Opinion: How do we protect our native bee species?

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Credit: University of Plymouth

Bees are among the most charismatic and familiar animals of the insect world, and thoughts of a summer's day picnic would not be complete without the recollection of the hum of bees or the sight of a belaboured

individual lifting off from a flower with its heavy load of pollen.

Despite these positive associations, however, many casual observers will likely be unaware of the sheer variety of different species of bee. In the UK alone, there are around 250 species, which includes the honey bee, 24 species of bumblebee and many solitary species.

Unfortunately, many of these species are now under threat, with widespread records of significant reductions in their abundance. The reasons for the declines are complex but they are generally associated with agricultural intensification, the associated losses of floral diversity, and the use of agrochemicals and pesticides. There are also interconnected threats from the spread of novel diseases and pathogens.

There are many reasons why it is important to tackle the threats posed to bees, not just for aesthetic reasons, but because of the value of the pollination service they provide. An international study in 2008 estimated that the insect pollination of crops and wildflowers had an annual economic worth of €153 billion.

Of all the species, honey bees are the most commercially important, for their role in pollination of crops and because they provide us with honey. But like many of their sister species they have suffered recent heavy declines in numbers.

"Colony collapse disorder" has become well-documented over recent years as having a very significant impact on honey bee colonies, but there is no single smoking-gun identified as its cause.

Like all other bees, the honey bee faces losses of floral diversity, the impacts of pesticides like neonicotinoids, and the spread of pests and diseases such as the Varroa mite, foulbrood and chalkbrood. They are also affected over winter by the weather and the strength of the colony in

the autumn.

One important aspect when examining the conservation of bee diversity is recognising the diversity that exists within species. There are 27 subspecies (distinct varieties) of honey bee across the world, and ten within Europe alone which owe their origin to the glacial history of Europe. Within these varieties lies much genetic variation.

Having this diversity is important as it enables species to adapt and survive in changing environments. Favourable traits that allow individuals to survive, for example disease resistance, are coded in DNA and passed on from one generation to the next.

Because genetic variation is this raw material for evolution, it is important to conserve it and species that are more genetically variable have a greater probability of long-term survival.

In the honey bee's case, genetic variation is distributed among individuals, among different varieties and also within populations of these varieties.

Conserving the diversity that exists is therefore a crucial legacy for future generations, but there is some debate among academics about how this should be achieved.

On the one hand, practices used by commercial honey bee keepers could threaten the native diversity that exists. Most commercial honey bee colonies are from two Mediterranean varieties of honey bee (Apis mellifera ligustica and Apis mellifera carnica) and hybridisation between these varieties and native ones can potentially erode the local adaptations and genetic integrity of naturally occurring varieties.

On the other hand, hybridisation itself can increase genetic diversity,

although the way that it is 'structured' and distributed amongst natural varieties is altered.

Many conservation biologists believe the best way to manage and 'future-proof' natural populations is to maintain the natural population structuring that occurs. This allows varieties to act as important 'reservoirs' of genetic variation.

Being alert to this potential loss of diversity among varieties, a group of beekeepers in Cornwall have come together to try and conserve native honey bee diversity in South West of England.

Under the banner 'B4: bringing back black bees', the group's aim is to protect the UK's native honey bee variety, Apis mellifera mellifera. And recently, they have come together with researchers at Plymouth University to use modern genetic methods to ask how distinct black bees are in this region, and whether much uncontrolled mating with commercial colonies has already taken place.

This project has revealed that while there has been some hybridisation, some apiaries contain relatively pure Apis mellifera mellifera. But the two organisations are now expanding their collaboration and embarking on an exciting new project – including a PhD studentship funded by the Natural Environment Research Council – that will investigate local adaptation in UK populations of dark honey bee.

This will involve using the latest in genetic screening techniques as well as looking at colony traits such as worker production, disease susceptibility, colony longevity and honey yield of honey bees with different genetic signatures.

They will also investigate the feasibility of cryopreserved sperm as an archive of genetic material for safeguarding present day genetic

variation, and therefore local adaptation, for the future.

Finding a means through which to preserve these varying traits is essential to ensuring nature's diversity continues for future generations.

Provided by University of Plymouth