

To Bee or Not to Bee...

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The plight of pollinators is causing worldwide concern. Not only are population numbers of many formerly abundant species dwindling, some species are disappearing altogether. While many types of pollinators have suffered, we will here focus on how certain species of bumblebees have gone either extinct or close thereto due to habitat and resource destruction, pesticide use and pathogens.

Pollinators are a necessity for ecosystems around the globe. Including innumerable species of insects and birds, bats and other small mammals, and even some reptiles, pollinators play a vital role in plant reproduction by performing the essential job of transferring pollen from anther to stigma. Pollinators assist in the propagation and diversification of plants. They improve seed set in produce and are crucial for the creation of the seed banks that feed bird and beasts alike. They are also essential for an estimated two-thirds of the crops that we grow. Without them, the world as we know it would not exist. Despite these facts, we have allowed their populations to decline to alarmingly low levels.

Perhaps the most renowned group of pollinators is the insect order Hymenoptera. Many people identify anything that is yellow and black as a "bee," but not all black and yellow insects are bees. Furthermore, there are thousands of different kinds of bees, not all of which are even black and yellow. Because of these misconceptions, it seems logical that populations of the more rare bees could easily disappear without the general public noticing, or even caring. However, each of these different types of bees plays a different role in the ecosystem. Though some species' niches overlap, no two species are identical, and thus each is valuable in its own right.

Bumblebees exemplify a bee genus (*Bombus*) that includes many rare species with highly diverse ecologies, unlike its renowned cousin, the honeybee. There are almost 240 species of bumblebees worldwide (Williams 1998). They are found mostly in the northern hemisphere, from the Arctic to the Tropics. Bumblebees, as a group, have a wide range of habitats, and are somewhat unique among insects in that they are endotherms. This means that they have the ability to warm themselves by "shivering," or rapidly contracting



Bumblebees and other pollinators are an essential part of global ecosystems.

Photo: Marianna E. Horn

and releasing their powerful indirect flight muscles to produce heat by metabolism. This allows them to survive much cooler climates than many other bees.

Bumblebees are social insects; they live in colonies. They make their homes in abandoned animal burrows or in grassy tussocks, and feed on both the nectar and pollen rewards offered by the plants they pollinate. Bumblebees have a special technique in foraging that makes them exclusive pollinators of certain plants. Similarly, however, some species of bumblebees are very specialized or selective the varieties of flowers on which they will forage. For example, some species will only forage on plants in the pea family (Benton

2006). Unfortunately, specialization may come at a cost, as it leaves species vulnerable to habitat and resource destruction.

Habitat destruction is thought to be the leading causes of bumblebee population decline in Britain. Three of the twenty-five bumblebee species known to inhabit the UK have gone extinct in the last few decades, and numerous others have their dangerously low population sizes (Goulson *et. al* 2006). According to Dr. David Goulson (2006), the Director of the Bumblebee Conservation Trust in the UK, agricultural intensification has caused destruction of bumblebees' native habitats, particularly foraging resources, by replacing the diverse native flora with monocultural blocks. While species that are less specialized are believed to find sufficient resources in residential gardens, the specialists that feed on the formerly abundant wildflowers have found themselves without food (Biesmeijer *et. al* 2006).

Unfortunately, habitat destruction is not the only detrimental effect of agricultural intensification. Pesticides used by farmers can be picked up by

bumblebees and, if not immediately deadly to the insects, carried back to their nests to poison the other colony members. However, many efforts are being made to reduce, if not eliminate pesticide application, as the far-reaching repercussions of their use are well-understood.

Another aspect of the agricultural industry which has impacted bumblebees is the use of commercial bumblebee colonies in greenhouses to pollinate crops such as tomatoes, peppers and some field crops such as high bush blueberries. The commercialization of bumblebees in North America over the past two decades is thought to have caused a pathogen spillover that has served to devastated populations of wild

species. Studies done in southern Ontario, Canada, have shown that pathogens are more prevalent in wild populations located close to greenhouses that host commercial bumblebees (Colla *et. al* 2005). These pathogens include tracheal mites (*Locustacarus buchneri*) and intestinal protozoa (*Crithidia bombi*, *Nosema bombi*), which can be transferred from bumblebee to bumblebee via the flowers upon which they feed, or within the colony. Although these pathogens are not considered lethal because they don't directly kill their hosts, they reduce the bumblebees' ability to learn to handle or feed on new flower types (Gegear, Otterstatter, Thomson 2004). This can have extremely detrimental consequences on the health of the colony, by reducing the resources brought in from foraging, and thus limiting the size of the colony and number of offspring it can produce.

Habitat or resource loss, pesticide use, pathogens, or any combination of the above, can explain massive declines in bumblebee population numbers. When paired with restricted habitats, as in the case of *Bombus franklini*, these threats are devastating. Found in a very small region of the western USA, this species has been observed in drastic population decline over the past decade, to the point that, in a species profile from 2005, Dr. Robbin W. Thorp postulates that *B. franklini* is on the brink of extinction. To this end, or to prevent such an end, *B. franklini* has recently been submitted for incorporation into the *IUCN Red List of Threatened Species*.

However, *B. franklini* is far from alone in its plight. Conservation efforts must continue in order to extend to other species of pollinators. The IUCN recently extended a new group within the Species Survival Commission called the Declining Pollinator Task Force. This specialist group, headed by Dr. Peter G. Kevan of the University of Guelph, in Canada, is working in conjunction with a number of pollinator protection groups to try to raise awareness of declines in pollinator populations and ultimately to protect this important group from continued devastation. Groups such as the International Pollinators Initiative, the North American Pollinator Protection Campaign are actively pursuing these goals, and the

US Government is now recognizing the problem with the first ever "National Pollinator Week" from June 24-30, 2007 which was be synchronized with the release of a new *Pollination* stamp series from the US Postal Service.

The Xerces Society, a group for Invertebrate Conservation, has a special pollinator conservation program that they are launching across North America, with the support of the US Golf Association. One of the current goals of the Declining Pollinator Task Force is to deliver other pollinators listed by the Xerces Society as in need of protection to the *IUCN Red List of Threatened Species* for incorporation. The next on this list for delivery is another North American species of bumblebee, *Bombus affinis*, whose populations numbers are dropping to dangerous lows.

With the combined efforts of these groups, we hope that bumblebees, among other precious pollinators, will gain some protection from the threats that are currently devastating their numbers. With public awareness and stronger policies to prevent damage from habitat destruction, agricultural intensification, and bumblebee commercialization, as well as active efforts to restore pollinator friendly

plantings and to decrease monocultures (CSPNA, NRC 2006), perhaps we can protect our pollinators from destruction, and ourselves from their loss.

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Bombus franklini is now on the brink of extinction.

Photo: Robbin W. Thorp