

New record of the European Amazon ant *Polyergus rufescens* (Latreille) (Hymenoptera: Formicidae) from the Kraków–Wieluń Upland, with notes on its distribution in Poland

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Abstract: The study provides updated information on the distribution of the socially parasitic ant *Polyergus rufescens* (Latreille) in Poland, compiled from historical records, a recent field observation and data from iNaturalist. The species was recorded in the Kraków area, where it had last been noted over a century ago. Its occurrence in suburban habitats and a potential gradual range expansion in response to urban microclimatic conditions are discussed. Moreover, in a laboratory setting, an alate gyne of *P. rufescens* was observed feeding independently on honey and subsequently sharing it with workers of its host, *Formica cinerea* Mayr, which may point to previously undocumented behavioural plasticity. Overall, we highlight aspects of behaviour worthy of further study and emphasize the need for continued monitoring of this rare and biologically specialized species.

Key words: alate gyne, dulosis, faunistics, feeding behaviour, slave-making ant, social parasitism, trophallaxis

INTRODUCTION

Polyergus rufescens (Latreille, 1798), commonly known as the European Amazon ant is a socially parasitic species obligatorily dependent on *Formica* Linnaeus ants of the subgenus *Serviformica* Forel. From nests of these hosts it carries away worker pupae, which are subsequently reared in its own nest and serve as auxiliaries. Such slave-making behaviour, also referred to as dulosis, was first described by Huber (1810) and later referenced in Charles Darwin's *Origin of Species* (Darwin 1859). To date, more than 50 ant species are known to exhibit slave-making strategies (Stoldt & Foitzik 2021). Among them, the genus *Polyergus* Latreille is the most taxonomically diverse, comprising 14 described dulotic species: 3 Palearctic, 11 Nearctic (Trager 2013). *P. rufescens* is a Palearctic species with the highest number of records in Europe (e.g., Collingwood 1979; Rigato & Sciaky 1991; Dekoninck et al. 2001; Borowiec & Salata 2012, 2022). In Poland, *P. rufescens* has been recorded predominantly in northern and central regions, with only a few records from southern Poland (Czechowski et al. 2012). Moreover, most records are historical and geographically scattered, with only a few recent confirmations.

MATERIALS AND METHODS

The observation was carried out on 1 August 2025, between 2:00 and 3:00 p.m., on the campus of the Jagiellonian University in Kraków, Kraków–Wieluń Upland (50.027644° N, 19.904666° E). A single alate gyne of *P. rufescens* was found during routine fieldwork in an urban green area with

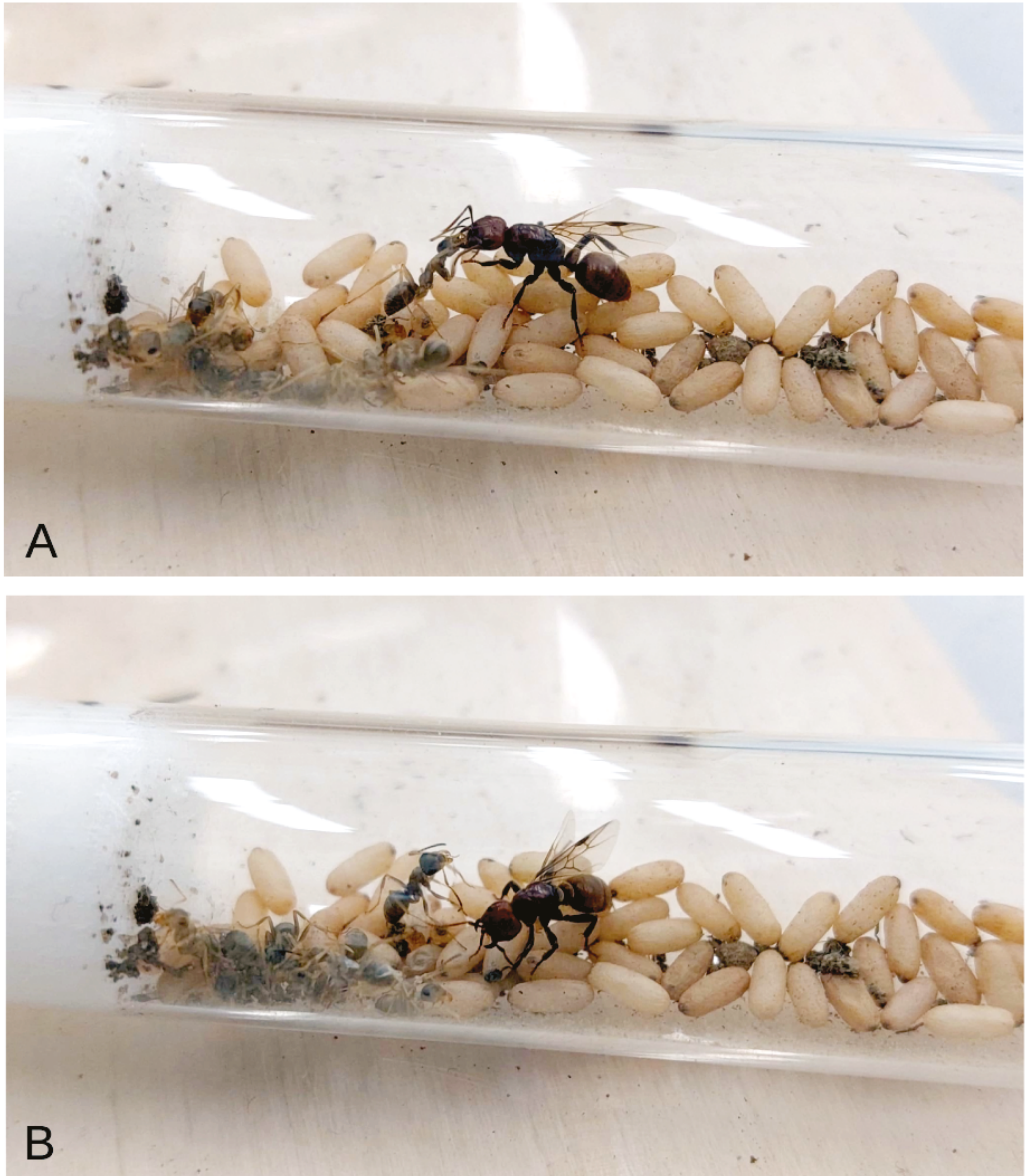


Figure 1. Trophallaxis between *Polyergus rufescens* (Latreille) gyne and *Formica cinerea* Mayr worker (A), and self-grooming behaviour of individuals of both species after trophallaxis (B).

scattered lawns and ornamental shrubs adjacent to pedestrian paths. The site represents a typical anthropogenic habitat characterized by compacted soil, fragmented vegetation and the presence of several *Formica cinerea* Mayr, 1853 nests. Weather conditions during the observation were partly cloudy, with an ambient temperature of approximately 24 °C. The specimen was collected using a small transport tube and transferred to the laboratory, where it was kept for further behavioural observation.

The *P. rufescens* gyne exhibited partial wing loss and was actively moving near a nest of *F. cinerea*, suggesting post-nuptial behaviour. No accompanying *P. rufescens* workers were observed at the time of collection. After transportation to the laboratory, the gyne was placed in an artificial nest together with several dozen pupae and a few callow workers of *F. cinerea* to initiate adoption (see Tanquary 1911; Zimmerli & Topoff 1994; Mori et al. 1995, 2000a, b). A sample of pupae and callow workers from the host colony was collected on the same day from the field site, in close proximity to the nest where the *P. rufescens* gyne had been found. The gyne promptly accepted the callow workers and intensive grooming of the workers by the gyne was observed immediately after their introduction. On the following day, trophallaxis (i.e., mouth-to-mouth food exchanges) between the gyne and host workers was observed (Fig. 1). Notably, after a drop of honey was introduced into the nest, the gyne fed independently and subsequently shared the food with the workers.

To illustrate the distribution of *P. rufescens* in Poland, we generated a map (Fig. 2) using the software MapaUTM v.6 (Gierłasiński 2025). The map was based on data from published literature and citizen science observations (iNaturalist 2025). Records lacking sufficiently detailed locality information were excluded to ensure the reliability and spatial resolution of the presented distribution data.

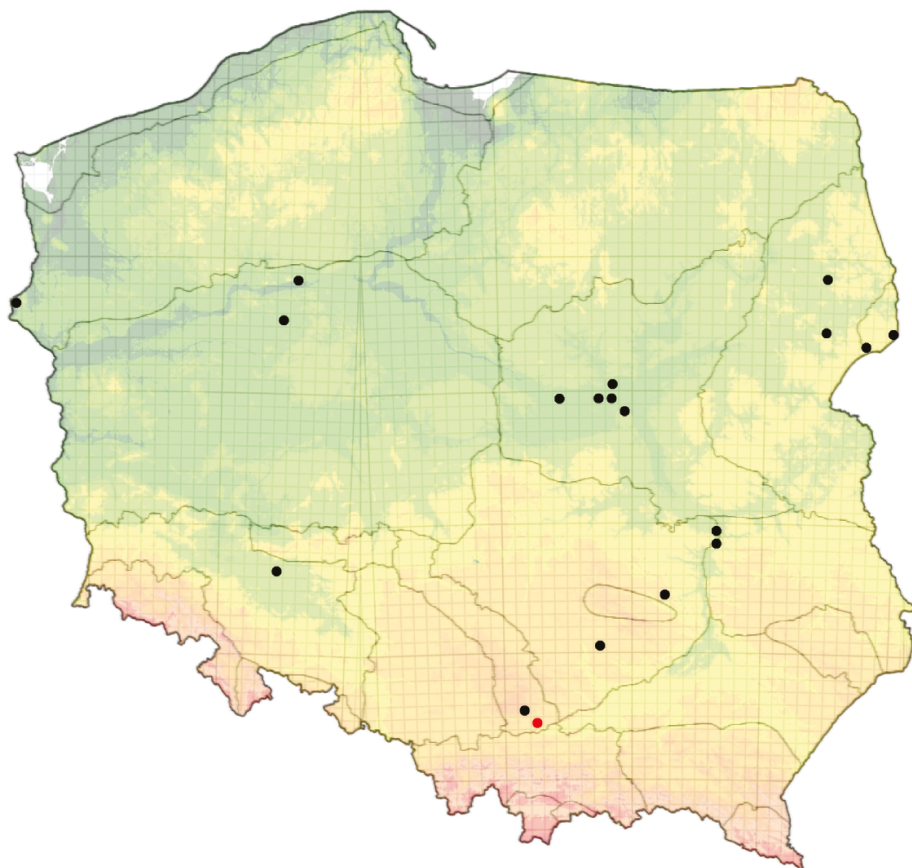


Figure 2. Distribution of *Polyergus rufescens* (Latreille) in Poland. Dots represent UTM grid squares based on the geographical division of Poland (A). Black dots indicate known localities from the literature and the iNaturalist database, while the red dot marks a newly confirmed locality reported in the present study.

Specimen(s) or colonies of *P. rufescens* were documented from the following locations, given as UTM grid squares within the KFP zoogeographical regions (Burakowski et al. 1990):

Pomeranian Lakeland

[VU46], Bielinek, Chojna district (Griep 1910, cited in Czechowski 1975);

Wielkopolska–Kujawy Lowland

[XU58], Osiek, Wyrzysk district (Torka 1914, cited in Czechowski 1975);

[XU45], Durowo, Wągrowiec district (Kulmatycki 1922);

Lower Silesia

[XS46], Wrocław (M. Woyciechowski, unpubl. data, cited in Czechowski et al. 2012);

Mazovian Lowland

[DC89], Kampinos Forest, Warsaw district (Dobrzański in litt., cited in Czechowski 1975);

[DD80], Łomna, Nowy Dwór district (Czechowski 1975);

Podlasie

[FD44], Bielsk Podlaski (Mazur 1983);

[FD48], Białystok (Tragust et al. 2025);

[FD73], Topiło, Hajnówka district (Czechowski 2007);

[FD94], Białowieża, Hajnówka district (Bischoff 1925, cited in Czechowski 1975);

Lubelska Upland

[EB68], Kazimierz Dolny and Oblasy, Puławy district (Minkiewicz 1935; Pisarski 1953, cited in Czechowski 1975, Czechowski & Rotkiewicz 1997);

[EB69], Puławy (Dobrzańska & Dobrzański 1960);

Świętokrzyskie Mountains

[EB24], Szewna, Ostrowiec Świętokrzyski district (Krzysztofiak 1984);

Małopolska Upland

[DB70], Stawiany, Pińczów district (Kaszyca-Tszakowska & Simka 2017);

Kraków–Wieluń Upland

[DA15], Ujazd, Kraków district (Kulmatycki 1920);

[DA24], Kraków (current observation and Łomnicki 1923, cited in Czechowski 1975).

Moreover, four additional records of *P. rufescens* have been documented on the iNaturalist website (2025), each accompanied by photographs available under a Creative Commons license:

Mazovian Lowland

[DC49], Sochaczew, 2 Sep 2024, <https://www.inaturalist.org/observations/283133820>;

[DC79], Julinek, Leszno district, 28 Jun 2025, <https://www.inaturalist.org/observations/293720899>;

[DC98], Warszawa, 11 Aug 2025, <https://www.inaturalist.org/observations/305585052>;

Kraków–Wieluń Upland[DA15], Zabierzów, Kraków district, 17 Jul 2022, <https://www.inaturalist.org/observations/126647400>.**DISCUSSION**

The site where the alate gyne of *P. rufescens* was observed was suburban in character, consisting of lawns and ornamental shrubs adjacent to pedestrian pathways. *P. rufescens* may occur in dry and open environments such as sandy dunes, heathlands, xerothermic grasslands and light forests (Krzysztofiak 1984; Dekoninck et al. 2001; Czechowski et al. 2012; Vankerhoven et al. 2021). Recent observations from anthropogenic landscapes, including meadows (Ješovnik et al. 2019), confirm that the species may tolerate a broad range of habitats. Urban environments, which often function as heat islands, can positively influence the development of ant colonies inhabiting these areas (Trigos-Peral et al. 2024). Since *Serviformica* species are well adapted to urbanized habitats (e.g., Czechowski & Pisarski 1990; Ślipiński et al. 2012; Stukalyuk et al. 2022; Stukalyuk & Kozyr 2023), it is plausible that *P. rufescens* may also gradually expand its range in response to urban microclimatic conditions.

Although only a single alate gyne was collected during this survey, the presence of a nearby natal colony is likely, given that *P. rufescens* typically exhibits relatively short post-mating dispersal, however passive transport by wind cannot be excluded (Mori et al. 1994; Grasso et al. 2003). The mating behaviour of *P. rufescens* is variable, with queens capable of copulating during nuptial flights, slave raids, or on the ground near their natal nests (Mori et al. 1994). The gyne was found in close proximity to a nest of *F. cinerea*, a recognized host species frequently exploited by social parasites during colony founding. Given these observations, further targeted surveys in the surrounding area are required to confirm the possible presence of established local colonies of *P. rufescens*. In this locality, the species had previously been documented only once, more than 100 years ago (Łomnicki 1923, cited in Czechowski 1975). It should be noted, however, that Łomnicki referred to the species as occurring in “the vicinity of Kraków”, and a century ago the area of the present Jagiellonian University campus would itself have been considered such a vicinity.

Previous studies suggest that queens and workers of *P. rufescens* have lost the ability to feed themselves and tend their own brood, relying entirely on their *Formica* slaves for nourishment and brood care (Mori et al. 2000a, b; Trager 2013; Stoldt & Foitzik 2021). This behavioural and morphological degeneration, including highly modified, sickle-shaped mandibles, is considered a hallmark of advanced dulosis (Hölldobler & Wilson 1990). In contrast, our observation revealed that the captured gyne consumed honey independently and subsequently shared the resource with nearby workers, suggesting a potential degree of behavioural flexibility under certain conditions. This may be related to the fact that only callow workers were available, but such direct feeding by a *Polyergus* gyne and subsequent food-sharing with host workers has not previously been reported, which makes it worthy of further investigation. Nevertheless, further detailed behavioural studies are required to assess the extent and ecological relevance of such feeding abilities in *P. rufescens*. So far, only a few studies have examined the behaviour of this species under laboratory conditions (Mori et al. 2000b; Heller 2004), leaving many aspects of its biology insufficiently understood.

To sum up, our record adds to the known distribution of *P. rufescens* in Central Europe. The observation indicates that the species can be encountered in semi-natural and anthropogenically transformed sites. Increasing reports from synanthropic areas are to be expected and citizen science initiatives may prove crucial for detecting rare species of ants, including socially parasitic and conservation-relevant taxa such as *P. rufescens*. Given its obligate social parasitism and the limited representation of *Polyergus* in Europe, this species warrants continued faunistic attention and systematic monitoring.

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REFERENCES

- Borowiec L., Salata S. 2012. Ants of Greece – checklist, comments and new faunistic data (Hymenoptera: Formicidae). *Genus*, 23: 461–563.
- Borowiec L., Salata S. 2022. A monographic review of ants of Greece (Hymenoptera: Formicidae). Vol. 1. Introduction and review of all subfamilies except the subfamily Myrmicinae. *Natural History Monographs of the Upper Silesian Museum* 1: 1–775.
- Burakowski B., Mroczkowski M., Stefańska J. 1990. Chrzęszcze – Coleoptera. Cerambycidae i Bruchidae. *Katalog fauny Polski* 23, 15: 1–312.
- Collingwood C.A. 1979. The Formicidae (Hymenoptera) of Fennoscandia and Denmark. *Fauna Entomologica Scandinavica*, 8: 1–174.
- Czechowski W. 1975. Mixed polycalic colony of *Formica (Serviformica) cinerea* Mayr and *Polyergus rufescens* Latr. (Hymenoptera: Formicidae). *Annales Zoologici*, 33(5): 67–76.
- Czechowski W. 2007. Behavioural and socially parasitic relations between *Polyergus rufescens* (Latr.) and *Formica polyctena* Först. (Hymenoptera: Formicidae). *Entomologica Fennica*, 18(1): 54–64.
- Czechowski W., Pisarski B. 1990. Ants (Hymenoptera: Formicoidea) of the Vistula escarpment in Warsaw. *Fragmenta Faunistica*, 33: 109–128.
- Czechowski W., Radchenko A., Czechowska W., Vepsäläinen K. 2012. The ants of Poland with reference to the myrmecofauna of Europe. *Natura optima dux Foundation, Fauna Poloniae, New Series*, vol. 4, 496 pp.
- Czechowski W., Rotkiewicz W. 1997. Common activities of female sexuals of *Lasius umbratus* (Nyl.) and *Formica sanguinea* Latr. or *Polyergus rufescens* (Latr.) on nests of the dulotic species (Hymenoptera, Formicidae). *Annales Zoologici*, 47(3–4): 465–467.
- Darwin C. 1859. On the origin of species by means of natural selection, or the preservation of favoured races in the struggle for life. John Murray, London, 502 pp.
- Dekoninck W., Versteirt V., Grootaert P. 2001. Rediscovery of a colony of *Polyergus rufescens* (Latreille, 1798) in Belgium: observations at the “Hageven” nature reserve (Hymenoptera, Formicidae). *Bulletin de la Société Royale Belge d'Entomologie*, 137: 98–101.
- Dobrzańska J., Dobrzański J. 1960. Quelques nouvelles remarques sur l'éthologie de *Polyergus rufescens* Latr. *Insectes Sociaux*, 7(1): 1–8.
- Gierłasiński G. 2025. MapaUTM v. 6. Available from: <https://www.heteroptera.us.edu.pl/mapautm.html>; accessed on 4.12.2025.
- Grasso D.A., Visicchio R., Castracani C., Mori A., Le Moli F. 2003. The mandibular glands as a source of sexual pheromones in virgin queens of *Polyergus rufescens* (Hymenoptera: Formicidae). *Italian Journal of Zoology*, 70: 229–232.
- Heller G. 2004. Aggressives Verhalten von Formica-Arbeiterinnen gegen frisch geschlüpfte Arbeiterinnen von *Polyergus rufescens* (Latreille, 1798) (Hymenoptera: Formicidae). *Myrmecological News*, 6: 13–17.
- Hölldobler B., Wilson E.O. 1990. The Ants. Harvard University Press, Cambridge, 732 pp.
- Huber P. 1810. Recherches sur les mœurs des fourmis indigènes. J.J. Paschoud, Genève, 328 pp.
- iNaturalist 2025. European Amazon Ant. Available from: https://www.inaturalist.org/observations?subview=map&taxon_id=300597; accessed on: 4.12.2025.
- Ješovnik A., Blažević I., Lemić D., Pajač Živković I. 2019. The ant fauna of annual and perennial crops. *Applied Ecology and Environmental Research*, 17(6): 12709–12722.
- Kaszyc-Taszkowska N.B., Simka M. 2017. Pierwsze stwierdzenie *Polyergus rufescens* (Latreille, 1798) (Hymenoptera: Formicidae) na Wyżynie Małopolskiej. *Acta Entomologica Silesiana*, 25: 1.
- Krzysztofiak L. 1984. Mrówki (Hymenoptera: Formicidae) Świętokrzyskiego Parku Narodowego. *Fragmenta Faunistica*, 28: 309–323.
- Kulmatycki W. 1920. Mrówki niektórych okolic Małopolski. *Sprawozdanie Komisji Fizjograficznej*, 53/54: 157–172.
- Kulmatycki W. 1922. Przyczynek do fauny mrówek Wielkopolski i Pomorza. *Sprawozdanie Komisji Fizjograficznej*, 55/56: 71–86.
- Mazur S. 1983. Mrówki borów sosnowych Polski. *Rozprawy Naukowe i Monografie*, 25. Wydawnictwo SGGW-AR, Warszawa, 73 pp.
- Mori A., D'Ettorre P., Le Moli F. 1994. Mating and post-mating behaviour of the European amazon ant, *Polyergus rufescens* (Hymenoptera: Formicidae). *Bollettino di Zoologia*, 61: 203–206.

- Mori A., D'Ettorre P., Le Moli F. 1995. Host nest usurpation and colony foundation in the European amazon ant, *Polyergus rufescens* Latr. (Hymenoptera: Formicidae). *Insectes Sociaux*, 42: 279–286.
- Mori A., Grasso D.A., Visicchio R., Le Moli F. 2000a. Colony founding in *Polyergus rufescens*: the role of the Dufour's gland. *Insectes Sociaux*, 47: 7–10.
- Mori A., Visicchio R., Sledge M.F., Grasso D.A., Le Moli F., Turillazzi S., Spencer S., Jones G.R. 2000b. Behavioural assays testing the appeasement allomone of *Polyergus rufescens* queens during host-colony usurpation. *Ethology Ecology & Evolution*, 12: 315–322.
- Rigato F., Sciaky R. 1991. The myrmecofauna of the Gesso Valley (Maritime Alps) (Hymenoptera: Formicidae). *Ethology Ecology & Evolution*, 3: 87–89.
- Stoldt M., Foitzik S. 2021. Slave-making in ants (dulosis). In: Starr C.K. (ed.), *Encyclopedia of Social Insects*, Springer, 1–8.
- Stukalyuk S., Akhmedov A., Gilev A., Reshetov A., Radchenko Y., Kosiuk N. 2022. Effect of urban habitats on colony size of ants (Hymenoptera: Formicidae). *Turkish Journal of Zoology*, 46: 194–206.
- Stukalyuk S., Kozyr M. 2023. The impact of warfare on the structure of ant assemblages on trees (Hymenoptera: Formicidae). *Fragmenta Entomologica*, 55: 1–8.
- Ślipiński P., Żmihorski M., Czechowski W. 2012. Species diversity and nestedness of ant assemblages in an urban environment. *European Journal of Entomology*, 109: 197–206.
- Tanquary M.C. 1911. Experiments on the adoption of *Lasius*, *Formica* and *Polyergus* queens by colonies of alien species. *The Biological Bulletin*, 20: 281–308.
- Trager J.C. 2013. Global revision of the dulotic ant genus *Polyergus* (Hymenoptera: Formicidae, Formicinae, Formicini). *Zootaxa*, 3722: 501–548.
- Tragust S., Brinker P., Włodarczyk T. 2025. The transition to a social parasitic lifestyle influences maintenance and expression of essential immune defence traits. *Behavioral Ecology and Sociobiology*, 79: 113.
- Trigos-Peral G., Maák I.E., Schmid S., Chudzik P., Czaczkes T.J., Witek M., Casacci L.P., Sánchez-García D., Lőrincz Á., Kochanowski M., Heinze J. 2024. Urban abiotic stressors drive changes in the foraging activity and colony growth of the black garden ant *Lasius niger*. *Science of the Total Environment*, 915: 170157.
- Vankerhoven F., Bielen S., Dekoninck W., Crevecoeur L. 2021. Surprising observations of *Polyergus rufescens* (Latreille, 1798) (Hymenoptera: Formicidae) in a repeated faunistic study of heathlands in the Belgian Province of Limburg. *Bulletin de la Société Royale Belge d'Entomologie*, 157: 107–116.
- Zimmerli E., Topoff H. 1994. Queens of the socially parasitic ant *Polyergus* do not kill queens of *Formica* that have not formed colonies (Hymenoptera: Formicidae). *Journal of Insect Behavior*, 7: 119–121.

STRESZCZENIE

Nowe stwierdzenie mrówki amazonki, *Polyergus rufescens* Latreille (Hymenoptera: Formicidae) na Wyżynie Krakowsko-Wieluńskiej wraz z danymi o jej rozmieszczeniu w Polsce

W artykule przedstawiono zaktualizowane dane o rozmieszczeniu pasożytniczej mrówki *Polyergus rufescens* (Latreille) w Polsce, na podstawie danych historycznych, niedawnej obserwacji terenowej oraz danych z serwisu iNaturalist. Gatunek stwierdzono w okolicach Krakowa, gdzie był odnotowany ostatnio ponad sto lat temu. Omówiono jego występowanie w siedliskach podmiejskich oraz możliwość stopniowego rozszerzania zasięgu w odpowiedzi na miejskie warunki mikroklimatyczne. Ponadto w warunkach laboratoryjnych zaobserwowano uskrzydłą samicę *P. rufescens* samodzielnie pobierającą miód, a następnie dzielącą się nim z robotnicami gospodarza *Formica cinerea* Mayr, co może świadczyć o nieodnotowanej dotąd plastyczności behawioralnej. Podsumowując, w niniejszej pracy zwracamy uwagę na aspekty zachowania wartę dalszych badań oraz podkreślamy potrzebę stałego monitoringu tego rzadkiego i wyspecjalizowanego biologicznie gatunku.

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