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LIVING

Colonies in crisis

Much of the honey bee population is disappearing throughout Europe and North America

OUR CHANGING SEASONS
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Jon Sullivan, special to The Examiner

As a child, my gateway into nature was a fascination with turtles. Nothing gave me more satisfaction than catching a wily painted turtle in the pond behind the Kawartha Park Beach on Clear Lake. Over the years, however, I've often thought that an equally alluring entry point to the wonders of the natural world would be the study of honey bees. Fascinating on every possible level, from their amazing biology to their pivotal ecological role, a thorough knowledge of bees is a knowledge of how nature works.

Now, however, we are learning that much of the honey bee population is mysteriously disappearing throughout Europe and North America. The scale of the decline is staggering. About a quarter of the more than two million commercial bee colonies across the United States have been lost since last fall. In southern Ontario, apiarists lost about 23,000 of their 76,000 hives this past winter. The Niagara Region has seen a 90-per-cent hive loss. A typical winter loss is between 10 and 20 per cent. Fortunately for the Peterborough area, however, bee colonies north of a line between Hamilton and St. Thomas appear to have been spared. The loss in the Kawarthas was just slightly above normal, according to one local beekeeper. An abnormally cool September resulting in less fall honey production — and therefore fewer young bees produced — was a contributing factor. As elsewhere in North America, there is also an ongoing problem with mites which can destroy bee colonies if left unchecked.

Before we take a closer look at what else may be causing the precipitous falloff in bee numbers in some parts of North America, it's important to have an understanding of just how complex and important honey bees are.

Generally golden brown in colour, with the abdomen banded in lighter and darker shades, Apis mellifera is one of only two insects that have been domesticated, the silk moth being the other one. Indo-European peoples learned the art of domestic beekeeping, or apiculture, more than 4,000 years ago. Until sugar became widely available, honey was by far the most common sweetener. Early settlers brought the first honey bee colonies with them to North America in the early 1600s.

Wild honey bee populations quickly became established since queens frequently lead swarms from crowded nests in late spring in order to start a new colony. They would usually relocate in a tree cavity or crevice. These colonies would often last for years or even decades. However, almost all of our wild honey bee population has been devastated as a result of the parasitic varroa mite from Europe that first showed up in the early 1990s. There are some indications that feral (wild) bee populations are beginning to recover, thanks to natural selection for varroa resistance.

A bee colony comprises workers, drones, queens and larvae. The queen is a fertile female whose main role is to lay eggs. She may lay as many as 2000 a day. The fertile eggs produce workers (and queens on occasion), while the infertile eggs produce drones. The queen is considerably larger than the other bees.

The workers, who are also female but sterile, do all of the heavy slugging. Depending on their age, they feed the larvae, make wax, build the honeycomb, keep the hive clean, make honey, store pollen, guard the hive, and, most importantly, collect pollen and nectar from flowers. The pollen is fed to the larvae, because it is rich in protein and the babies need it to grow. Honey bees, therefore, have evolved to gather pollen as a high-protein "prey" (rather than hunting other invertebrates like most wasps do) for use as a larval food. Most of the nectar goes towards the production of honey which is stored for consumption during the winter.

Drones, the hapless, stingless male members of the hive, only number a few hundred and don't do anything other than take part in the mating flight. Only a few ever actually succeed in mating, however. Eventually, all of the drones are driven off and destroyed by the workers.

The eggs which produce queens and workers are alike. However, the cell destined to house a new queen is cylindrical rather than hexagonal. Also, the queen larva is fed royal jelly — a highly nutritious glandular secretion produced by young worker bees — until she pupates. Regular worker larvae only get this type of food during the first three days of life.

Although we nearly always think of bees as social insects, the great majority of Ontario's native bee species are solitary and do not live in colonies.

Fortunately, there's lots of fascinating bee watching that can be done outside of the hive, as well. Go to most any large patch of flowers or a blossoming tree on a warm, sunny day. An amazing interaction is going on between the bees and the flowers, one that you can witness yourself. The essence of the "game" is that the flowers need to entice the bees into pollinating them. In other words, pollen, the powder-like male sex cells, must be transferred from the male stamens of a flower on one plant to the sticky, receptive pistal, or female organ, of a flower on a different plant. This results in cross pollination — a mixing of genetic traits — which produces a new generation of plants which may be better adapted to changes in the environment.

The flowers are luring the bees in with brightly coloured petals, alluring smells and rewards of nectar and the pollen itself. The nectar is strategically located near the sexual organs of the flower — the stamens and pistal — so that the bee's body will usually come into contact with these structures as she slurps up the nectar or stuffs pollen into the little "baskets" on her rear legs. However, in doing so, she also gets the dusty pollen all over her body. When she flies to the next flower, some of the pollen from her body hairs rubs off and onto the pistal of the flower. Presto, the new flower is pollinated.

A given bee will tend to collect nectar or pollen from only one type of flower. In doing so, it quickly learns where the nectar and pollen are located and can collect them more quickly. If it constantly switched flower types, it would waste a lot of time finding the pollen and nectar on all of them. This also allows them to conserve energy.

It's interesting to watch how a bee "works" a given flower. On long spikes such as loosestrife, bees tend to land at the bottom and work their way in spiral fashion to the top. On flat-topped flowers like daisies, they tend to land on the edge and move in a spiral towards the centre. In the early fall, goldenrod plants are especially good for bee-watching.

Take time to observe how the bees actually collect the pollen, gathering it first with their front legs and passing it back to their hind legs. Here, it is packed into small openings called pollen baskets for easy transport back to the hive. You might also be able to see where they stick their mouthparts into the flower and how long they stay there. This should indicate the location of the nectar and how much is available.

North American populations of honey bees have experienced a devastating collapse in the past six months or so. In a phenomenon known as Colony Collapse Disorder, worker bees leave the hive to forage, but fail to return, leaving only the queen and some juveniles. Although no one can yet point to one cause, a study released in late April is indicating that a fungus may be involved in some of the declines, at least in the U.S. There is also research showing that pesticides may be partly to blame, since some chemicals may interfere with honeybee memory and cause the bees to forget their way home. Other top suspects are a parasite, an unknown virus, or some kind of bacteria. The long-domesticated honey bee does not appear to have the normal complement of genes that take poisons out of their systems or fight disease. This makes honey bees very vulnerable when faced with pathogens and toxins.

Canadian beekeepers, however, aren't even sure that the hive losses in this country are connected to those in the U.S. While abandoned U.S. hives still had healthy amounts of honey and pollen, many of those in southern Ontario had very little pollen remaining. A lack of food would have meant smaller broods and more stress on the older bees. Adding to the localized effect theory, honeybee colonies in central and northern Ontario have largely been spared.

Honey bee decline has very serious implications for agriculture since many of our key fruits and vegetables are pollinated by bees. In fact, about one-third of the human diet comes from insect-pollinated plants — everything from cherries and canola to pear trees and blueberries — and the honey bee is responsible for 80 per cent of that pollination. Commercial beekeepers simply take their hives to the farms or orchards and the bees do the rest. Pulitzer Prize-winning biologist E.O. Wilson of Harvard says that the honeybee is nature's "workhorse — and we took it for granted. We've hung our own future on a thread."

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