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A Genomic Approach For The Creation Of Isolated Mating Areas for the Conservation of Italian Ligustica and Carnica Honeybees

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Abstract number:

SESALMEC project



MINISTERO DELL'AGRICOLTURA
DELLA SOVRANITÀ ALIMENTARE
E DELLE FORESTE



Selection and Protection of Apis Mellifera Ligustica and Carnica in Italy



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Introduction

The honeybee *Apis mellifera* has major ecological and economic importance.

Honey, is the most well-known and economically important hive product.

However, bees plays an extremely important role in the pollination of tree and herbaceous species essential for human nutrition.



Honeybees in Italy



Plus:

✓ **Hybrids**

✓ **Buckfast bee:**

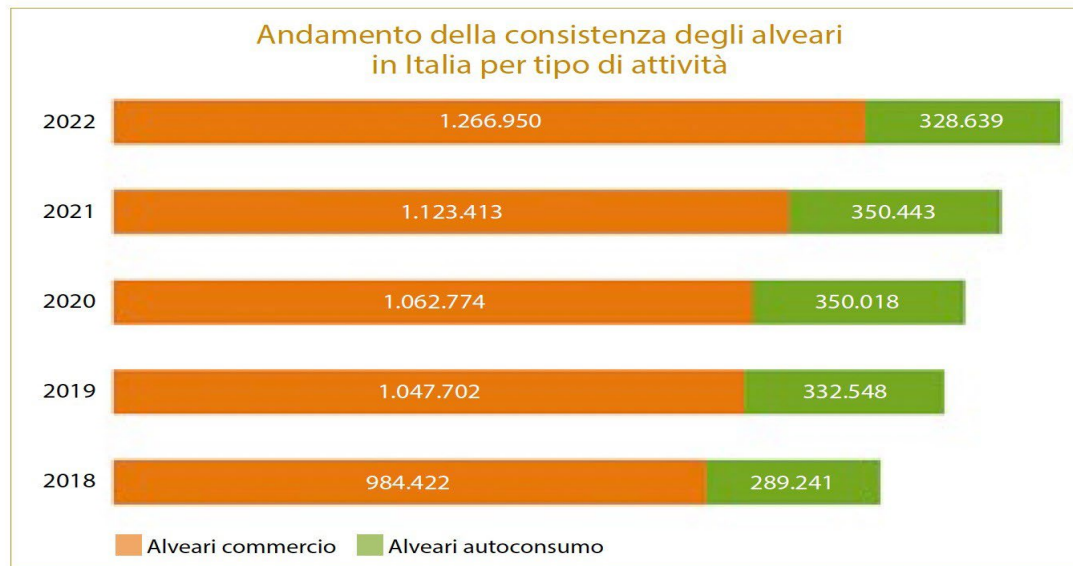


Beekeepers in Italy

Total 74.548 divided in :

55.633 produce for self-consumption **(75%)**

18.915 produce for commercial purposes **(25%)**



<https://www.informamiele.it>

Two different needs

- ✓ 70% of the colonies are commercial beekeepers
- ✓ 70% of the beekeepers are "hobbyists", self-consumption.

Self-consumption give a lot of importance to

- purity of the local breed
- selection left to mother nature
- naturalness of breeding

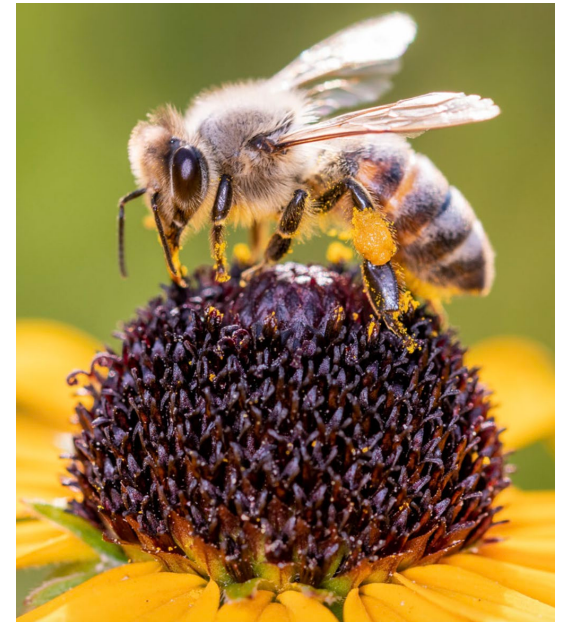
Professional beekeepers have a sometimes different vision

- little interest in racial purity
- More interest in performance
- More interest in resistance to diseases

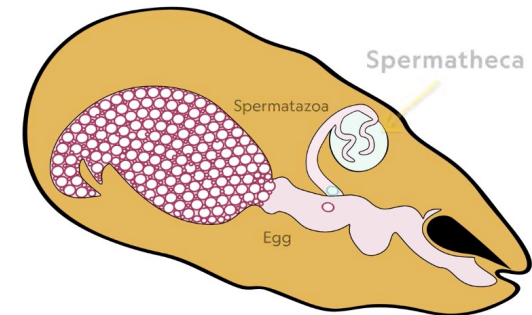
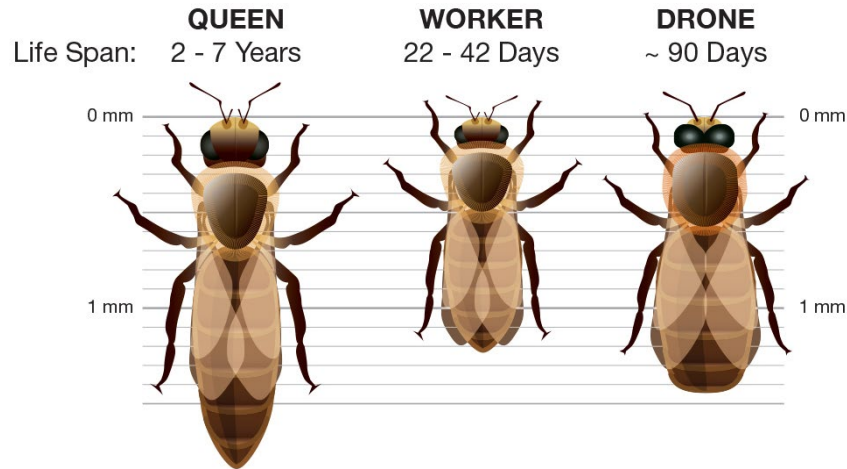


Aim of the project

The aim was to create three Isolated Mating Areas (IMA) for the Italian honeybee's population of Ligustica and Carnica bees, using next-generation sequencing (NGS) techniques for breed assignment.



Honeybee Queens



<https://www.nationalgeographic.com/animals/article/honey-bee-job-queen-hive-animals>

Isolated Mating Area

- ✓ Absence of unwanted males thanks to genetic isolation from foreign hives
- ✓ Presence of natural barriers, such as mountainous reliefs or marine or lake areas
- ✓ Good accessibility for cars
- ✓ Possibility of obtaining a Municipal Ordinance to protect the genetic isolation
- ✓ Drones of certified origin
- ✓ The IMA must be populated by drones of different genetic lines in order to guarantee a mating of genetic type, but with an adequate spectrum of variability in the paternal contribution.



Results & workflow

- ✓ Searched for isolated areas
- ✓ Requested municipal ordinance
- ✓ Verified the absence of males from other beekeepers
- ✓ We searched for the best Carnic and Ligurian genetics in Italy of registered beekeepers
- ✓ Genetically tested (SNP 44,000) the genetic type of more than 100 bees
- ✓ Created dense areas of males of certain genetic type
- ✓ Organized transport of bees in 2/3 fertilization cycles on each area
- ✓ Verified fertilizations and results



ADA della Val Fraele



REGIONE: Lombardia



LOCALITÀ: Valdidentro (SO)



ALTITUDINE: 1950 m slm



TIPO GENETICO: Carnica



RAGGIO DI ISOLAMENTO:
8 km



N° ALVEARI DPQ: 14

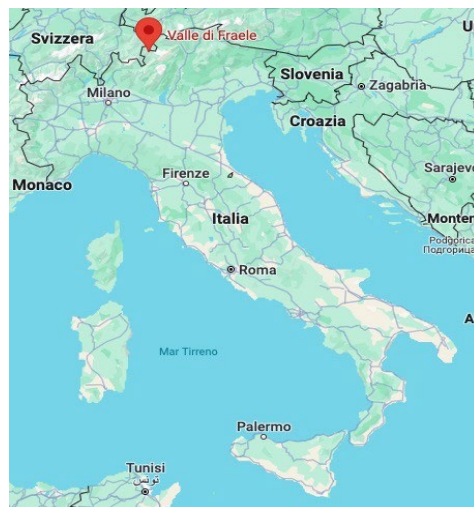


N° CICLI
DI FECONDAZIONE: 2

PERIODO DI FECONDAZIONE:
giugno - luglio



NUCLEI DI FECONDAZIONE
AMMESSI: Apidea



Dates	N° Beekeepers	N° hives	N° queens	% Fert.
28/06/2023	28	164	143	87,20 %
12/07/2023	28	159	123	77,36 %
TOTALE		323	266	82,35 %



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Island of San Pietro



REGIONE: Sardegna



LOCALITÀ: Carloforte (SU)



ALTITUDINE: 150 m slm



TIPO GENETICO: Ligustica



RAGGIO DI ISOLAMENTO:
4 km dalla terraferma



N° ALVEARI DPQ: 60



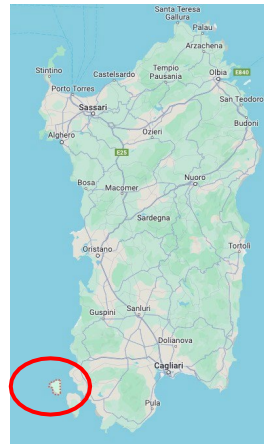
N° CICLI
DI FECONDAZIONE: 3



PERIODO DI FECONDAZIONE:
aprile - maggio



NUCLEI DI FECONDAZIONE
AMMESSI: Apidea



Island of Ponza



REGIONE: Lazio



LOCALITÀ: Ponza (LT)



ALTITUDINE: 23 m slm



TIPO GENETICO: Ligustica



RAGGIO DI ISOLAMENTO:
32 km dalla terraferma



N° ALVEARI DPQ: 24



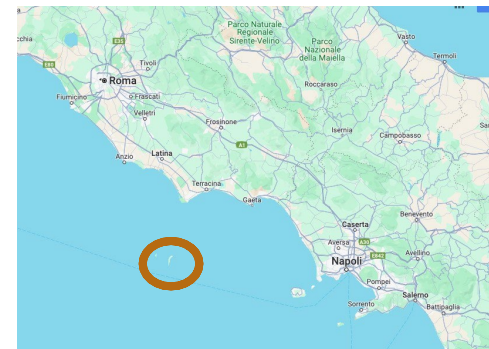
N° CICLI
DI FECONDAZIONE: 3



PERIODO DI FECONDAZIONE:
marzo - aprile



NUCLEI DI FECONDAZIONE
AMMESSI: Apidea



Conclusions

- ✓ The Sesalmec Project has developed three Isolated Mating Areas (IMA) for the carnica and ligustica genetic type.
- ✓ The areas are in San Pietro Island (South West Sardinia), Ponza Island (LT) and Val Bodengo (SO), active and guaranteed by specific local ordinances.



Thank you

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