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The increasing demand for food has promoted the intensive commercial use of honey bees through the transhumance of colonies to ensure crop pollination. Beekeepers are rewarded directly through hive rental payments, and indirectly through colony access to crops that provide pollen and nectar for honey bees. However, this movement of managed honey bees may have a trade-off, particularly regarding the transmission of pathogens to wild bees. Another beekeeping practice that may also impact bees, is the introduction of foreign subspecies of *Apis mellifera* without quarantine or prior control of their colony health in areas with local ecotypes. Both practices could potentially affect the conservation of local managed and wild bee biodiversity.

In this research we obtained information on the presence of pathogens in wild bees, and the occurrence of foreign honey bee subspecies on the Canary Island of La Palma. On this island, transhumance is concentrated on the western side and a conservation programme for the local black honey bee ecotype was established in 2001. These circumstances make La Palma an ideal natural laboratory to test our hypotheses.

Wild bee species were identified through visual examination with identification keys and confirmed by DNA barcoding. Pathogen (Trypanosomatidae and Nosematidae) presence was determined by molecular methods. Honey bees were characterized by sequencing the intergenic mitochondrial region to determine haplotypes.

Honey bee trypanosomatids (*Crithidia mellificae* and *Lotmaria passim*) were detected in wild bees albeit at low prevalence. Other pathogen species observed were host-specific (*Nosema bombi* and *Crithidia bombi* in bumblebees). Regarding the honey bee colonies sampled, all of them exhibited haplotypes characteristic of the local ecotype.

These results indicate that honey bee pathogens are present in the wild bee communities at a low frequency, but whether their presence leads to disease development remains to be studied. Finally, the conservation programme of the local black honey bee ecotype has proven effective and respected by beekeepers who are aware of the importance of working with honey bees locally adapted to the unique environment of the Canary Islands. This project receives funding from the Ministry of Science and Innovation of Spain under grant agreement TED2021-131316B-I00.

Buzzing Boundaries: Balancing Honey Bee Movement and Pathogen Risks to protect Biodiversity

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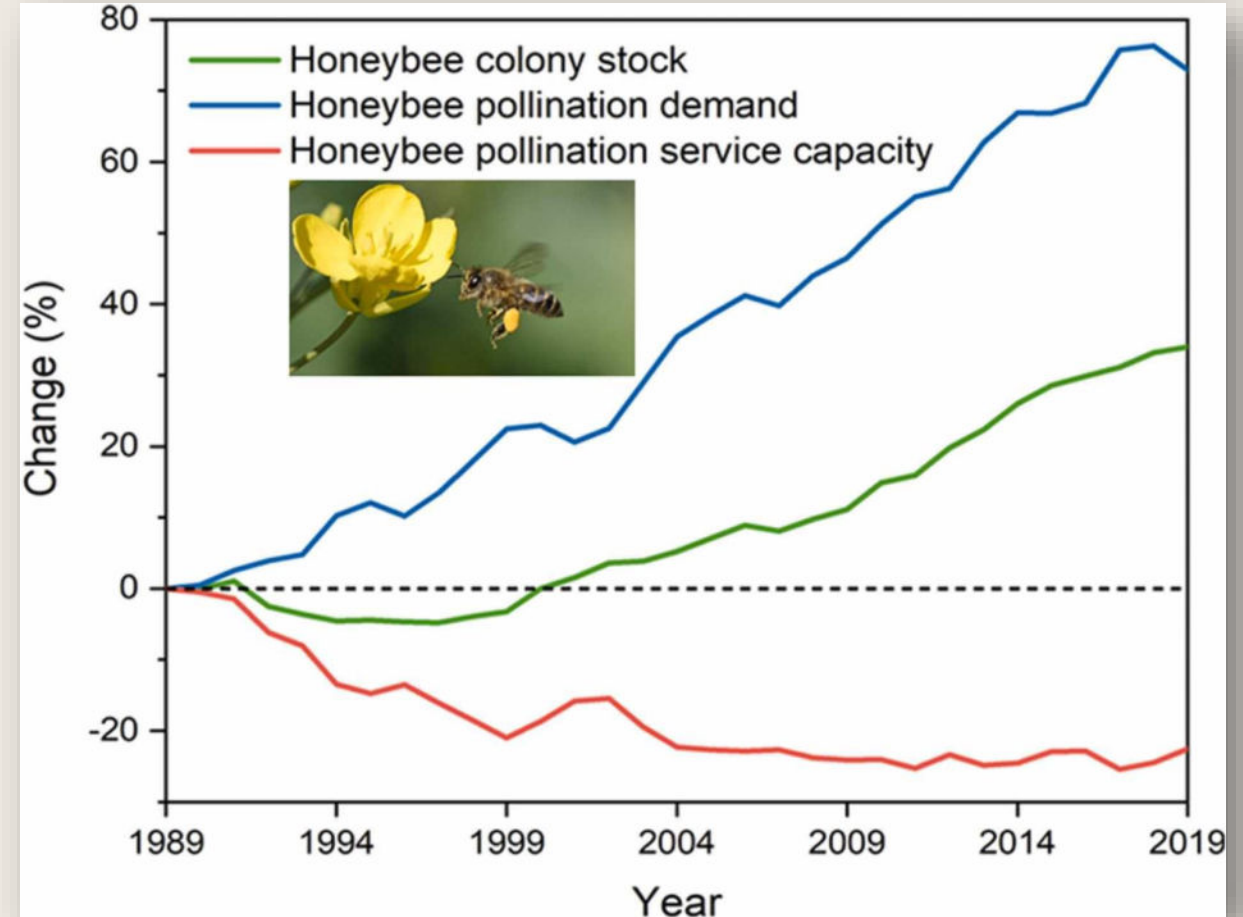
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The increasing demand for food has promoted the intensive commercial use of honey bees through the transhumance of colonies to ensure crop pollination



Shibonage et al. 2022, <https://doi.org/10.1016/j.agee.2022.108003>.



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Beekeepers are rewarded:

- directly through hive rental payment
- and indirectly through colony access to crops that provide pollen and nectar for honey bees



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However, this movement of managed honey bees may have a trade-off, particularly regarding the transmission of pathogens to wild bees (**spillover**)



Although which pathogens compromise wild bees, to what extent, and in which contexts they are impacted, remain unclear, especially for interspecific transmission (Beaurepaire et al. 2025)

Another beekeeping practice that may also impact bees, is the **introduction of foreign subspecies of *Apis mellifera*** without quarantine or prior control of their colony health in areas with local ecotypes



<https://www.biodiversidadcanarias.es/biota/especie/A00121#>



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Black Canarian honey bee



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The New York Times

Dec. 4, 2021

Honeybees Survived for Weeks Under Volcano Ash After Canary Islands Eruption

For roughly 50 days, thousands of honeybees sealed themselves in their hives, away from deadly gas, and feasted on honey. “It is a very empowering story,” one entomologist said.

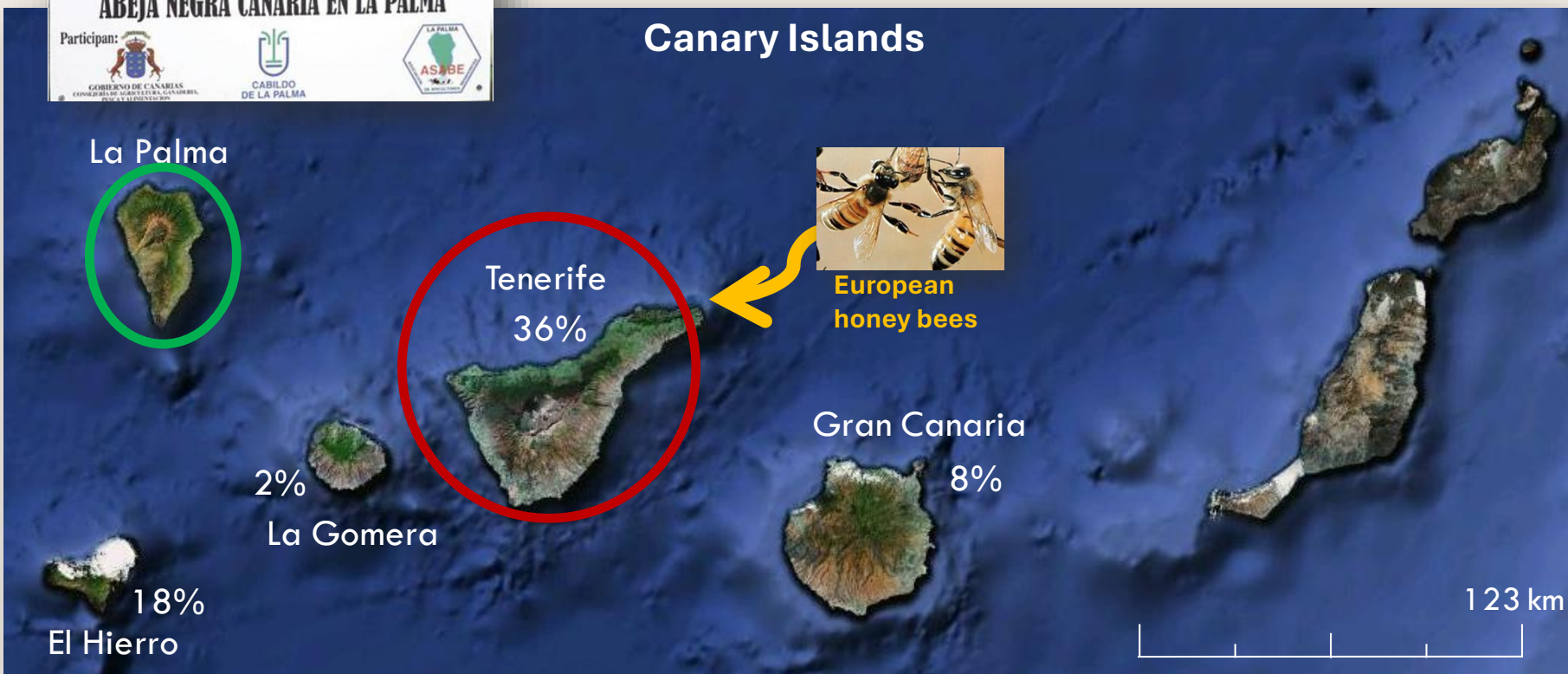


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* COLMENAR DE LA ASOCIACION DE APICULTORES *
 BENAHORITAS (ASABE) PARA LA CRIA DE REINAS
PROGRAMA DE RECUPERACION DE LA
ABEJA NEGRA CANARIA EN LA PALMA
 Participan:



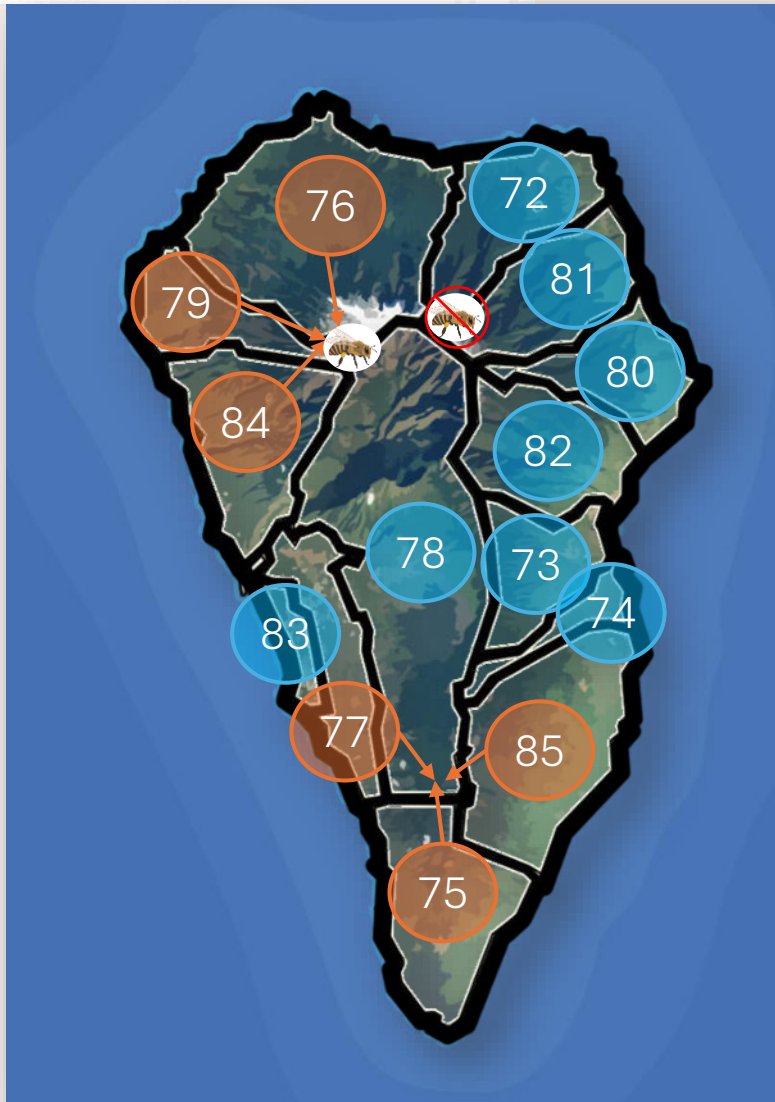



De la Rúa et al. (1998, 2001, 2002)



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Code	Municipality	% trashumant hives
72	Barlovento	0
73	Breña Alta	0
74	Breña Baja	0
75	Fuencaliente	11
76	Garafía	57
77	Los Llanos de Aridane	24
78	El Paso	0
79	Puntagorda	41
80	Puntallana	0
81	San Andrés y Sauces	0
82	S/C de la Palma	0
83	Tazacorte	0
84	Tijarafe	61
85	Villa de Mazo	40

Hypothesis

Both practices (transhumance and foreign subspecies introduction) affect the conservation of local managed and wild bee biodiversity

Objetives

1. To determine the presence and prevalence of pathogens in wild bees
2. To analyse a subset of honey bee colonies on La Palma to detect introduced subspecies

Methods

- Wild bee species were identified through visual examination with identification keys and DNA barcoding
- Pathogen (Trypanosomatidae and Nosematidae) presence was determined by molecular methods
- Honey bees were characterized by sequencing the intergenic mitochondrial region to determine mitochondrial haplotypes



WILD BEES:

- Four 50x50 m units
- Passive sampling: three pan-traps with blue, yellow and white plates per unit set for 6 hours
- Active sampling with entomological net, 1 hour of controlled effort per unit)



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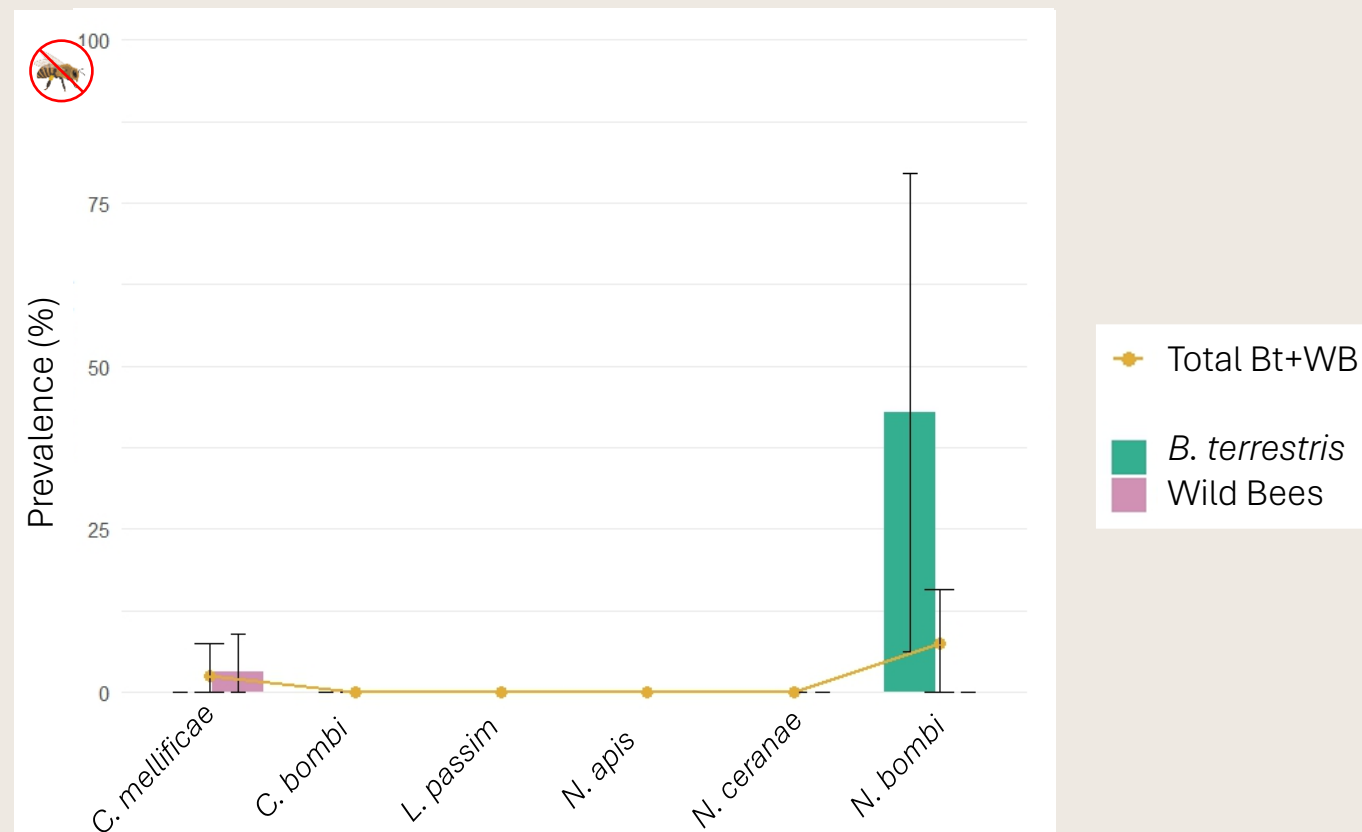
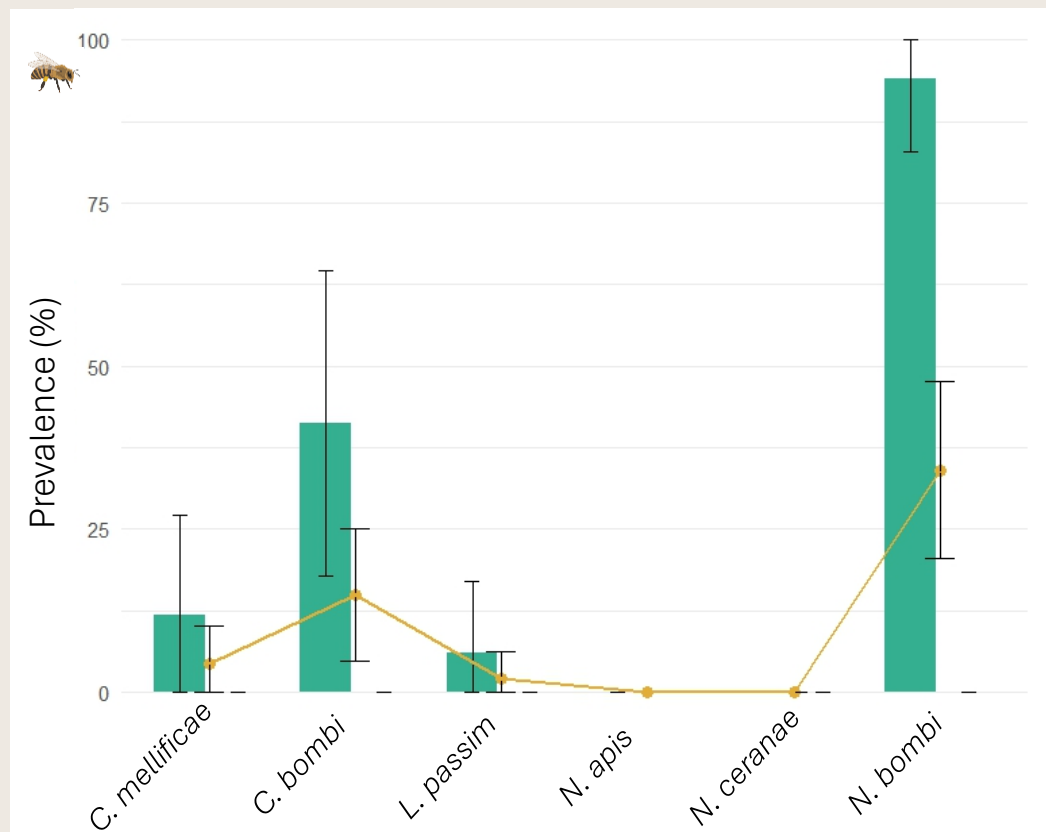
HONEY BEES:

- Worker honey bees were taken from the inner frames of 10 hives in six apiaries, ensuring that the queen was not present.

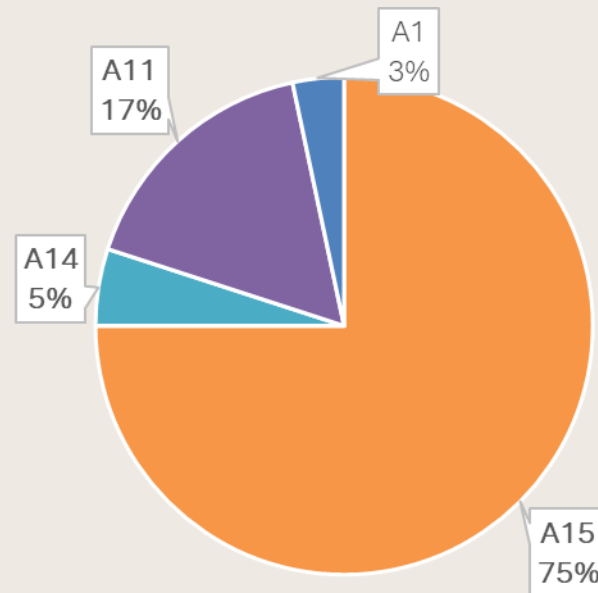


Honey bee trypanosomatids (*Crithidia mellificae* and *Lotmaria passim*) were detected in wild bees at low prevalence

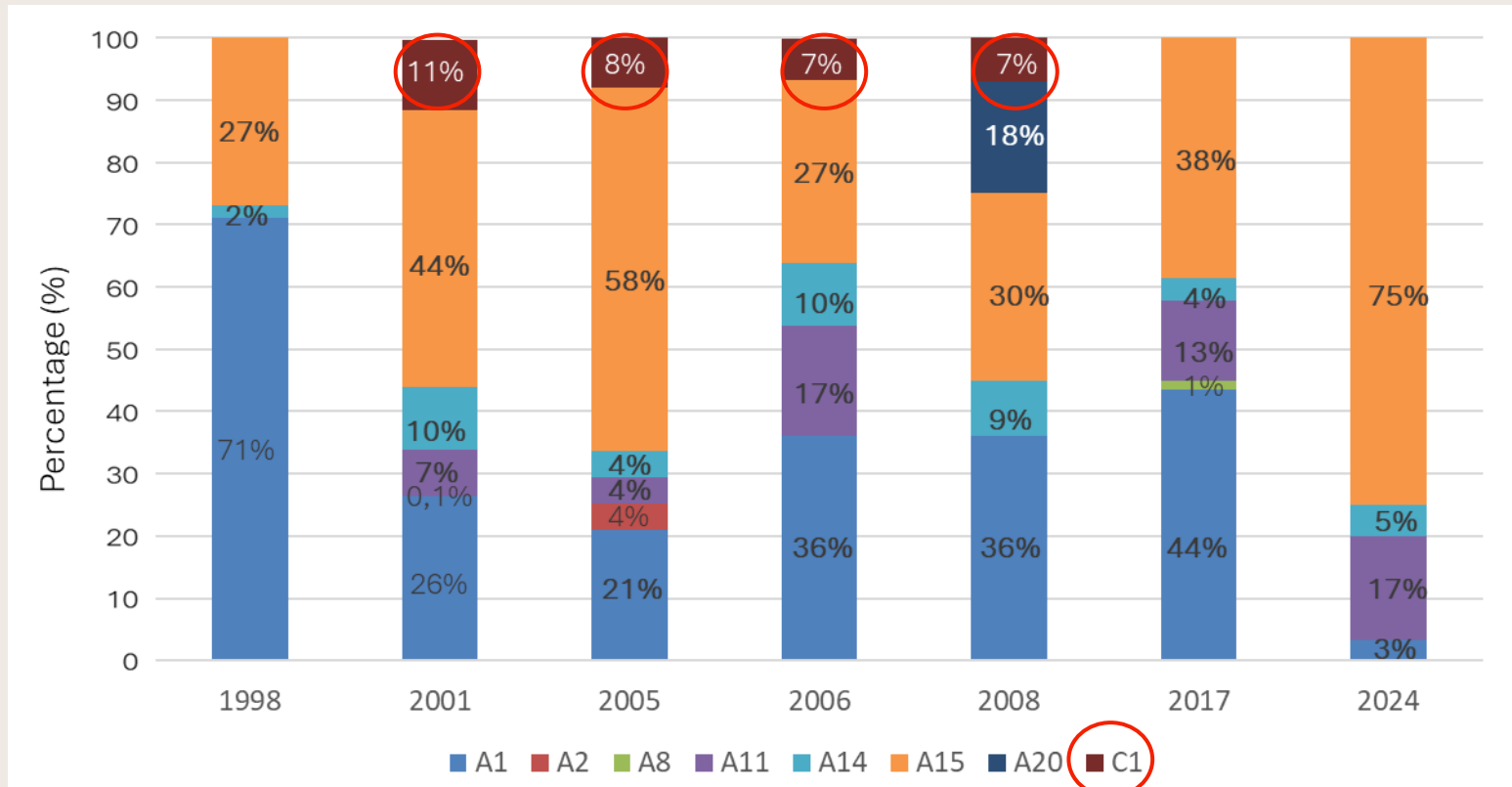
Other pathogen species observed were host-specific (*Nosema bombi* and *Crithidia bombi* in bumblebees)



All the honey bee colonies sampled exhibited mitochondrial haplotypes most frequently found in the local Canarian ecotype



Honey bee mitochondrial haplotypes most frequently found in the local ecotype along a 28-years period



De la Rúa et al. 2001, Muñoz and De la Rúa 2012 and unp. res., Muñoz et al. 2013



TAKE-HOME MESSAGES:

Honey bee pathogens are already present in the wild bee communities at a low frequency, but it remains to be studied whether their prevalence increases after direct contact with migratory hives
→ experiment in progress

The conservation programme of the local black honey bee ecotype has proven effective and respected by beekeepers who are aware of the importance of working with honey bees locally adapted to the unique environment of the Canary Islands





Thanks to my group
in the University of
Murcia and to the
many beekeepers
from La Palma that
have provided
samples along 30
years



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Thanks for your attention

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