

# Bees Are Un-Bee-Lievably Important!

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Question...have you ever wondered what our world would be like without the existence of honeybees? It's quite a pain when you're bitten by one, and when things like that do occur, you might find yourself cursing against the existence of bees! It's no wonder that subsequent idioms exist, such as, "be careful what you wish for, lest it come true!" To your surprise, bees are absolutely vital to not only your surrounding ecosystem but also the plethora of ecosystems that make up the Earth. It's thanks to bees that we have the plants that we do, the animals that eat those plants, and so on up the food chain. While they may be small in size, bees play quite a ginormous role in the world around you, whether you know it or not. It's for this reason that bees have been intentionally shipped to different parts of the world for agricultural pollination purposes. However, with this, bees have also been accidentally transported to foreign environments.

As with any sort of introduction of a plant or animal to a brand new environment, you can assume that foreign bees would potentially have a negative impact and the native species in it. You may wonder, "how exactly can you unintentionally transport bees overseas or to different countries in general?" Surprisingly enough, the spread of invasive species have been studied in order to observe their impact on ecosystems around the world. It's come to light that invasive species have been hiding somewhere on transports unbeknownst to, for example, shipping companies and cargo ships (Padayachee et al. 2017). At this point, you may be wondering what might be so bad about new animals or plants coming over to somewhere new.

For one, you'll begin to see that new, foreign species can indeed impact the native species around it. We find this with the example of honeybees in an article, *Decline of six native mason bee species following the arrival of an exotic congener*, written by LeCroy et al. 2020. Knowing all this, you may be ask, "how exactly were LeCroy and the co-authors able to observe and quantify these bees? It's hard enough to catch one that accidentally invades our home!" The

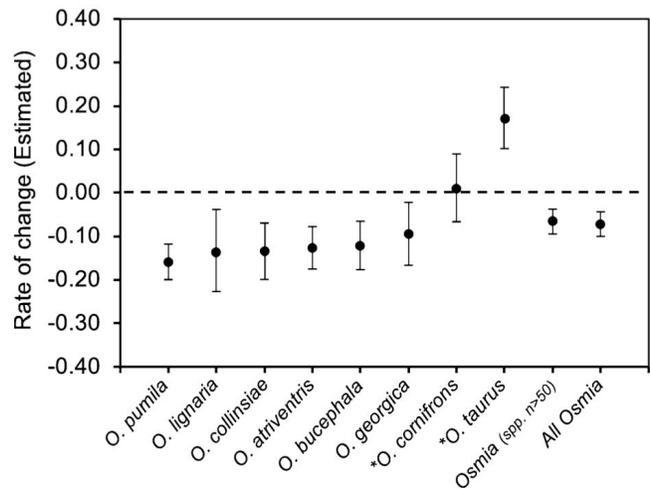


experiment utilized a practice called pan trapping to capture the bees and quantify the colonies. Researchers used colorful bowls or pans, varying in size yet similar in color and solution, to attract bees and collect data. Despite there being spatial and temporal variations in the sampling efforts and data filtering for erroneous data, the study was able to collect, with the help of various citizen science program participants, a whopping 5,901 *Osmia* specimens from 1,125 sampling events.

It's also important to note that the colors of the pan traps played an important role in the data collection. It's known that insects are attracted to certain colors: very much like how you'd expect a bee to be attracted to flower-like colors rather than, say, black or grey. It's even been studied that fluorescent pan traps may have different capture rates for flower-visiting insects compared to non-fluorescent pans (Shrestha et al. 2019). This finding

has made it all the more important to keep the pan traps uniform throughout the sampling events for all species of honeybees.

As one might expect from the title of the study, six of the native mason bee species populations declined while the foreign species, *Osmia taurus* and *Osmia cornifrons*<sup>1</sup>, increased as shown from the study (Figure 1). However, *O. cornifrons* barely increased at all compared to the staggering increase seen in *O. taurus*: for a reason not yet known. It's also important to note that *O. cornifrons* were discovered to be in the Mid-Atlantic region 2 decades before *O. taurus* (Lecroy et al. 2020). This is quite interesting, because one would think that *O. cornifrons*, an exotic but not truly invasive species, should have declined alongside the other 6 mason bee species as *O. taurus* began to dominate in the introduced area. In terms of the other categories in this figure, it was found that the entire genus, *Osmia*, declined at a mean of 7.25% per year and *Osmia* species, with more than 50 specimens, declined at around 6.64% per year (LeCroy et al. 2020). All in all, exotic *O. taurus* became the most frequently captured species while the other native mason bee species declined throughout the years.



**Figure 1**

With such interesting and unexpected findings, the researchers did attempt to theorize and explain why the data is the way it is. It was suggested that there may have been four reasons behind why *O. taurus* was the most successful and common species: competition for resources, habitat changes favoring introduced species, release from natural enemies in the introduced area, and introduction of novel disease with exotic species. All of these potential factors were discussed, but none were necessarily a clear reason for the observed trends in *O. cornifrons* and why *O. taurus* had such a dramatic increase. However, some nuances in bee behavior may explain the observed decrease in native *Osmia* species. It's been observed that honeybees don't touch flowers that other bees have touched (Williams 1998)! This may have been an additional perspective for the trends of *O. cornifrons*, *O. taurus*, and the six other mason bee species. With 2 additional foreign species nearby, it would make quite enough sense for the general *Osmia* genus and the 6 specific species to have declined in the rate of change. A greater number of new honeybee species in the area means more of one's flowers being touched by other species. All this equates to a greater lack of resources, and with less resources, it becomes exponentially more difficult to survive and reproduce. Who knows! Despite the short thought on the results of this study, you and I can both agree that there are many questions still yet to be answered about honeybees or even the general impact of foreign species.

Now, recall earlier in this paper that we discussed possible impacts that foreign species may have to their environments. We examined a study that sought to directly observe this phenomena with honeybees, and we can conclude that it's quite clear how much of an impact

<sup>1</sup> Also known as the horned-face bee

any foreign organism can have on the ecosystem and its native inhabitants. Even though we might not know why and how certain populations may decline in number with the introduction of a foreign species, we know for a fact that they do decline. Understanding how vital honeybees are to not only their ecosystems but our very lives, you can see how much of a key biosecurity priority it is to maintain and keep native species together and separated from exotic ones. Honeybees, if left to decline and possibly extinguish, would lead to great shortages and even disappearances of a multitude of crops and plants. This would eventually lead to declines in populations in herbivores and eventually the rest of the food chain. To make it a bit more personal, you wouldn't have your delicious fruits and vegetables at the very least. You wouldn't be able to just walk into a grocery store to select the best looking, ripe fruit that you could place your eyes on. It would be a scarcity, a luxury if at all.

Now, you might be able to convince me that you'd be fine without fruits or veggies, but let's also think about those in the world who are socioeconomically challenged: those who have an extremely difficult time getting access to or even the financial resources needed to purchase healthy foods. The decline and disappearance of bees in the world would impact these communities of people the greatest, leading to all different kinds of divisions in countries. Poverty rates, unemployment, and obesity, to name a few, would all increase everywhere around the world. Now, I don't intend to paint a hypothetical future as an apocalypse of any kind, but these studies do go to show just how much of an impact honeybees have on the world: an impact greater than what you would have first thought.



It's become quite clear that this study asks for its readers to be cognizant of the importance of honeybees and to also be aware of the impact exotic organisms can have in a new environment. Although more research needs to be done in this academic field to learn about the whys and hows behind honeybee population declines, we can pull from this study that this issue may very well be something much bigger at hand. The TSA is a perfect example of our efforts! The TSA, Transportation Security Administration, does its very best job to ensure that no

such transport of fruits, foods, or organisms occur at airports! I do hope that in light of this study, we, as members of this shared Earth, would do our part in aiding the balance of the natural world. Each and every one of our actions truly do matter!

### References

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### Pictures

Pan traps

- <https://www.ceh.ac.uk/pmrp/pollinator-monitoring-scheme-frequently-asked-questions>

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