The Buzz on Bees

Approximately one third of all the food Americans eat is directly or indirectly derived from honey bee pollination

Wings
A bee's two sets of wings beat more than 200 times a second

Hair
Bees have feathery body hair that helps collect pollen

Thorax

Head

Eyes

Antennae
Bees use their antennae for smelling and touching

Abdomen

Stinger
The stinger is hidden until the bee is ready to sting

Tongue
Bees have a long tongue, or proboscis which helps them reach nectar deep in flowers

Pollen Sac
This is where the bee stores pollen

Legs
Bees have six legs

Some crops pollinated are Apples, Mangos, Kiwi Fruit, Plums, Peaches, Nectarines, Guava, Rose Hips, Pomegranites, Pears, Black and Red Currants, Alfalfa, Okra, Strawberries, Onions, Cashews, Cactus, Prickly Pear, Apricots, Allspice, Avocados, Passion Fruit, Lima Beans, Kidney Beans, Green Beans, Apples, Cherries, Celery, Coffee, Walnuts, Cotton, Flax, Macadamia Nuts, Sunflowers, Lemons, Buckwheat, Figs, Fennel, Limes, Quince, Carrots, Persimmons, Cucumber, Hazelnuts, Cantaloupe, Tangelos, Coriander, Caraway, Chestnuts, Watermelon, Coconut, Tangerines, Boysenberries, Starfruit, Brazil Nuts, Beets, Mustard Seed, Rapeseed, Broccoli, Cauliflower, Cabbage, Brussels Sprouts, Turnips, Chili peppers, red peppers, bell peppers, green peppers, Papaya, Safflower, Sesame, Eggplant, Raspberries, Elderberries, Blackberries, Clover, Tamarind, Cocoa, Black Eyed Peas, Vanilla, Cranberries, Tomatoes and Grapes.

There are nearly 20,000 known species of bees in seven to nine recognized families living on every continent except for Antarctica.

There are three members of a honey bee colony:

A queen bee can live up to 5 years.

Queen - mother to all the bees in the colony; she is a fertile female.

Worker - an infertile female that performs the labor tasks of the colony, including feed preparation, guarding the hive, feeding the queens, drones and brood, and heating and cooling the hive. Workers live about 6 weeks

Drone - the male that starts out as an unfertilized egg. Its only purpose in the colony is to mate with a virgin queen. They live to mate with the queen, but not more than one in a thousand get the opportunity to mate. Drones live no more than about two months

Bees maintain a temperature of 92-93º Fahrenheit in their central brood nest regardless of whether the outside temperature is 110º or -40º.

On average, a worker bee in the summer lasts six to eight weeks. Their most common cause of death is wearing their wings out. During that six to eight-week period, their average honey production is 1/12 of a teaspoon. In that short lifetime, they fly the equivalent of 1½ times the circumference of the earth. The peak population of a colony of honeybees is usually at mid-summer (after spring buildup) and results in 60,000 to 80,000 bees per colony.

A good, prolific queen can lay up to 3,000 eggs per day. A honeycomb cell has six sides because the bees can fill the space without gaps, thus requiring the least amount of wax and offering the most storage space. To make one pound of honey, the bees in the colony must visit 2 million flowers, fly over 55,000 miles and will be the lifetime work of approximately 768 bees. A single honey bee will visit 50-100 flowers on a single trip out of the hive. A bee hive may be home to as many as 60,000 bees. Bees produce honey as food stores for the hive during the long months of winter when flowers aren't blooming and therefore little or no nectar is available to them.

Honey is the ONLY food that includes all the substances necessary to sustain life, including water. A typical beehive can make up to 400 pounds of honey per year. Honey never spoils. It would take about 1 ounce of honey to fuel a honeybee's flight around the world. Flowers and other blossoming plants have nectarines that produce sugary nectar. Worker bees suck up the nectar and water and store it in a special honey stomach. When the stomach is full the bee returns to the hive and puts the nectar in an empty honeycomb. Natural chemicals from the bee's head glands and the evaporation of the water from the nectar change the nectar into honey.

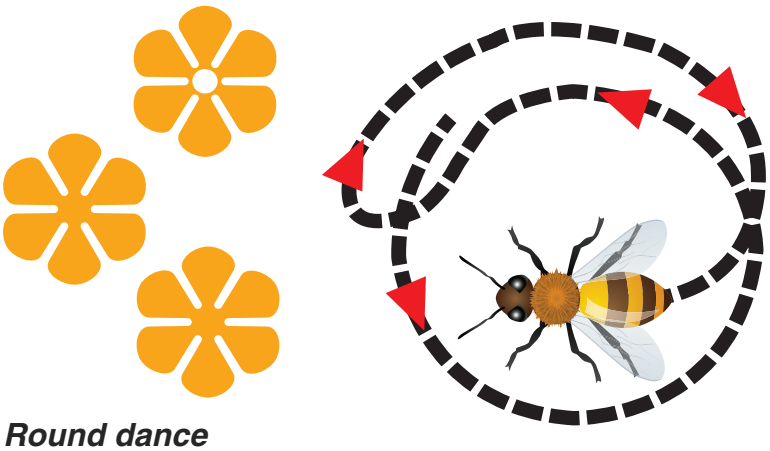
Out of 20,000 species of bees, only 4 make honey

Honeybee Communication

The domestic honeybee, Apis mellifera, is a colonial insect living in hives containing one queen - a fertile female a few drones (males) thousands of workers (infertile females) The workers are responsible for keeping the hive clean building the wax combs of the hive tending the young foraging for food: nectar and pollen

Some 5-25% of the workers in the hive are scouts. Their job is to search for new sources of food for the other workers, the foragers, to harvest.

When food is discovered by scouts, they return to the hive. Shortly after their return, many foragers leave the hive and fly directly to the food. The remarkable thing about this is that the foragers do not follow the scouts back. The scouts may remain in the hive for hours and those that leave continue to hunt for new sources of food even though the foragers are continuing to bring back ample supplies of food from the sites the scouts discovered earlier. So the scout bees have communicated to the foragers the necessary information for them to find the food on their own.

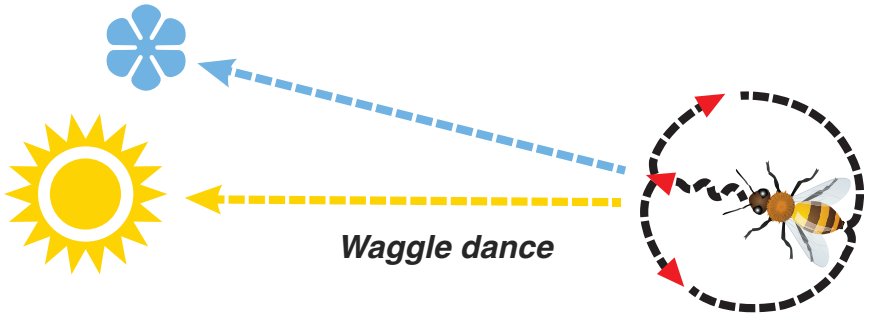


Round dance

It turns out that the scouts can convey to the foragers information about the odor of the food its direction from the hive its distance from the hive When food is within 50-75 meters of the hive, the scouts dance the "round dance" on the surface of the comb.

But when the food is farther than 75 meters from the hive, the scouts dance the "waggle dance".

The waggle dance has two components: a straight run - the direction of which conveys information about the direction of the food the speed at which the dance is repeated which indicates how far away the food is.



Waggle dance

How do the bees calculate distance?

(*Nature - International Weekly Journal of Science*, John Whitfield)

A bee measures how far it has travelled by how much scenery it has flown past. By jamming this navigation system, researchers have shown that bees incorporate this measurement into the dances that alert their nestmates to food.

Bees have no depth perception. Bees measure distance using optic flow. This is the amount that an image appears to move as the position of the observer moves. Nearby things produce more optic flow than distant objects. This is why the scenery close to a moving train seems to zip by more quickly than the distant landscape, and why driving a ground-hugging vehicle such as a go-kart gives such an impression of speed.

A honeybee's waggle dance relates the distance and direction of food. The bees' dance, then, contains information about the optic flow that a forager should experience on the way to its target, but not about the absolute distance it should travel.

Major Threats to Pollinators

Bees and other insect pollinators are beset by the same environmental challenges as other species, including habitat loss, degradation, and fragmentation; non-native species and diseases; pollution, including pesticides; and climate change.

Habitat Loss, Degradation, and Fragmentation

Much pollinator habitat has been lost to agriculture, resource extraction, and urban and suburban development. Although these land uses can provide floral resources and benefit some pollinators, many bees and butterflies are habitat-specific, and the loss of habitat that provides sites for overwintering, foraging for pollen and nectar, or nesting can be detrimental to these species.

Habitat degradation, the decline in habitat quality, is another serious concern. For example, the loose, friable soil required by ground-nesting bees may be trampled by heavy foot traffic or the use of off-road vehicles. In cities, ground-nesting species may be particularly limited due to the large amount of landscape that has been covered with concrete or other impervious surface.

Many pollinators are adversely affected when large, intact tracts of habitat are broken up into smaller, isolated patches by road construction, development, or agriculture. These habitat fragments may not be large enough to meet all pollinator needs by themselves. Establishing and maintaining connectivity-safe passage among patches-is key to pollinator persistence in these areas.

Non-native Species and Diseases Plants

Plants or animals brought here from other places can decrease the quality of pollinator habitat. When non-native shrubs such as autumn olive and multiflora rose take over open fields, they crowd out the wildflowers needed by certain butterfly and bee species for pollen, nectar, or larval food. For example, Japanese barberry shades out native spring ephemerals like Dutchman's breeches, which provide food for early spring bumble bees. Some non-native plants also attract pollinators away from native species that are superior food sources. West Virginia white butterflies sometimes lay their eggs on non-native

Garlic Mustard (Alliaria petiolata) covers a forest floor.

garlic mustard instead of native toothwort, for example, and the young caterpillars fail to thrive. In other instances, non-native species can compete with native plants or animals for resources-in fact, in some habitats European honey bees have been shown to compete with native bees for pollen and nectar.

Parasites and Diseases

Introduced parasites and diseases are still another threat to pollinators. Thus far, the effects of these parasites have been species-specific, including the mite and virus species that have severely compromised honey bee colonies.

Thus far, 16 species of non-native bees have been documented in New York City, including the European Honey Bee. It is unclear if many of them are having a negative effect on native bees. Surveys indicate that populations of these non-native bees currently are not very large in most locations (although there are some exceptions), suggesting that right now they may not be having a major impact on native bees. However, given the history of introductions that subsequently cause major ecological damage, it is important to carefully monitor populations of introduced bee species.

Although they were intended to be beneficial at the time, some non-native organisms introduced as biocontrol agents have caused problems for native species. For example, non-native lady beetles introduced to this country for aphid control have eliminated New York's state insect, the nine-spotted lady beetle. These introduced lady beetles have even been found to feed on Monarch butterfly caterpillars. Since the 1950s, the tachinid fly Compsilura concinnata, introduced in the early 1900s to control gypsy moths, has likely contributed to the regional decline of the large sphinx moths that pollinate flowers such evening primrose and certain orchids.

It's important to note that overabundant native species can also be a problem for plants and animals in the metropolitan region. White-tailed deer numbers have increased over the years, due in part to the fragmentation of forest habitat into the open areas they prefer. Deer browse removes understory vegetation that caterpillar larvae and other pollinators depend upon. For example, deer often preferentially feed on native shrubs such as spicebush, the host plant of the spicebush swallowtail caterpillar, while avoiding thorny non-native bushes like Japanese barberry.

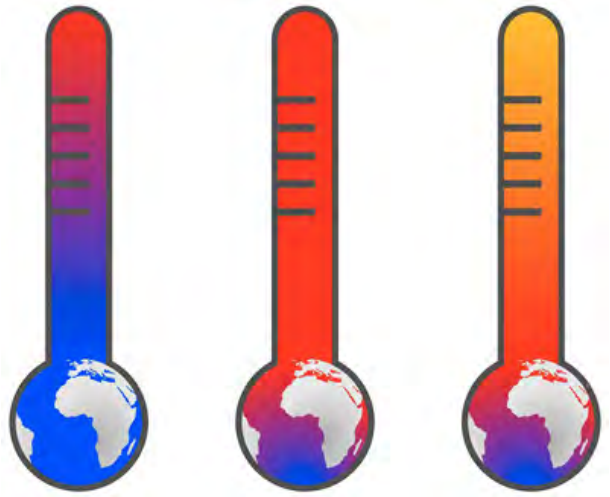
Pollution

Pollution, Including pesticides and air pollution is a very real problem for bees and other pollinators that rely on scent trails to find flowers. Light pollution can harm moth pollinators by increasing their susceptibility to predation by bats or birds when they are attracted to artificial lights at night.

Pesticide misuse and drift from aerial spraying are a major threat to insect pollinators, especially spraying with so-called persistent chemicals that remain in the environment for a long time before degrading. Systemic insecticides applied to seeds can contaminate the pollen grains that are an essential source of food for bees and their young. Pesticides often kill directly, but sublethal amounts can also be detrimental to bees and other pollinators by impeding their ability to navigate or forage. The use of herbicides that eradicate important forage plants for bees and other pollinators is an additional problem.

Climate Change

Climate change studies predict that climate change will alter the close relationship between insect pollinators and the plants that depend upon them for reproduction. Flowering plants migrating north or to cooler, higher elevation habitat in response to warming temperatures or other changes may not move in sync with their pollinators. The composition of pollinator communities is expected to change. According to the Xerces Society, anecdotal observations have found that bumble bees adapted to cooler temperatures are in decline, while bumble bees adapted to warmer temperatures are expanding their ranges northward. What effect this will have on local plants is unknown.



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