



Breeding of the Korean Native Bumblebee, *Bombus ignitus* Queens





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Introduction

-  Bees are diverse and abundant, with 16,325 species identified throughout the world. Arguably, **the most important activity of bees is their pollination of natural vegetation and agricultural plants.**
-  Commercially managed bees are also available for pollination services and are used in large commercial fields, small gardens, or enclosures such as greenhouses and screen houses.
-  The introduction of bumblebees into greenhouses for pollination has become widespread in recent years and demand increases annually.
-  It has been estimated that the bumblebees sold in 2004 consisted of approximately 1,000,000 colonies.

Introduction

-  **Bumblebees provide farmers the opportunity to decrease their pollination labor costs and promise a good crop yield, both in quantity and in quality.**
-  **About 239 species of bumblebees are known to exist throughout the world.**
-  **Many bumblebee species have declined in number in recent decades, particularly in developing regions.**
-  **Widespread declines of bumblebee species threaten the pollination levels of both wildflowers and crops.**

Objectives



**Conservation of Korean native bumblebee,
Bombus ignitus for breeding**



**Attempt to substitute Korean native bumblebees
for foreign bumblebees**

Materials and Methods



Collection of post-hibernated *B. ignitus* queens

- Mainly the blossom of *Corydalis speciosa* and *Prunus yedoensis*
- Collected in many localities, including Jeong-Sun, Korea
- The spring seasons of 2000 to 2010.



Indoor rearing

- Three types of plastic boxes each for nest initiation, colony foundation, and colony maturation.
- Fourty percent honey solution and pollen dough were provided ad libitum.



Frequency distribution of the body weight of founder queens

- Weight classes: below 0.5g, 0.6g, 0.7g, 0.8g, 0.9g, 1.0g and over 1.1 g
- The number of bumblebees collected was 713 in 2000, 170 in 2001, 80 in 2002, 865 in 2003, 949 in 2004, 404 in 2005, 1,147 in 2006, 713 in 2007, 407 in 2008, 752 in 2009, and 653 in 2010.



Colony development of founder *B. ignitus* queens by indoor rearing

- The developmental ability of each colony: colony oviposition, colony foundation, production of progeny-queen, number of progeny-queen per queen, and number of generations of offspring.

Weights of founder queens

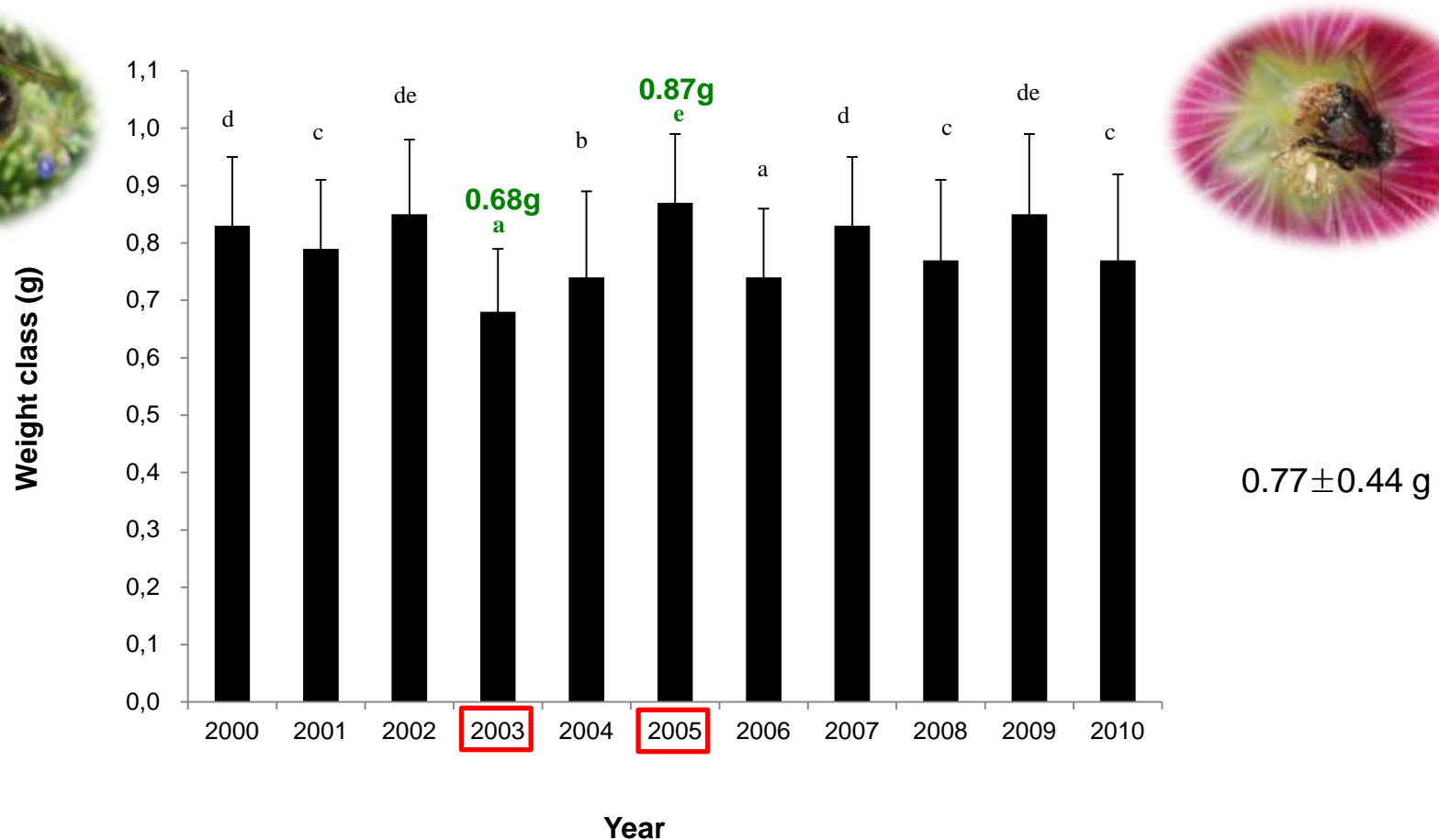


Fig. 1. Weights of founder *B. ignitus* queens collected from 2000 to 2010.

The number of bumblebees collected in 2000 to 2010 was 713, 170, 80, 865, 949, 404, 1,147, 713, 407, 752 and 653, respectively. There were significant differences in body weight among years ($p < 0.001$ using Tukey's pair-wise comparison test).

Frequency distribution of the weights

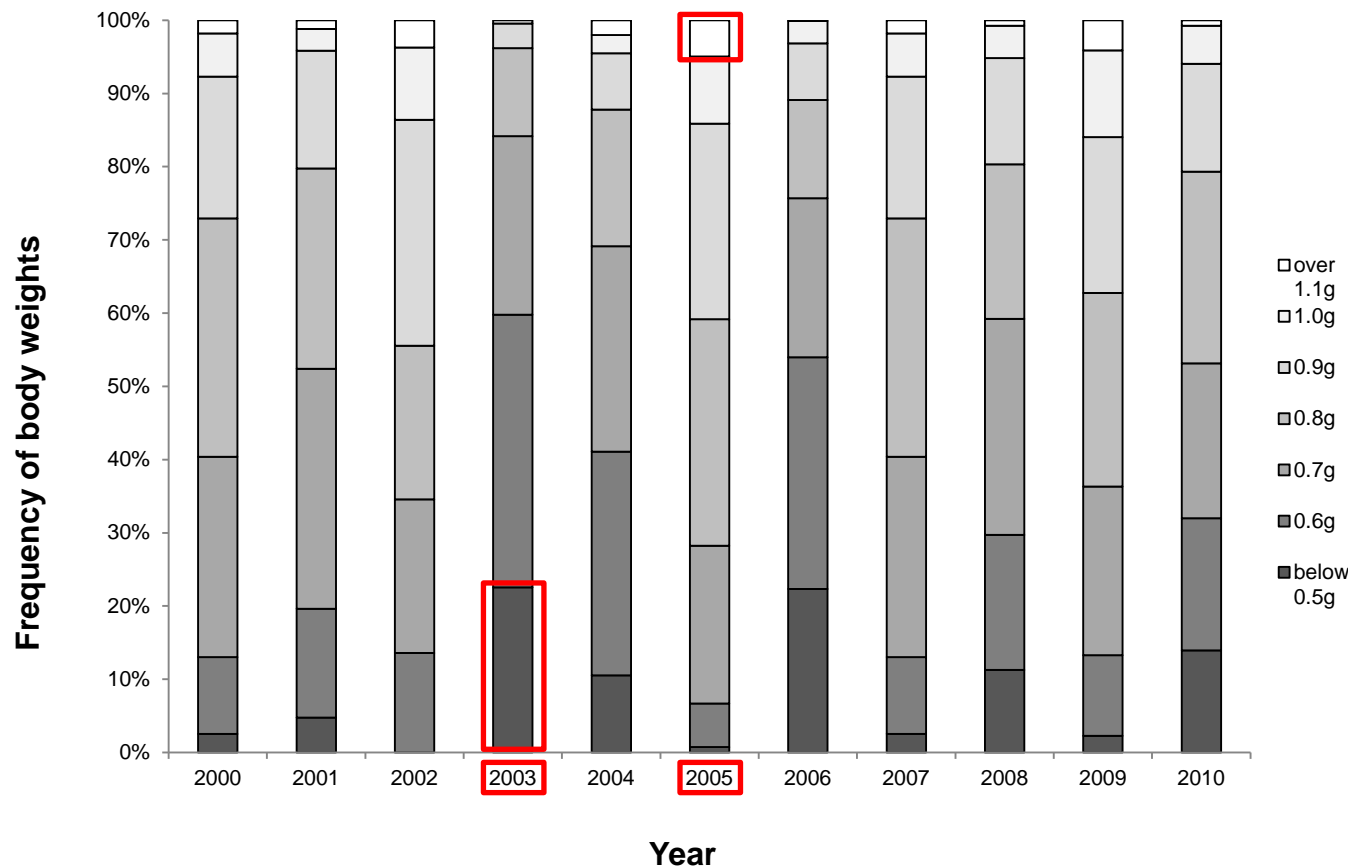


Fig. 2. Frequency distribution of the weights of founder *B. ignitus* queens collected in 2000 to 2010. The body weights of queens were classified below 0.5 g (below 0.59 g), 0.6 g (0.60-0.69 g), 0.7 g (0.70-0.79 g), 0.8 g (0.80-0.89 g), 0.9 g (0.90-0.99 g), 1.0 g (1.0-1.99 g), and over 1.1 g (over 1.10 g).

Oviposition rate

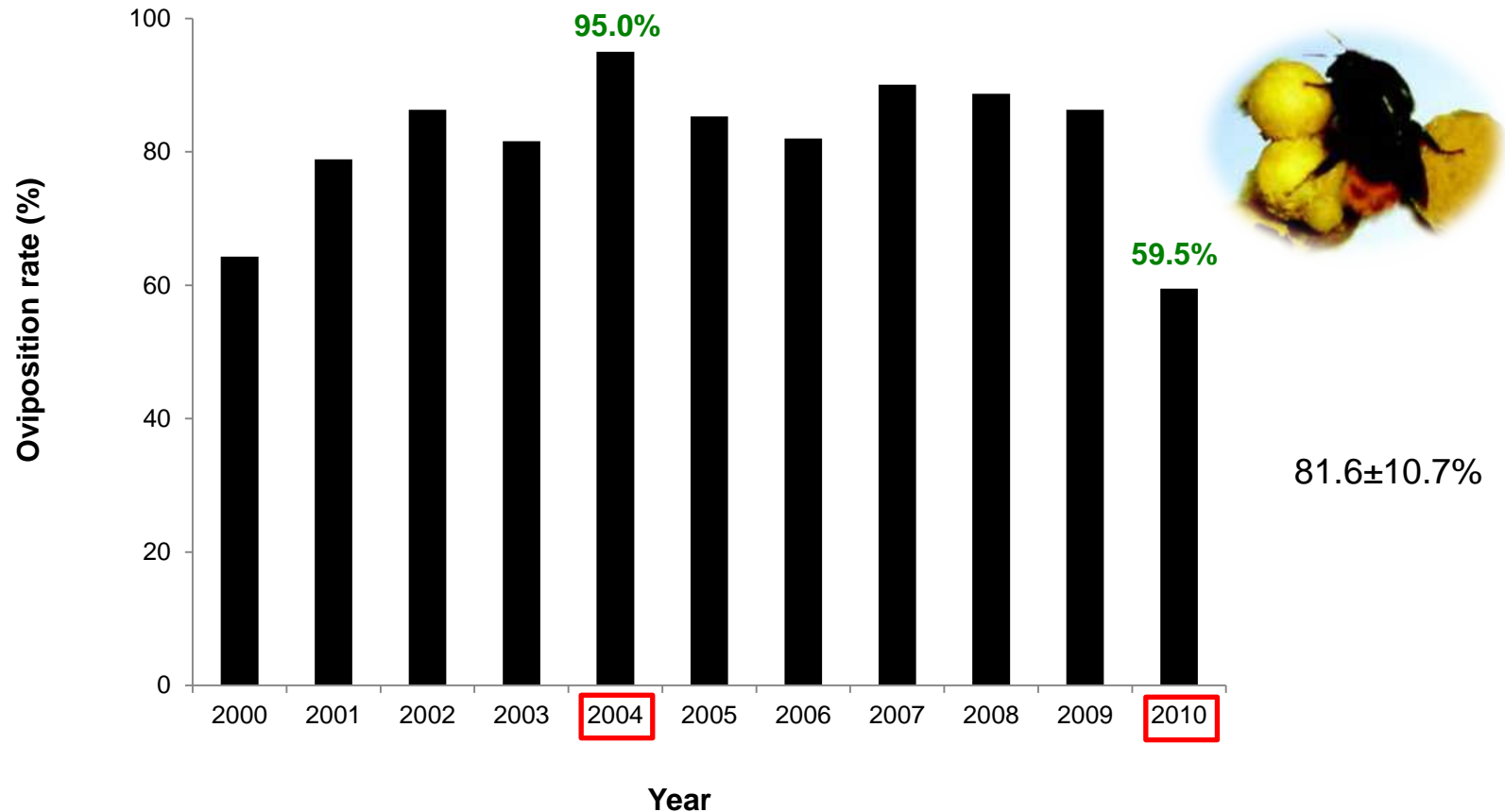


Fig. 3. Oviposition rate of *B. ignitus* queens reared in 2000 to 2010.

The number of bumblebees reared in 2000 to 2010 was 412, 170, 80, 844, 822, 404, 1,081, 546, 400, 753 and 827, respectively. There was no significant difference in the oviposition rate among years ($p < 0.05$, chi-square test).

Rate of colony foundation

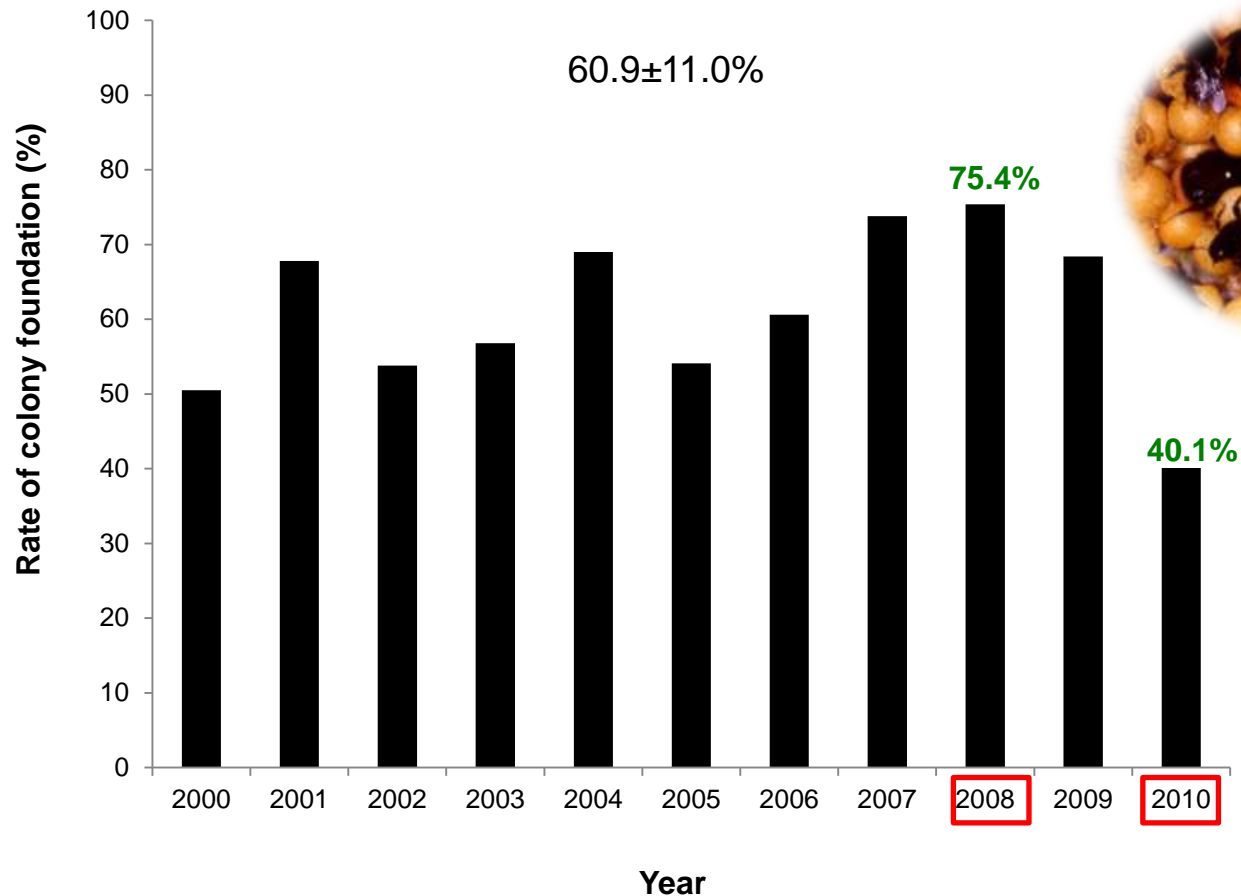


Fig. 4. Rate of colony foundation of *B. ignitus* reared in 2000 to 2010.

A statistically significant difference was noted in the rate of colony foundation among years ($p < 0.05$, chi-square test).

Rate of progeny-queen production

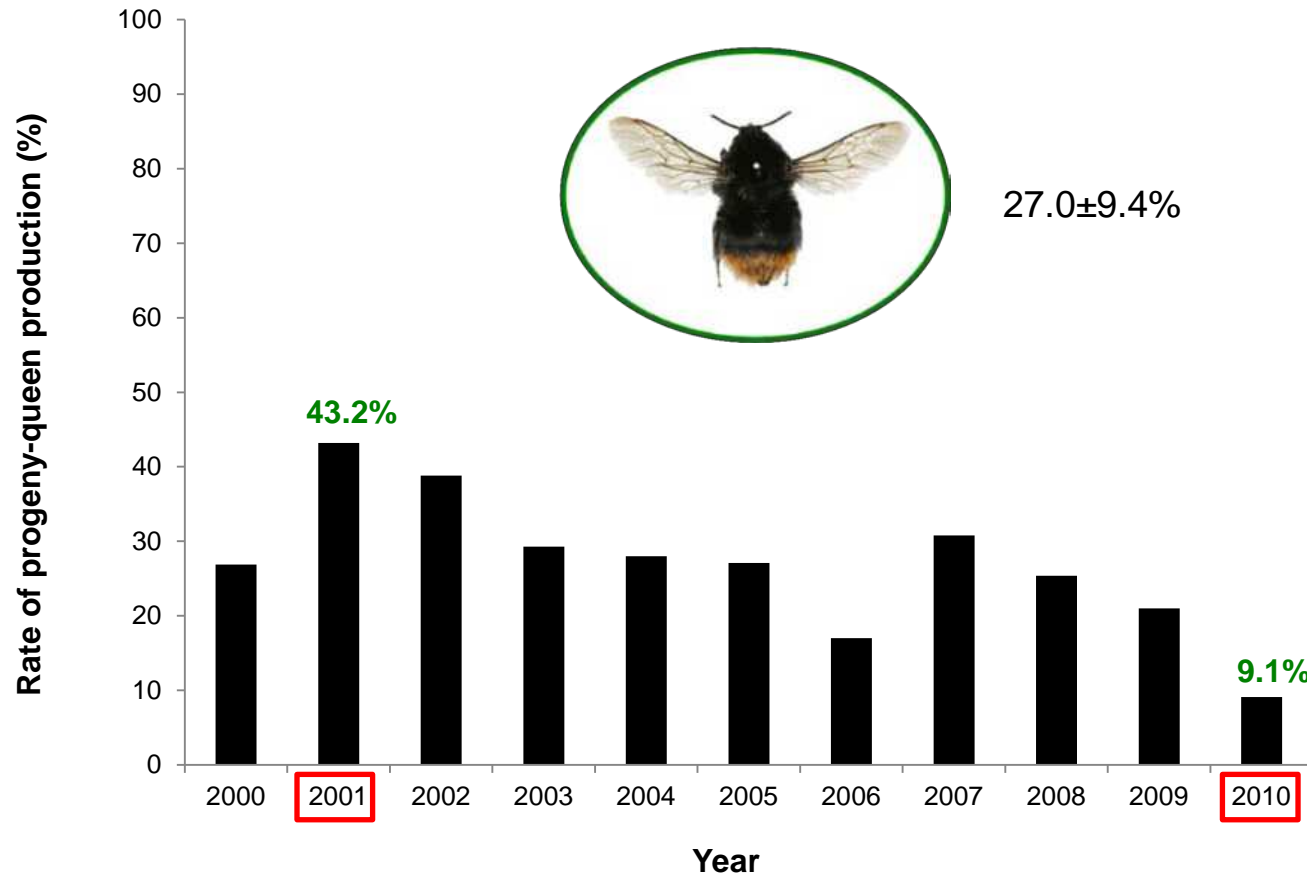


Fig. 5. Rate of progeny-queen production of *B. ignitus* reared in 2000 to 2010. There was a statistically significant difference in the rate of progeny-queen production of *B. ignitus* among years ($p < 0.001$, chi-square test).

The number of progeny-queens

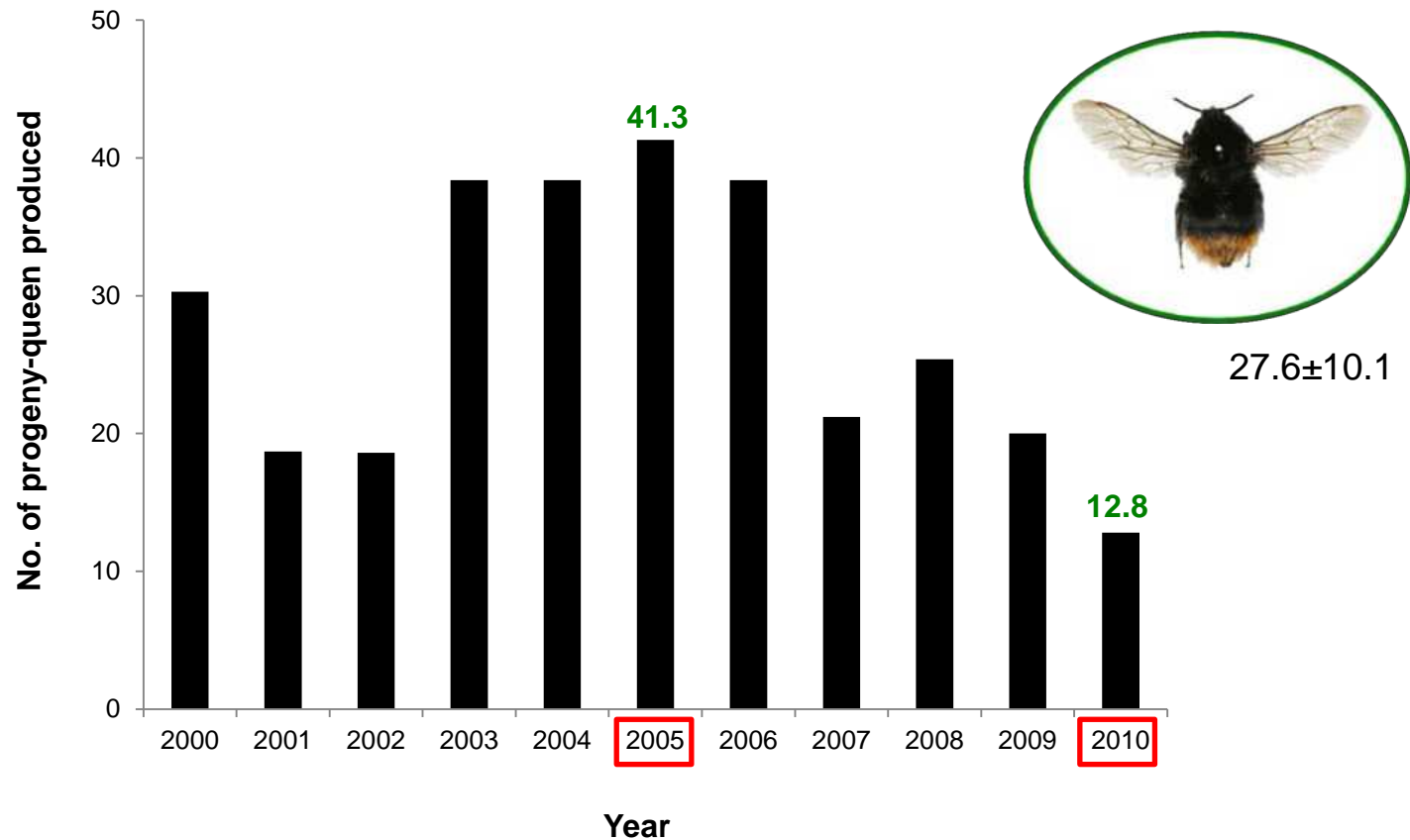


Fig. 6. The number of progeny-queens produced by *B. ignitus* in 2000 to 2010. A statistically significant difference was noted in the number of progeny-queens produced among years ($p < 0.001$, chi-square test).

The number of generations of offspring

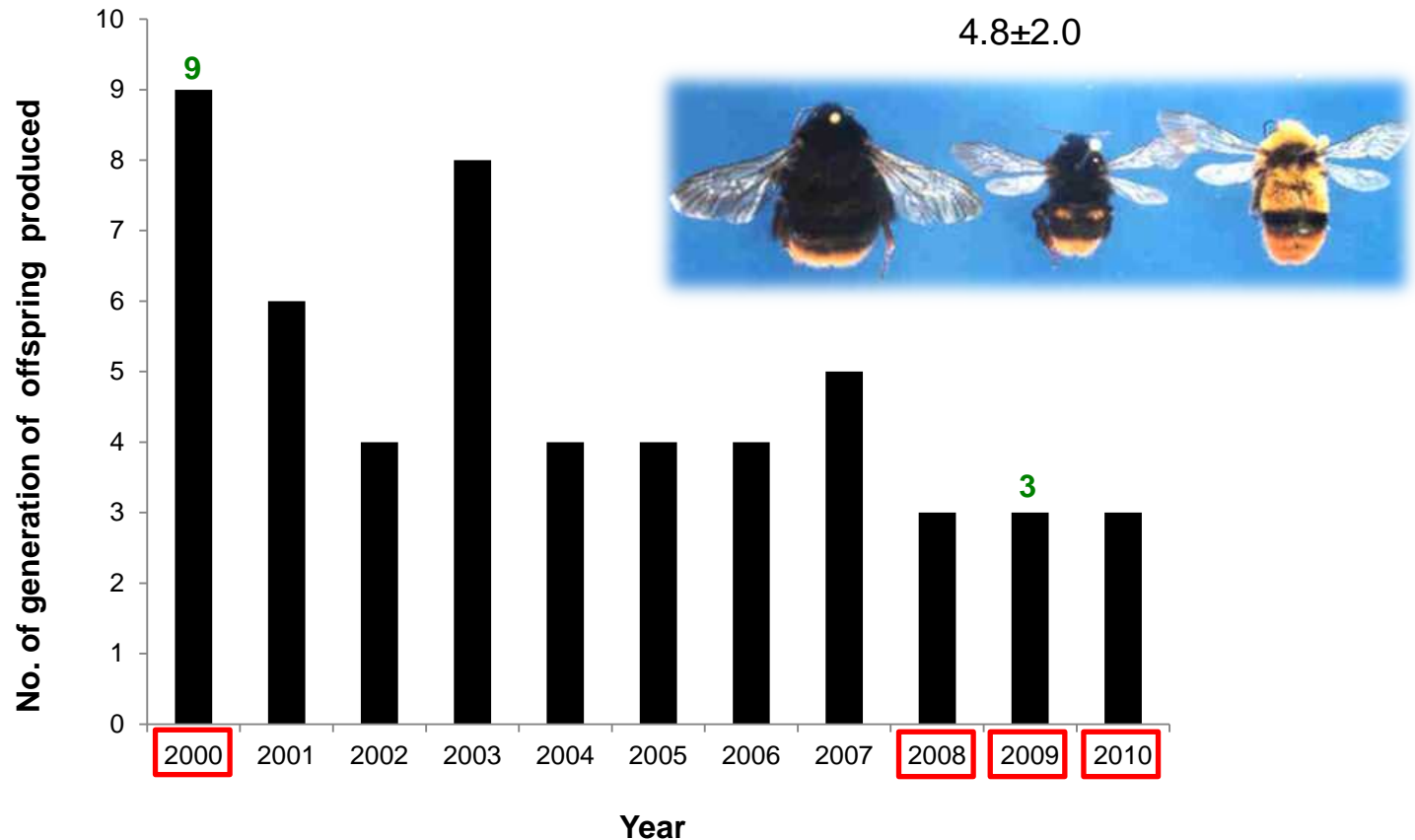





Fig. 7. The number of generations of offspring produced by *B. ignitus* queens in 2000 to 2010. There was no significant difference in the number of generations produced by queens of different years ($p < 0.05$, chi-square test).

Conclusion

-  The colony-developmental characteristics of the collected queens changed significantly from 2000 to 2010.
-  In addition, there was no correlation between body weight and number of queens collected, although body weight was affected by collection year.
-  Since 2008, the colony-developmental characteristics of queens have worsened from **climate changes, reductions in floral resources, loss of nest and hibernation sites and pesticides use.**