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The distribution of cryptic species of *Bombus lucorum*-complex in Eastern Fennoscandia

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INTRODUCTION & AIM

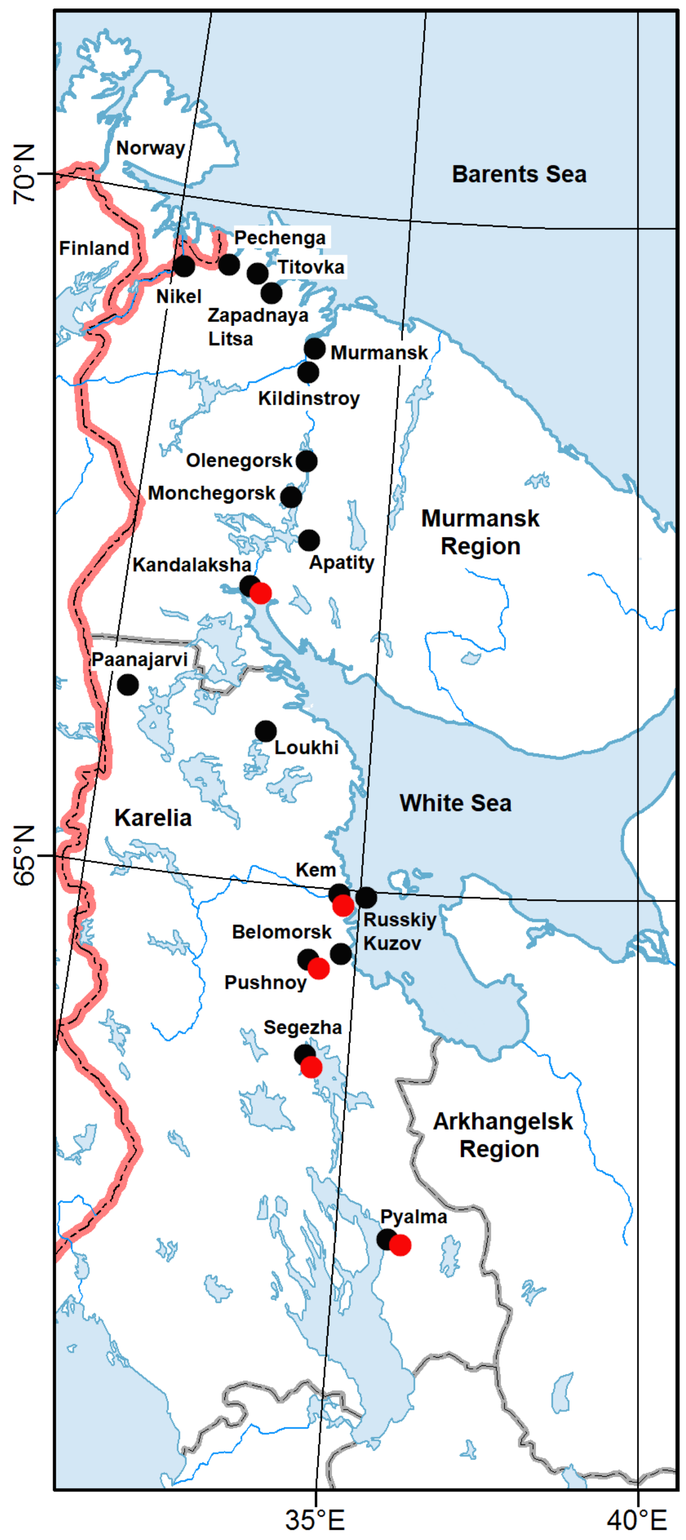
The cryptic species of bumblebees of the *Bombus lucorum*-complex (*B. lucorum*, *B. cryptarum* and *B. magnus*), are one of the challenges for the conservation management. They are morphologically indistinguishable in much of their range, so in most cases leads to misidentification. However, total DNA barcoding for these widespread species is impossible due to financial and labor costs. Among the regions of Northern Europe, reliable and detailed data on their distribution and ecological attributes exists only for the British Isles (Murray et al. 2008; Waters et al. 2011; Scriven et al. 2015). There is some information regarding Finland in the papers of Pamilo et al. (1997) and Bertsch (2014). Concerning to the Russian part of Eastern Fennoscandia (Murmansk Region and Karelia), no information are available, except for a few records.

METHOD

Morphological characters were used for initial identification of species of the *Bombus lucorum*-complex (Rasmont et al. 2021). After that we used the PRC-RFLP method (Polymerase chain reaction – restriction fragment length polymorphism). This approach allows accurately (100% correspondence between RFLP patterns and COI sequences), quickly (within 18 hours after DNA extraction) and relatively cheaply (the cost of one sample after PCR is cheaper than sequencing) identify species of the *Bombus lucorum*-complex. The RCR-RFLP approach is also applicable to the reliable identification of *B. terrestris*.

Total DNA was extracted from a single leg of each dry specimen using a standard phenol/chloroform procedure (Sambrook et al. 1989). A fragment of the mitochondrial gene COI (460-bp) was amplified using primer pairs: LepF (Hajibabaei et al. 2006) and our own designed primer BMBR. Fragments were separated on 1.5% agarose gels and visualized under ultraviolet light. For the verification of this method, a number of specimens were sent for analysis to the Engelhardt Institute of Molecular Biology of the Russian Academy of Sciences (Moscow, Russia), where sequencing was performed using the ABI PRISM® BigDye™ Terminator v. 3.1 reagent kit.

RESULTS & DISCUSSION



Map of the Russian part of Eastern Fennoscandia. Red circles indicate the records of *Bombus lucorum*, black circles for *B. cryptarum*.

The distribution of *Bombus cryptarum* and *B. lucorum* in the Russian part of Eastern Fennoscandia is close to what is known in Finland (Pamilo et al. 1997).

B. cryptarum was found throughout Eastern Fennoscandia. Only *B. cryptarum* is known from the north of Murmansk Region and the north of Norway near the Russian border (Hallmen, 2024). *B. lucorum* is also widespread, but absent or rare above the Arctic Circle.

The habitat preference of *B. cryptarum* and *B. lucorum* in Eastern Fennoscandia is consistent with what is known from the British Isles (Waters et al. 2011; Scriven et al. 2015). *B. lucorum* is common in different types of meadows in lowland and urban areas, while *B. cryptarum* is associated with uplands and cool climate.

CONCLUSION

Among the species of the *Bombus lucorum*-complex only two species, *B. cryptarum* and *B. lucorum*, were found in the Russian part of Eastern Fennoscandia. *B. cryptarum* was recorded in all studied localities of this region. *B. lucorum* was found in most of the localities in the central and southern parts of the studied region.

FUTURE WORK / REFERENCES

The future research in this region may be directed to study the distribution of cryptic species of the *Bombus lucorum*-complex in south-western Karelia, which remains poorly studied in this aspect. This research was funded by the Russian Science Foundation № 24-24-20016, https://rscf.ru/project/24-24-20016/