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First record of *Bombus haematurus* Kriechbaumer, 1870 (Hymenoptera: Apidae) in Poland

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Short communication

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Abstract. *Bombus haematurus* Kriechbaumer, 1870 is one of a few European bumblebee species that are predicted to benefit from climate change. Its expansion in a north-western direction has been observed since the end of the 20th century. In 2023, this species was recorded for the first time in Poland. Two observations of a female, separated by about two weeks, were made in the same locality in Ustrzyki Górne, Bieszczady Mountains.

Key words: Anthophila, Apiformes, bees, bumblebee, range expansion, blood-tailed bumblebee.

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I. INTRODUCTION

Bumblebees are a cold-adapted genus; thus, they are particularly vulnerable to the effects of climate change (Soroye et al. 2020, Martinet et al. 2021). According to the modelling of future distribution changes by Rasmont et al. (2015), most European species will be negatively affected by climate change, with as many as 36% of them predicted to lose over 80% of their current ranges by 2100. There are only three species that are predicted to benefit from climate change and to enlarge their distribution, one of them being *Bombus haematurus*. Its range was originally restricted to south-east Europe and the Middle East, with Serbia and Albania being its most western and northern limits (Biella et al. 2021). Since the 1980s, spreading of the species towards the west and north has been recorded. Now, *B. haematurus* is found as far as Italy (Biella & Galimberti 2020) to the west and the Czech Republic to the north (Straka et al. 2015).

The rate of its spread is quite high. For example, in Slovakia, 67 new localities of *Bombus haematurus* were recorded between 2003 and 2017 (Šima et al. 2018). Overall, its current range has increased by 20% over ca. 30 years (Biella et al. 2021). Among the manifestations of climate change, warmer winters and early springs (i.e. the time when young queen overwinter and emerge) seem to be the most important factor facilitating the range expansion in this species (Biella et al. 2021).

The preferred habitat of *B. haematurus* is forested areas, but it is flexible in this respect and can also be

found in open habitats or urbanised areas (Biella et al. 2021). The nests can be built in various types of places, including trees, mouse holes or artificial nest boxes (Šima et al. 2018).

II. MATERIALS AND METHODS

The observations took place near the village of Ustrzyki Górne in the Bieszczady Mountains, about 700-725 m above mean sea level (49°05′39″N, 22°39′10″E; Fig. 1A). The area of the observations consists of forests (mostly dominated by European beech) mixed with patches of open areas of grassland with single spring-flowering shrubs, including willows. There is a small stream flowing through the forested area. The buildings of the nearest village are located less than 1 km from the locality of the observations.

III. RESULTS

The first observation was made accidentally, during a general naturalist exploration focused on vascular plants, on 16 April 2023. One female resting on a flowering shoot of *Daphne mezereum* was photographed by S. Czyżewski (Figs 1B, C). The observation was published on iNaturalist (Gbif 2023). The species was originally identified by S. Czyżewski with the aid of an artificial intelligence module built in iNaturalist, and the first confirmation of the initial identification was done by Leonid Grishaev (username: sibnaturalist) (iNaturalist 2024a).

The second visit to the same place, on 1 May 2023, was aimed at re-finding the species. One female was observed by J. Kierat and K. Zapotoczny foraging with other bumblebee species on a flowering female tree of *Salix* sp. The tree was ca. 5 m high, and the female *B. haematurus* was foraging mostly near the top of the tree. She was observed foraging for about an hour, and remained within sight almost all of that time. There was no visible pollen in her baskets, and as the female flowers of the tree don't produce pollen, she could only collect nectar from them. The bee was identified in the field by J. Kierat, and photographs showing its diagnostic traits were taken (Fig. 1D).

Species identification of the both the observed specimens was made without examining the specimens under a stereomicroscope. *B. haematurus* is usually possible to identify on the basis of its colouration alone (Rasmont et al. 2021; Fig. 1E). It is most similar in its colour pattern to *B. pratorum*, which belongs to the same subgenus (*Pyrobombus*). The most important difference that allows for separating these two species in both sexes is the presence of yellow bands on T2 and T3 of *B. haematurus*, whereas in *B. pratorum* there is no yellow band on T3. In addition, the amount of red on the tail is variable, but is less extensive in *B. haematurus* than in *B. pratorum*, and is sometimes even lacking in the former (Gokcezade et al. 2015).

IV. DISCUSSION

In light of past distribution changes and the model prediction for *B. haematurus*, the locality of the first observation in Poland is not surprising. The Bieszczady Mountains are located at the south-eastern extreme of Poland, so this is likely to be the first area colonised by a species expanding from south-eastern Europe. In general, mountainous areas can be a barrier hindering species dispersion, but *B. haematurus* can be found up to 2600 m above mean sea level in its native range. In a recently colonised area of Slovakia, it was recorded at up to 755 m above mean sea level; that is, a similar height as indicated the Polish records (Šima et al. 2018).

We do not know whether the two observations in Ustrzyki Górne referred to one or two different individuals, but in either case, no symptoms of nesting in the area were observed. It is therefore not clear whether the female founded a nest successfully, and if so, then what will be the fate of its progeny. We did not visit the place later in the season to look for symptoms of nesting (e.g. workers collecting pollen or males). It would be interesting to monitor the locality in the upcoming seasons, to check whether a population has been established.

Even if this dispersion event will not be followed by establishing a population, further records of *B. haematurus* should be expected in Poland in the years to come. The species was recorded in Ukraine, about 80-100 km from the locality reported in this paper (Hleba 2024, iNaturalist 2024b), so it is likely that more gynes will disperse to the territory of Poland through the Bieszczady Mts. On the other

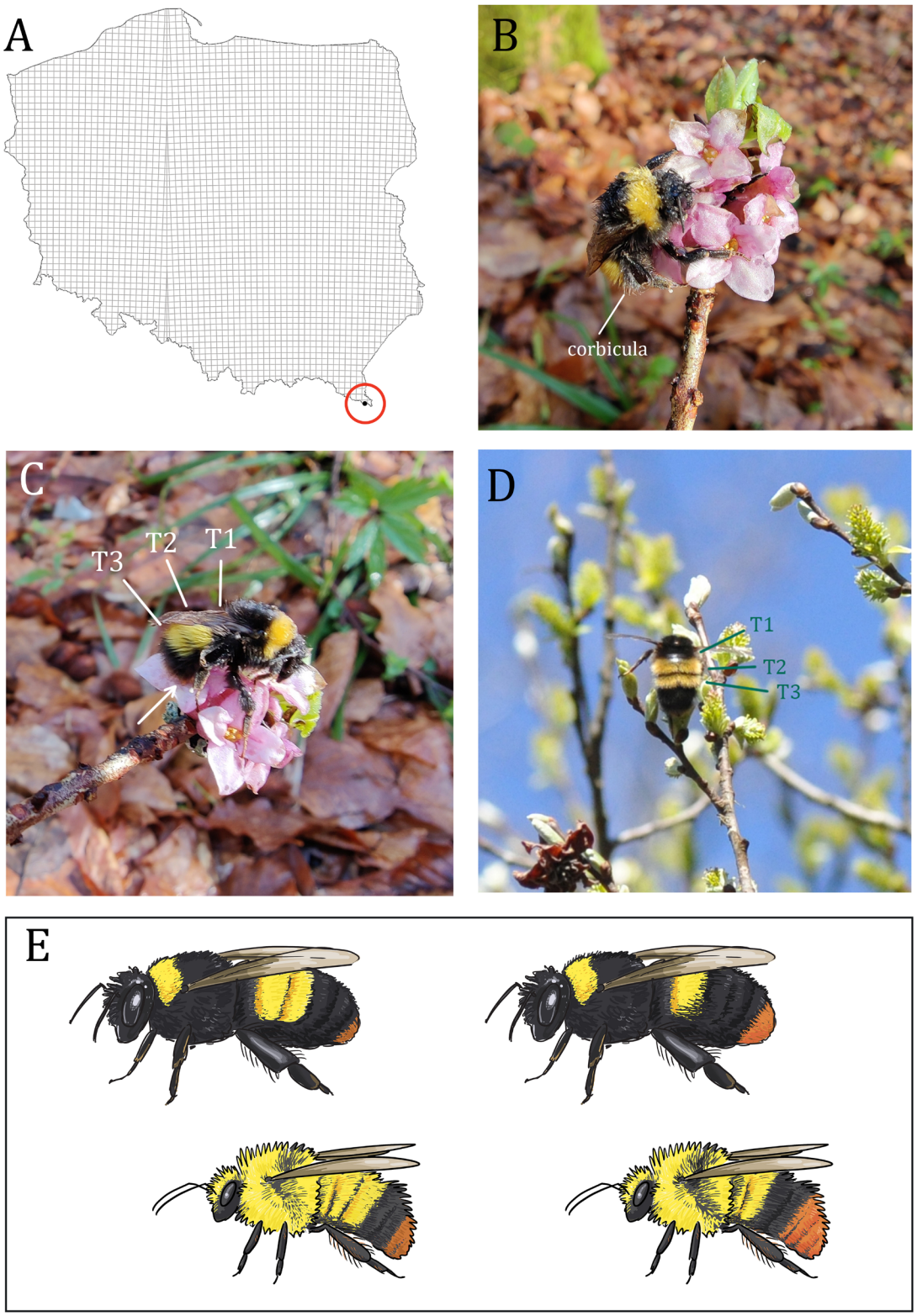

Fig. 1. *Bombus haematurus*, the first record in Poland and identification. A – Map showing the locality of *B. haematurus* in Poland, presented in a 10 × 10 km grid of the UTM coordinate system (created with MapaUTM ver 5.4, Grzegorz Gierlasiński, https://www.heteroptera.us.edu.pl/mapautm.html). B, C – Female observed on 16 April 2023. A corbicula on the hind tibia allows for the identification of the specimen as a female social (non-cuckoo) bumblebee, and the colouration of the abdomen is diagnostic for the species: tergite 1 (T1) is black, and the two following terga (T2, T3) are yellow. A hint of red colour on the end of the abdomen is traceable (arrow). Photos: S. Czyżewski. D – Diagnostic colouration of the first three terga can be seen. No red hairs on the tail are visible because of the lighting. Photo: J. Kierat. E – Schematic drawings showing the diagnostic differences between *Bombus haematurus* (left) and *Bombus pratorum* (right): top females, bottom males. Pale individuals of *B. pratorum* were pictured. Note the extent of yellow on the abdomen (tergite 3 is always yellow in *haematurus* but not in *pratorum*) and the amount of red on the tail. Drawing: J. Kierat.

hand, an independent expansion route from Czech Republic through the Moravian Gate is also possible. This has already been anticipated by Biella et al. (2021), and is even more likely in the light of the recent discovery of other expanding bee species in southern Poland. Specifically, *Halictus scabiosae* (Kierat et al. 2023) and *Colletes hederae* (Kierat 2024) were observed in Kraków, where they most likely arrived through the Moravian Gate. Therefore, southern Poland is also worth monitoring for the presence of *B. haematurus* in the upcoming years.

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VI. CONFLICT OF INTEREST

The authors declare no conflict of interest.

VII. REFERENCES

Biella P., Ćetković A., Gogala A., Neumayer J., Sárospataki M., Šima P., Smetana V. 2021. Northwestward range expansion of the bumblebee *Bombus haematurus* into Central Europe is associated with warmer winters and niche conservatism. *Insect Science*, **28**(3): 861-872. https://doi.org/10.1111/1744-7917.12800

Biella P., Galimberti A. 2020. The spread of *Bombus haematurus* in Italy and its first DNA barcode reference sequence. *Fragmenta entomologica*, **52**(1): 67-70. https://doi.org/10.13133/2284-4880/413

Gbif.org. 2023. GBIF Occurrence Download. https://doi.org/10.15468/dl.xsacdz

Gokcezade J.F., Gereben-Krenn B.A., Neumayer J., Krenn H.W. 2015. Feldbestimmungsschlüssel für die Hummeln Österreichs, Deutschlands und der Schweiz (Hymenoptera, Apidae). *Linzer Biologische Beiträge*, **47**(1): 5-42.

Hleba V. 2024. *Bombus haematurus*. Image ID # 151404. In: UkrBIN, Database on Biodiversity Information. Accessed: 2024-02-25 via https://ukrbin.com/show_image.php?imageid=151404.

iNaturalist. 2024a. iNaturalist Research-grade Observations. iNaturalist.org. Occurrence dataset https://doi.org/10.15468/ab3s5x Accessed via GBIF.org on 2024-02-25. https://www.gbif.org/occurrence/4091572331

iNaturalist. 2024b. iNaturalist Research-grade Observations. iNaturalist.org. Occurrence dataset https://doi.org/10.15468/ab3s5x Accessed via GBIF.org on 2024-02-25. https://www.gbif.org/occurrence/4516681762

Kierat J. 2024. New records of *Colletes hederae* Schmidt & Westrich, 1993 (Hymenoptera, Apiformes) in Poland. *Acta Zoologica Cracoviensia*, **67**(1-2): 1-6. https://doi.org/10.3409/azc.67.01

Kierat J., Żmuda A., Bugiera L., Czechowski P., Dubicka-Czechowska A. 2023. Nowe stwierdzenia smuklika szerokopasego *Halictus scabiosae* (ROSSI, 1790) z Polski. [New records of the great banded furrow bee *Halictus scabiosae* (ROSSI, 1790) from Poland]. *Wiadomości Entomologiczne*, **42**: 17-20. [In Polish]. https://doi.org/10.5281/zenodo.8051698

Kriechbaumer J. 1870. Vier neue Hummelarten. *Verhaudlungen der Kaiserlich-Königlichen Zoologischen-Botanischen Gesellschaft in Wien*, **20**: 157-160.

Martinet B., Dellicour S., Ghisbain G., Przybyla K., Zambra E., Lecocq T., Boustani M., Baghirov R., Michez D., Rasmont, P. 2021. Global effects of extreme temperatures on wild bumblebees. *Conservation Biology*, **35**(5): 1507-1518. https://doi.org/10.1111/cobi.13685

Rasmont P., Franzén M., Lecocq T., Harpke A., Roberts S.P.M.., Biesmeijer J.C., Castro L., Cederberg B., Dvořák L., Fitzpatrick U., Gonseth Y., Haubruge E., Mahé G., Manino A., Michez D., Neumayer J., Ødegaard F., Paukkunen J., Pawlikowski T., Potts S.G., Reemer M., Settele J., Straka J., Schweiger O. 2015. Climatic risk and distribution atlas of European bumblebees. *BioRisk*, **10**: 1-236. https://doi.org/10.3897/biorisk.10.4749

Rasmont P., Ghisbain G., Terzo M. 2021. Bumblebees of Europe and neighbouring regions. N.A.P. Editions, 632 pp.

Šima P., Smetana V., Riegler M. 2018. Quo vadis *Bombus haematurus*? An outline of the ecology and biology of a species expanding in Slovakia. *Acta Musei Tekovensis Levice*, **11**: 41-65.

Soroye P., Newbold T., Kerr J. 2020. Climate change contributes to widespread declines among bumble bees across continents. *Science*, **367**(6478): 685-688. https://doi.org/10.1126/science.aax8591

Straka J., Bogusch P., Tyrner P., Říha M., Benda D., Cížek O., Halada M., Macháčková L., Marhoul P., Tropek R. 2015. Faunistic records from the Czech Republic – 380. Hymenoptera: Aculeata. *Klapalekiana*, **51**: 77-91.