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Abstract. Data on the spider fauna from the forest ecosystems of the Děvín National Nature Reserve (South Moravia, Czech Republic) are presented. The research was carried out on 15 randomly chosen research plots in oak-hornbeam forest stands within different management regimes. Spider sampling was done by pitfall trapping from May to October 2016. Overall, 3683 adult spiders belonging to 22 families, 70 genera and 116 species were collected. The families Linyphiidae, Lycosidae, Gnaphosidae and Thomisidae exhibited high species richness. The most abundant species were *Pardosa lugubris* (Walckenaer, 1802) and *Trochosa terricola* Thorell, 1856. Faunistically remarkable species were *Atypus piceus* (Sulzer, 1776), *Drassyllus villicus* (Thorell, 1875), *Gnaphosa montana* (L. Koch, 1866), *Panamomops affinis* Miller & Kratochvíl, 1939 and *Walckenaeria monoceros* (Wider, 1834). The record of *Gnaphosa montana* is one of the first accounts of this psychrophilic spider from European lowlands. Of the identified species, 23 are listed in the Red List of Threatened Species in the Czech Republic (EN – 1 species, VU – 12 species, LC – 10 species).

Keywords: Araneae, arthropods, biomonitoring, endangered species, protected areas, species richness

Zusammenfassung. Epigäische Spinnen aus Eichen-Hainbuchen-Wäldern im Nationalen Naturschutzgebiet Děvín (Tschechische Republik). Daten zur Spinnenfauna der Wälder des Nationalen Naturschutzgebietes Děvín (Südmähren, Tschechische Republik) werden präsentiert. Die Untersuchung wurde in 15 zufällig ausgewählten Flächen dreier Nutzungsvarianten in Eichen-Hainbuchen-Wäldern und thermophilen Eichenwäldern durchgeführt. Die Spinnen wurden von Mai bis Oktober 2016 mit Bodenfallen gefangen. Insgesamt wurden 3683 adulte Spinnen aus 22 Familien, 70 Gattungen und 116 Arten erfasst. Am artenreichsten waren die Linyphiidae, Lycosidae, Gnaphosidae und Thomisidae. Die häufigsten Arten waren *Pardosa lugubris* (Walckenaer, 1802) und *Trochosa terricola* Thorell, 1856. Faunistisch bemerkenswert sind die Arten *Atypus piceus* (Sulzer, 1776), *Drassyllus villicus* (Thorell, 1875), *Gnaphosa montana* (L. Koch, 1866), *Panamomops affinis* Miller & Kratochvíl, 1939 und *Walckenaeria monoceros* (Wider, 1834). Der Fund von *Gnaphosa montana* ist einer der ersten dieser psychrophilen Art aus dem europäischen Tiefland. 23 Arten sind auf der Roten Liste der Tschechischen Republik enthalten (EN – 1 Art, VU – 12 Arten, LC – 10 Arten).

Spiders are of great importance in nature conservation and in the monitoring of environmental changes (Wise 1993, Marc et al. 1999, Buchar & Růžička 2002, Hamřík & Košulič 2019). In particular, spiders occurring on the soil surface (the so called epigeic spiders) are widely used because they are relatively easy to monitor using pitfall traps and individual collecting methods (Wise 1993, Pearce & Venier 2006). Therefore, they constitute a good indicator group for the assessment of the current state of natural habitats and their changes (Marc et al. 1999, Košulič et al. 2016). For these reasons, they are very suitable for faunistic and biodiversity studies in various ecosystems (Buchar & Růžička 2002).

The arachnofauna of the Czech Republic has been extensively studied, e.g. forest ecosystems such as montane forests and forest habitats at higher altitudes with beech and spruce forest stands (e.g. Kůrka 1997, 1999, Buchar & Růžička 2002, Košulič 2015). However, forest habitats (especially thermophilic oak-hornbeam woodlands) in the South Moravia region still require more attention (e.g. Buchar & Růžička 2002, Košulič 2017, Surovcová et al. 2017). There are only a few studies which mention faunistic records of spiders from oak-hornbeam woodlands in lowland landscapes of the Czech Republic (Bryja et al. 2005, Košulič et al. 2016, Surovcová et al. 2017). These authors provided the first account of rare spider species important as indicators of these habitats. They were also the first to suggest that sparse and formerly managed oak-hornbeam forests may be important for many xerothermic spiders which usually live in steppe habitats.

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Děvín NNR (National Nature Reserve) is situated in the Pálava Protected Landscape Area (PLA), which is a very important protected area in the Czech Republic. The Pálava PLA, dominated by the Pavlov Hills, hosts natural or slightly affected steppe and lowland forest ecosystems with dominant representation of oak-hornbeam forests (Mackovčin & Sedláček 2007). There has been a lot of research focused primarily on insects in this area (Rozkošný & Vaňhara 1996, 1998, 1999, Nováková & Šťastná 2013, Přidal 2014). However, data on spiders were published only in a broader context. Bryja et al. (2005) mentioned faunistic records of spiders in the Lower Morava Biosphere Reserve, which also extends to our research area. To date, published records of spiders occurring directly in the Děvín NNR, and especially in their forest parts, is missing. One of the aims of our research was to investigate the impact of different management methods on spider faunas, and this analysis will be published elsewhere. What we present here is the faunistic data from the region. In addition, we expect that the possibly interesting faunistic findings might draw attention to the importance of oak-hornbeam lowland forest habitats for maintaining biodiversity within protected areas in Central Europe.

Material and methods

Study area

The Děvín NNR (48.87480°N, 16.65330°E, 280–555 m a.s.l.) is located in the South-Moravia region of the Czech Republic (Fig. 1). It was declared a Specially Protected Area on 10. May 1946, even before it became a part of the Pálava Protected Landscape in 1976 (Danihelka et al. 1995). The protected area has 377.79 ha with xerothermic grasslands and forest ecosystems preserved there.

The Děvín NNR is an important landmark of the Pavlov Hills (Pálava Protected Landscape Area). The present study was carried out in a forested part that used to be intensively managed by coppicing. The last logging activities and forest opening in the previously coppiced forest are documented from the 1920's. Since the declaration of the Protected Area in 1946, all activities have been banned and the area has been conserved with non-interventional management aids. Since 2010, the first active management methods aimed at canopy thinning have been applied (Šipoš et al. 2017).

The natural forest communities of the study area are oak-hornbeam and thermophilic oak woods. *Tilia* spp. (especially *Tilia platyphyllos)* are well represented altogether with *Fraxinus excelsior*, next being *Carpinus betulus* and *Quercus* spp. (Hédl et al. 2010). Vegetation is still rich in species but considerably impoverished compared to the past, light-demanding species in particular have disappeared (Hédl et al. 2010). Black soils on loess predominate in the area. The territory belongs to the Thermophyticum phytogeographical region of the Czech Republic and according to Quitt's (1971) classification it belongs to the warmest area in this country, T4. The average annual temperature is 9.2°C and the average annual rainfall is 550 mm (Quitt 1971). Its surrounding landscape is heterogeneous with various habitat types (xerothermic steppes, oak-hornbeam forests, open pubescent oakwood, scree woodlands, and agriculture fields). The Děvín NNR is located in faunistic square 7165 of the faunistic zoological grid mapping system (Novák 1989).

Study sites and sample collection

The research was carried out in areas of Pannonian oak-hornbeam and thermophilic oak forests of the NNR Děvín (Fig. 1). The present-day forests in the NNR Děvín are among the best examples of abandoned coppices of oak hornbeam forests in the Czech Republic. The trees in the stands are on average 85–90 years old. The research took place on 15 randomly chosen plots, within three management regimes (Fig. 1). There were five plots under the most open canopy (36–39% of openness, stocking value 0.4), with high vegetation cover (85–90% of coverage), which were actively managed by artificial canopy thinning (sites 1–5). The next five plots were characterised by moderate open canopy cover (22–29% of openness, stocking value 0.6–0.7), which was lightly thinned and with lower vegetation coverage (60–76%) (sites 6–10). The last five plots were dense non-intervention forests (stocking value 1.0) characterised by low vegetation cover (32–55%), high canopy cover (10–16% of openness) and by the presence of damp scree habitats (sites 11–15). Detailed information on study sites is shown in Tab. 1.

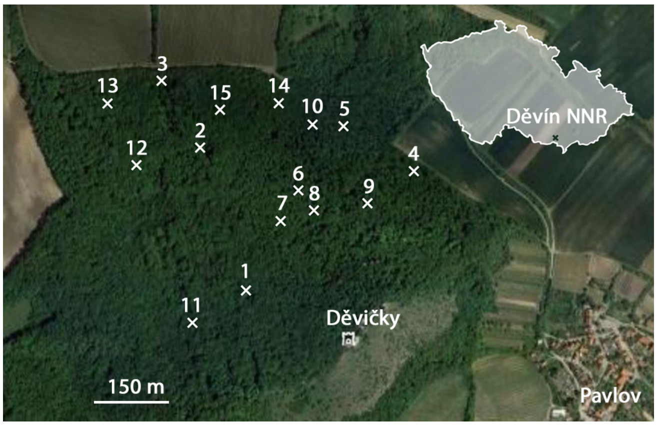

Fig. 1: Location of the Děvín NNR in Czech Republic with 15 sampling plots in forest ecosystems of the studied locality. Detailed characteristics of sampling plots are shown in Tab. 1

Tab. 1: Characteristics of study sites located in the Děvín NNR. Vegetation coverage was evaluated by means of phytosociological relevés (100 m²). Canopy coverage was estimated by imaging software (GAP Light Analyzer, version 2.0) which extract canopy structural parameters and light transmission indices from fish-eye photos. A = Study plot, B = Altitude (m a.s.l.), C = Vegetation cover (%), D = Canopy openness (%)

Management	A	Coordinates	B	C	D
Strong thinning	1	48.87648°N 16.65813°E	378	87	37
	2	48.87906°N 16.65695°E	327	85	39
	3	48.88026°N 16.65564°E	298	87	37
	4	48.87856°N 16.66309°E	331	85	36
	5	48.87949°N 16.66096°E	324	85	39
Moderate thinning	6	48.87854°N 16°65952°E	351	70	25
	7	48.87814°N 16.65901°E	359	74	24
	8	48.87845°N 16.65978°E	352	73	28
	9	48.87822°N 16.66149°E	340	60	22
	10	48.87958°N 16.66007°E	327	76	29
Non intervention	11	48.87550°N 16.65664°E	387	55	11
	12	48.87883°N 16.65544°E	330	45	16
	13	48.87988°N 16.65439°E	305	45	15
	14	48.88005°N 16.65896°E	321	46	12
	15	48.88002°N 16.65741°E	318	32	10

The spiders were sampled using ground pitfall traps with a 4% formaldehyde preservative solution and detergent. Pitfall traps consisting of 500 ml plastic cups (9 cm in diameter and 15 cm height) were inserted into the soil so that the top of the cup was level with the soil. The cup was filled up to ⅓ with a preservative liquid. Three pitfall traps in each sampling plot were placed five meters from each other making it a total of 45 pitfall traps per studied locality.

Material was collected from 14. Apr. 2016 to 25. Sep. 2016 at approximately monthly intervals on the following days: 12. May 2016, 14. Jun. 2016, 16. Jul. 2016, 13. Aug. 2016 and 25. Sep. 2016. After collecting, the specimens were preserved in 70% ethanol. All examined material was deposited in the collection of the Mendel University, Faculty of Forestry and Wood Technology in Brno. The numbers of collected species and individuals are shown in Tab. 2.

Species identification and classification

The spiders were identified to species level. Only adult spiders that could be identified to species with certainty were used for the analysis. Spiders were identified using a stereomicroscope and basic arachnological literature (Miller 1971, Heimer & Nentwig 1991, Roberts 1995, Nentwig et al. 2020). Data on nomenclature were obtained from the World Spider Catalog (2020) and information on species from Buchar & Růžička (2002). The taxonomically complicated specimens were revised and identified by Petr Dolejš (National Museum, Praha) and Vladimír Hula (Mendel University, Brno). Species of conservation concern were classified according to their status in the national Red List (Řezáč et al. 2015: see Tab. 2).

Results and Discussion

Fauna overview

Overall, 3683 adult spiders belonging to 116 species in 70 genera of 22 families were collected (Tab. 2) which is approxi-

Tab. 2: List of recorded species with specimen number in the studied plots of the Děvín NNR, in alphabetical order. Conservation status in the Czech Republic according to Řezáč et al. (2015): CR (critically endangered), EN (endangered), VU (vulnerable), LC (least concern), ES (ecologically sustainable). Characteristics of study plots are shown in Tab. 1. A = Conservation status

Species	A	Sum	strong thinning					moderate thinning					non intervention				
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Agelena labyrinthica (Clerck, 1757)	ES	1	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.
Agroeca brunnea (Blackwall, 1833)	ES	53	1	13	3	.	3	4	3	2	.	4	2	2	4	4	8
Agroeca cuprea Menge, 1873	LC	7	.	1	.	.	2	1	.	.	.	3	.	.	.	.	.
Agroeca lusatica (L. Koch, 1875)	VU	2	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.
Agroeca proxima (O. Pickard-Cambridge, 1871)	ES	1	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.
Agyneta rurestris (C. L. Koch, 1836)	ES	2	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.
Allagelena gracilens (C. L. Koch, 1841)	ES	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Alopecosa cuneata (Clerck, 1757)	ES	3	.	2	.	.	1	.	.	.	.	.	.	.	.	.	.
Alopecosa pulverulenta (Clerck, 1757)	ES	3	1	1	.	.	1	.	.	.	.	.	.	.	.	.	.
Alopecosa trabalis (Clerck, 1757)	ES	3	.	.	1	.	1	.	.	.	.	.	.	.	.	.	1
Amaurobius jugorum L. Koch, 1868	ES	367	29	34	3	16	25	53	46	5	43	8	35	12	24	7	27
Anyphaena accentuata (Walckenaer, 1802)	ES	1	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.
Apostenus fuscus Westring, 1851	ES	22	2	3	.	.	2	3	4	1	1	2	.	2	1	1	.
Araneus quadratus Clerck, 1757	ES	1	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.
Arctosa lutetiana (Simon, 1876)	VU	1	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.
Atypus piceus (Sulzer, 1776)	VU	14	.	.	.	.	5	.	.	.	.	3	.	.	.	6	.
Bathyphantes parvulus (Westring, 1851)	ES	4	.	.	.	.	.	2	.	.	.	.	1	1	.	.	.
Centromerus sylvaticus (Blackwall, 1841)	ES	15	2	.	1	2	.	2	.	3	.	1	.	4	.	.	.
Ceratinella brevis (Wider, 1834)	ES	4	1	.	.	.	2	.	.	.	.	.	.	.	.	1	.
Ceratinella scabrosa (O. Pickard-Cambridge, 1871)	ES	1	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.
Cicurina cicur (Fabricius, 1793)	ES	5	1	.	1	1	1	.	.	.	.	.	.	1	.	.	.
Clubiona terrestris Westring, 1851	ES	13	1	2	.	1	2	2	.	.	.	1	.	.	.	1	3
Coelotes terrestris (Wider, 1834)	ES	1	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.
Cozyptila blackwalli (Simon, 1875)	VU	10	.	.	3	1	.	.	.	.	.	2	.	.	3	1	.
Diplocephalus cristatus (Blackwall, 1833)	ES	3	.	.	.	.	.	.	.	3	.	.	.	.	.	.	.
Diplocephalus picinus (Blackwall, 1841)	ES	2	.	.	.	.	.	.	.	.	.	.	.	.	.	2	.
Diplostyla concolor (Wider, 1834)	ES	128	8	8	4	4	9	22	16	24	5	6	3	2	3	4	10
Drassodes lapidosus (Walckenaer, 1802)	ES	9	.	2	3	3	1	.	.	.	.	.	.	.	.	.	.
Drassodes pubescens (Thorell, 1856)	ES	3	2	.	.	.	.	.	.	.	.	1	.	.	.	.	.
Drassyllus praeficus (L. Koch, 1866)	ES	13	1	2	1	4	2	.	.	.	.	3	.	.	.	.	.
Drassyllus pusillus (C. L. Koch, 1833)	ES	2	.	.	.	.	.	1	.	.	.	.	.	.	1	.	.
Drassyllus villicus (Thorell, 1875)	VU	6	1	.	2	.	2	.	.	.	.	1	.	.	.	.	.
Dysdera cechica Řezáč, 2018	ES	44	2	3	4	5	7	6	1		3	1	1	4	1	2	4
Dysdera moravica Řezáč, 2014	LC	3	.	2	.	.	1	.	.	.	.	.	.	.	.	.	.
Enoplognatha latimana Hippa & Oksala, 1982	ES	14	.	1	1	1	.	1	.	.	2	.	.	2	.	6	.
Enoplognatha ovata (Clerck, 1757)	ES	2	1	.	.	.	.	.	.	1	.	.	.	.	.	.	.
Enoplognatha thoracica (Hahn, 1833)	ES	2	.	.	.	.	.	.	.	.	2	.	.	.	.	.	.
Entelecara acuminata (Wider, 1834)	ES	6	.	1	.	.	.	.	.	2	2	.	.	.	.	.	1
Entelecara flavipes (Blackwall, 1834)	LC	1	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.
Ero cambridgei Kulczyński, 1911	ES	4	2	.	.	.	.	.	.	.	.	.	2	.	.	.	.
Euryopis flavomaculata (C. L. Koch, 1836)	ES	69	.	7	8	2	12	17	1	2	6	3	3	.	2	.	6
Gnaphosa montana (L. Koch, 1866)	VU	1	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.
Gonatium rubellum (Blackwall, 1841)	ES	4	.	2	.	.	.	.	.	.	.	.	.	.	1	1	.
Haplodrassus kulczynskii Lohmander, 1942	VU	1	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.
Haplodrassus signifer (C. L. Koch, 1839)	ES	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1
Haplodrassus silvestris (Blackwall, 1833)	ES	17	.	.	1	.	3	.	2	.	1	1	.	1	1	4	3
Harpactea lepida (C. L. Koch, 1838)	ES	23	2	.	1	6	5	3	2	2	.	.	.	1	1	.	.
Harpactea rubicunda (C. L. Koch, 1838)	ES	150	3	9	3	14	12	25	9	5	12	10	11	4	8	8	17
Ipa keyserlingi (Ausserer, 1867)	VU	3	1	.	.	.	.	.	.	1	.	1	.	.	.	.	.
Linyphia hortensis Sundevall, 1830	ES	89	8	8	4	2	3	15	11	7	6	.	5	2	5	7	6
Linyphia triangularis (Clerck, 1757)	ES	2	.	.	1	.	.	.	.	.	1	.	.	.	.	.	.
Liocranoeca striata (Kulczyński, 1882)	LC	7	4	.	.	.	.	.	.	.	.	.	3	.	.	.	.
Macrargus rufus (Wider, 1834)	ES	1	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.
Megalepthyphantes pseudocollinus Saaristo, 1997	LC	3	1	.	.	1	.	.	.	.	.	.	1	.	.	.	.
Metellina mengei (Blackwall, 1869)	ES	1	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.
Micaria pulicaria (Sundevall, 1831)	ES	4	.	1	1	.	.	.	.	.	.	.	.	.	.	.	2
Micrargus herbigradus (Blackwall, 1854)	ES	5	.	1	1	.	.	1	.	.	.	.	.	.	1	1	.

Species	A	Sum	strong thinning					moderate thinning					non intervention				
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Microlinyphia pusilla (Sundevall, 1830)	ES	1	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
Microneta viaria (Blackwall, 1841)	ES	4	2	.	.	.	.	.	.	.	.	.	.	1	.	.	1
Neriene clathrata (Sundevall, 1830)	ES	2	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.
Neriene emphana (Walckenaer, 1841)	ES	4	1	1	.	.	.	1	.	.	.	.	.	.	.	1	.
Neriene montana (Clerck, 1757)	ES	5	2	.	.	.	2	.	.	1	.	.	.	.	.	.	.
Nigma flavescens (Walckenaer, 1830)	ES	1	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.
Nuctenea umbratica (Clerck, 1757)	ES	1	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
Oedothorax agrestis (Blackwall, 1853)	ES	2	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.
Oedothorax apicatus (Blackwall, 1850)	ES	1	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.
Ozyptila atomaria (Panzer, 1801)	ES	1	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.
Ozyptila claveata (Walckenaer, 1837)	LC	1	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.
Ozyptila praticola (C. L. Koch, 1837)	ES	99	5	13	2	.	.	51	1	6	5	3	4	3	4	.	2
Ozyptila pullata (Thorell, 1875)	VU	1	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.
Panamomops affinis Miller & Kratochvíl, 1939	VU	5	.	2	.	.	1	.	.	.	.	.	.	.	.	2	.
Pardosa agrestis (Westring, 1861)	ES	2	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.
Pardosa alacris (C. L. Koch, 1833)	ES	242	12	16	25	14	7	21	10	17	9	41	1	1	.	63	5
Pardosa hortensis (Thorell, 1872)	ES	16	2	.	5	2	5	.	.	.	.	2	.	.	.	.	.
Pardosa lugubris (Walckenaer, 1802)	ES	1428	52	28	46	62	58	461	89	136	43	230	3	2	4	190	24
Pardosa riparia (C. L. Koch, 1833)	ES	2	.	.	1	.	1	.	.	.	.	.	.	.	.	.	.
Pelecopsis radicicola (L. Koch, 1872)	ES	5	.	.	.	.	.	1	.	4	.	.	.	.	.	.	.
Philodromus albidus Kulczyński, 1911	ES	1	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
Phrurolithus festivus (C. L. Koch, 1835)	ES	1	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
Pisaura mirabilis (Clerck, 1757)	ES	13	1	.	7	1	2	.	1	.	.	1	.	.	.	.	.
Pistius truncatus (Pallas, 1772)	LC	1	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.
Pocadicnemis pumila (Blackwall, 1841)	ES	1	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.
Robertus arundineti (O. Pickard-Cambridge, 1871)	ES	6	1	3	1	.	.	.	1	.	.	.	.	.	.	.	.
Robertus lividus (Blackwall, 1836)	ES	8	.	.	.	.	1	1	2	1	1	.	.	2	.	.	.
Scotina celans (Blackwall, 1841)	VU	5	.	2	.	.	1	.	1	.	.	.	.	.	.	1	.
Synema globosum (Fabricius, 1775)	LC	1	.	.	.	.	.	.	.	.	.	1	.	.	.	.	.
Tapinocyba insecta (L. Koch, 1869)	ES	3	.	.	1	.	1	.	1	.	.	.	.	.	.	.	.
Tegenaria campestris (C. L. Koch, 1834)	ES	15	2	1	.	2	1	3	2	.	.	3	.	1	.	.	.
Tegenaria ferruginea (Panzer, 1804)	ES	2	.	.	.	.	.	.	.	1	.	.	.	1	.	.	.
Tenuiphantes alacris (Blackwall, 1853)	ES	2	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.
Tenuiphantes flavipes (Blackwall, 1854)	ES	91	5	3	1	9	11	8	4	6	6	6	3	5	5	5	14
Tenuiphantes mengei (Kulczyński, 1887)	ES	9	.	.	.	1	6	.	.	.	.	.	.	.	.	.	2
Tenuiphantes tenebricola (Wider, 1834)	ES	2	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.
Tenuiphantes tenuis (Blackwall, 1852)	ES	12	.	3	2	1	.	1	2	.	.	.	.	.	.	2	1
Tiso vagans (Blackwall, 1834)	ES	3	.	.	1	.	1	.	.	.	.	.	.	.	.	1	.
Trachyzelotes pedestris (C. L. Koch, 1837)	ES	22	5	5	1	.	.	2	2	2	1	3	.	1	.	.	.
Trichoncus affinis Kulczyński, 1894	VU	1	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.
Trochosa terricola Thorell, 1856	ES	435	19	49	49	24	20	44	16	27	26	29	8	23	39	20	42
Walckenaeria antica (Wider, 1834)	ES	2	.	1	.	.	1	.	.	.	.	.	.	.	.	.	.
Walckenaeria atrotibialis (O. Pickard-Cambridge, 1878)	ES	1	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.
Walckenaeria dysderoides (Wider, 1834)	ES	12	1	3	.	.	1	2	1	1	.	.	.	2	.	1	.
Walckenaeria furcillata (Menge, 1869)	ES	3	.	.	.	.	1	.	1	.	1	.	.	.	.	.	.
Walckenaeria mitrata (Menge, 1868)	ES	1	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.
Walckenaeria monoceros (Wider, 1834)	EN	3	.	.	1	.	.	.	.	.	.	1	.	1	.	.	.
Xerolycosa nemoralis (Westring, 1861)	ES	14	.	2	.	2	4	1	.	4	.	1	.	.	.	.	.
Xysticus erraticus (Blackwall, 1834)	ES	1	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.
Xysticus kochi Thorell, 1872	ES	6	1	1	1	3	.	.	.	.	.	.	.	.	.	.	.
Xysticus lanio C. L. Koch, 1835	ES	1	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.
Zelotes apricorum (L. Koch, 1876)	LC	4	1	.	1	2	.	.	.	.	.	.	.	.	.	.	.
Zelotes electus (C. L. Koch, 1839)	LC	1	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.
Zelotes petrensis (C. L. Koch, 1839)	ES	1	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.
Zelotes subterraneus (C. L. Koch, 1833)	ES	1	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
Zodarion germanicum (C. L. Koch, 1837)	ES	7	.	4	.	.	3	.	.	.	.	.	.	.	.	.	.
Zodarion rubidum Simon, 1914	ES	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Zora nemoralis (Blackwall, 1861)	ES	6	1	.	.	.	1	.	1	.	.	2	.	.	.	.	1
Zora spinimana (Sundevall, 1833)	ES	3	.	.	.	.	.	.	1	.	.	1	.	.	.	.	1

mately 13.4% of the Czech arachnofauna (Kůrka et al. 2015). The most abundant species was *Pardosa lugubris* (Lycosidae) with 1428 individuals (Tab. 2). Two lycosid species, *P. lugubris* and *Trochosa terricola* significantly dominated almost all studied plots. They are typical both for forest margins as well as more open habitats (Buchar & Růžička 2002). The highest number of individuals belonged to Lycosidae with a total of 2149 individuals.
In terms of the number of species, the Linyphiidae family were clearly dominant with 42 species (Tab. 2). However, most of these species were found only sporadically with a few specimens. The exceptions were only several very common species occurring in higher numbers at almost all sites e.g. *Diplostyla concolor*, *Linyphia hortensis* and *Tenuiphantes flavipes*.

A total of 23 rare and endangered species belonging to the Red List of Czech Spiders (Řezáč et al. 2015) was discovered (Tab. 2). *Walckenaeria monoceros* is the only endangered taxon (EN). Twelve species are classified as vulnerable (VU) and ten species as least concern (LC).

Numerous species of conservation interest were found in sampling plots, where canopy cover was thinned as a part of habitat management. Here, higher numbers of rare and endangered spiders, such as *Atypus piceus*, *Drassyllus villicus*, *Panamomops affinis* and *Zelotes petrensis* were found. On the contrary, the shaded habitats with a more humid environment and dense tree crowns hosted both many ubiquitous species, e.g. *Amaurobius jugorum*, *Pardosa alacris*, *Pardosa lugubris*, *Trochosa terricola* and the endangered spiders that are specific to more shaded habitats without any disturbances, e.g. *Cozyptila blackwalli*, *Walckenaeria monoceros* and *Zelotes apricorum* (Bryja et al. 2005, Surovcová et al. 2017). *Gnaphosa montana* was a special discovery, since it is a psychrophilic species occurring at higher altitudes throughout Europe (Pantini & Isaia 2019). The other faunistically important discovery was *Panamomops affinis.*

Species number and spider assemblages – a comparison
Our study is difficult to compare with other studies, because nobody has done research on spiders specifically in the Děvín NNR, also data on spiders from oak-hornbeam forests are in general missing and insufficient. There is a study by Bryja et al. (2005), who found 574 spider species in total, but the collection was carried out over a large area (including the Pálava PLA) of the biosphere reserve across many contrasting habitats using many different collecting methods.

It should be noted that the total spider species number (116 species) was relatively high (despite the data being obtained only with pitfall traps) with the occurrence of rare species typical for open woodlands as well as dense forests (Czech Arachnological Society 2019). Several authors showed even higher species richness in oak and hornbeam forests (e.g. Bryja et al. 2005) than in our study, however they were using various collecting methods, thus covering higher number of forest microhabitats. If other collecting methods were used in our study, the observed richness would surely have been significantly higher. Furthermore, Surovcová et al. (2017) found only 90 epigeic species of spiders in eight forest stands of Pannonian oak forests located across the South Moravian Region including some locations in close vicinity to our study site of the Děvín NNR. Both authors also found a similar composition of spider assemblages with the dominant representation of typical woodland spiders (e.g. *Harpactea rubicunda, Pardosa alacris* and *P. lugubris*) and with findings of rare species of spiders typical for forest-steppes and similarly endangered habitats (e.g. *Atypus piceus, Drassylus villicus, Zelotes electus*).

There are also very scarce data on spiders from oak-hornbeam forest ecosystems from other countries of Central Europe. Krumpálová (2005) found 158 species of epigeic spiders in several forest stands located in the Malé Karpaty Mountains (Slovakia). The composition of spider assemblages, with the presence of several rare and endangered species, were very similar to our findings from the Děvín NNR. Furthermore, Milasowszky et al. (2015) provided a comprehensive study on spiders from Austrian forest ecosystems, including data from oak-hornbeam forest stands. They found a high proportion of forest-steppe spiders and other open habitat specialists typical for sparse forests, which is in accord with our study. In Germany, Blick (2010) found a high number of spider species (278) in several protected forest reserves in Hesse including stands with oak and hornbeams, however using several sampling methods in various microhabitats, which resulted in covering more functional groups of spiders than in our study. Also, the same author (Blick 2013) collected 200 species by pitfall trapping, but the sampling was conducted at nine locations of variously afforested stands, therefore covering a higher number of habitats than in our study. The spider composition in these studies (Blick 2010, 2013) differed as we found more thermophilous species typical for warmer regions of Central Europe (such as the northern-part of the Pannonian region) (Buchar & Růžička 2002). This is confirmed by the presence of strictly xerothermic spider species typical for open and warm habitats such as *Dysdera moravica* and *Zodarion germanicum*. Schuldt et al. (2008) recorded 64 ground-dwelling spider species from a protected oak-hornbeam forest located in Central Germany. The typical species were more or less similar to our spider composition with a relatively high presence of *Pardosa lugubris* and *Diplostyla concolor* which are usually reported as a characteristic species for lowland forests such as oak-hornbeam woodlands (Buchar & Růžička 2002, Nentwig et al. 2020).

In relation to our collected data and from abovementioned information, it seems that the Děvín NNR hosts relatively high richness of ground-dwelling spiders including many faunistically remarkable species of spiders. As mentioned above, the presented richness of spiders is recorded only from one forest stand and the spider assemblages are composed mainly of ground-dwelling species collected by pitfall trapping. We suggest that use of various sampling methods may reveal a significantly more diversified composition of spiders and overall richness may be even higher than in previously mentioned studies (e.g. Krumpálová 2005, Blick 2010, 2013).

Remarkable species
The following species were selected based on their faunistic and conservation value in the Czech Republic and Central Europe. They often dwell in endangered habitats such as sparse coppiced woodlands and forest-grassland mosaics (listed in Red List of Habitats of the Czech Republic), which now face a decline in biodiversity due to abandonment of traditional forest management practices (Chytrý et al. 2019). Some findings were also very unexpected as the species are not typical

for lowland woodlands (World Spider Catalog 2020). All of the presented species belong to 'rare' to 'scarce' categories (R, S) according their rarity level in the Czech Republic (Buchar & Růžička 2002) and are listed in the EN or VU category of Red List of Spiders of the Czech Republic (Řezáč et al. 2015). These species are not only regionally important (across the Czech Republic) but also in Central Europe (see below, Nentwig et al. 2020).

Atypus piceus (Sulzer, 1776)
Atypus piceus resides in open habitats (pasture, steppe) and also in forest habitats, especially in sunny thermophilous oak forests, sunny edges of forests and forest-steppes mainly on calcareous soil (Řezáč et al. 2015). It occurs from France to Greece and the central part of European Russia (Nentwig et al. 2020). In the Czech Republic, this species is found rarely on the margins of thermophilic oak woodlands, although in the region of South Moravia it is usually found more frequently (Bryja et al. 2005). It is categorized as a vulnerable (VU) species in the Red List of Czech Spiders (Řezáč et al. 2015).

Fourteen males were captured in pitfall traps in the study area. Most of the individuals were caught in dense forest (nine specimens) and five specimens were sampled in more open forest habitats.

Drassyllus villicus (Thorell, 1875)
Drassyllus villicus occurs in lowland landscapes on steppes and forest-steppes, sunny rocky slopes, in shrubs and sparse forests under stones and rocks (Buchar & Růžička 2002). It is a European species that occurs across most of mainland south-west, central, south and east Europe to Turkey and Azerbaijan (Nentwig et al. 2020). In the Czech Republic, this species is typical of xerothermic habitats such as steppes and forest-steppes, occurring quite regularly in the surroundings of the Pálava PLA (Bryja et al. 2005), however *D. villicus* has a strong affinity to habitats with early succession such as slopes of vineyard terraces and limestone quarries (Košulič & Hula 2014). Our finding of this species in the forest ecosystems of Děvín is therefore quite surprising and suggests that this species is able to spread out from surrounding xerothermic habitats and maintain populations in newly opened forest habitats. It is categorized as a vulnerable (VU) species in the Red List of Czech Spiders (Řezáč et al. 2015).

Two females and four males were captured in pitfall traps in the study area. All six specimens were caught in open stands under active management. It seems that this species benefits from the artificial opening of the forest induced by the reestablishment of active management as was also shown by Surovcová et al. (2017).

Gnaphosa montana (L. Koch, 1866)
Gnaphosa montana is a species preferring areas with low temperatures that occurs in medium to high altitudes in spruce forests and forest edges, under the bark of dead trees and on stumps (Kůrka et al. 2015). *Gnaphosa montana* is a European species that occurs across most of mainland central, north and east Europe, it also has some records from Turkey, Kazakhstan and South Siberia of Russia (Nentwig et al. 2020). It is scarce in the Czech Republic (Buchar & Růžička 2002) with sporadic findings throughout the whole of Europe (Pantini & Isaia 2019). This species, as mentioned above, is typical for montane forests and clearings, so it is a very special and surprising finding in the Děvín NNR. It is categorized as a vulnerable (VU) species by the Red List of Czech Spiders (Řezáč et al. 2015). In general, it is a rare and endangered spider included in most of the Red Lists in Central European countries (Gajdoš & Svatoň 2001, Staręga et al. 2002, Gajdoš et al. 2014, Řezáč et al. 2015, Blick et al. 2016).

In the study area, only one specimen (female) was captured in the pitfall traps. It was caught in a moist and shaded locality with the presence of a rock block and scree slopes which had significantly colder microhabitats than the surrounding area. Therefore, it seems that this species can adapt even for living in lowland areas due to the presence of cold scree slopes (e.g. Růžička & Klimeš 2005, Růžička & Zacharda 2010). It is the first finding of this species for South Moravia (Fig. 2a) and in a lowland landscape of Europe (Nentwig et al. 2020).

Panamomops affinis Miller & Kratochvíl, 1939
Panamomops affinis occurs in the leafy undergrowth of warm forests and forest-steppes on sunny slopes. It occurs only in Germany, Switzerland, Czech Republic, Slovakia, Austria, Slovenia and Serbia (Nentwig et al. 2020). It is a species with a small distribution range and is usually found with very few and sporadic records (Buchar & Růžička 2002). It seems that *P. affinis* occurs mainly in well-maintained locations with specific ecological conditions required by this thermophilous species (e.g. high openness, low level of disturbance, availability of bare ground) (Nentwig et al. 2020). It is categorized as vulnerable (VU) in the Red List of Czech spiders (Řezáč et al. 2015).

In the study area, three males and two females were captured in pitfall traps. All of them were caught only in open stands, under active management. It is the second finding of the species for Moravia (Fig. 2b), where it was previously known from the Podyjí National Park (Růžička 2000). In Bohemia it has more records from the Křivoklátsko Protected Landscape Area (Buchar & Růžička 2002), Bohemian Karst PLA (Buchar & Žďárek 1960) and other locations (Kůrka & Buchar 2010).

Walckenaeria monoceros (Wider, 1834)
This is a rare species occurring in detritus under rocks in rocky steppes and forest-steppes, where it prefers places with denser canopy (Buchar & Růžička 2002, Surovcová et al. 2017). *Walckenaeria monoceros* has been recorded from many European countries (gaps mainly in the Balkans and Eastern Europe) and in Azerbaijan (Nentwig et al. 2020). In the Czech Republic, it occurs only in the warmest places (Český kras, Křivoklátsko, Dolní Povltaví, Kokořínsko) (Buchar & Růžička 2002, Kůrka et al. 2015). In Moravia, it has only been discovered in one location of oak woodland which lies about 30 km from our studied area of Děvín (Surovcová et al. 2017). In the Red List of Czech Spiders, it is categorized as an endangered (EN) species (Řezáč et al. 2015).

In the study area, five males and one female were captured in pitfall traps. These specimens were caught in both open (four individuals) as well as shady stands (two individuals). According to Surovcová et al. (2017) the species occurs mostly in densely overgrown habitats of thermophilous oak forests, as it requires higher substrate moisture (Buchar & Růžička 2002).

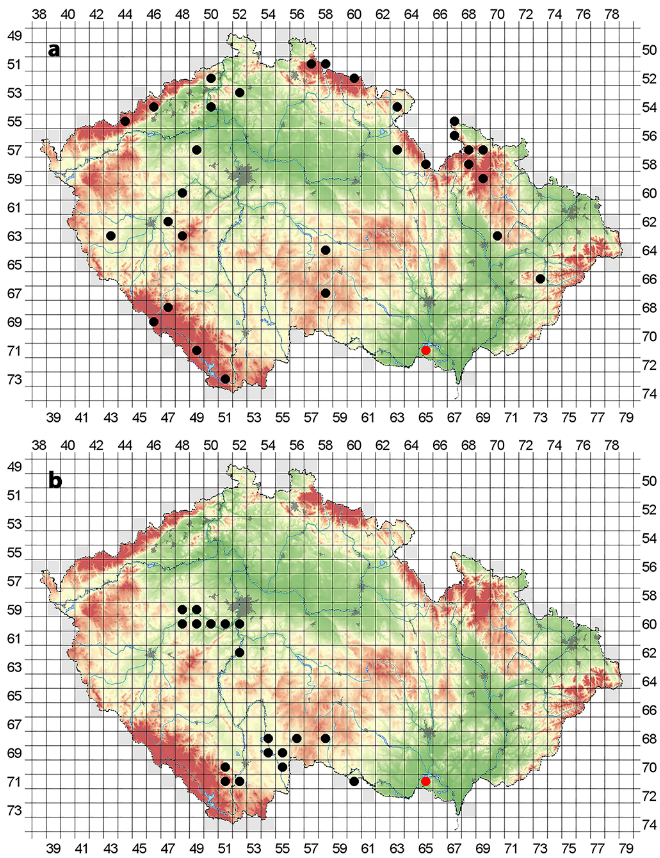

Fig. 2: Records of: **a.** *Gnaphosa montana*; **b.** *Panamomops affinis*, in the Czech Republic

Suggestions on conservation management for the area

We suggest that specific management interventions such as canopy thinning and returning to coppicing should be continued in the studied locality to enhance the richness and distribution of the microhabitats (Hédl et al. 2010, Košulič et al. 2016). It seems that most faunistically important findings (mainly xerothermic species, e.g. *Agroeca lusatica*, *Arctosa lutetiana*, *Atypus piceus*, *Drassylus villicus*, *Haplodrassus kulczynskii*) benefit from the artificial opening of the forest induced by the reestablishment of active management (e.g. coppicing). On the other hand, rare and endangered species preferring more shaded places (*Cozyptila blackwalli*, *Gnaphosa montana* and *Walckenaeria monoceros*) as well as highly dominant species of oak forest ecotones (*Amaurobius jugorum* and *Pardosa lugubris*) point to the importance of maintaining diverse habitats in oak-hornbeam forests. Therefore, to increase and preserve overall biodiversity, it is necessary that the areas with dense vegetation remain, to preserve the total forest biodiversity and avoid the loss of typically forest species occurring in the stands with higher canopy cover. We suggest that individual patches in the forest should form a diverse mosaic of habitats, i.e. a brighter portion with an initial stage of succession should be connected to non-intervention areas (Ausden 2007, Spitzer et al. 2008).

To conclude, the results of this study confirm the high biotic value of forest ecosystems of the Děvín NNR in the Czech Republic's otherwise rather homogeneous landscape. However, suitable conservation management methods should be fully integrated into the future conservation plans of the Děvín NNR which will enhance the local forest biodiversity.

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