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A Case Study of the Třeboň Basin Biosphere Reserve, Czech Republic

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CHAPTER 29

COMMUNITIES OF SPIDERS (ARACHNIDA) IN THE WET MEADOWS

V. Růžička

LOCALITIES STUDIED

The material for this study was collected in eight meadows in the Třeboň Basin Biosphere Reserve, TBBR, (Figure 29.1). Selected meadow communities representing a hydric series of communities, from inundated unmanaged meadows to intensively managed mesic meadows (Table 29.1) were used. For easier orientation, the symbols of the selected localities are the initial letters of the meadows' phytocenological characteristics. For more detailed characteristics of the respective plant communities see Chapters 13, 17 and 18. The species assemblages of spiders were assumed to respond to the different environmental conditions in each locality and thus contribute to the indication value of the respective plant community.

Locality Ca – sedge marsh

An inundated and occasionally mown sedge meadow situated at the southernmost end of the inundation area of Rožmberk fishpond. This meadow can be phytocenologically classified as a community of the alliance *Caricion gracilis*. The characteristic plant species are *Carex gracilis*, *Calamagrostis canescens*, *Carex vesicaria*, *Galium palustre* ssp. *elongatum*, *Lythrum salicaria* and *Lysimachia vulgaris*.

Locality Mo1 – *Molinia*-dominated grassland no. 1

An unmanaged moist meadow with scattered solitary willows (mostly *Salix cinerea*) and Scots pine (*Pinus sylvestris*). It is situated in the eastern part of the inundation area of Rožmberk fishpond. This meadow may be classified as a community of the alliance *Molinion coeruleae*. Plant species typical of this community are *Molinia coerulea*, *Sanguisorba officinalis*, *Achillea ptarmica*, *Peucedanum palustre*, *Juncus filiformis*, *Agrostis canina*, *Deschampsia caespitosa*, *Senecio rivularis*, *Hydrocotyle vulgaris*, *Iris pseudacorus*, *Juncus effusus*, *Lysimachia vulgaris*, *Potentilla erecta* and *Naumburgia thyrsiflora*.

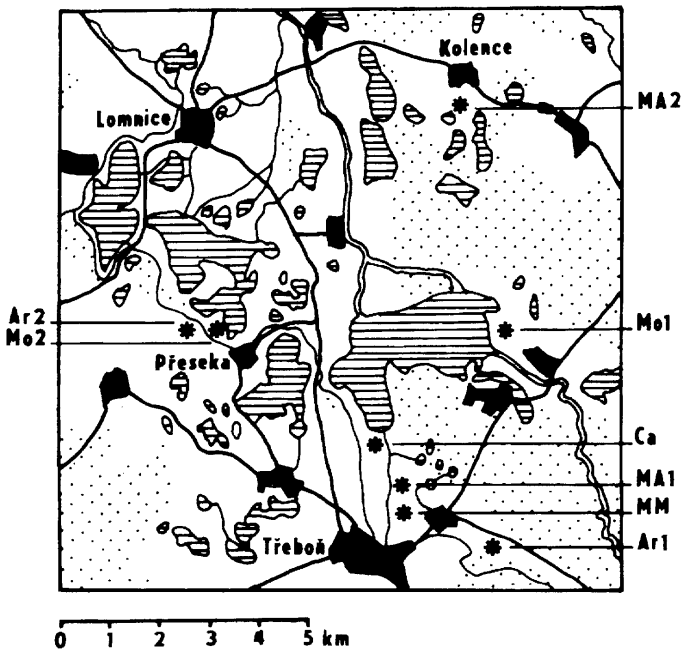

Figure 29.1 Situation map of the studied localities

Locality Mo2 – *Molinia*-dominated grassland no. 2

This is also an unmanaged moist meadow in the inundation area of the Velký Tisý fishpond, at the northwestern edge of Přeseka village. This meadow can be classified as a community of the alliance *Molinion coeruleae*. Two biotopes are distinguishable on this site. The first represents a typically developed *Molinion* community, the other is moister and represents a transitional community type towards the alliance *Caricion gracilis*. Plant species characterizing the first biotope are *Molinia caerulea*, *Angelica sylvestris*, *Selinum carvifolia*, *Parnassia palustris*, *Sanguisorba officinalis*, *Scorzonera humilis*, *Polygonum amphibium*, *Equisetum palustre*, *Avenochloa pubescens*, *Briza media*, *Trifolium spadiceum*, *Centaurea jacea*, *Succisa pratensis* and *Betonica officinalis*. Plants characterizing the other biotope are *Mentha austriaca*, *Equisetum fluviatile*, *Carex nigra*, *Lysimachia vulgaris*, *Carex gracilis* and *Calamagrostis epigeios*.

Locality MM – Wet Meadows site

A managed, waterlogged meadow, situated in the Wet Meadows complex to the north of Třeboň town (see Chapter 13). This meadow can be classified as a

Table 29.1 Characteristics of arachnocenoses at the localities studied

Locality	*Number of species*	*Number of ind.*	*Most numerous species*	*Species prevailingly in natural habitats*
Ca	33	869	*Pardosa prativaga*, *Oedothorax gibbosus*, *Erigone atra*, *Ozyptila trux*, *Oedothorax retusus*	*Pirata piscatorius*, *Centromerus incultus*, *Porrhomma convexum*, *Satilatlas britteni*, *Silometopus elegans*
Mo1	48	937	*Trochosa spinipalpis*, *Pardosa prativaga*, *Antistea elegans*, *Pirata latitans*, *Allomengea vidua*, *Walckenaeria kochi*	*Gnaphosa nigerrima*, *Neon valentulus*, *Sitticus caricis*, *Pirata piscatorius*, *Allomengea vidua*, *Centromerus incultus*, *Notioscopus sarcinatus*, *Metopobactrus prominulus*, *Silometopus elegans*, *Walckenaeria kochi*
Mo2	67	3003	*Pardosa prativaga*, *Alopecosa pulverulenta*, *Trochosa spinipalpis*, *Allomengea vidua*, *Pardosa pullata*, *Pirata latitans*, *Pardosa palustris*	*Pardosa nigriceps*, *Pirata piscatorius*, *Allomengea vidua*, *Araeoncus crassiceps*, *Centromerus incultus*, *Erigonella ignobilis*, *Kaestneria pullata*, *Maro minutus*, *Notioscopus sarcinatus*, *Silometopus elegans*, *Walckenaeria kochi*
MM	40	2453	*Oedothorax fuscus*, *Pardosa pullata*, *Oedothorax retusus*, *Pardosa palustris*, *Pardosa prativaga*	*Pirata piscatorius*, *Meioneta mollis*
MA1	46	1671	*Pardosa prativaga*, *Oedothorax retusus*, *Pardosa palustris*, *Oedothorax fuscus*, *Erigone atra*	*Centromerus incultus*, *Silometopus elegans*, *Walckenaeria kochi*
MA2	50	2488	*Pardosa palustris*, *Oedothorax fuscus*, *Erigone atra*	*Hahnia nava*, *Allomengea vidua*, *Araeoncus crassiceps*, *Erigonella ignobilis*, *Silometopus elegans*
Ar1	54	5624	*Pardosa palustris*, *Pardosa prativaga*, *Oedothorax retusus*	*Erigonella ignobilis*, *Silometopus elegans*
Ar2	41	2740	*Pardosa palustris*, *Alopecosa pulverulenta*, *Alopecosa cuneata*	*Hypsosinga pygmaea*, *Erigonella ignobilis*

community of the order *Molinietalia* with relationships to the order *Magnocaricetalia*. The following plant species predominate: *Deschampsia caespitosa*, *Alopecurus pratensis*, *Glyceria fluitans*, *Ranunculus flammula*, *Carex vesicaria*, *Ranunculus auricomus*, *Lychnis flos-cuculi*, *Lythrum salicaria*, *Glechoma hederacea*, *Caltha palustris* ssp. *laeta*, *Filipendula ulmaria*, *Epilobium adenocaulon*, *Glyceria maxima* and *Carex gracilis*.

Locality MA1 – waterlogged managed meadow no. 1

This locality is in a waterlogged managed meadow in an acidic fen with a deep (over 1 m) organosol, ameliorated by drainage, manuring and deposition of mineral soil. The locality is also situated in the Wet Meadows complex. This meadow can be classified as a drier type of community of the alliance *Molinion*, showing some relations to communities of the order *Arrhenatheretalia*. Plants characterizing this community are *Deschampsia caespitosa*, *Alopecurus pratensis*, *Agrostis alba*, *Ranunculus acer*, *Barbarea stricta*, *Senecio erraticus* ssp. *barbaraeifolius*, *Arrhenatherum elatius*, *Iris pseudacorus*, *Taraxacum officinale* and *Cardamine pratensis*.

Locality MA2 – waterlogged managed meadow no. 2

This is also a waterlogged managed meadow occupying a depression at the northern edge of Ostrý fishpond, about one 1 km south of Kolence village in the TBBR. This meadow may be classified as a relatively dry community of the alliance *Molinion*, showing transitions to communities of the alliance *Arrhenatherion*. Plant species most represented in this community are *Senecio erraticus* ssp. *barbaraeifolius*, *Sanguisorba officinalis*, *Centaurea jacea*, *Juncus filiformis*, *Arrhenatherum elatius*, *Holcus lanatus*, *Vicia cracca*, *Succisa pratensis*, *Ranunculus acer*, *Festuca rubra* and *Trifolium hybridum*. This meadow has a strongly developed moss layer with predominating *Rhytidiadelphus squarrosus* and *Climacium dendroides*.

Locality Ar1 – intensely managed mesophytic meadow no. 1

An intensely managed mesophytic meadow, situated to the east of Třeboň town. This meadow community can be classified as belonging to the alliance *Arrhenatherion*. Its assemblage of plant species comprises *Dactylis glomerata*, *Arrhenatherum elatius*, *Taraxacum officinale*, *Rumex obtusifolius*, *Ranunculus acer* and *Trifolium pratense*.

Locality Ar2 – intensely managed mesophytic meadow no. 2

This is also an intensely managed mesophilous meadow, about 1 km to the west of Přeseka village in the TBBR. This meadow can be classified as a community of the alliance *Arrhenatherion*. Plant species typical of it are *Arrhenatherum*

elatius, *Dactylis glomerata*, *Lolium multiflorum*, *Taraxacum officinale*, *Sanguisorba officinalis* and *Ranunculus acer*.

METHODS

The research was accomplished between 1977 and 1980. Pitfall traps with lower drainage of the surplus fixation fluid were used for collection of the material (Růžička, 1982). A 4% formaldehyde solution was used as fixation fluid. At the localities Mo2 and Ar1 ten traps, on the other localities five traps, were placed along a line and exposed for a period of one year. The traps were placed 10 m apart. In spring and summer the traps were emptied at about 14–day intervals, in autumn and winter at monthly or even longer intervals.

Based on cephalothorax length, the spider species were divided into four size classes: 1st class to 1.30 mm, 2nd class 1.31–2.00 mm, 3rd class 2.01–3.20 mm, 4th class above 3.20 mm (Růžička, 1985). This classification was used in material processing.

Spider activity is expressed in terms of their diurnal movements, the appropriate dimension being number of individuals m^{-1} day^{-1} (Heydemann, 1957; Růžička, 1987). The dominance of species during the whole year is calculated within the range of each size class exclusively, from the sum of year-round activity of a species (Růžička, 1987).

The material was evaluated with respect to the occurrence of each species in habitats of various degrees of 'originality' (Buchar, 1992): I – species occurring in natural habitats corresponding to the climatic or edaphic climax; II – species capable of occupying some shaded and wet semi-natural secondary habitats (managed forests, shrubs, managed wetlands); and III – species capable of forming viable populations in artificially deforested, human-made habitats (fields, meadows, spoil banks, etc.).

Interrelations between each species' share in the total number of species and its share in year-round activity are interpreted according to the concept of Růžička and Antuš (1989). Names of the species follow Buchar *et al.* (1995).

RESULTS

In total, 19,785 spider specimens belonging to 118 species were captured (Table 29.1, partly also Růžička, 1987). The highest numbers of species belonged to the families Linyphiidae s. l. (59) and Lycosidae (19). An absolute majority among the specimens captured is formed by species of the families Lycosidae (65.2%) and Linyphiidae (27.2%). The most abundant species within the family Lycosidae belong to the genera Pardosa, Alopecosa and Trochosa, and within the Linyphiidae the genera Oedothorax and Erigone.

In biotopes similar to those in the studied meadows, the first positions in the sequence of decreasing dominance are occupied by the same species in individual size classes. Their positions change gradually in dependence on the changing conditions (Figure 29.2). The 1st size class comprises in total 56 species, the

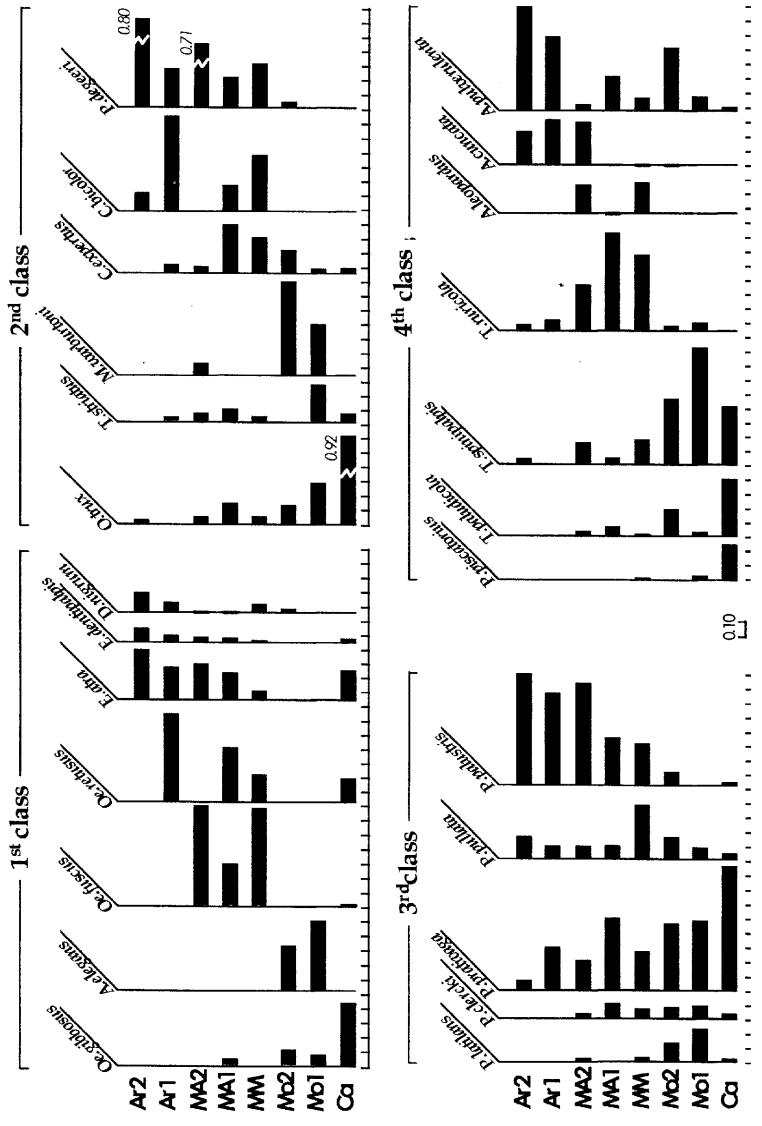

Figure 29.2 Share in the year-round activity of the more abundant species divided into the four size classes at the studied localities

2nd one 18 species, the 3rd one 26 species and the 4th one 19 species. In the 1st, 2nd and 4th size classes, 5 species with dominance over 0.30 occupy alternately the leading position in the humidity gradient, while in the 3rd size class only three species alternate in this position.

In the first size class in the inundated meadow, the dominant spider species is *Oedothorax gibbosus*, in the unmown waterlogged meadows it is *Antistea elegans*, in the mown waterlogged meadows *Oedothorax fuscus*, in the intensively managed wet meadow *Oedothorax retusus*, and in the intensively managed dry meadow *Erigone atra*. All these species are considered to be photophilous and hygrophilous (*A. elegans* as a hygrobiont). Obviously, even within the category 'hygrophilous' are the moisture demands of individual species finely graduated.

In the second size class, in the inundated meadow, *Ozyptila trux* (ombrophilous, hygrophilous) clearly dominates while in the unmown waterlogged meadows *Allomengea vidua* (hemiphotophilous, hygrobious) is dominant, in the mown waterlogged meadows *Tallusia experta* (hemiphotophilous, hygrobious), *Centromerita bicolor* (euryphotophilous, euryhygrophilous) and *Pachygnatha degeeri* (photophilous, euryhygrophilous) occur quite abundantly. *C. bicolor* prevails on wet and *P. degeeri* dominates in dry intensively managed meadows. The 2nd size class includes, on the studied sites, species with more variable ecological demands than the 1st and 3rd size groups. Besides, the photophilous, hemiphotophilous, and ombrophilous species also occupy marked positions. Moreover, the reproduction periods of these species are different: *P. degeeri* is eurychronous whereas *O. trux* is stenochronous with a maximum of sexual activity in May and June, and in *C. bicolor*, *A. vidua* and *T. experta* the maxima of sexual activity occur in autumn and winter.

In the third size class, on all sites, the leading species are *Pardosa prativaga* (photophilous, hygrophilous) and *P. palustris* (photophilous, semihygrophilous). The ratio between their dominance, 0.84:0.02, giving advantage to *P. prativaga* in the inundated meadow, is quite reversed, namely 0.05:0.75, in the dry intensively managed meadow. *Pardosa pullata* (photophilous, hygrophilous), with its significant dominance values, approaches those two species.

The fourth size class included photophilous, eurychronous and stenochronous species. The maxima of their sexual activity come in spring. In the inundated meadow, *Pardosa paludicola* and *Trochosa spinipalpis* (both hygrophilous) belonged to the most abundant species. The latter species belonged to the most abundant ones also in the unmown waterlogged meadows. *Trochosa ruricola* (hemihygrophilous) dominated in the mown waterlogged meadows, while *Alopecosa pulverulenta* (hemihygrophilous) dominated in the intensively managed meadows.

The proportion of species occurring prevailingly in natural and semi-natural habitats decreased gradually with increasing intensity of the meadow management (Figure 29.3). Ten species occurring prevailingly in natural habitats were found on only one of the unmown (or mown only occasionally) sites.

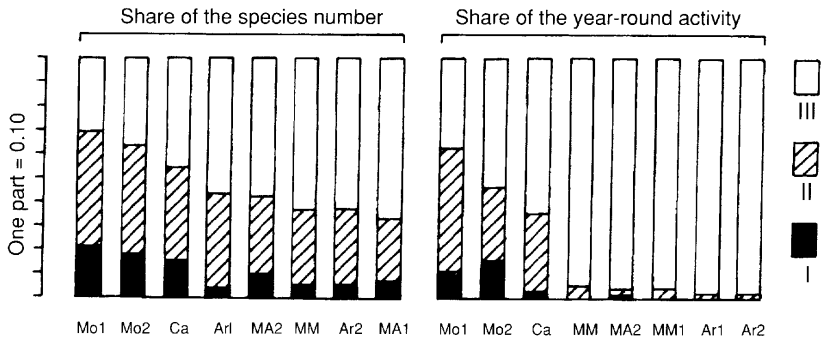

Figure 29.3 Share in the total species number and in year-round activity of species belonging to three species groups: I – species occurring prevailingly in natural habitats, II – species occurring prevailingly in semi-natural habitats, III – species occurring prevailingly in man-made habitats

They were: *Gnaphosa nigerrima*, *Neon valentulus*, *Sitticus caricis*, *Pardosa nigriceps*, *Kaestneria pullata*, *Maro minutus*, *Motopobactrus prominulus*, *Notioscopus sarcinatus*, *Porrhomma convexum* and *Satilatlas britteni*. Seven species occurring prevailingly in natural habitats were found in both mown and unmown meadows: *Pirata piscatorius*, *Allomengea vidua*, *Araeoncus crassiceps*, *Centromerus alnicola*, *Walckenaeria kochi*, *Erigonella ignobilis* and *Silometopus elegans*. Three species occurring prevailingly in natural habitats were found exclusively in the mown meadows: *Hahnia nava*, *Hypsosinga pygmaea* and *Meioneta mollis*.

The share in year-round activity of species occurring prevailingly in natural and semi-natural habitats shows a sudden break, separating distinctly the unmown meadows from the other, regularly managed meadows (Figure 29.3).

CONCLUSIONS

Buchar (1981) pointed to the specificity of arachnofauna in the Třeboň region. Many species are typical of the local arachnofauna and they either do not occur in other parts of Bohemia at all, or occur far less abundantly. Some of these species were also found during our investigation. *Gnaphosa nigerrima* was found only in the unmanaged meadow at Mo1, *Centromerus incultus* was mainly in the unmown meadows. *Pardosa prativaga* was collected in hundreds in both unmown and mown meadows. The most typical species of mown waterlogged meadows was *Oedothorax fuscus*.

The arachnocenoses of inundated and waterlogged unmown meadows are characterized by a high share of activity of species occurring in natural habitats (0.03–0.16), and of species occurring prevailingly both in natural and semi-

natural habitats (0.35–0.63). In managed meadows, these species are represented by remnants of their formerly more abundant populations and/or by immigrants from surrounding unmanaged areas.

Twenty-one species occurring prevailingly in natural habitats were found at the localities studied. Also, most of them have an origin of their occurrence in moorland, peat bogs and swamps. Also, most of them were found at least at one of the unmown localities. The occurrence of those species illustrates the landscape history.

Our findings have repeatedly confirmed the great importance of non-managed wetlands as gene pool reservoirs where the original fauna finds refuge for its survival and constitutes an important component of the landscape-stabilizing framework.

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