



## Habitat of a Prikamsky Honeybee Population

Alexander V. Murylev\*, Alexander V. Petukhov

Perm State Humanitarian Pedagogical University, 24 Sibirskaya Street, Perm, 614990, Russian Federation

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### ABSTRACT

This article discusses the features of *Apis mellifera mellifera* associated with the expansion of their habitat to the north. The *A. m. mellifera* isolated in Kama Urals is considered the Prikamsky honeybee population and has retained the features of a pure gene pool. Here, we analysed the biological and physiological features of bees native to Kama Urals and the crossbreeding that occurs among these bee species.

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### Introduction

Before the anthropogenic period, a Euro-Siberian sub-species of the honeybee, the Central Russian dark hylile bee (*Apis mellifera mellifera* L.), spread naturally over a large area from southern France to Siberia, reaching as far north as 60°N latitude (Ruttner et al, 1990). This area expanded as the species moved north due to complex ethological and physiological adaptations to the cold climate zone (Eskov, 1995).

The Cis-Ural region is the territory located on the western slope of the Ural Mountains on the outskirts of the East European Plain. The territory lies in the basins of the Kama and Pechora Rivers and includes the Pechora lowlands to the north and the Verkhnekamskaya Bugulma-Belebey upland to the south. In the Cis-Ural region in Kama basin, the Kama Cis-Ural territory predominates. The northern region of the Kama Cis-Ural territory is a typical middle taiga consisting of spruce–fir forests, pine forests and peat bogs. The central region of the territory is southern taiga that includes spruce–fir forests with an admixture of linden. In the southern region of the territory, there is a subzone of mixed forests. The southeast is occupied with Kungursky forest steppe with typical degraded chernozems. Northeast of the Kama Cis-Ural territory is a dark coniferous mountain taiga with bald peaks standing high above the taiga (Grigoriev, 1962).

Central Russian bees (*A. m. mellifera*) have been historically developed in natural biological communities on the Kama Cis-Ural territory. This finding was recorded by Mikhailov (1927) and Alpatov (1948). According to studies conducted by researchers in the Zoology Department of Perm Pedagogical University, Central Russian bees overwhelmingly dominated the Perm Territory previously. However, from the 1950s onwards, agricultural workers have been importing the queens and bee packages of southern races that were not adapted to the harsh conditions of the north area. The importation of these southern bees with the purpose of increasing productivity resulted in the emergence of hybrids of unknown origin. By the 1980s, cross-breeding of bees had reached 40% in

\* Corresponding author.

E-mail address: [mavrus@list.ru](mailto:mavrus@list.ru) (A.V. Murylev).

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some apiaries causing increased morbidity and the withdrawal of bee colonies in the winter. This process was aggravated by the mite *Varroa destructor* affect. To a lesser extent, the cross-breeding of bees influenced the Uinsky and Krasnovishersky areas, which had been declared as pure breeding areas of the Central Russian bees. The recruitment of honeybee populations in natural conditions (wild hive, hollows of trees, rocks, and other shelters) is performed because the bees disperse during swarming. In the late 20th century, a negative impact on the gene pool of the Central Russian bees caused by the introduced bees was observed. The conservation of the gene pool of Central Russian bees and the preservation of the indigenous forms of local Central Russian bee populations have been discussed in many publications (Grankin, 1998; Kryvtsov, 2008).

## Materials and Methods

Studies performed by Perm researchers on bee colonies (1990–2000 Gg.) in the Kama Cis-Ural territory distinguished a population of honey bees of the Central Russian race that had the features of a pure gene pool based on physiological, morphological (Petukhov, 1996; Shurakov et al, 1999) and genetic (Ilyasov et al, 2006) indicators. These bees are named “Prikamsky” after the territory where they were detected. The Prikamskaya population formed naturally in the northern area and has a particular value today, as it is the natural reserve of the pure gene pool of Central Russian bees. Currently, in the Kama Cis-Ural territory, two groups of native bees of the Central Russian Prikamskaya population have been identified. They are separated from each other by a distance of 300 km. The Uinskaya group exists in the southeast of the Perm region, and the Visherskaya group exists in the north of the Perm region, which is the northern boundary of the honeybee, (Petukhov, 1996; Ilyasov et al, 2006) (Fig. 1).

To preserve the bees of the Uinskoe Central Russian environmental group, a 5242 ha area was allocated for the landscape reserve “Raspberry Farm” (decree of the Governor No. 218 of 30.10.2002). “Raspberry Farm” is located in the Uinsky district of the Perm Territory along the Kameniy log brook on the border of two steppe regions: Tulvinsky and Irensky. Here, fir and linden forests and, occasionally, maple, elm and oak forests sprout. Also, aspen and birch forests with luxuriant herbs are common. The bees collect pollen from more than ninety species of herbs from early spring to late autumn. This is a unique place in the Ural region where wild honeybees of the Central Russian race live in a natural environment. There are a limited number of such sanctuaries, not only in the Urals but in Russia overall.

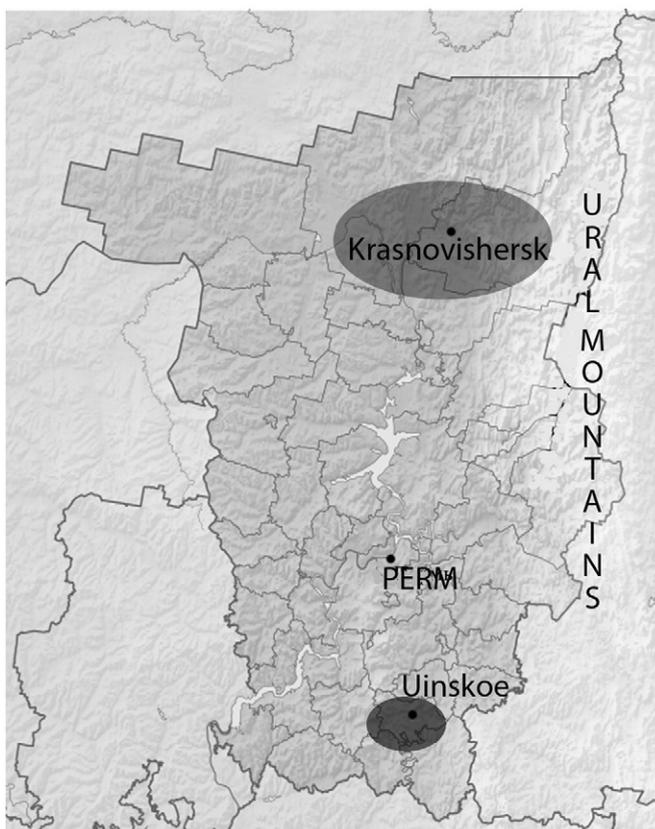


Fig. 1. Spatial arrangement of Visherskaya (north) and Uinskoe (south) environmental groups.

## Results and Discussion

The habitat of the Visherskaya environmental group is located within the Krasnovishersky district of Perm Krai. The Krasnovishersky area is located above 60° north latitude and is the natural territory of honeybees that has the most unfavourable climatic factors for honeybees. The harsh climatic conditions of this area are due to the significant impact of the Ural Mountains and the remoteness of the Gulf Stream.

The advantages of the Prikamsky bee populations of the Kama Cis-Ural territory are as follows: They are winter-hardy. None of the existing races (subspecies) of honey bees are able to survive without play-flight during the 7-month winter. They are resistant to nosema disease, produce a large number of wax and well-built cells, and are capable of refilling the fodder reserves with short-intensive forage. They are able to produce a honey bag with up to 85 mg of nectar, and the average daily gains reach 21 kg. Swarming occurs during a short period of time in the middle of summer. Queens have a high fecundity.

Studies performed in the Kama Cis-Ural territory in 2009–2013 revealed that the Central Russian Prikamsky bee populations are 5–10 mg heavier than crossbred bees. The moisture percentage in the body of Prikamsky bees has an average of 5–7% lower than that of crossbred bees. It has been observed that winter bee generations have the lowest water content in the body: Prikamsky bee population – 64%, crossbred bees – 70%. The higher water content in the body of crossbred bees indicates that they remain active longer than the Prikamsky bee population. Significant activity of crossbred bees in the winter leads to high rates of rectum filling in March ( $45.3 \pm 1.42$  mg). The maximum load of the Central Russian race is lower in April ( $36.6 \pm 1.62$  mg). Slow and relatively low rectum filling is an adaptation to a prolonged winter period. The conditions of the Kama Cis-Ural territory cause the crossbred bees to commence brood incubation earlier and to develop rapidly in the spring. However, in the early summer, the queens of the native Central Russian bees manage to outperform the breeding power of the imported bees. The maximum daily average breeding performance of the Prikamsky bee population ( $2862 \pm 208$  eggs/day) is higher than that of crossbred bees ( $1913 \pm 168$  eggs/day). Therefore, the gene pool of the Prikamsky population of Central Russian bees has a certain value and requires preservation for future generations.

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