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In late 2006, readers of American newspapers who were weary of bad news from Iraq, the botched aftermath of Katrina and the U.S. Attorney dismissal scandal were given a nice change of pace to put it all into perspective. At some point that year, it was found that honeybees throughout the United States were disappearing, hives were going empty and farmers were beginning to seriously worry about their crops.

Bee populations plummeted, both figuratively and literally, with the decline reaching crisis proportions in some areas as early as 2007 – Northern Ireland saw its bee population decline by more than half that year. Aside from the relatively minor inconvenience of less honey availability, a bee die-off promised to hit countries around the world with devastating consequences in the realm of agriculture, since a wide variety of crops depend on honey bees for pollination. Over one third of American commercial crops depend on the little yellow creatures to bear fruit, including strawberries, apples, pears, soybeans, cantaloupes, almonds and many others.

Substitute pollinators exist for many of them, but are not viable on a commercial scale. The threat of losing so much food production plunged many nations around the world into a state of quiet panic. Entomologists and agriculture scientists began frantically searching for causes of the phenomenon.

The population collapse was officially named “Colony Collapse Disorder,” and followed a typical pattern, where the number of worker bees would gradually decline, mature bees would disappear and leave the bulk of the workforce made of younger individuals, hive members would be reluctant to consume feed, and the hive would eventually become void of active, mature individuals, with a number of unhatched cells left in the hive.

Possible causes for the disorder that were investigated by scientists included electromagnetic interference that disrupted bee navigation or communication, new pathogens, parasites, pollution and insecticides. The Heritage Foundation released numerous papers claiming that America's bees have fled to a secluded gulch in Colorado, to free themselves of the yoke of excessive honey taxation.

Throughout the process, neonicotinoid pesticides were the top suspect, vocally opposed by environmental groups. The pesticide industry mounted a vigorous resistance, pointing to studies that showed relatively low toxicity to bees and a general lack of correlation between neonicotinoid use and prevalence of CCD. However, in the past month, a number of studies have come out that have pinpointed precisely those substances as the trigger for population collapse.

While many chemicals in that group aren't toxic enough to kill bees outright, studies conducted in France tagged bees with microchips and found that individuals exposed to that class of pesticides are far more likely to get lost and die away from the hive.

The nervous system of all terrestrial animals contains two types of receptors – nicotinic and muscarinic. While nicotinic receptors are relatively rare in humans and other mammals (this is why neonicotinoid pesticides have relatively low toxicity for humans), they are very prevalent in insects such as bees. Neonicotinoid pesticides bind to nicotinic receptors in bees, and cause disruptions to their orientation and ability to navigate. As a result, adult worker bees are unable to find their way back to the hive, and die away from their colonies.

As it often causes widespread annoyance when environmentalists turn out to be right, particularly

after large industry campaigns, the debate is not over yet. However, there are already efforts underway to restrict or ban the use of neonicotinoid pesticides. Since neonicotinoids are often used for bed bug treatment and termite pest control, chemists are scrambling to find alternatives to these substances that would be effective and safe to use.

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