTION

Compared with interiors of grasslands, forest-grassland edges typically have both different plant and animal species compositions and different community structures (POLLARD, 1968; SAUNDERS *et al.*, 1991). Specialized grassland species may be excluded from edge zones in small grassland fragments due to intrusion of edgerelated physical effects and the penetration of forest species (LOVEJOY *et al.*, 1986; MATLACK, 1993). In this context, the edge zone is the grassland area adjacent to the forest in which forest and ecotone species penetrate. Edge width measures a marginal zone of altered microclimate and contrasting community structure distinct from the forest or grassland interior. Thus, edge effects make the functional interior area of a grassland remnant smaller than its actual area (LAURENCE & YENSEN, 1991). To assess the conservation value of small grassland fragments, it is essential to have an estimate of edge zone width.

In the northwestern Jura mountains of Switzerland, unfertilized calcareous grasslands were large and continuous at the beginning of this century, but since the 1950's changes in agricultural practices such as the use of modern machinery, chemical fertilizers, herbicides and pesticides, and new breeds of plants have reduced the size of these areas and split them into small and isolated fragments. For example, the total area of unfertilized calcareous grassland was reduced by 78% in the Passwang region 20 km south of Basel between 1950 and 1985 (ZOLLER *et al.*, 1986).

Keywords: Araneae, Coleoptera, Diplopoda, biodiversity, calcareous grassland, forest edge, Jura mountains

This overall reduction of the unfertilized grassland area and the isolation of the remnants has led to a dramatic loss of plant species within a short period (FISCHER & STÖCKLIN, 1997). For many plant and animal species the functional interior area of these scattered grassland remnants may even be smaller than their actual size, since most of them are at least partly surrounded by forest. Yet, little information is available about the influence of forest edges on arthropod communities in grasslands (SAMWAYS, 1994; NEW, 1995; but see HÄNGGI, 1993; BEDFORD & USHER, 1994; ŁU-CZAK, 1997). In the present context, edge is considered as the physical boundary between two plant communities (i.e. forest and grassland), whereas the ecotone is the narrow overlap zone between adjacent plant communities (SAMWAYS, 1994).

This paper aims to examine the effect of an abrupt and gradual forest edge on the distribution of ground-dwelling arthropod species (spiders, staphylinid and carabid beetles and diplopods) on a forest-grassland transect. In particular, we addressed the following questions: (1) How far do forest and ecotone species of the four taxonomical groups penetrate into the remnant of unfertilized calcareous grassland? (2) Does the width of the edge zone differ between a sharp and a gradual forest edge? and (3) How much is the functional interior area of the grassland remnant reduced due to forest edge effects?

#### MATERIAL AND METHODS

### Study site

The study was conducted on a 39 m wide remnant of nutrient-poor, dry calcareous grassland (belonging to the Teucrio-Mesobrometum type; ELLENBERG, 1988) near Movelier (5 km N of Delémont) in the northwestern Swiss Jura mountains (47°25' N; 7°19' E). A detailed description of the grassland vegetation is given in BAUR *et al.* (1996). The adjacent forest is dominated by beech (*Fagus sylvatica*).

The grassland remnant is situated on a SSE-facing slope (inclination  $20-22^{\circ}$ ) at an elevation of 780 m. The humus layer is relatively thick (>20 cm) and contains some clay. Until 1993, the grassland was grazed by cattle and a moderate amount of artificial fertilizer was used. The south-facing forest edge was distinct with an abrupt change of the vegetation along the cattle fence (Fig. 1). Tree species at the forest edge included *Fagus sylvatica* (40%), *Quercus petraea* (30%), *Pinus sylvestris* (20%) and *Acer pseudoplantanus* (10%). The bushes of the forest edge consisted of *Viburnum lantana* (30%), *Crataegus monogyna* (20%), *Prunus spinosa* (20%), *Rosa* sp. (20%) and *Ligustrum vulgare* (10%). The north-facing forest edge was gradual with bushes (*Corylus avellana* 90% and *Rosa* sp. 10%) extending 7 m across its original edge (indicated by a cattle fence; Fig. 1). Tree species found at the north-facing forest edge included *F. sylvatica* (70%), *Q. robur* (20%) and *Prunus avium* (10%).

### Sampling procedure

Pitfall traps were used to investigate the effect of forest edge on grassland-living arthropods. Traps were white plastic jars, 7 cm deep x 7 cm in diameter, containing about 50 ml formalin (4%) with detergent. The traps were protected against rain by grey plastic roofs (measuring 18 x 18 cm) that were fixed horizontally about 10 cm above ground. Three parallel transects of traps were established 1 m apart from each other. In each transect the pitfall traps were placed at distances of 3 m, resulting in a total of 18 rows (Fig. 1). The transects run from the interior of the forest (6 m) over the open grassland (32 m) through a gradual forest edge (bushes in the grassland, 7 m) into the interior of the forest (6 m). All traps were emptied and reset fortnightly from 5 May to 24 July 1994, giving a total of 12 trap weeks.



Fig. 1. Position of pitfall traps on the transects indicated by figures. Three parallel transects (1 m apart) with a distance of 3 m between traps were used. Arrows indicate the position of cattle fences.

All spiders, staphylinid and carabid beetles and diplopods caught in pitfall traps were identified to species level using standard keys. Nomenclature of spiders followed MAURER & HÄNGGI (1990). FREUDE *et al.* (1976) and LOHSE & LUCHT (1989) were used for carabid and staphylinid beetles and PEDROLI-CHRISTEN (1993) for diplopods. Detailed lists of species and abundances are available from the authors upon request. All arthropods collected are deposited in the Natural History Museum of Basel.

# Data analysis

The catch data for each taxonomical group (spiders, staphylinids, carabids and diplopods) were analysed separately. The catch frequency for each species in all three replicate traps within a row was summed over the entire trapping period. For detailed analyses, a species was only considered if five or more individuals were recorded over the entire trapping period. This criterion was used to reduce the possibility of vagrant individuals affecting the results.

Arthropod species were categorized based on their relative abundances in particular habitats (cf. DUELLI *et al.*, 1990). Species with more than 67% of the individuals caught in the forest (traps no. 1–3 and 16–18) are referred to as 'forest' species. Similarly, species with more than 67% of the individuals collected in the grassland (traps no. 4–13) are termed 'open-habitat' species. Species associated with forest edge (more than 67% of individuals collected in the traps no. 2–4 and 13–17 are termed 'ecotone' species. According to these critieria some species were assigned to two groups (e.g. forest and ecotone (f/e) or ecotone and open habitat (e/o); see Fig. 3).

## RESULTS

## Number of individuals recorded

A total of 3251 spiders belonging to 116 species were collected during summer 1994 (Tab. 1). The corresponding figures were 1034 individuals (68 species) for the staphylinid beetles, 853 individuals (33 species) for the carabid beetles and 351 individuals (8 species) for the diplopods (Tab. 1). In all taxa, a large proportion

Aranase      Species      Species <t< th=""><th colspan="12">Tab. 1: Total species lists with reference to codes in Fig. 3. Pitfall rows are indicated in italics in species with less than 5 individuals.</th></t<>	Tab. 1: Total species lists with reference to codes in Fig. 3. Pitfall rows are indicated in italics in species with less than 5 individuals.											
Species on Figure 1      Species on Figure 1      Species on Figure 1        in Fig.3      A01      Centromarus serratus (O.PCAMBR, 1875)      A33      Pocadicnemis pumila (BLACKWALL, 1834)        A02      Micragus herbigradus (BLACKWALL, 1833)      A31      Callipies achuszteri (HERMAN, 1879)        A03      Haplodrassus silvestris (BLACKWALL, 1833)      A32      Walckenaeria antica (WIDER, 1834)        A04      Panamonops menge SIMON, 1926      A33      Clubiona neglecto D.PCAMBR, 1871)        A06      Saaria conceptulus fuscopes (BLACKWALL, 1839)      A33      Clubiona neglecto SUDNDEVALL, 1831)        A07      Argmatche formicaria (DEGEER, 1778)      Haplodrassus signifer (C.L.KOCH, 1839)        A09      Maso sundevalit (WESTRING, 1851)      A38      Haplodrassus signifer (C.L.KOCH, 1839)        A11      Leiphyphantes fanyes (BLACKWALL, 1854)      A41      Zelotes parefisios (CLERCK, 1757)        A11      Leiphyphantes fanyes (BLACKWALL, 1854)      A42      Dasodes putescons (CLERCK, 1757)        A11      Leiphyphantes fanyes (BLACKWALL, 1854)      A44      Dasodes putescons (CLERCK, 1757)        A12      Leiphyphantes fanyes (BLACKWALL, 1854)      A44      Dasodes putescons (CLERCK, 1757)        A12      Leiphypha	Araneae											
n°193      cantromerus serratus (O.PCAMBR, 1875)      A30      Pocadicnemis pumila (BLACKWALL, 1841)        A01      Cantromerus serratus (O.PCAMBR, 1875)      A33      Panamomops mengei SIMON, 1926      A33      Clubiona negloca (MUER, 1879)        A04      Panamomops mengei SIMON, 1926      A33      Clubiona negloca O.PCAMBR, 1872)      A33      Clubiona negloca O.PCAMBR, 1872)        A05      Saaristoa abnormis (BLACKWALL, 1841)      A35      Micaria formicaria (SUNDEVAL, 1831)        A06      Saaristoa abnormis (BLACKWALL, 1841)      A35      Michonata molis (O.PCAMBR, 1871)        A08      Monocephatus fuscipes (BLACKWALL, 1839)      A37      Myrmarachne formicaria (DEGEER, 1776)        A11      Liphyphanis fortenis SUNDEVAL, 1829      A38      Hapdorasus silvering (CL.RCCH, 1839)        A11      Laphyphanis fortenis SUNDEVAL, 1829      A42      Drasodes cupreus (BLACKWALL, 1834)        A14      Laphyphanis fair (CL.RCCH, 1836)      A41      Cleates partileus (L.RCCH, 1834)        A14      Laphyphanises (BLACKWALL, 1834)      A43      Zelotes partileus (L.RCCH, 1834)        A15      Varactea addring (CL,RCCH, 1835)      A44      Trice alutetiana (SIMON, 1876)        A15      Varactea addring (CL,RCCH, 1835)	Species code	Species	Species code	Species								
AD    Leintoninus serialis (C.L.COCH, 1834)      AD    Microgus herbigradus (BLACKWALL, 1853)      AD    Paramomops mengi SIMON, 1926      AD    AD      AD    Fapinocyba patlens (D.PCAMBR, 1872)      AD    Paramomops mengi SIMON, 1928      AD    Saariso abnormis (BLACKWALL, 1831)      AD    Saariso abnormis (BLACKWALL, 1831)      AD    Saariso abnormis (BLACKWALL, 1831)      AD    Saariso abnormis (BLACKWALL, 1834)      AD    Manacos undevalit (WESTRING, 1851)      AD    Maso sundevalit (WALCKENAER, 1802)      AD    AD      AD    Hapiodrassus signifier (C.L.KOCH, 1839)      AD    Leiphyphantes fanceical (WIDER, 1834)      AD    Eperigone trilobata (CLERCK, 1757)      Eperigone trilobata (CLERCK, 1757)      AD    Eperigone trilobata (CLERCK, 1757)      AD    Valckenaeria cucultas (C.L.KOCH, 1836)      AD    Valckenaeria cucultas (C.L.KOCH, 1836)      AD    Valckenaeria cucultas (C.L.KOCH, 1834)      AD    Valckenaeria cucultas (C.L.KOCH, 1834)      AD    Valckenaeria cucultas (C.L.KOCH, 1834)      AD    Paracosa optimana (MALCKENALL, 1847)	in Fig.3	Contromorus corretus (O.B. CAMBR 1975)	in Fig.3	Pocadicpomic pumila (PLACK)(ALL 1941)								
A33      Highedmissus silvestrik (BLACKWALL, 1833)      A32      Verainomops amongs SIMON, 1920        A34      Pranomops amongs SIMON, 1920      A33      Clubics aneglecto, DP, -CAMBR/DGE, 1862        A35      Saaristoa anormis (BLACKWALL, 1841)      A35      Clubics aneglecto, DP, -CAMBR/DGE, 1862        A36      Monocephalus fuscipes (BLACKWALL, 1841)      A35      Micaria formicaria (SURDEVALL, 1831)        A36      Monocephalus fuscipes (BLACKWALL, 1836)      A37      Mymarachne formicaria (SURGER, 1773)        A36      Monocephalus fuscipes (BLACKWALL, 1836)      A37      Mymarachne formicaria (SURGER, 1773)        A10      Dyadera erythrina (WALCKENAER, 1823)      A40      Experiment into and strain and strain (CLERCH, 1757)        A11      Liphtyphantes tenebricola (WIDER, 1834)      A41      Zalotes partinous (BLACKWALL, 1834)        A14      Lephtyphantes flavices (BLACKWALL, 1834)      A43      Zalotes partinous (BLACKWALL, 1834)        A14      Lephtyphantes flavices (BLACKWALL, 1834)      A44      Tricca usubace aquipes (OL-RCM, 1877)        A14      Evophrys aequipes (OL-RCM, 1877)      A46      A40      A40        A14      Lephtyphantes flavices (BLACKWALL, 1834)      A44      A47      A44      A44 <td>402</td> <td>Micrarous berbigradus (BLACKWALL 1854)</td> <td>A31</td> <td>Callilenis schuszteri (HERMAN 1879)</td>	402	Micrarous berbigradus (BLACKWALL 1854)	A31	Callilenis schuszteri (HERMAN 1879)								
Aug      Panamomoga mengel SIMON 1926      A33      Clubiona neglecta D.PCAMBR105C; 1862        Ads      Tapinoxyba pallenci D.PCAMBR,1872)      A34      Zoldes puallus (C.L.KOCH,1831)        Ady      Agrineta (SLMCWALL,1841)      A35      Micaria formicaria (SLMCVALL,1831)        Ady      Agrineta (SLMCWALL,1835)      A35      Micaria formicaria (SLMCVALL,1831)        Ady      Agrineta (SLMCVALL,1835)      A35      Micaria formicaria (SLMCVALL,1831)        Ady      Agrineta (SLMCVALL,1834)      A35      Hapiodrassus signifer (C.L.KOCH,1839)        A11      Laptitybphantes fancticulars (D.PCAMBR,1871)      A34      Zoldes prefinacius (L.KOCH,1839)        A13      Valckenaeria cuculata (C.L.KOCH,1833)      A41      Zoldes prefinacius (L.KOCH,1836)        A14      Laptitybphantes fanges (B.L.CKWALL,1861)      A44      Tricca luclatias (C.L.ROCH,1839)        A14      Valckenaeria cuculata (C.L.KOCH,1833)      A44      Tricca luclatias (C.L.ROCH,1837)        A15      Valckenaeria atrollibalis (O.PCAMBR,1871)      A46      Alopecosa cuceata (CLERCK,1757)        A17      Pardosa pulata (CLERCK,1757)      Aloradosa pulata (URCKVALL,1851)      A17        A16      Alopecosa cuceata (CLERCK,1757)	A03	Haolodrassus silvestris (BLACKWALL 1833)	A32	Walckenaeria antica (WIDER 1834)								
Add      Tapinocybr patters (D.PCAMBR, 1872)      Add      Zalotes pualitus (C.L.KOCH, 1833)        Add      Saaristoa aborning (BLACKWALL, 1841)      Add      Add      Saaristoa aborning (BLACKWALL, 1836)        Add      Agrineta ramosa JACKSON, 1912      Add      Add      Menocephalus fuscipes (BLACKWALL, 1836)        Add      Monocephalus fuscipes (BLACKWALL, 1820)      Add      Add      Addocase trabalis (CLEROCH, 1839)        A10      Dyadera erythrina (WALCKENAER, 1802)      Add      Addocase trabalis (CLEROCH, 1839)        A11      Lipybrybia hortensis SUNDEVALL, 1829      Add      Zelotes praeficus (L.KOCH, 1836)        A11      Lapthrybia hortensis SUNDEVALL, 1824)      Add      Zelotes praeficus (L.KOCH, 1836)        A14      Lapthrybia hortensis SUNDEVALL, 1834)      Add      Zelotes praeficus (L.KOCH, 1836)        A15      Walckenaeria corriculans (O.PCAMBR, 1871)      Add      Fairoda utina (SIMON, 1876)        A15      Zera nemoralis (BLACKWALL, 1836)      Add      Tricca luteliana (SIMON, 1876)        A16      Kalcenaeria corriculans (O.PCAMBR, 1871)      Add      Diapocas pullata (CLEROCK, 1757)        A17      Pardosa pullata (CLEROCK, 1757)      Add      Pardosa pullata (CLEROCK, 1757)	A04	Panamomoos mengei SIMON 1926	A33	Clubiona neglecta O.PCAMBRIDGE 1862								
A06      Saaristos athoormis (BLACKWALL, 1841)      A35      Micaria formicaria (SUNDEVALL, 1831)        A07      Ayneta rancesa JACKSON, 1912      A36      Meinota molisa (D.PCAMBR, 1871)        A08      Maso sundevalli (WESTRING, 1851)      A38      Hapiodrassus signifer (GL.KOCH, 1839)        A10      Dyadera erythink (WLCKENAER, 1802)      A30      Hapicotassus signifer (GL.KOCH, 1839)        A11      Liptyhphantes thenebricola (WDER, 1834)      A41      Zotoles prefacious (L.KOCH, 1836)        A13      Harpactae lepida (CL.KOCH, 1836)      A44      Zotoles prefacious (L.KOCH, 1834)        A15      Walckenaenia curulata (CL.KOCH, 1834)      A43      Zotoles prefacious (L.KOCH, 1877)        A16      Walckenaenia curulata (CL.KOCH, 1834)      A44      Fricca luteliana (SIMON, 1876)        A17      Histopona torpida (CL.KOCH, 1834)      A44      Adopacosa cuneata (CLERCK, 1757)        A17      Hadiconard atbinana (WALCKENALL, 1851)      A45      Alopacosa cuneata (CLERCK, 1757)        A18      Zoto anemaria (SULACKWALL, 1841)      A50      Laphtyphantes tenuis (BLACKWALL, 1841)        A20      Cratinelia acabrosa (O.PCAMBR, 1878)      A51      Phuroillius followids (CLERCK, 1757)        A19      Lephtyphant	A05	Tapinocyba pallens (O.PCAMBR., 1872)	A34	Zelotes pusillus (C.L.KOCH, 1833)								
AD7      Apyneta ramosa JACKSON 1912      A36      Meioneta mollis (0, PCAMBR, 1871)        A08      Monocaphalus tuscipes (BLACKWALL, 1830)      A37      Mymrarachen formicaria (DEGEER, 1778)        A10      Dyadera erythrina (MALCKENRER, 1802)      A38      Haplodrassus signifer (CL.KOCH, 1839)        A11      Linyphia hortonsis SUNDEVALL, 1829      A40      Eperigone trilobata (EMERTON, 1982)        A11      Lapthrybantes tenebricola (WIDER, 1834)      A41      Zelotes praeficus (L.KOCH, 1839)        A13      Harpactea lepid (C.L.KOCH, 1834)      A42      Zelotes proteinsis (CL.KOCH, 1839)        A15      Walckenaeria corniculars (C.L.KOCH, 1834)      A44      Tricca luteliana (SIMON, 1876)        A15      Valckenaeria corniculars (O.PCAMBR, 1871)      A48      Euophrys aequipes (O.PCAMBR, 1871)        A16      Valckenaeria corniculars (O.PCAMBR, 1877)      A48      Lophrybantes pailota (CLERCK, 1757)        A18      Zora nemoralis (BLACKWALL, 1841)      A44      Tricca luteliana (WALCKENAER, 1805)        A20      Ceratinelia scabrosa (O.PCAMBR, 1871)      A49      Drasodes pubscens (ThCHELL, 1852)        A21      Valckenaeria corniculars (O.PCAMBR, 1877)      A45      Lophrybnhates malox (VALCKENAER, 1805)	A06	Saaristoa abnormis (BLACKWALL, 1841)	A35	Micaria formicaria (SUNDEVALL, 1831)								
A08      Monocephalus fuscipes (BLACKWALL, 1836)      A37      Mymmarachne formicand (DEGEER, 1778)        A09      Maso sundvalit (WESTRING, 1851)      A38      Alopocosa trabalis (CLERCK, 1757)        A11      Linyphin Internaris SUNDEVALL, 1829      A40      Epergone triobata (EMERTON, 1882)        A12      Lepihyphantes tenebricola (WDER, 1834)      A41      Zelotes praeficus (L.KOCH, 1839)        A13      Harpactea lepida (C.L.KOCH, 1838)      A42      Drasodes cupreus (BLACKWALL, 1834)        A14      Lepihyphantes functiculans (D.PCAMBR, 1875)      A45      Ecophrys acquipes (D.PCAMBR, 1871)        A16      Walckenaeria curcultata (C.L.KOCH, 1836)      A44      Tricca luteliana (SIMACKENAER, 1805)        A17      Histopona torpida (C.L.KOCH, 1834)      A44      Alopicosa cuneata (CLERCK, 1757)        A18      Zora emororial (BLACKWALL, 1861)      A45      Pardosa pubescens (THOREL, 1856)        A21      Walckenaeria acrotibialis (D.PCAMBR, 1871)      A48      Audonia albimana (WALCKENAER, 1805)        A22      Robertus lividus (BLACKWALL, 1861)      A51      Phrurolithus fealivus (C.L.KOCH, 1839)        A22      Robertus lividus (BLACKWALL, 1841)      A52      Plotopiosta cunocol (WIDER, 1834)        A23	A07	Agyneta ramosa JACKSON, 1912	A36	Meioneta mollis (O.PCAMBR., 1871)								
A09      Maso sundevalii (WESTRING, 1851)      A38      Haplodrassus signifer (C.L.KOCH, 1839)        A11      Linyphia hortensis SUNDEVALL, 1829      A40      Experiment analis (C.LEROCH, 1850)        A11      Linyphia hortensis SUNDEVALL, 1829      A40      Experiment analis (C.LEROCH, 1836)        A12      Lepthyphantes tenchricola (WIDER, 1834)      A41      Zelotes praeficus (L.KOCH, 1836)      A42        A13      Hapactea lepida (C.L.KOCH, 1838)      A42      Drassodes cupreus (BLACKWALL, 1834)        A14      Lepthyphantes flavipes (BLACKWALL, 1854)      A43      Zelotes patrensis (L.L.KOCH, 1837)        A15      Walckenaeria curculata (C.L.KOCH, 1834)      A44      Fricca luttiatina (SIMON, 1875)        A18      Zora nemoralis (BLACKWALL, 1851)      A47      Pardosa pullata (CLERCK, 1757)        A18      Zora nemoralis (BLACKWALL, 1836)      A51      Phrurolithus feativus (C.L.KOCH, 1835)        A21      Walckenaeria atrotibialis (O.PCAMBR, 1871)      A49      Drassodes pubescens (THORELL, 1852)        A22      Robertus lividus (BLACKWALL, 1836)      A51      Phrurolithus feativus (C.L.KOCH, 1833)        A22      Diplocephalus picinus (BLACKWALL, 1841)      A52      Morecas pureleavitus (CLERCK, 1757)	A08	Monocephalus fuscipes (BLACKWALL, 1836)	A37	Myrmarachne formicaria (DEGEER, 1778)								
A10    Dysdera erythrina (WALCKENAER, 1802)    A39    Alopecosa trabalis (CLERCK, 1757)      A11    Lupphyshanot sensis SUNDEVALL, 1829    A40    Eperigone trilobata (EMERTON, 1882)      A12    Lepthyshanots tenebricala (WIDER, 1834)    A41    Zolotes praeficus (L.KOCH, 1836)      A13    Harpactea lepida (C.L.KOCH, 1836)    A42    Drassodes cupreus (BLACKWALL, 1834)      A14    Lepthyshanots faivipes (BLACKWALL, 1854)    A43    Zolotes perinesis (C.L.KOCH, 1839)      A15    Walckenaeria curciluata (C.D.C.AMBR, 1875)    A44    Fuchysha acquipes (O.PCAMBR, 1871)      A18    zora emoronis (BLACKWALL, 1861)    A47    Pardosa pullata (CLERCK, 1757)      A19    Lepthyshantes pailidus (O.PCAMBR, 1871)    A48    Aufonia albimana (WALCKENAER, 1805)      A20    Ceratinelia scabrosa (O.PCAMBR, 1871)    A48    Aufonia albimana (WALCKENAER, 1805)      A21    Robertus lividus (BLACKWALL, 1861)    A52    Phrurolithus beatuuis (WESTRING, 1851)      A22    Robertus lividus (BLACKWALL, 1841)    A55    Phrurolithus beaquuis (WESTRING, 1851)      A22    Hahnia pusilia C.L.KOCH, 1834)    A54    Phrurolithus minimus (C.L.KOCH, 1833)      A23    Alpopecabaus pi-tisa individuaia    Batorg as usbaequuis (WESTRI	A09	Maso sundevalli (WESTRING,1851)	A38	Haplodrassus signifer (C.L.KOCH, 1839)								
A11    Linyphia hortensis SUNDEVALL, 1829    A40    Eperigone trilobata (EMERTON, 1882)      A12    Lepthyphantes tenebricala (WDER, 1834)    A41    Zelotes praficus (L.KOCH, 1836)      A14    Lepthyphantes flavipes (BLACKWALL, 1854)    A43    Zelotes perfectious (L.KOCH, 1836)      A15    Walckenaeria curculata (C.L.KOCH, 1836)    A44    Tricca luteliana (SIMON, 1876)      A16    Walckenaeria curculata (C.L.KOCH, 1834)    A46    Euophys aequipes (O.PCAMBR, 1871)      A17    Histopna torpid (C.L.KOCH, 1834)    A46    Alopecosa cuneata (CLERCK, 1757)      A18    Zora nemoralis (BLACKWALL, 1861)    A47    Pardosa pullata (CLERCK, 1757)      A18    Zora nemoralis (BLACKWALL, 1836)    A51    Phrurolithus festivus (C.L.KOCH, 1835)      A22    Robertus lividus (BLACKWALL, 1836)    A51    Phrurolithus festivus (C.L.KOCH, 1835)      A23    Diplocephalus picinus (BLACKWALL, 1841)    A52    Micrargus subaequalis (WESTRING, 1851)      A24    Clubina terrestrist WESTRING, 1682    A53    Phrurolithus minimus (C.L.KOCH, 1839)      A25    Diplostyla concolor (WIDER, 1834)    A54    Phrurolithus desirus (UKECKWALL, 1827)      A27    Microneta viaria (BLACKWALL, 1841)    A56    Pardosas hortensi	A10	Dysdera erythrina (WALCKENAER, 1802)	A39	Alopecosa trabalis (CLERCK, 1757)								
A12Lepthyphantes tenebricola (WIDER, 1834)A41Zelotes praeficus (LNCCH, 1866)A13Harpactea lepida (C.L.KOCH, 1838)A42Drassodes cupreus (BLACKWALL, 1834)A14Lepthyphantes flavipas (BLACKWALL, 1854)A43Zelotes petrensis (C.L.KOCH, 1839)A15Walckenaeria conclutans (O.PCAMBR, 1875)A44Tricca luteliana (SIMON, 1876)A16Walckenaeria conclutans (O.PCAMBR, 1871)A44Adopecosa cuenata (CLERCK, 1757)A17Histopona torpida (C.L.KOCH, 1834)A44Adopecosa cuenata (CLERCK, 1757)A19Lepthyphantes pallidus (O.PCAMBR, 1871)A44Adopecosa cuenata (CLERCK, 1757)A19Lepthyphantes pallidus (O.PCAMBR, 1871)A48Autonia albimana (WALCKENAER, 1805)A20Ceratinelia scabrosa (O.PCAMBR, 1871)A48Autonia albimana (WALCKENAER, 1805)A21Walckenaeria atrolbialis (O.PCAMBR, 1878)A50Depthyphantes flavius (CL.KOCH, 1835)A22Robertus lividus (BLACKWALL, 1861)A51Phrurolithus minimus (CL.KOCH, 1835)A23Diplocephalus picinus (BLACKWALL, 1834)A53Alopacosa pulvenutea (CLERCK, 1757)A24Clubiona terrestris WESTRING, 1862A53Alopacosa pulvenutea (CLERCK, 1757)A25Dipolsyla concolor (WIDER, 1873)A54Pardosa pulvenutea (CLERCK, 1757)A26Hahnia pusilla CL.KOCH, 1834)A54Pardosa pulvenutea (CLERCK, 1757)A28Pardosa sp. (-saltans s. TOPFER & HELV. 1990)A57Togenaria picta SiMON, 1870A28Pardosa sp. (-saltans s. TOPFER & HELV. 1990)A57<	A11	Linyphia hortensis SUNDEVALL, 1829	A40	Eperigone trilobata (EMERTON, 1882)								
A13    Harpactea lepida (C.L.KOCH, 1839)    A42    Drasodes cupreus (BLACKWALL, 1834)      A14    Lepthyphanets favioes (BLACKWALL, 1836)    A44    Zototes petrensis (C.L.KOCH, 1834)      A16    Walckenaeria conculata (O.L.KOCH, 1836)    A44    Tricca luteliana (SIMON, 1876)      A17    Histopona torpida (C.L.KOCH, 1834)    A46    Alopecosa cuneata (O.LERCK, 1757)      A18    Zora nemoralis (BLACKWALL, 1861)    A47    Pardosa pullata (CLERCK, 1757)      A19    Lepthyphanets spalidus (D.PCAMBR, 1871)    A48    Autoria albimana (WALCKENAER, 1805)      A22    Caratinella scabrosa (D.PCAMBR, 1871)    A49    Drasodes pubescons (THORELL, 1852)      A23    Diplocephalus picinus (BLACKWALL, 1841)    A50    Lepthyphanets semilis (WEACKWALL, 1852)      A24    Chiobina terrestive WESTRING, 1862    A53    Alopecosa pubevalentalis (WESTRING, 1851)      A24    Microneta viaria (BLACKWALL, 1841)    A54    Phrurolithus minimus (C.L.KOCH, 1839)      A27    Microneta viaria (BLACKWALL, 1841)    A56    Pardosa pubevalentalis (WESTRING, 1851)      A28    Pardosa a notrensi (KILCZYNSKI, 1887    A54    Phrurolithus minimus (C.L.KOCH, 1839)      A35    Pardosa a notrensi sindividuatis    Pitell row    <	A12	Lepthyphantes tenebricola (WIDER,1834)	A41	Zelotes praeficus (L.KOCH,1866)								
A14    Lepthyphantes flavipes (BLACKWALL, 1854)    A43    Zolotes petrensis (CL. KOCH, 1839)      A15    Walckenaeria corniculara (CL. KOCH, 1834)    A45    Eucophrys aequipes (O.PCAMBR, 1871)      A17    Histopona torpida (CL. KOCH, 1834)    A45    Eucophrys aequipes (O.PCAMBR, 1871)      A18    Zora nemoralis (BLACKWALL, 1861)    A47    Pardosa pultata (CLERCK, 1757)      A19    Lepthyphantes pallidus (O.PCAMBR, 1871)    A49    A40 paceosa cuneata (CLERCK, 1757)      A19    Lepthyphantes faulidus (O.PCAMBR, 1871)    A49    Autonia albimana (WALCKENAER, 1805)      A21    Walckenaeria atrotibialis (O.PCAMBR, 1871)    A45    Diracodes pubescens (Th/ORELL, 1856)      A22    Robertus lividus (BLACKWALL, 1834)    A53    Alopecosa pulvarulenta (CLERCK, 1757)      A23    Diplocephalus picinus (BLACKWALL, 1834)    A54    Phrurolithus festitums (CL.KOCH, 1839)      A24    Clubiona terrestris WESTRING, 1862    A53    Alopecosa nurcical (CDEGEER, 1778)      A26    Hahnia pusilia CL-KOCH, 1841    A55    Tracchosa rurical (CDEGEER, 1778)      A28    Pardosa sp. (=saitans s. TOPFER & HELV. 1990)    A57    Tegenaria picta SiMoN, 1870      A28    Pardosa sp. (=saitans s. TOPFER & HELV. 1990)    A5	A13	Harpactea lepida (C.L.KOCH,1838)	A42	Drassodes cupreus (BLACKWALL, 1834)								
A15Walcknaeria cucultati (C.L.KOCH, 1836)A44Tricca luteliana (SIMON, 1876)A16Walcknaeria corniculans (O.PCAMBR, 1875)A45Eucophys aequipes (O.PCAMBR, 1871)A18Zora nemoralis (BLACKWALL, 1861)A46Alopeccsa cuncata (C.LERCK, 1757)A19Lephtyphantes pallidus (O.PCAMBR, 1871)A46Alopeccsa cuncata (C.LERCK, 1757)A20Ceratinella scabrosa (O.PCAMBR, 1871)A49Drassodes pubsecens (THORELL, 1856)A21Walcknaeria atroibilais (O.PCAMBR, 1871)A49Drassodes pubsecens (THORELL, 1855)A22Robertus lividus (BLACKWALL, 1841)A51Phrurolithus festivus (C.L.KOCH, 1835)A23Diplocephalus picinus (BLACKWALL, 1841)A52A53A24Clubiona terrestris WESTRING, 1862A53Alopeccsa ruirola (DECERCR, 1757)A25Diplostyla concolor (WIDER, 1834)A54Phrurolithus miniums (C.L.KOCH, 1839)A26Hahnia pusila C.LKOCH, 1841A55Torchosa ruirola (DECERCR, 1778)A27Microneta viaria (BLACKWALL, 1841)A56Tordosa potrensis (THORELL, 1872)A28Pardosa bacensis (THORELL, 1872)Toradosa bacensis (THORELL, 1872)A29Lepthyphantes mangel KULCZYNSKI, 1887A58Zora spinimana (SUNDEVALL, 1831)5Appecosa accentuata (LATREILE, 1817)5, 7, 8, 136Alopecosa accentuata (LATREILE, 1817)4Lepthyphantes keyserling (AUSSERER, 1867)16Centromerus sylvaticus (BLACKWALL, 1831)4Metopobactus prominulus (O.PCAMBR, 1872)17Amaurobius fenestratis (STROEM,	A14	Lepthyphantes flavipes (BLACKWALL, 1854)	A43	Zelotes petrensis (C.L.KOCH, 1839)								
A16Walckeneria corriculans (O.PCAMBR, 1875)A45Euophrys acquages (O.PCAMBR, 1871)A17Histopona torpida (C.L.KCCH, 1834)A47Pardosa pullata (C.LERCK, 1757)A18Zora nemoralis (BLACKWALL, 1861)A47Pardosa pullata (C.LERCK, 1757)A19Lepthyphantes pallidus (O.PCAMBR, 1871)A48Aulonia albimana (WALCKENAER, 1805)A20Ceratinelia scabrosa (O.PCAMBR, 1871)A49Drassodes pubescens (THORELL, 1856)A21Walckenaeria atrotibialis (O.PCAMBR, 1873)A50Ephtyphantes tenuis (BLACKWALL, 1835)A23Diplocephalus picinus (BLACKWALL, 1836)A51Phrurolithus festivus (C.L.KOCH, 1835)A24Clubiona terrestris WESTRING, 1862A53Alopecosa pulvarulenta (C.LERCK, 1757)A25Diplosityla concolor (WIDER, 1834)A54Phrurolithus minimus (C.L.KOCH, 1839)A26Hahnia pusilla C.L.KOCH, 1841A55Trochosa ruricola (DEGEER, 1778)A28Pardosa pot, esaltans s. TOPEER & HELV. 1990)A57Tegenaria picta SIMON, 1870A29Lepthyphantes mengei KULCZYNSKI, 18874.Lepthyphantes keyserlingi (AUSSERER, 1867)6Alopecosa couroutada (LATRELLE, 1817)5.7.8, 13Meioneta turestris (C.L.KOCH, 1833)717Amaurobius fenestrails (STROEM, 1765)14718Bathyphantes parvulus (WESTRING, 1851)4719Centromerus divutus (O.PCAMBR, 1875)13716Centromerus divutus (O.PCAMBR, 1875)14717Amaurobius fenestrails (STROEM, 1855)14718Centromeru	A15	Walckenaeria cucullata (C.L.KOCH,1836)	A44	Tricca lutetiana (SIMON, 1876)								
A17    Histopona torpida (CL, KOCH, 1834)    A46    Alopeccsa curreata (CLERCK, 1757)      A18    Zora nemoralis (GLACKWALL, 1861)    A47    Pardosa pullata (CLERCK, 1757)      A19    Lepthyphantes pallidus (O.PCAMBR, 1871)    A48    Aulonia albimana (WALCKENAER, 1805)      A20    Ceratinella scabrosa (O.PCAMBR, 1878)    A50    Lepthyphantes tenuis (BLACKWALL, 1856)      A21    Walckenaeria atrotibialis (O.PCAMBR, 1878)    A50    Micrargus subaequalis (WESTRING, 1851)      A22    Robertus lividus (BLACKWALL, 1834)    A51    Phrurotilitus relius (WESTRING, 1851)      A22    Clubiona terrestris WESTRING, 1862    A53    Alopeccas pulverulenta (CLERCK, 1757)      A25    Diplostyla concolor (WIDER, 1834)    A54    Phrurotilitus reliumis (THORELL, 1872)      A28    Pardosa b notinesis (THORELL, 1872)    Torenesa indicas (SUNDEVALL, 1833)      A29    Lepthyphantes mengei (LUCZYNSKI, 1887    A58    Zora spinimana (SUNDEVALL, 1833)      A39    Lepthyphantes restraits (STROEM, 1768)    4, 54, 11    Miconeta avera for (LACCH, 1836)      Fieldir ow    Species with isst than 5 individuals    Pultatinow    Species with isst than 5 individuals      5    Agroeca cuprea MENGE, 1873    4    Lepthyphantes	A16	Walckenaeria corniculans (O.PCAMBR., 1875)	A45	Euophrys aequipes (O.PCAMBR., 1871)								
A18Lora nemoralis (BLACKWALL, 1851)A47Pardosa pulma (ULERCK, 1757)A19Lepthyphantes paildus (O.PCAMBR, 1871)A48Autonia albimana (WALCKENAER, 1805)A20Ceratinella scabrosa (O.PCAMBR, 1878)A50Lepthyphantes tenuis (BLACKWALL, 1852)A21Walckenaeria atrotibialis (O.PCAMBR, 1878)A50Lepthyphantes tenuis (BLACKWALL, 1852)A22Robertus lividus (BLACKWALL, 1841)A51Micrargus subequalis (WESTRING, 1862A32Diplocephalus picinus (BLACKWALL, 1841)A52Micrargus subequalis (WESTRING, 1862A45Diploty a concolor (WIDER, 1834)A54Phrurolithus festivus (C.L.KOCH, 1839)A26Hahnia pusilla C.L.KOCH, 1841A55Pridosa hortensis (THORELL, 1872)A28Pardosa puiser internation (C.L.KOCH, 1839)Trochosa ruricola (DEGER, 1778)A29Lepthyphantes mengis KULCZYNSKI, 1887A58Zora spinimana (SUNDEVALL, 1842)A29Pardosa puiser internation (C.L.KOCH, 1833)Pitfail rowSpecies with less than 5 individuals5Agroeca cuprea MENGE, 18734Lepthyphantes keyserling (AUSSERER, 1867)6Alopecosa accentuta (LATREILLE, 1817)57, 8, 13Micaria fulgens (WALCKENAER, 1802)17Amaurobius fenestralis (STROEM, 1768)4, 58, 11Micaria fulgens (WALCKENAER, 1802)16Centromerus sylvaticus (BLACKWALL, 1841)13Micaria fulgens (WALCKENAER, 1802)16Centromerus sylvaticus (BLACKWALL, 1843)4Oxyptilia nigrita (THORELL, 1875)17Amaurobius fenestralis (C.L.KOCH, 1839)7	A17	Histopona torpida (C.L.KOCH, 1834)	A46	Alopecosa cuneata (CLERCK, 1757)								
A19Leptnyphantes paindus (U.PCAMBR, 1871)A49Automa automina (WALCRENAER, 1800)A20Ceratinella scatorosa (D.PCAMBR, 1871)A49Dissodes pubescens (THORELL, 1856)A21Walckenaeria attroitbialis (O.PCAMBR, 1878)A50Lepthyphantes tenuis (BLACKWALL, 1852)A22Robertus lividus (BLACKWALL, 1841)A52Micrargus subaequalis (WESTRING, 1862)A24Clubiona terrestris WESTRING, 1862A53Alopecosa pulverulenta (CLERCK, 1757)A25Diplostyla concolor (WIDER, 1834)A54Phrurolithus minimus (C.L.KOCH, 1839)A26Hahnia pusilla C.L.KOCH, 1841A55Trochosa ruricola (DEGEER, 1778)A27Microneta viaria (BLACKWALL, 1841)A55Pardosa sp. (Fanais (CL, 1772)A28Pardosa sp. (Fasaitans s. TOPFER & HELV. 1990)A57Tegenaria picta SIMON, 1870A29Lepthyphantes mengei KULCZYNSKI, 1887A58Zora spinimana (SUNDEVALL, 1833)Pittai rowSpecies with less than 5 individualsPitfai rowSpecies with less than 5 individuals5Agroeca cupred MENGE, 18734Lepthyphantes keyserlingi (AUSSERER, 1867)6Alopecosa accentuata (LATREILE, 1817)57, 78, 13Micioneta rurestris (C.L.KOCH, 1836)17.7Amaurobius fenestralis (STROEM, 1768)4, 58, 11Micorare pulcara (SUNDEVALL, 1831)15Centromerus dilutus (O.PCAMBR, 1875)14Micaria pulcara (SUNDEVALL, 1831)16Cicurina cluur (FABRICUS, 1793)4Oxypilia nigrata (THORELL, 1875)17.8Centromerus dilutus (O.PCAMBR, 1875)14<	A18	Zora nemoralis (BLACKWALL, 1861)	A47	Pardosa pullata (CLERCK, 1757)								
A20Certainella scatorsa (C.FCAMBR, 1878)A35Diassodes jubuscens (InCACEWALL, 1830)A21Walckenaeria atroitbialis (C.FCAMBR, 1878)A50Lepthyphantes tenuis (BLACKWALL, 1835)A22Robertus lividus (BLACKWALL, 1841)A52Micrargus subaequalis (WESTRING, 1851)A24Clubiona terrestris WESTRING, 1862A53Alopecosa pulverulenta (CLERCK, 1757)A25Diplostyla concolor (WIDER, 1834)A54Phrurolithus minimus (C.L.KOCH, 1839)A26Hahnia pusilia C.L.KOCH, 1841A55Trochosa ruricola (DEGEER, 1778)A27Microneta viaria (BLACKWALL, 1841)A56Pardosa burtens (ICHCELL, 1872)A28Pardosa sp. (=saltans s. TÖPFER & HELV. 1990)A57Tegenaria picta SIMON, 1870A29Lepthyphantes mengei KULCZYNSKI, 1887A58Zora spinimana (SUNDEVALL, 1833)5Agroeca cuprea MENCE, 18734Lepthyphantes keyserlingi (UUSSERER, 1867)6Alopecosa accentuata (LATREILLE, 1817)5,7,8,13Meioneta beata (O.PCAMBR, 1906)17Amaurobius fenestralis (STROEM, 1765)14Micaria pulicaria (SUNDEVALL, 1831)15Centromerus silvaticus (BLACKWALL, 1841)13Micaria pulicaria (SUNDEVALL, 1831)16Cieurina cicur (FABRICIUS, 1793)4Oxyptila alomaria (PANZER, 1810)16,16Ciubiona compt a C.LXOCH, 183911Peleropsis parallela (WIDER, 1842)17Prasodes labiosus (WALCKENAER, 1802)7Printa uliginosus (THORELL, 1875)16,17Diplocephalus latifrons (O.PCAMBR, 1863)3Pirrata uligens (WALCKENAER	A19	Ceretizella sectores (O.PCAMBR., 1071)	A40	Draggadag pubaggang (THORELL 1866)								
A21Walckenaeria atuguias (C)CAMBR, 1876)A30Lephrophines tertus (CL-KOCH, 1835)A22Robertus iividus (BLACKWALL, 1841)A51Phrurolithus festivus (CL-KOCH, 1835)A23Diplocephalus picinus (BLACKWALL, 1841)A53Alopecosa pulverulenta (CLERCK, 1757)A24Clubiona terrestris WESTRING, 1862A53Alopecosa pulverulenta (CLERCK, 1757)A25Diplotyla concolor (WIDER, 1834)A54Phrurolithus minimus (C.L.KOCH, 1839)A26Hahnia pusilla C.L.KOCH, 1841A55Trochosa nuricola (DEGEER, 1778)A27Microneta viaria (BLACKWALL, 1841)A56Pardosa hortensis (THORELL, 1872)A28Pardosa sp. (=saltans s. TÖPFER & HELV. 1990)A57Tegenaria picta SIMON, 1870A29Lepthyphantes mengei KULCZYNSKI, 1887A58Zora spinimana (SUNDEVALL, 1833)Fittal rowSpecies with bas individualsPitfal rowSpecies with bas individuals5Agroeca cuprea MENGE, 18734Lepthyphantes keyserling (AUSSERER, 1867)6Alopecosa accentuata (LATREILLE, 1817)5,7,8,13Meioneta rurestris (C.L.KOCH, 1836)17Amaurobus fenestraiis (STROEM, 1768)4,5,8,17Meioneta rurestris (C.L.KOCH, 1836)14,18Bathyphantes parvulus (WESTRING, 1851)4Metopatarus (VILCKNAER, 1802)16Centromerus dilutus (O,PCAMBR, 1875)13Micaria pullcaria (SUNDEVALL, 1831)16Cicurina cicur (FABRCICUS, 1793)4Oxyptila atomara (SUNDEVALL, 1836)17,17Jopoepalus tetricus (C.L.KOCH, 1839)7Philodromus collinus C.L.KOCH,	A20	Ceratinella scabrosa (C.PCAMBR., 1071)	A49	Lepthyphoptos topula (PLACK)(ALL 1952)								
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1.11.	1	Cybaeus tetricus (C.L.KOCH 1839)	7	Philodromus collinus C.L.KOCH 1835								
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	1,3,15,17	Harpactocrates drassoldes (SIMON, 1882)	2,14	Walckenaena oblusa BLACKWALL, 1836								
4,5,11 Heliophanus cupreus (WALCKENAEK, 1602) 76 Aysticuts and Getta, 1602 778 Aysticuts and Getta Aysticuts and Ays	4,5,11	Heliophanus cupreus (WALCKENAER, 1802)	1319	Zelotes anticorum (LKOCH 1876)								
4, 70 reiiophanus navipes (riArin, 1652) 15 Leothyphantes cristatus (MENGE 1866) 8.11.13 Zelotes latreillei (SIMON 1878)	4,10	Leothyphantes cristatus (MENGE 1866)	8.11.13	Zelotes latreillei (SIMON, 1878)								

Tab. 1 (cont.): Total species lists with reference to codes in Fig. 3. Pitfall rows are indicated in italics in species with less than 5 individuals.										
Staphylinidae										
Species code	Species	Species code	Species							
in Fig.3		in Fig.3	Develle appelleulete (C. 1797)							
S01	Omalium caesum GRAV., 1806	S14	Drusilia canaliculata (F.,1787)							
S02	Aleochara ruficornis GRAV.,1802	515	Astopus gracilis (PAYK 1789)							
S03	Plataraea brunnea (F., 1798)	817	Ocyclus approcentalus (GEER 1774)							
S04	Plataraea elegans (BENICK, 1934)	S18	Stanhylinus caesareus CED 1798							
505	Anotylus sculpturatus (GRAV., 1600)	\$19	Paederus littoralis GRAV. 1802							
506	Atheta alegatula (GRA)( 1902)	\$20	Ocypus fulvipennis ER. 1840							
508	Philophus decorus (GRAV, 1802)	S21	Zvras collaris (PAYK., 1800)							
509	Lathrimaeum atrocenhalum (GYLL, 1827)	S22	Ocypus olens (MÜLL., 1764)							
S10	Stanhvlinus fossor (SCOP, 1772)	S23	Zyras similis (MÄRK., 1844)							
S11	Othius punctulatus (GOEZE, 1777)	S24	Omalium rivulare (PAYK., 1789)							
S12	Liogluta microptera (THOMS., 1867)	S25	Alaobia scapularis (SAHLB.,1831)							
S13	Stenus impressus GERM., 1824	S26	Quedius curtipennis BERNH.,1908							
Pitfall row	Species with less than 5 individuals	Pitfall row	Species with less than 5 individuals							
5	Aleunota gracilenta (ER.)	4	Ocalea rivularis MILL., 1851							
9	Astenus longelytratus (GRAV., 1806)	11	Ocypus compressus (MARSH.,1802)							
4	Astenus procerus (GRAV., 1806)	1	Ocypus tenebricosus (GRAV., 1846)							
17	Atheta fungi (GRAV.,1806)	17	Oxypoda alternans (GRAV., 1802)							
18	Atheta negligens (MULS.REY, 1873)	17	Oxypoda spectabilis MARK., 1844							
17	Atheta pervagata BENICK, 1975	9	Philonthus carbonarius (GRAV., 1810)							
17	Domene scabricollis (ER.,1840)	16	Philonthus politus (L., 1756)							
16	Enalodroma hepatica (ER.,1839)	4,15	Plataraea dubiosa (BENICK, 1934)							
15	Eusphalerum florale (PANZ., 1793)	610	Platydracus lateoricola (Orcav., 1000)							
2	Eusphalerum stramineum (KR., 1857)	0,10	Scopaeus sulcicollis (STEPH 1833)							
14	Falagria thoracica STEPH., 1832	4,7	Sepedophilus pedicularius (GRAV., 1802)							
14	Gyrohypnus angustatus STEPH., 1833	16 17	Stenus fuscicornis ER. 1840							
2,10,18	Habrocerus capillaricornis (GRAV., 1808)	5 13	Sunius melanocephalus (F., 1792)							
2,18	Homoeusa acuminata (MARR., 1042)	8.13	Tachyporus dispar (PAYK., 1789)							
8	Lathrabium multipunctum GRAV 1802	10.12	Tachyporus hypnorum (L., 1758)							
16	Lantusa ruficollis (FR 1839)	14	Tachyporus nitidulus (F., 1781)							
15	Liogluta longuiscula (GRAV 1802)	14	Tachyporus obtusus (L., 1767)							
8	Mycetoporus longulus MANNH., 1830	17	Xantholinus jarrigei COIFF.1956							
7	Myrmoecia confragrosa (HOCHH., 1849)	10	Xantholinus linearis (OL., 1795)							
5,17,18	Ocalea picata (STEPH., 1832)	1,2,14,15	Xantholinus tricolor (F.,1787)							
	Cara	bidae								
Species code	Species	Species code	Species							
in Fig.3	apatros	in Fig.3	Conchus problemations HERBST 1786							
C01	Pterostichus burmeisteri HEER,1841	C09	Carabus problematicus HERBS1, 1700							
C02	Abax ovalis (DUFTSCHMID, 1812)	C10	Harpalus latus LINNE 1758							
C03	Pterostichus selmanni DUFTSCHMID, 1812	611	Pterostichus ovoideus (STURM, 1824)							
C04	Carabus auronitens FABRICIUS, 1792	C12	Carabus monilis FABRICIUS, 1792							
C05	Abax parallelus (DUFL, 1812)	C14	Carabus convexus FABRICIUS,1775							
C07	Abax parallelepipedus (PILLER & MITT., 1703)	C15	Carabus nemoralis MÜLLER,1764							
C08	Report Provide PANZER, 1795)	0.0								
Pitfall row	Species with less than 5 individuals	Pitfall row	Species with less than 5 individuals							
11	Amara lunicollis SCHIÖDTE 1837	7	Loricera pilicornis FABRICIUS, 1775							
12	Amara nitida STURM 1815	13	Microlestes maurus STURM, 1827							
11	Amara plebeia (GYLLENHAL, 1819)	15,17	Nebria brevicollis (FABRICIUS, 1792)							
4,9	Amara similata (GYLLENHAL, 1819)	14	Nebria salina FAIRMAIRE & LAB., 1854							
12	Badister meridionalis PUEL, 1925	9	Panagaeus bipustulatus (FABRICIUS, 1775)							
4,8	Calathus fuscipes (GOETZE, 1777)	1,3	Philorhizus notatus (STEPHENS, 1828)							
5,8,10	Carabus purpurascens FABRICIUS, 1787	12	Poecilus versicolor (STURM, 1824)							
1	Cychrus attenuatus FABRICIUS, 1792	18	Trechus quadristriatus (SCHKANK, 1701)							
1,17	Licinus hoffmannseggi PANZER,1797	2	Trichotichnus laevicollis DUPTSCHMID, 1812)							
Diplopoda										
Species code	Species	Species code	Species							
in Fig.3		in Fig.3	Glomeris hexasticha intermedia LATZEL 1884							
	Giomeris conspersa C.L.KOCH, 1847	05	Tachypodoiulus niger (LEACH, 1815)							
D3	Aliajulis nitidus VERHOEFF, 1930	D6	Cylindroiulus caeruleocinctus (WOOD, 1864)							
Pitfall row	Species with less than 5 individuals	Pitfall row	Species with less than 5 individuals							
14,17	Glomeris connexa C.L. KOCH.1847	17	Rhymogona alemannica (VERHOEFF, 1910)							

of species were represented by 1–4 individuals (58 of the 116 (50%) spider species, 42 of the 68 (62%) of the staphylinid species, 18 of the 33 (55%) carabid species, and 2 of the 8 (25%) milliped species). These species were either rare or not susceptible to pitfall trapping. Altogether, the species with low catches contributed to 4% of the total number of individuals caught (spiders 3.6%, staphylinid beetles 6.6%, carabid beetles 3.9% and millipedes 0.9%).





Fig. 2. Number of individuals (top) and species (bottom) of four groups of arthropods caught along the transect (only species with  $\geq 5$  individuals recorded). Positions of the traps as in Fig. 1.

In the following analyses we omitted species with less than five individuals. Over the entire transect significant differences in catch frequency were found in all taxonomical groups (X<sup>2</sup>-test, in all taxonomical groups P < 0.001; Fig. 2, top). In general, catch frequency was higher in the forest than in the grassland. In staphylinid beetles and diplopods, the number of individuals trapped increased in the forest edge zones and decreased towards the interior of the grassland. In spiders and carabid beetles, the differences in mean number of individuals caught per trap row were not as pronounced as in the other two groups.

## Species richness

Species richness is presented for each taxonomical group over the entire transect in Fig. 2, bottom. Both forest edge zones were found to have a slightly elevated species richness of spiders and staphylinid beetles (Tab. 2 and Fig. 2, bottom). No similar trend was observed in carabid beetles and diplopods.

Taxonomical group	Habitat type (pitfall row no. in transect)											
	Forest	Ecotone		Gras	sland	Eco	Forest					
	(1+2)	(3+4)	(5+6)	(7+8)	(9+10)	(13+14)	3+14) (15+16)					
Diplopods	5	5	1	1	1	1	3	4	6			
Carabid beetles	10	7	6	6	7	7	11	11	7			
Staphylinid beetles	11	18	11	10	9	11	16	14	15			
Spiders	31	45	30	33	29	32	37	30	29			
Total	57	75	48	50	46	51	67	59	57			

Tab. 2. Number of species recorded in different types of habitats along the transect. Data from two rows of pitfall traps are combined. See Fig. 1 for positions of traps.

Fig. 3 shows the spatial distribution and abundance of individual species collected over the transect. Species names are given in Tab. 1. In most species the majority of the individuals were trapped either in the grassland or in the forest as indicated by an abrupt decline in catch frequency at the edge of their preferred habitat. Thus, the grassland and forest supported distinct species assemblages. However, there were some species (e.g. the spiders A27 *Microneta viaria* (BLACKWALL, 1841) and A28 *Pardosa saltans* TÖPFER & HELVERSEN, 1990), which appear to favour the edge zone over both the open grassland and the forest interior. At the habitat interface the communities were composed of a mixture of forest and grassland species and some ecotone species (i.e. species with individuals occurring predominantly in the edge zone).

Our classification of the species according to their relative abundance in particular habitats (Fig. 3) revealed in most cases the same classification as described in the literature (e.g. MARGGI, 1992).

## Edge effect

Individuals of several 'forest' and 'ecotone' species penetrated 6 m and farther into the grassland (e.g. the staphylinid beetle S04 *Plataraea elegans* (BENICK, 1934) and the spider A04 *Panamomops mengei* SIMON, 1926; Fig. 3). The two forest edges differed in the number of 'forest' and 'ecotone' species that were caught in the 6 mwide grassland strip. In each taxonomical group more 'forest' and 'ecotone' species were found in the grassland strip adjacent to the gradual forest edge than in the grassland strip adjacent to the sharp forest edge (Fig. 3). This indicates that the type of forest edge may affect the extent to which forest- and ecotone-living arthropods penetrate into the grassland.

Considering the 'forest' and 'ecotone' species of the four taxonomical groups, a higher proportion of staphylinid species than carabid and diplopod species were found in the grassland strip adjacent to the gradual forest edge (Fig. 3). This suggests that different taxonomical groups show different responses to the forest edge.

# DISCUSSION

The present study shows that species richness in ground-living arthropods slightly increased in the forest edge zone and that individuals of several forest species showed little movement into the adjacent grassland. Most studies of edge effects on invertebrate communities have shown that abundance, richness and diversity usu-

							а	) Ar	ane	ae						NURODAN PARCH			2020010200
Species	HC								Pitfal	row									
code		1 2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	16
A01															-				52
A02 A03	f			]															18
A04	f			1.															26
A05	f																		15
A06	f	-																	13
A07	f			-														NOT THE OWNER	51
A08	f			1															84
A09	f																		8
A10	f			-															0
A11	f/e			1															9
A12	f/e																		33
A13	f/e														Course and the second			and the second second	130
A14 A15	f/e			1															31
A16	f/e																<b>.</b>	-	39
A17	f/e	-		-											COLUMN DE LA VIE		ADDADEND		80
A18	f/e			4															11
A19	f/e																		21
A20	е		-																19
A21	е													CONTRACTOR N				and the second	94
A22	е			1															219
A23	е			1															8
A24	e																		25
A25	8																		87
A27	e													and a state of					108
A28	е															Constanting of the	<b>D</b>		100
A29	e/o											•			•				16
A30	e/o												-						15
A31	e/o																		9
A32	0																		5
A33	0																		6
A34	0																		8
A35 A36	0									and the second	-								31
A30	0																		33
A38	0				-														35
A39	0			-							ocuciona concelion								47
A40	0							and and the local states of the											70
A41	0			-				and the second		No. of Concession, Name	CANDING CO	CHANNEL COL							91
A42	0																		67
A43	0																		21
A44	0																		11
A45	0											-							72
A46	0									Statute states	-								390
A47	0			-	D. CONTRACT						-		STATISTICS.		-				469
A49	0																		17
A50	0														•				16
A51	0			- ·	-			•						ł					57
A52	0			-			NO STREET				an a			-					164
A53	0													1					13
A54	0																		61
A55	0											COLUMN A STOR							50
A56	0		Contraction of the	-	-														5
A57	n																•		21
Type of	habitat	Fore	est					Open	pasture					Sh	rubs		Fores		3133
Pitfall	row	1 2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Ind.
				1-2 in	dividua	ls per	trap					-	6-9 ir	ndividu	als per	trap			
1				- 3-5 in	dividua	ls per	trap				2	COMPANY OFFIC	>9 in	dividua	als per	trap			

Fig. 3. Catch frequency of abundant arthropod species ( $\geq 5$  individuals recorded) plotted against position on the transect: a) Araneae; b) Staphylinidae; c) Carabidae; d) Diplopoda. Positions of traps as in Fig. 1. The thickness of the horizontal line indicates the abundance of each species. HC refers to the classification of the species to a particular habitat type (f = forest; e = ecotone; o = open habitat). Species codes are explained in Tab 1.



ally increase towards the edge of habitats (HEUBLEIN, 1983; DUELLI *et al.*, 1990; DENNIS & FRY, 1992; BEDFORD & USHER, 1994). In our study, the edge zone included both forest and grassland. In spiders and staphylinid beetles, the species assemblages of both habitats overlapped over a short distance. This resulted in an

elevated species richness at the forest edge. A highly structured forest edge may also provide a more complex habitat structure and thus additional niches for a variety of animals. However, we used pitfall trapping to record ground-living arthropods. This method does not consider invertebrates living in the vegetation or on bushes. Taking into account animals living in these niches, species richness might even be higher in the edge zone.

The edge effect and ecotone are not clearly definable discrete units (SAMWAYS, 1994). Each animal species responds differently to the boundary and the environmental characteristic of spatially variable conditions. In addition, biotic interactions may also influence the species distribution pattern. Forest edge may be regarded as a zone which experiences the climate-buffering effects of a tree canopy, but has not the lateral protection afforded by trees to one side. Based on abiotic variables, estimates of edge zone width reached 50 m into the interior of the forest (MATLACK, 1993). The width of the edge zone may vary, primarily determined by the size of the adjacent habitats and the degree of difference between the habitat types. In nature, spatial patterns may be abrupt or gradual as it was the case in the present study. Furthermore, the orientation of the edge may influence the width of the edge zone (FRAVER, 1994). It is possible that different results would be obtained for similarly structured edges with other orientation.

The structural similarity between habitats is also important in controlling the degree of interchange of animals across the edge (cf. edge permeability; STAMPS *et al.*, 1987). When the difference is pronounced, the level of exchance is reduced, and when adjacent habitats are more similar, the number of species crossing the edge will be greater (BAUER, 1989; DOWNIE *et al.*, 1996). In this context, we did not consider the possibility of small-scale movements shown by some arthropod species (cf. MORSE, 1997). For example, small-scale movements of spiders in a forest-grass-land edge zone can be explained as a response to changing weather conditions, as seasonal behaviour of different developmental stages in certain species, or as sexspecific behaviour after mating (HEUBLEIN, 1983). Seasonal migrations may not be detectable in the present study due to the relatively short sampling period (May to July). However, small-scale movements of some species as a response to differences in ground temperature cannot be excluded.

Another study using transects of pitfall traps across forest edges on Monte San Giorgio (Southern Switzerland) showed that ground-living spiders penetrate 3–8 m into open meadows (HÄNGGI, 1993). Different spider species responded differently to the forest edge, as found in the present study in all four taxonomical groups.

The size of the habitat island, edge to size ratio and habitat similarity are important in the context of conservation strategies. With increasing fragmentation of the landscape, edges of land patches are becoming proportionately greater relative to interiors (MADER, 1981). In many cases the remnants may be too small or too isolated from other grasslands to function in the same capacity as larger unbroken grassland ecosystems (e.g. SAUNDERS *et al.*, 1991). Extremely narrow grasslands or belts of pasture may be perceived by invertebrates to be essentially all edge, rather than edge and interior habitat (BEDFORD & USHER, 1994). The results of our study indicate that the extent of this effect depends, among other factors, on the structure of the forest edge and varies from 3–12 m for the arthropods considered. This suggests that remnants of unfertilized calcareous grassland wider than 30 m may contain a functional interior area for grassland specialists among the ground-living arthropods.

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### ZUSAMMENFASSUNG

Die Grösse der durch externe Einwirkungen beeinflussten Randzone ist für das Vorhandensein einer habitatcharakteristischen Kernzone in kleinen Restflächen von entscheidender Bedeutung. Auf einer kleinen (39 m breiten) Restfläche einer Juramagerweide in der Nordwestschweiz wurde der Einfluss der Waldrandstruktur (scharf abgeschnitten oder abgestuft) auf die lebensraumspezifische Verteilung von bodenlebenden Arthropoden (Spinnen [Araneae], Kurzflügelkäfer [Staphylinidae], Laufkäfer [Carabidae] und Tausendfüsser [Diplopoda]) mit Hilfe von Becherfallen untersucht. Die Magerweide wie auch der Wald beherbergten unterschiedliche Artengemeinschaften. Bei beiden Waldrändern Wurde eine erhöhte Artenvielfalt bei den Spinnen und Staphyliniden gefunden. Carabiden und Diplopoden hingegen zeigten keine erhöhte Artenvielfalt am Waldrand. Im Übergangsbereich Wald/Weide (Ökoton) bestehen die Gesellschaften aus einer Mischung von echten Wald- und Offenlandarten sowie aus spezifischen Ökotonarten. Individuen von verschiedenen Waldarten drangen auch in die Magerweide ein. Allerdings wurden sie nur in einem 3–6 m breiten Streifen entlang des scharf abgeschnittenen Waldrandes und in einem 6–12 m breiten Streifen entlang des abgestuften Waldrandes gefangen. Dies deutet darauf hin, dass auch relativ kleine Restflächen von Magerweiden für bodenlebende Arthropoden noch eine lebensraumtypische Kernzone enthalten dürften.

## REFERENCES

- BAUER, L.J. 1989. Moorland beetle communities on limestone 'habitat islands'. I. Isolation, invasion and local species diversity in carabids and staphylinids. *J. Anim. Ecol.* 58: 1077–1098.
- BAUR, B., JOSHI, J., SCHMID, B., HÄNGGI, A., BORCARD, D., STARY, J., PEDROLI-CHRISTEN, A., THOM-MEN, G.H., LUKA, H., RUSTERHOLZ, H.-P., OGGIER, P., LEDERGERBER, S. & ERHARDT, A. 1996. Variation in species richness of plants and diverse groups of invertebrates in three calcareous grasslands of the Swiss Jura mountains. *Revue Suisse Zool. 103*: 801–833.
- BEDFORD, S.E. & USHER, M.B. 1994. Distribution of arthropod species across the margins of farm woodlands. *Agric. Ecos. Environ.* 48: 295–305.
- D<sub>ENNIS</sub> P. & FRY, G.L.A. 1992. Field margins: can they enhance natural enemy population densities and general arthropod diversity on farmland? *Agric. Ecos. Environ.* 40: 95–115.
- Downie, I.S., Coulson, J.C. & Butterfield, J.E.L. 1996. Distribution and dynamics of surface-dwelling spiders across a pasture-plantation ecotone. *Ecography* 19: 29–40.
- DUELLI, P., STUDER, M., MARCHAND, I. & JACOB, S. 1990. Population movements of arthropods between natural and cultivated areas. *Conserv. Biol.* 54: 193–207.
- ELLENBERG, H. 1988. Vegetation Ecology of Central Europe. Cambridge University Press, Cambridge, 731 pp.
- FISCHER, M. & STÖCKLIN, J. 1997. Local extinctions of plants in remnants of extensively used calcareous grasslands 1950–1985. *Conserv. Biol.* 11: 727–737.
- $F_{RAVER}$ , S. 1994. Vegetation responses along edge-to-interior gradients in the mixed hardwood forests of the Roanoke River Basin, North Carolina. *Conserv. Biol.* 8: 822–832.
- F<sub>REUDE</sub>, H., HARDE, K.W. & LOHSE, G.A. 1976. *Die Käfer Mitteleuropas*. Band 2, Adephaga 1. Goecke & Evers, Krefeld, 302 pp.
- H<sub>ÅNGGI</sub>, A. 1993. Minimale Flächengrösse zur Erhaltung standorttypischer Spinnengemeinschaften Ergebnisse eines Vorversuches. *Bull. Soc. neuchât. Sci. nat. 116*: 105–112.
- HEUBLEIN, D. 1983. Räumliche Verteilung, Biotoppräferenzen und kleinräumige Wanderungen der epigäischen Spinnenfauna eines Wald-Wiesen-Ökotons; ein Beitrag zum Thema "Randeffekt".
  Zool. Jb. Syst. 110: 473–519.
- L<sub>AURENCE</sub>, W.F. & YENSEN, E. 1991. Predicting the impacts of edge effects in fragmented habitats. Biol. Conserv. 55: 77–92.
- L<sub>OHSE</sub>, G.A. & LUCHT, W.H. 1989. *Die Käfer Mitteleuropas*. 1. Supplementband mit Katalogteil. Goecke & Evers, Krefeld, 346 pp.
- Lovejoy, T.E., BIERREGAARD, R.O., RYLANDS, A.B., MALCOLM, J.R., BROWN, K.S., QUINTELA, C.E., HARPER, L.H., POWELL, A.H., POWELL, G.V.N., SCHUBART, H.O.R. & HAYS, M.B. 1986. Edge

and other effects of isolation on Amazon forest fragments. *In*: SOULÉ, M.E. (ed.), *Conservation Biology: The Science of Scarcity and Diversity*, pp. 257–285. Sinauer Associates, Sunderland, Mass.

- ŁUCZAK, J. 1997. Ecotonal systems on the border of the Kampinos Forest and their importance to spiders. Proceedings of the 16th European Colloquium of Arachnology. Wyż sza Szkoła Rolniczo – Pedagogiczna, Siedlce, pp. 211–219.
- MADER, H.-J. 1981. Untersuchungen zum Einfluss der Flächengrösse von Inselbiotopen auf deren Funktion als Trittstein oder Refugium. *Natur und Landschaft 56*: 235–242.
- MARGGI, W.A. 1992. Faunistik der Sandlaufkäfer und Laufkäfer der Schweiz (Cicindelidae & Carabidae) Coleoptera. Teil 1. Documenta Faunistica Helvetiae 12. Centre suisse de cartographie de la faune (CSCF), Neuchâtel, 477 pp.
- MATLACK, G.R. 1993. Microenvironment variation within and among forest edge sites in the Eastern United States. *Biol. Conserv.* 66: 185–194.
- MAURER, R. & HÄNGGI, A. 1990. *Katalog der schweizerischen Spinnen*. Documenta Faunistica Helvetiae 12. Centre suisse de cartographie de la faune (CSCF), Neuchâtel, 412 pp.
- MORSE, D.H. 1997. Distribution, movement, and activity patterns of an intertidal wolf spider *Pardosa lapidicina* population (Araneae, Lycosidae). J. Arachnol. 25: 1–10.
- NEW, T.R. 1995. An Introduction to Invertebrate Conservation Biology. Oxford University Press, Oxford, 194 pp.
- PEDROLI-CHRISTEN, A. 1993. Faunistique des mille-pattes de Suisse (Diplopoda). Documenta Faunistica Helvetiae 14. Centre suisse de cartographie de la faune (CSCF), Neuchâtel, 248 pp.
- POLLARD, E. 1968. Hedges IV. A comparison between the Carabidae of a hedge and field site and those of a woodland glade. J. Appl. Ecol. 5: 649–657.
- SAMWAYS, M.J. 1994. Insect Conservation Biology. Chapman & Hall, London, 358 pp.
- SAUNDERS, D.A., HOBBS, R.J. & MARGULES, C.R. 1991. Biological consequences of ecosystem fragmentation: a review. *Conserv. Biol.* 5: 18–32.
- STAMPS, J.A., BUECHNER, M. & KRISHNAN, V.V. 1987. The effects of edge permeability and habitat geometry on emigration from patches of habitat. *Am. Nat. 129*: 533–552.
- ZOLLER, H., WAGNER, C. & FREY, V. 1986. Nutzungsbedingte Veränderungen in Mesobromion-Halbtrockenrasen in der Region Basel: Vergleich 1950–1980. *Abh. Westfäl. Mus. Naturk.* 48: 93–107.

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