ACTA UNIVERSITATIS AGRICULTURAE ET SILVICULTURAE MENDELIANAE BRUNENSIS

Volume 63 160 Number 5, 2015
http://dx.doi.org/10.11118/actaun201563051471

SPIDERS OF THE VINE PLANTS IN SOUTHERN MORAVIA

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Abstract

HAVLOVÁ LUCIE, HULA VLADIMÍR, NIEDOBOVÁ JANA. 2015. Spiders of the Vine Plants in Southern Moravia. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis,* 63(5): 1471–1476.

Araneofauna of vineyards is relatively known in Central Europe but we have a lack of knowledge about araneofauna which occur directly on the vine plants. Our investigation was focused on spiders which live on vine plants, especially on the vine plants trunks. We investigated spiders in six vineyards in southern Moravia (Šatov, Mikulov, Popice, Morkůvky, Nosislav and Blučina). Vineyards were under different soil management, traps were placed on different parts of particular locality (terraced and plain) and all localities were under integrated pest management. We employed two types of cardboard traps for spider collecting during whole vegetation season. Altogether, we collected 21 spider species which belong to seven families. The most important species was *Marpissa nivoyi* (Lucas, 1836), which is mentioned in the Red List as vulnerable (VU) and *Sibianor tantulus* (Simon, 1868) which had unknown distribution in the Czech Republic. The other very interesting result is that the most common species is myrmecomorph *Synageles venator* (Lucas, 1836), which is scarcely recorded in such huge numbers as we documented in our study.

Keywords: Arboricolous spiders, faunistics, vineyards, southern Moravia, cardboard traps

INTRODUCTION

Vineyards occupy 17,400 ha in southern Moravia which is the most important wine-producing part of the Czech Republic. Biological control of vine plants is ensured by several predatory mites mainly (Hluchý *et al.*, 1991) but natural enemies are not usually used. The principle of supporting of natural enemies of pests is used in crops like various field cultures via supplementary habitats – floristically rich field margins (Baines *et al.*, 1998; Asteraki *et al.*, 1995, 2004), weed strips (Frank, 1997), intercropping (Hummel *et al.*, 2012), mulching (Renkema *et al.*, 2012) etc. There are several studies focused on natural enemy fauna in different orchards (Marc *et al.*, 1999; Isaia *et al.*, 2010).

Spiders, due to their high abundances and predominantly insectivorous feeding habits, are suspected to play a fundamental predatory role in agroecosystems, woodlands and other terrestrial ecosystems (Marc *et al.*, 1999). However, there also exist studies which represent the opposite point of view. For example according to Debach and Rosen (1991), spiders may not be efficient enough in controlling pests in spite of their abundance and diversity in agroecosystems. Despite these few opinions, we still consider spiders as in fact one of the most effective natural enemies of pests.

There exist just a few studies about spiders from vineyards. There are studies dealing with biodiversity of places surrounding the vineyards (Košulič *et al.*, 2014; Košulič and Hula, 2013, 2014) and also of vineyards themselves (Hänggi *et al.*, 2014; Caprio *et al.*, 2015). But there is insufficient number of studies dealing with spiders living directly on vine plants. The only studies are those of Seung-Tae *et al.* (2002) who found relatively poor assemblages of spiders on vine plants in South Korea, and Costello and Daane (1995) who found that particular vineyards in California (USA) differ in species composition according to different management.

Despite the few studies evaluating ecological role of spiders in vineyards abroad (Costello and Daane, 1998; Nobre and Meierrose, 2000; Venturino *et al*., 2008), there is a lack of knowledge on spider assemblages living on vine plants in the Czech Republic. We investigated just fauna which is living on vine plant trunks according method which we used (cardboard traps).

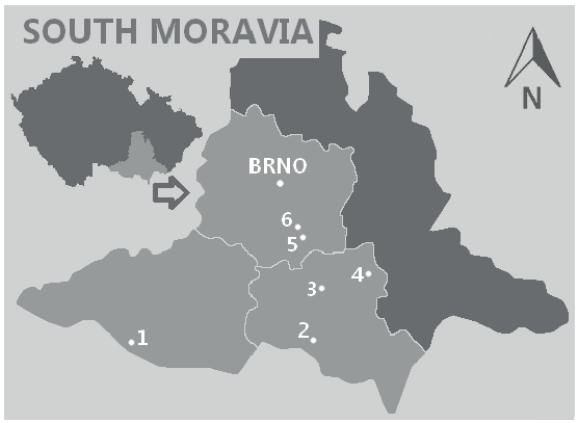
The aim of this research was thus to find out diversity and abundance of spiders inhabiting vine plant trunks.

MATERIAL AND METHODS

Study Sites

We investigated spiders in seven vineyards in the South Moravian Region. We choose six vineyards which consisted always of both parts – terraced and plain just for cover of whole species spectrum which inhabits vine plants. These six sites were in the districts of Znojmo, Břeclav and Brno-venkov (Fig. 1). All our study vineyards were under integrated pest management and were faced to the south. We used faunistic squares according to Pruner and Míka (1996) and GPS coordinates for better location of study areas:

1. Šatov (7262, 48°46'35.4"N, 16°00'41.6"E), the vineyard "Peklo" was located at the border with Austria. In vineyard rows was planted special plant culture providing habitat for butterflies. Main plants, excluding different grass species, were: *Lotus corniculatus, Onobrychis viciifolia* and *Sanguisorba minor*.
2. Mikulov (7165, 48°49'02.9"N, 16°37'36.4"E), the vineyard was located next to the Růžový kopec Natural Monument in Pálava Protected Landscape Area. The vineyard rows were cultivated annually with mainly nectar-source plants for honey bees (*Trifolium incarnatum, Brassica napus*).
3. Popice (7066, 48°56'10.7"N, 16°40'59.4"E), the vineyard was situated near the Popice village; there are agrocenoses and orchards in surrounding of the study area. Vineyard rows were cultivated as permanent grassland with dominant of grass *Lolium* spp.
4. Morkůvky (7067, 48°58'21.5"N, 16°52'11.4"E), the vineyard was situated near the Morkůvky village, the study area was surrounded by agriculture fields. Vineyard rows were covered by rich termophilous natural vegetation including *Thymus* spp., *Hieracium pilosella* agg. etc.
5. Nosislav (6965, 49°01'24.0"N, 16°38'15.7"E), vineyard is situated 1,5 km north from the Nosislav village. Vineyard rows in terraced parts of vineyard were cultivated as permanent grassland, the plain parts were cultivated as permanent grassland too, but every second row was stubbled.
6. Blučina (6965, 49°02'17.2"N 16°39'28.6"E), vineyard is situated near the Blučina village on the Výhon hill. Vineyard rows were covered by species poor permanent grassland.



1: *Location of collecting sites (they were situated in three districts of South Moravia region – light grey), numbers present particular study sites (see Material and Methods)*

Sampling Methods

We used two types of cardboard traps for spider collecting: The tube-type traps and the layer-type traps (Isaia *et al*., 2006). Each trap consisted of a cardboard strip and a bubble wrap strip. The tube-type traps were made from 40×20 cm pieces of cardboard and bubble wrap; they were rolled together forming a cylinder and fixed by adhesive tape (bubble wrap inside). The cylinder was then hanged parallel to trunk of the vine plant and fixed to it by sellotape. The layer-type traps were made from 20×20 cm pieces of cardboard and bubble wrap; they were put together (the bubble wrap formed the inside) forming a plate. The plate was then rolled around trunk of the vine plant and fixed to it by sellotape. Both types of traps thus served as hiding places for spiders inhabiting the vine plant trunks.

We established two plots of rectangle shape in each locality. The first plot was in a non-terraced part of the vineyard and the second in a terraced part of the vineyard. Each plot consisted of two lines of traps. There were ten traps placed in each line (fife tube-type traps and fife layer-type traps). Altogether, we mounted 40 traps per each locality.

Our investigation lasted nearly one year: from November 2013 to October 2014. Over winter time, the traps were left on locality without further manipulation not to disturb overwintering spiders. The traps were collected and new traps were installed monthly on the following dates: 4th March, 14th April, 6th May, 10th June, 8th July, 11th August, 11th September and 15th October. Each trap was inserted separately into plastic bag with a localization tag and replaced by new one. In the laboratory, traps were unpacked; spiders were removed and preserved in 70% ethanol.

All individuals were determined to species (adults) or family (juveniles) level. The majority

of spiders were determined by Vladimír Hula according to the basic arachnological literature (Roberts, 1987, 1995; Heimer and Nentwig, 1991; Nentwig *et al*., 2015). Nomenclature follows World Spider Catalogue (2015). All material is deposited in Vladimír Hula's collection.

Particular species rarity was evaluated according to Buchar and Růžička (2002). The Red List of threatened species in the Czech Republic (Růžička, 2005) (further "the Red List") was used for subsequent evaluation.

RESULTS

There were 727 adult spiders collected on vineyards in southern Moravia. The spiders belonged to 21 species and 7 families (Tab. I). Most spider species belonged to the family Salticidae (10 species). Other families were represented by three (Gnaphosidae), two (Dictynidae and Araneidae) and one species (Zodariidae, Philodromidae and Theridiidae). There was one species collected mentioned in the Red List – category vulnerable (VU): *Marpissa nivoyi*.

The most common species belonged all to the family Salticidae: *Synageles venator* (499 specimens), *Pseudicius encarpatus* (80 specimens), *Salticus scenicus* (67 specimens) and *Heliophanus auratus* (26 specimens). The remaining species were represented by less than 20 specimens. There were no relevant differences among localities in distribution of the most common species.

DISCUSSION

The species diversity is on the one hand relatively poor but, on the other hand, such poor species spectrum was recorded also in other works from vine plants (c.f. Seung-Tae *et al*., 2002; Costello and Daane, 1995). Only two interesting species were found there:

Marpissa nivoyi (Lucas, 1846)

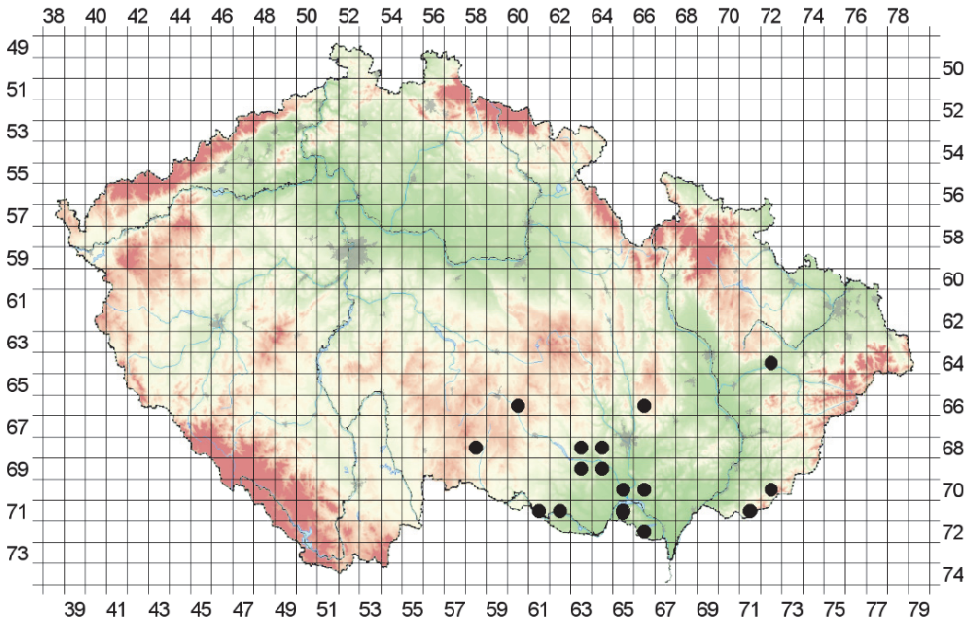
This species is characteristic mainly for different xeric habitats (Buchar and Růžička 2002), including steppe protected sites (Bryja *et al*., 2005; Košulič and Hula, 2012) or limestone slopes (Niedobová *et al*., 2011). It is also living in human settlements (Radek Šich, pers. comm.). It is known from Moravia only (Fig. 2) and it is mentioned in the Red List – category vulnerable (VU).

Sibianor tantulus (Simon, 1868)

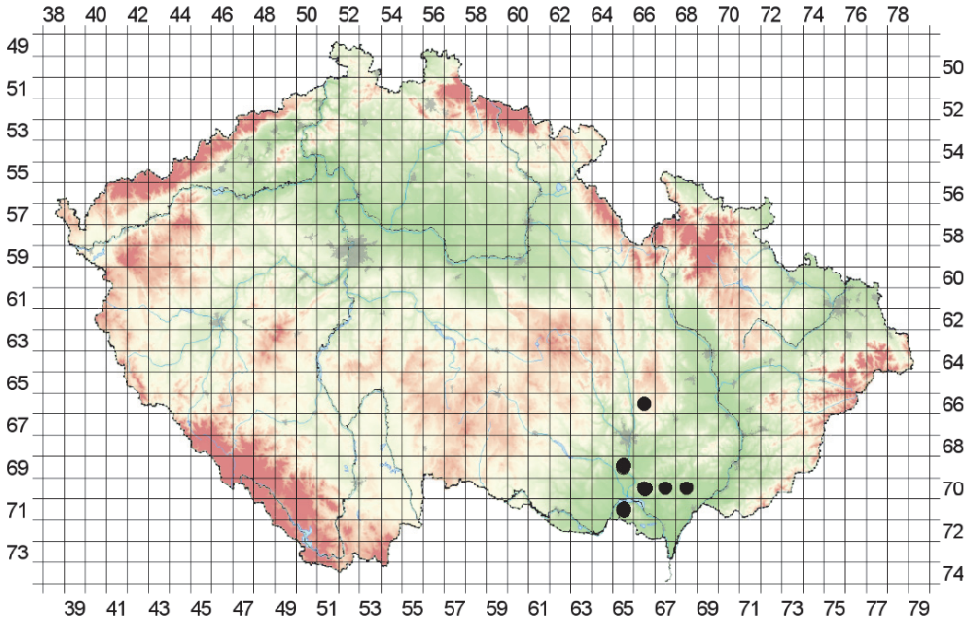
A species recorded from the territory of the Czech Republic recently (Niedobová *et al*., 2011; Košulič and Hula, 2014). It is a member of *Sibianor aurocinctus* species complex which was taxonomically revised by Logunov (2000) and therefore its occurrence is not known in the Czech Republic. According to published data, the species is distributed mainly in xeric habitats (Fig. 3).

I: *Species composition (numbers represent the number of individuals)*

		Study sites					
Family	**Species**	**Šatov**	**Nosislav**	**Blučina**	**Morkůvky**	**Mikulov**	**Popice**
Salticidae	*Synageles venator* (Lucas, 1836)	75	180	43	80	45	76
Salticidae	*Salticus zebraneus* (C. L. Koch, 1837)	1	0	0	0	0	0
Araneidae	*Nuctenea umbratica* (Clerck, 1757)	2	0	1	1	1	0
Salticidae	*Pseudicius encarpatus* (Walckenaer, 1802)	8	33	2	15	6	16
Dictynidae	*Dictyna uncinata* (Thorell, 1856)	2	0	6	2	0	1
Salticidae	*Salticus scenicus* (Clerck, 1757)	9	17	13	2	7	19
Dictynidae	*Dictyna arundinacea* (Linnaeus, 1758)	1	0	4	1	0	0
Salticidae	*Heliophanus auratus* (C. L. Koch, 1835)	4	2	4	1	6	9
Gnaphosidae	*Micaria subopaca* (Sundevall, 1831)	0	0	0	0	2	0
Salticidae	*Marpissa nivoyi* (Lucas, 1846)	0	0	0	0	4	0
Araneidae	*Agalenaetea redii* (Scopoli, 1763)	3	0	1	0	1	0
Araneidae	*Gibbaranea bituberculata* (Walckenaer, 1802)	0	0	0	1	0	0
Gnaphosidae	*Drassodes lapidossus* (Walckenaer, 1802)	0	0	0	2	0	1
Salticidae	*Macaroeris nidicolens* (Walckenaer, 1802)	0	0	1	0	1	1
Zodariidae	*Zodarion Rubidum* (Simon, 1914)	0	1	0	0	0	0
Salticidae	*Sibianor tantulus* (Simon, 1868)	0	1	2	0	1	2
Salticidae	*Marpissa muscosa* (Clerck, 1757)	0	0	1	1	1	0
Salticidae	*Siticus penicillatus* (Simon, 1857)	0	0	1	0	0	0
Philodromidae	*Philodromus cespitum* (Walckenaer, 1802)	0	0	0	1	0	0
Gnaphosidae	*Micaria formicaria* (Sundevall, 1831)	0	0	1	0	0	0
Theridiidae	*Enoplognatha ovata* (Clerck, 1757)	0	0	0	1	0	0



2: *Distribution map of Marpissa nivoyi – this map is based on data published by Buchar and Růžička (2002); Bryja et al., 2005; Košulič and Hula, 2012; Niedobová et al., 2011 and unpublished data of V. Hula. Map was created by application of BioLib (2013)*



3: *Distribution map of Sibianor tantulus (BioLib, 2013) – this map is based on data published by Košulič and Hula, 2014; Niedobová et al., 2011 and unpublished data of V. Hula. Map was created by application of BioLib (2013)*

From a species composition point of view, most species belonged to arboricolous spiders (e.g. *Pseudicius encarpatus*, *Salticus* spp., *Dictyna uncinata*, *Macaroeris nidicolens*, *Marpissa muscosa*, *Micaria subopaca*) accompanied by species living on lower vegetation (e.g. *Heliophanus auratus*, *Agalenatea redii*, *Dictyna arundinacea*) and epigeic species (*Drassodes pubescens*). Similar composition was found on cherry (Bucher *et al.*, 2010) and apple trees (Šťastná and Psota, 2013) as well as on other fruit trees (Fišákova, 2013). The myrmecomorph salticid *Synageles venator* was the most common spider on the vine plants and its high occurrence was quite unusual. In previous studies, this species was recorded as common from young cherry trees only (Bucher *et al.*, 2010) but not from the old trees (Fišáková, 2013; Šťastná and Psota, 2013). It thus seems that the species is related to the bushes and small trees. The presence

of a jumping spider *Marpissa muscosa* was also surprising because it occurs mainly in canopies of high trees (Niedobová *et al*., 2015). *Macaroeris nidicolens* was other typically arboricolous species. According to Buchar and Růžička (2002), it is a sparse species, but according to our observation, it became a common species of various species of trees in the region of South Moravia.

CONCLUSION

According to our results, vine plants host valuable fauna. This fact rejected common expectations that intensive agricultural land is species poor and those particular plants, in our case the vine plants, does not host so many species (specimens). The most interesting was the discovery of a jumping spider *Synageles venator* in high abundance. Actually, this species is distributed usually in very low abundances. Beside the positive association with ants, its life history is unknown. This species thus needs a special focus in future study.

Acknowledgement

Special thanks to project IGA MENDELU Brno No. IP8/2014. This study was also supported by project: Indikátory vitality dřevin (INVID) [No. CZ 1.07/2.3.00/20.0265].

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