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BEE CONSERVATION IS NOT 'Child's Play'

Paolo **Fontana** & Laura **Bortolotti** & Giacomo **Ciriello**

There are concerns among conservationists in Italy about the sale of solitary bee species, under the purported aim of supporting pollination and to raise awareness about these bees, mistakenly defined as 'at risk of extinction'. The marketing campaign aims to educate the public about the plight of the bees and threats to pollinators. These issues affect honey bees, and therefore beekeepers, but even more so all other bee species. The so-called *bee decline* is a complex phenomenon and therefore bee conservation is not 'child's play'.

The plight of bees

The causes of the decline in bee numbers are linked to many factors including changes in land use, and unusual seasonal weather patterns. Honey bees in Europe are affected by many health problems especially the parasite *Varroa destructor* and the viruses which are transmitted by this mite. Another issue is the pollution of local honey bee populations (subspecies and ecotypes) with imported genetics and the loss of genetic diversity associated with intensive queen breeding. The safeguarding of local honey bee genetics has only recently emerged as an important theme which in Italy has been dealt with in depth through the San Michele all'Adige Declaration (2018).

Recently a narrative has taken hold in the media pitting 'wild bees' against 'domesticated bees'. Honey bees are thus blamed for out-competing other bee species, especially when there is a high concentration of beehives in a particular area, as often happens with migratory beekeeping. The alarm raised by the spread of honey bees as a cause for the decline in 'wild' bees and pollinators, while not entirely warranted, highlights growing public attention on the plight of pollinators. Many are however unaware that honey bees are not the only bees that are bred and managed by people. Even among the so-called 'wild bees' several species are increasingly subject to intensive breeding and management.

A bumblebee and a solitary bee on the same flower. There are over 1,000 species of bees in Italy.
©Paolo Fontana

Evidence of poisoning at the hive entrance. One of the gravest problems for bees is the use of pesticides.
©Mateo Marighi

Wild bees and breeding

The notion that honey bees are 'bad' because they are bred and other bees are 'good' because they are wild, crumbles readily if we consider that, in Italy and the rest of Europe, honey bees are part of our ecosystems and that many colonies live free from any human intervention. Little does it matter whether free-living colonies derive from managed colonies, because managed colonies in turn derive from those that lived freely in nature. This is true also for the 'other' bees. Some would say that bumblebees and other bee species are no longer 'wild' once they are managed and bred. This position however is not supported by a scientific vision.

Today beekeeping is practised by many people for reasons that have nothing to do with production and livelihoods, but rather with experiencing nature and transmitting traditional knowledge. On the other hand, the breeding of bumblebees and solitary bees has been almost exclusively for economic purposes - that is to guarantee adequate pollination services to specific commercial cultivars. It may court sympathies to enrol these cute and furry creatures, buzzing from flower to flower, in a bid to transmit a love of nature. But it takes only a few 'how' and 'where' questions to paint a less reassuring picture.

Breeding bumblebees

Around one million bumblebee colonies are sold every year for pollination. These colonies are bred intensively, starting with the queens held in captivity. To ensure a minimum of genetic variation, it is necessary to periodically capture queens from the wild. These are caught towards the end of summer, picking queens that are ready to hibernate, or caught toward the end of winter and beginning of spring, when new queens are emerging from hibernation and starting to build their new colony. Generally, spring captures are considered more damaging, as this is a removal of individuals that are key to the survival of that species in that habitat. Sophisticated techniques to rear colonies of bumblebees have developed over many years and are not in the public domain. Sometimes worker honey bees are used to help bumblebees establish colonies faster.

The bumblebee species that is most widely bred in Europe is *Bom-*

An apiary in the mountains. Competition between honey bees and other species depends largely on hive density in the area. ©Paolo Fontana

bus terrestris - indigenous to Europe and western-central Asia. Following the development of its commercial use, this species has been introduced to continents where it was not present, such as parts of South America, eastern Asia and Australasia, causing severe issues of genetic pollution and competition with local species. The introduction of *Bombus terrestris* in South America at the end of the 20th century led to the near extinction of *Bombus dahlbomii*, as well as issues linked to the inter-species spread of disease. In many other countries where it has been introduced since the 1990s including Argentina, Chile, Japan, Korea, New Zealand and Tasmania, *Bombus terrestris* spread at such a rate to be considered an invasive species. More recently, some countries including Australia, Japan and the USA, have forbidden the importation of these species for commercial purposes and incentivised the breeding of endemic species.

In addition to its diffusion outside its natural range, the commercialization of Bombus terrestris colonies does not take into account the fact that this species is present in Europe and in neighboring countries with as many as 9 subspecies. The problem of subspecies derives from the fact that they are interfering with each other. Therefore, the displacement of one subspecies within the range of another, unequivocally causes genetic pollution as occurs in *Apis mellifera*, in *Bombus terrestris* and in any other species.

There are many reasons to call into question the environmental sustainability of the use of bumblebees for pollination. Even though they have become essential for the economic sustainability of many farming businesses, it is necessary to regulate the commerce of these species adequately to reduce risks for biodiversity. The challenge then is to identify solutions that are sustainable both from an environmental and from an economic point of view. Favouring indigenous pollinators must entail protecting indigenous flora and biodiversity more broadly, making farms welcoming and healthy places for pollinators.

Rearing bumblebees for pollination started in the 1980s. ©Laura Bortolotti

Management of mason bees

Mason bees are solitary bees that nest in small cavities. In the past few years, several companies have emerged in Europe specialising in the management of these bees to offer commercial pollination services. How are these bees used? It starts with the capture of individuals in their natural habitat, siting *bee hotels* with straws or cavities of specific sizes depending on the species one seeks to capture. The nests with the bees are then taken to a production centre, where they are opened and the cocoons extracted, following a process of selection that eliminates those with parasites (as if parasites were not themselves serving an ecological function). Finally, the cocoons are frozen so that they can be made available, by modulating the temperature of conservation, on a specified date to match pollination requirements. The cocoons are thus sent to their destination ready to hatch according to farming requirements rather than to their natural lifecycle. When the mason bees have finished pollinating, their nests are retired back to the production centre, and are sorted and restocked for a new cycle.

A queen of Bombus terrestris *flying towards a* Prunus sp *blossom. ©Laura Bortolotti*

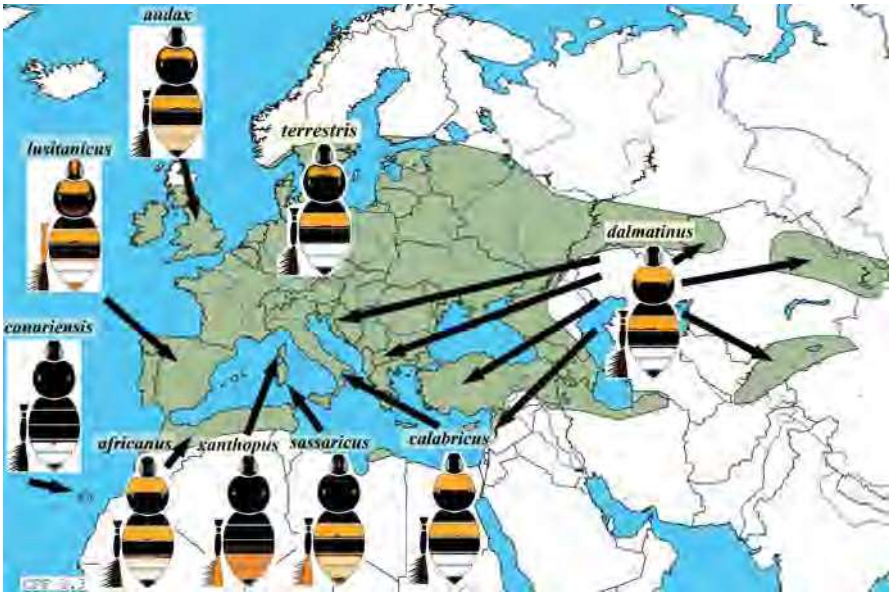
The species used in Europe are *Osmia cornuta* and *Osmia bicornis*, for which different subspecies have been described. As they are captured in the wild, and selected, handled and shipped as cocoons, there is a risk

that different species and subspecies to the ones identified are sent to where they are not endemic. In Italy, we know there are exotic species, such as *Megachile sculpturalis* from the Far East that compete with local species, especially for nesting sites and the large-scale trade in solitary bees can only increase the occurrence of the introduction of alien species.

Stingless bees

Looking beyond Italy, in tropical and subtropical areas of the world there are many species of stingless bees (*Meliponini* sp, social bees) that are kept for the production of honey, as well as for pollination of special cultivations, such as the vanilla orchid. The circa 500 *Meliponini* sp are severely threatened by the various environmental issues causing a decline of pollinators everywhere, but also by the introduction of honey bees in their habitats. This issue is especially acute in the Americas following the spread of 'Africanized' honey bees. In the case of stingless bees, we are witnessing a growing movement of particularly productive species outside of their endemic ranges, without much thought to competition with local species or to the spread of pests and diseases. This is the case for example with the Mexican species *Melipona beecheii*, which is exported to regions in the Caribbean and South America.

Entrance of a managed nest of Tetragonisca angustula, *Costa Rica* ©*Paolo Fontana*



Subspecies of Bombus terrestris *in Europe and the Mediterranean. Image from* Rasmont et al *(2008)*

Conservation of bees and sustainability

As noted at the start, we are seeing how in addition to breeding and moving bees for productive reasons, there are now initiatives doing so with educational goals, supposedly to enhance biodiversity and contrast the decline of pollinators. Unfortunately, despite good intentions, this proposal is not in the slightest sustainable from an ecological point of view: it fosters miseducation, as it reduces these marvellous beings to a mere object, a toy and a slogan. A different matter altogether is the setting up a of *bee hotel*, planting local flora, stopping the use of pesticides, and choosing to buy organic food, sustainably produced.

How can this mindless sale of mason bees be happening despite environmental and animal welfare legislation? From a legal standpoint, there are indeed laws that explicitly prohibit the transfer of wild animals outside of their endemic range. However, these laws are usually made to hold exclusively for vertebrate species. There is no good reason why they should not hold for bees, butterflies, crickets etc. Consider also, for example, the release of butterflies at

Inside a bee hotel: A mason bee nest (top) and a carder bee nest (bottom) parasite by checkered beetles (pink larva). Bee parasites have also an ecological function. ©*Paolo Fontana*

weddings and other events. Does the fact they are reared by people strip them of their status as 'wild' (and therefore of legal protection)? There is a need for knowledge, clarity and dedication on these themes. Superficiality is one of the great evils of our times. Today more than ever information is at our finger-tips, yet we fail to focus on the heart of the matter. Bees, with their great ecological role, with their variety of species and habits, but also with their fragility, are once again a key to understanding our reality and a measure to evaluate what is truly sustainable.

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Megachile sculpturalis *approaching a bee hotel. This is an alien species in Italy.*
©Paolo Fontana

Osmia cornuta *male and female mating and a male flying*
©Laura Bortolotti

Above
Planting and sowing some wildflowers helps bees and biodiversity..
©Paolo Fontana

Below
Bee hotel in a garden in Verona.
©Paolo Fontana