

THE OCCURRENCE OF FALSE HONEY ANT (*PRENOLEPIS NITENS*) IN THE URBAN GREENERY OF THE BRATISLAVA CITY (SW SLOVAKIA)

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KEY WORDS

Prenolepis nitens
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ABSTRACT

Prenolepis nitens is the only known species of the genus *Prenolepis* (Mayr, 1861) found in Europe. The southern part of Slovakia represents the northern border of the occurrence of this Mediterranean species. In addition to natural habitats, the European false honey ant can be also found in the anthropogenically influenced urban habitats. We recorded it at 13 sites in Bratislava during a 4-year study of the ant assemblages in the urban greenery. Our contribution extends the current knowledge about the occurrence and activity of this unusual ant in Slovakia.

Prenolepis is a small genus belonging to the subfamily Formicinae and containing 19 species (Williams & LaPolla 2018) with a worldwide distribution except for the northern Holarctis and tropical Africa (Chen & Zhou 2018; Seifert 2007). Southern China and south-eastern Asia are the species richest areas (16 spp.), while the occurrence of only one species per country is known in Australia, America and Europe (Williams & LaPolla 2018).

The European species *Prenolepis nitens* has been so far recorded in the following countries: Caucasus and Crimea (Dubovikoff & Yusupov 2017), Turkey (Kiran & Karaman 2012), Greece (Legakis 2011), Bulgaria (Lapeva-Gjonova et al. 2010), Macedonia (Bračko et al. 2014), Albania (Maidl 1922), Montenegro (Karaman 2011), Serbia (Petrov 2006), Romania (Markó et al. 2006), Bosnia and Herzegovina (Vesnić & Lelo 2009), Croatia (Bračko 2006), Georgia (Gratiashvili & Barjadze 2008), Slovenia (Bračko 2007), Italy (Poldi et al. 1995), Hungary (Csósz et al. 2011), Austria (Steiner et al. 2002), and Slovakia (Werner & Wiezik 2007).

The predominant natural habitats of this Mediterranean species include mainly warm deciduous forests, open landscapes with woods, xerothermic meadows, and forest edges (Bregant 1998; Seifert 2007). The known human-modified habitats include vineyards (Mayr 1853; Bregant 1998), streets and gardens (Müller 1923) as well as municipal cemeteries (Klesniaková et al. 2016). *P. nitens* constructs a deep nest, being one to three meters in length. It is typically placed in the ground, hollow roots of trees, among roots, within vertical dead wood, under fallen wood but also under stones and in wall crevices etc. (Bregant 1998; Seifert 2007; Lőrinczi 2016). Typical food sources of these ants comprise fruit juices, floral nectaries, honeydew, and elaiosomes (Seifert 2007). As concerns the foraging, *P. nitens* has special caste workers, the so-called “repletes”. These European false honey ant workers store the liquid and fat food in their highly expanded gaster (physogastric abdomen) and can nourish the rest of the colony, especially, overwintering queens and males (Rösler 1937; Tschinkel 1987; Williams & LaPolla 2018). The nuptial flight is carried out very early in the spring (Rösler

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1937; Seifert 2007). In *P. nitens*, similarly as in the American species “winter ant”, *Prenolepis imparis* (Say, 1863), the winter activity is known (Tschinkel 1987). It does not maintain strict winter hibernation and is not a distinct thermophile, occurring from October to March (Seifert 2007; Lőrinczi 2016). The highest activity of this species occurs during cooler periods of the year, even when the temperature is near freezing and foraging occurs until the temperature allows movement. On the other hand, the majority of ant species have little or no above-ground activity under such temperature conditions. In the warmest season, the summer aestivation period occurs (Lőrinczi 2016). The summer aestivation is well known and well-studied in the sister species *P. imparis* (Tschinkel 1987). A decline in workers’ above-ground activity and sealing of entrances to several nests, have been also observed during the warm period in the context of the aestivation. The temperature almost certainly affects the length of the aestivation period (Tschinkel 1987).

The occurrence of *P. nitens* in Slovakia

Almost 70 years after the description of this species and in the view of the extending knowledge about the distribution of *P. nitens* in Europe, Soudek (1922) supposed that this species could very likely occur also in Slovakia. The first data regarding

P. nitens from our country were provided by Hungarian entomologists from Oravice (Kratochvíl 1940). At present, the species is especially known from the south-western part of the country from oak-hornbeam forests in the Malé Karpaty (Little Carpathians) Mts. (Purkart & Holecová 2017), pine forests in Záhorie (Holecová et al. 2016) and from cemeteries in the Bratislava city (Klesniaková et al. 2016). Wiezik (2008) stated that *P. nitens* occurs very rarely also in the bright oak forests of the Štiavnické vrchy Mts in the central Slovakia. In addition, *P. nitens* was recorded from the southern Slovakia (Burda and Modrý vrch) near the border with Hungary (unpublished data). This interesting ant species is classified as rare in Slovakia and endangered in the Red List of Hymenoptera of Slovakia (Lukáš 2001).

MATERIAL AND METHODS

Myrmecofauna of the urban greenery in Bratislava was investigated during the vegetation season from April to October in 2013, 2014, 2015 and 2017

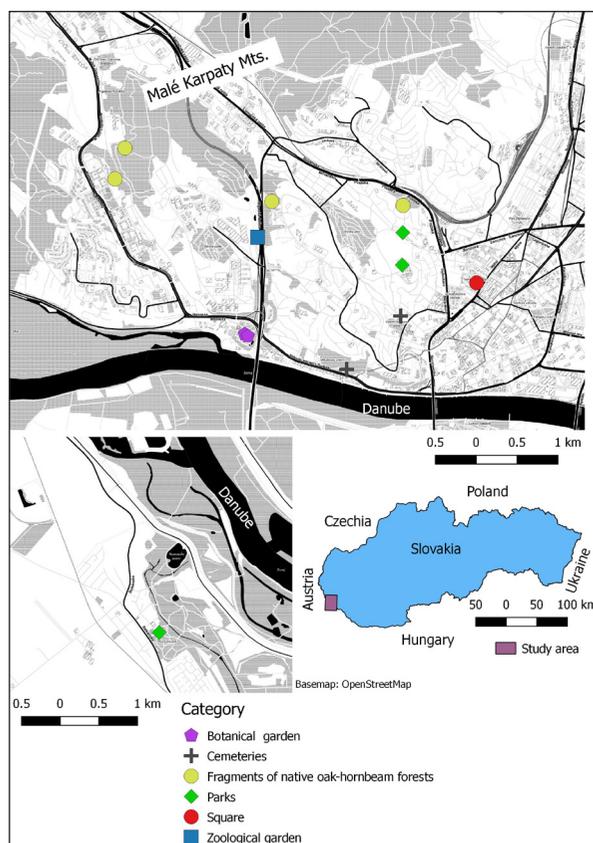


Figure 1. Study area and location of individual study plots (map design: J. Holec).

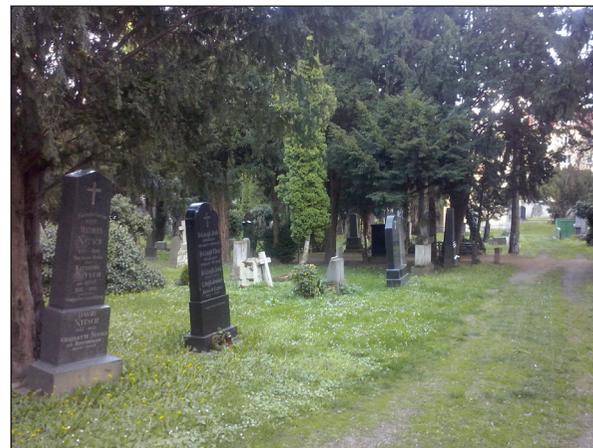


Figure 2. The historic cemetery Kozia brána known as the forest cemetery with dense tree plantation.

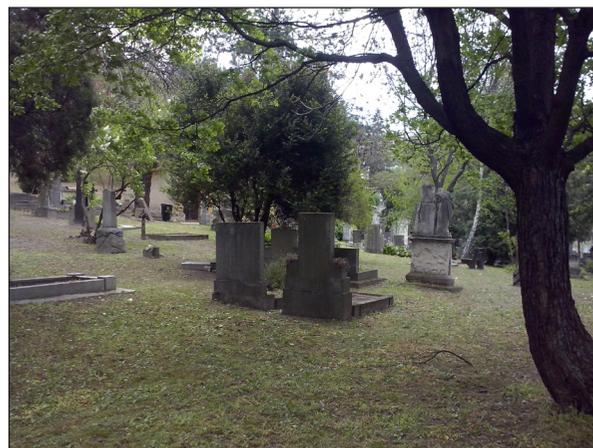


Figure 3. Mikulášsky cintorín, one of the smallest cemeteries in the Bratislava city.



Figure 4. Kalvária, one of the smallest fragment of a native oak-hornbeam forests.



Figure 8. Overshadowed area under the trees in the exterior of the Botanical Garden (photo: P. Fend'a).



Figure 5. Kalvária, one of the smallest fragment of a native oak-hornbeam forests.



Figure 9. Unshaded grassland in the exterior of the Botanical Garden (photo: P. Fend'a).



Figure 6. Broken terrain in Mlynská dolina with heaps of stones.



Figure 10. Memorial place near the Hlboká street, a pilgrimage place in Bratislava.



Figure 7. Sitina, the largest fragment of a native oak-hornbeam forest in the urban greenery of the Bratislava city.



Figure 11. Historical Rusovecký park without intensive human intervention in the present.



Figure 12. Memorial monument and military cemetery Slavín surrounded by grasslands, shrubs, and trees.



Figure 13. Banks of the Vydrlica stream in the ZOO (photo: N. Nováková).



Figure 14. Námestie slobody square with the largest fountain in the Bratislava city and surrounded by greenery.

at regular monthly intervals. The studied urban greenery could be categorized as follows: special greenery (including cemeteries, the Botanical Garden of the Comenius University, and the ZOO Bratislava), parks, squares and fragments of the native oak-hornbeam forests (Tab. 1, Figs 1 – 14). Native, synanthropic or cultural vegetation, and most often their combination, commonly occur in the studied urban greenery. Ants were collected using three methods: pitfall traps, individual collecting, and soil samples.

RESULTS AND DISCUSSION

In total, 726 specimens of *P. nitens* were collected at 13 study plots within the Bratislava city during the 4-year research of ants. The majority of specimens was recorded in the Botanical Garden under various trees (348 ex.) and in the Mikulášsky cintorín cemetery (152 ex.). Only a single specimen was captured at three study plots: Kozia brána, Rusovecký park, and ZOO. Specimens of the false honey ant were obtained by using all three collecting methods. The overview of the number of these ants found in the urban greenery of the Bratislava city is summarized in Tab. 1. The combination of soil traps and individual collecting was proven to be most effective in detecting *P. nitens* in the examined areas.

Because our research took place during the whole vegetation season and was primarily focused on ant assemblages in the urban greenery, we noticed occurrence of *P. nitens* also during the colder period of the year. We recorded the highest number of specimen *P. nitens* in October during the autumn period (276 ex.) and in May (75 ex.) during the spring period (Fig. 1). Only a single false honey ant was present in our samples collected in July (Fig. 15). The rare occurrence of *P. nitens* in June (14 ex.) and July (1 ex.) may be a consequence of the summer aestivation (Lőrinczi 2016). The summer aestivation is well known for and studied in the congeneric species *P. imparis*. The decline in workers' above-ground activity and sealing of the entrances to several nests, were also observed during the warm period in the context of the aestivation (Tschinkel 1987). Interestingly, relatively common occurrence of specimens (72 ex.) was obtained by pitfall trapping and individual collecting in August. Although August is one of the warmest months in Slovakia (Siman 2014), we recorded the activity of *P. nitens* at seven study plots during warm days, except for the Mikulášsky cintorín cemetery, ZOO, Kalvária, and Líščie údolie. The highest number of individuals (40 ex.) was collected at the Lurdská jaskyňa cave near the Hlboká ulica street by pitfall traps in 2015. The summer 2015 was characterized by an extremely high number of days with a maximum air temperature reaching 35 °C or more. Such 26

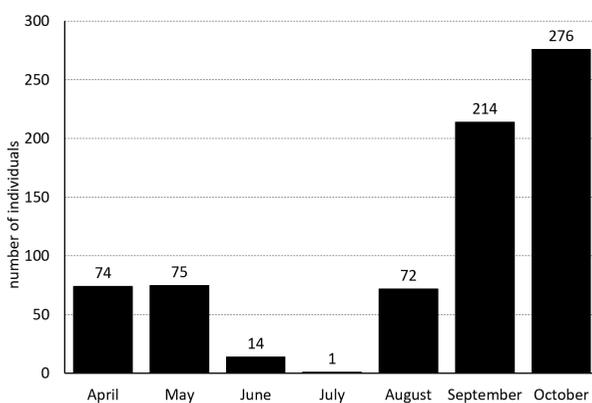
Table 1. The urban greenery in Bratislava city with the occurrence of *Prenolepis nitens* with the overview of the collecting methods and the number of obtained individuals.

Tmean – mean monthly temperature, Tmax – maximum monthly temperature, Tmin – minimum monthly temperature [°C], Prec/day – mean monthly precipitations expressed in daily precipitation values

The places with the occurrence of <i>P. nitens</i> in Bratislava	GPS coordinates (WGS84)	Altitude	The number of individuals of <i>P. nitens</i> obtained by different collecting methods			Total	
			Soil traps	Ind. collecting	Soil samples		
Cemeteries (2013)	Kozia brána	48°8'54"N, 17°5'57"E	170	—	1	—	1
	Mikulášsky cintorín	48°8'33"N, 17°5'25"E	176	151	—	1	152
Fragments of native oak-hornbeam forests (2014)	Kalvária	48°9'37.4"N, 17°5'58.4"E	250	2	—	—	2
	Líščie údolie	48°9'47.8"N, 17°3'7.9"E	201	2	—	—	2
	Mlynská dolina	48°9'39.0"N, 17°4'40.7"E	175	—	9	—	9
	Sitina	48°9'59.9"N, 17°3'13.8"E	216	—	13	—	13
Botanical garden 2014	under trees	48°8'46.9"N, 17°4'24.7"E	153	190	149	9	348
	open field	48°8'46.1"N, 17°4'26.5"E	153	92	6	—	98
Parks (2015)	Lurdská jaskyňa near Hlboká street	48°9'37"N, 17°05'57"E	230	59	—	—	59
	Rusovecký park	48°3'9"N, 17°9'5"E	136	1	—	—	1
	Slavín	48°9'14"N, 17°5'58"E	235	30	—	—	30
Zoological garden 2017	around Vydrica stream	48°9'24.9"N, 17°4'32.3"E	158	1	—	—	1
Square (2017)	Námestie slobody	48°9'7"N, 17°6'42"E	153	—	10	—	10
Total				528	188	10	726

days were in Bratislava also during June and August 2015 (Kajaba et al. 2015).

In the future, it would be appropriate to continuously record the annual activity of *P. nitens* at the study plots along with actual temperature. Such observations from the urban greenery, where the temperature is affected by the soil sealing phenomenon (Petrovič 1972), could be confronted with the activity of *P. nitens* in natural habitats.

**Figure 15.** Cumulative abundance of *Prenolepis nitens* in individual months during years 2013–2017.

Faunistic records

Abbreviations: PT – pitfall traps, IC – individual collecting, SS – soil samples, w – worker.

Cemeteries: Mikulášsky cintorín – PT (24. 4. – 17. 5. 2013) 37 w; PT (17. 8. – 18. 9. 2013) 20 w; PT (18. 9. – 17. 10. 2013) 94 w; SS (27. 6. 2013) 1 w. Kozia brána – IC (17. 8. 2013) 1 w.

Botanical Garden: Under trees – PT (26. 3. – 28. 4. 2014) 46 w; PT (28. 4. – 28. 5. 2014) 10 w; PT (28. 5. – 26. 6. 2014) 7 w; PT (26. 6. – 29. 7. 2014) 1 w; PT (29. 7. – 25. 8. 2014) 5 w; PT (25. 8. – 30. 9. 2014) 25 w; PT (30. 9. – 29. 10. 2014) 96 w; IC (16. 9. 2014) 149 w; SS (30. 9. 2014) 9 w. Open field – PT (26. 3. – 28. 4. 2014) 24 w; PT (25. 8. – 30. 9. 2014) 3 w; PT (30. 9. – 29. 10. 2014) 65 w; IC (16. 9. 2014) 6 w.

Fragments of native oak-hornbeam forests: Kalvária – PT (21. 3. – 25. 4. 2014) 2 w. Líščie údolie – PT (21. 3. – 23. 4. 2014) 2 w. Mlynská dolina – IC (23. 8. 2014) 9 w. Sitina – IC (20. 10. 2014) 13 w.

Parks: Slavín – PT (23. 4. – 26. 5. 2015) 15 w; PT (29. 7. – 24. 8. 2015) 15 w. Rusovecký park – PT (27. 7. – 25. 8. 2015) 1 w. Lurdská jaskyňa na Hlbokej ulici street – PT (24. 4. – 25. 5. 2015) 13 w; PT (25. 5. – 26. 6. 2015) 6 w; PT (29. 7. – 24. 8. 2015) 40 w.

Squares: Námestie slobody – IC (22. 8. 2017) 1 w; IC (25. 9. 2017) 1 w; IC (17. 10. 2017) 8 w.

Zoological garden: Around the Vydrica stream – PT (21. 8. – 25. 9. 2017) 1w.

CONCLUSIONS

We recorded the interesting false honey ant *P. nitens* during our myrmecological research focused on ant assemblages in the urban greenery of Bratislava. In total, 726 individuals were collected at 13 study plots in various types of urban habitats (Botanical and Zoological gardens, cemeteries, parks, squares and fragments of native oak-hornbeam forests). Due to the currently limited knowledge about the distribution of this ant species in Slovakia, our findings about its common occurrence in the urban greenery are surprising. Urban greenery thus not only fulfills various functions for citizens, but also represents a suitable urban biotope even for less frequent animal species, such as the red-listed ants in our country.

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