The Diablo Bee

Newsletter of the Mount Diablo Beekeepers Association

JULY 2008

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www.diablobees.org

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July's guest speaker

Nathanael J. Beach of Aiken Beekeepers Assoc. in Aiken, South Carolina. His topic will be the Small Hive Beetle. Visit http://aikenbeekeepers.org http://beachesbeehaven.com *for more information.*

HIGHLIGHTS OF THIS ISSUE

What's the Buzz?

Kudos and congrats to Josh Fisher for his polished presentation, and for sharing with us his enlightening video "Pollen Nation"

Meetings

Important DATE!

Our next meeting is July 10 at 7:30 pm at the Heather Farm Garden Center in Walnut Creek.

Announcements

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Please send interesting bee articles via email to: ersten3@yahoo.com

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Membership Dues

Your $15 yearly dues should be sent to:

Jeff Peacock, Treasurer
Mount Diablo Beekeepers Association
3341 Walnut Lane
Lafayette, CA 94549

Or…. you can give Jeff your check at any monthly meeting.

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If you have an active email address, you will receive this newsletter by e-mail unless you inform Kim Coleman at:
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Not receiving a hard copy? Contact Kim at the above e-mail address, or by calling her at 925-685-6849.

BUMBLE BEES IN DECLINE

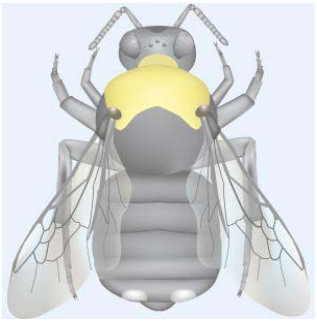
The Xerces Society

In the late 1990's, bee taxonomists started to notice a decline in the abundance and distribution of several bumble bee species. Three of these species (Western Bumble Bee, Rusty-patched Bumble Bee, and Yellow-banded Bumble Bee) were once very common and important crop pollinators over their ranges. Franklin's Bumble Bee was historically found only in a small area in southern Oregon and northern California, and it may now be extinct.

The dramatic decline in wild populations of these species occurred about the time that a disease outbreak was reported in populations of commercially raised Western Bumble Bees, which were distributed for greenhouse pollination in western North America. The timing of this suggests that an escaped exotic disease organism may be the cause of this widespread loss.

To better understand what has happened, the Xerces Society is working with many scientists and other individuals throughout the U.S. and Canada to document the former and current ranges of these species. This detailed information on past and present distribution and current search efforts will help determine the best methods for protecting those remaining populations. If you have any information on the distribution of any of these four species of bumble bees, please contact us.

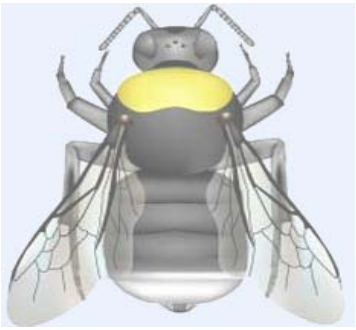
Rusty-patched Bumble Bee
Bombus affinis



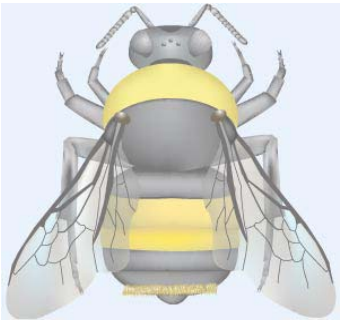
Franklin's Bumble Bee
Bombus franklini

THREATS

There are a number of threats facing bumble bees, any of which may be leading to the decline of these species. The major threats to bumble bees include: spread of pests and diseases by the commercial bumble bee industry, other pests and diseases, habitat destruction or alteration, pesticides, invasive species, natural pest or predator population cycles, and climate change.



Western Bumble Bee
Bombus occidentalis



Yellow-banded Bumble Bee
Bombus terricola

Commercial bumble bee rearing may be the greatest threat to *B. affinis, B. occidentalis, B. terricola,* and *B. franklini*. In North America, two bumble bee species have been commercially reared for pollination of greenhouse tomatoes and other crops: *B. occidentalis* and *B. impatiens*. Between 1992 and 1994, queens of *B. occidentalis* and *B. impatiens* were shipped to European rearing facilities, where colonies were produced then shipped back to the U.S. for commercial pollination. Bumble bee expert Robbin Thorp has hypothesized that these bumble bee colonies acquired a disease (probably a virulent strain of the microsporidian *Nosema bombi*) from a European bee that was in the same rearing facility, the Buff-tailed Bumble Bee (*Bombus terrestris*). The North American bumble bees would have had no prior resistance to this pathogen. Dr. Thorp hypothesizes that the disease then spread to wild populations of *B. occidentalis* and *B. franklini* in the West (from exposure to infected populations of commercially reared *B. occidentalis*), and *B. affinis* and *B. terricola* in the East (from exposure to commercially reared *B. impatiens*). In the late 1990's, biologists began to notice that *B. affinis, B. occidentalis, B. terricola,* and *B. franklini* were severely declining.

Where these bees were once very common, they were nearly impossible to find. *B. impatiens* has not shown a dramatic decline; Robbin Thorp hypothesizes that *B. impatiens* may serve as a carrier of an exotic strain of *Nosema bombi*, although it may not be as severly affected by the disease as *B. affinis, B. occidentalis, B. terricola,* and *B. franklini*. *B. affinis, B. occidentalis, B. terricola,* and *B. franklini* are closely related to each other (they all belong to the subgenus *Bombus sensu stricto*). *B. impatiens* is not as closely related, which may explain the difference in sensitivity to a pathogen. This hypothesis is still in need of validation, although the timing, speed, and severity of the population crashes strongly supports the idea that an introduced disease caused the decline of bees.

The rearing company Koppert recently applied for a permit to transport the eastern species *Bombus impatiens* to California for crop pollination. The Xerces Society worked with bumble bee researchers to prepare comments to the USDA/APHIS discouraging the movement of these bees into new areas. Read about our comments on the introduction of nonnative *Bombus impatiens* to California.

Besides the threat posed by the commercial bumble bee industry, there are many other threats to wild bumble bee populations. Bumble bees are threatened by many kinds of habitat alterations which may destroy, alter, fragment, degrade or reduce their food supply (flowers that produce the nectar and pollen they require), nest sites (e.g. abandoned rodent burrows and bird nests), and hibernation sites for over-wintering queens. Major threats that alter landscapes and habitat required by bumble bees include agricultural and urban development. Livestock grazing also may pose a threat to bumble bees, as animals remove flowering food sources, alter the vegetation community, and likely disturb nest sites. As bumble bee habitats become increasingly fragmented, the size of each population diminishes and inbreeding becomes more prevalent. Inbred populations of bumble bees show decreased genetic diversity and increased risk of decline.

Insecticide applications on farms pose direct threats to foraging bumble bees. Insecticide application on Forest Service managed public lands for spruce budworm has been shown to cause massive kills of bumble bees and reduce pollination of nearby commercial blueberries in New Brunswick. Broad-spectrum herbicides used to control weeds can indirectly harm bumble bees by removing the flowers that would otherwise provide the bees with pollen and nectar.

Bumble bees are threatened by invasive plants and insects. The invasion and dominance of native grasslands by exotic plants may threaten bumble bees by directly competing with the native nectar and pollen plants that they rely upon. In the absence of fire, native conifers encroach upon many meadows, which removes habitat available to bumble bees. The small hive beetle (*Aethina tumida*) is an invasive parasite of the honeybee, yet it also infests bumble bee colonies. Its actual impact on bumble bee colonies could be severe, although it has not been well studied.

Global climate change also poses a real threat to bumble bees; anecdotal evidence has suggested that some of the bumble bee species adapted to cool temperatures are in decline, whereas warmer adapted species are expanding their ranges. Baseline data and long term monitoring are needed to better understand the true impact of climate change on bumble bees.

BIOLOGY

All bumble bees belong to the genus *Bombus* within the family Apidae. The family Apidae includes the well-known honey bees and bumble bees, as well as carpenter bees, cuckoo bees, digger bees, stingless bees, and orchid bees. *B. affinis*, *B. terricola*, *B. occidentalis*, and *B. franklini* all belong to the same sub-genus of *Bombus*, *Bombus sensu stricto*.

Bumble bees are important pollinators of wild flowering plants and crops. As generalist foragers, they do not depend on any one flower type. However, some plants do rely on bumble bees to achieve pollination. Loss of bumble bees can have far ranging ecological impacts due to their role as pollinators. In Britain and the Netherlands, where multiple bumble bee and other bee species have gone extinct, there is evidence of decline in the abundances of insect pollinated plants.

Bumble bees are also excellent pollinators of many crops. Bumble bees are able to fly in cooler temperatures and lower light levels than many other bees, and they perform a behavior called “buzz pollination,” in which the bee grabs the pollen producing structure of the flower in her jaws and vibrates her wing musculature causing vibrations that dislodge pollen that would have otherwise remained trapped in the flower’s anthers. Some plants, including tomatoes, peppers, and cranberries, require buzz pollination.

WHAT YOU CAN DO TO HELP

Contact The Xerces Society at www.xerces.org with any information on current or recent sightings of *Bombus affinis*, *Bombus terricola*, *Bombus occidentalis*, or *Bombus franklini*, so that we can piece together the current distribution of these bees. If you do research on bumble bees, have incidental bumble bees in your collection, or have student insect collections from the past few years, it would help us to know if you have or have not seen these bees. It is as important for us to document where these bees were formerly common, but not recently collected, as it is to document where they were collected.

NEWBEE NUGGETS

HOW BEES WORK (Part 4 of a 4-part series)

Honey Production

Honey starts out as nectar that bees collect from flowers. Basically, nectar is a reward that plants produce to attract pollinating insects and birds. It's a sugary fluid includes the aromatic oils that give flowers their scent, as well as other trace substances. Bees collect this nectar by drawing it through their proboscis and storing it in their honey stomach. Honeybees then carry it back to their hive in tiny, 40-milligram loads.

The foraging bees regurgitate the nectar and pass it to worker bees in the hive. These bees then gradually transform the nectar into honey by evaporating most of the water from it. Nectar is as much as 70 percent water, while honey is only about 20 percent water. Bees get rid of the extra water by swallowing and regurgitating the nectar over and over. They also fan their wings over the filled cells of the honeycomb. This process retains lots of sugar and the plant's aromatic oils while adding enzymes from the bees' mouths.

The finished honey is thick, sticky and very sweet. It contains several types of sugar, including sucrose, laevulose and dextrose. Its flavor and color depend on the flowers from which the bees harvested their nectar. Orange blossom honey, for example, tastes and smells faintly of oranges.

Bees use the honey for food and store enough to survive the winter. At first glance, bees don't appear to be very active or need much food during the winter. They leave their hives only to relieve themselves, since they do not defecate in their living space. But while inside the hive, the bees are doing a lot of work. They take care of the queen and heat the hive by trembling their wing muscles, much like humans' bodies try to warm themselves through shivering.

Image courtesy hotblack/Morguefile
Honey and honeycomb

They control the temperature of the hive in summer as well, by circulating air through the hive with their wings and by sprinkling the honeycomb with water.

Honey is a good source of food for bees for two reasons. First, its high sugar content provides the bees with lots of calories, which they burn warming the nest and caring for the queen. Second, its physical properties make it extremely resistant to bacteria:

These honeys come from flowering plants that grow in the southeastern United States. The variations in color come from the different types of nectar the bees harvested to make the honey.

- One of the enzymes that goes into honey during nectar processing is glucose oxidase. When bees dilute honey to feed it to their young, glucose oxidase breaks glucose down into hydrogen peroxide, which helps to kill germs.
- The pH of honey is between 3.5 and 4. In other words, it's quite acidic - about as acidic as orange juice - which discourages the growth of bacteria.
- Honey is hygroscopic**,** meaning that it can draw moisture from its surroundings, and it has a high osmotic pressure. Bacteria that come into contact with honey undergo plasmolysis: they lose their moisture content to the surrounding honey and die.

Honey's high sugar content, flavor and antimicrobial properties make it useful to people as well. Today, it's used in home and commercial cooking, and medical research suggests that it may be effective at treating antibiotic-resistant organisms, particularly in open wounds. Neither of these is a new phenomenon -- people have been harvesting and using honey for more than 6,000 years. Historically, people have used it to sweeten food and make fermented beverages like mead. In addition, covering a wound with honey or honey-soaked bandages was a common practice before the development of antibiotics.

Honey and Botulism

Honey is generally very good at killing bacteria, but there is one notable exception -- spore-forming bacteria, like *Clostridium botulinum*, which causes botulism. *C. botulinum* can form protective spores that insulate it from honey's antibacterial properties. Since it can live in soil and sediment in nature, it's relatively easy for a few spores to hitchhike its way into honey on the bodies of bees. The amount of botulism spores in honey is generally not dangerous to adults, but it could be deadly to infants under one year of age. For this reason, it's never a good idea to give an infant honey.

Apitherapy

The use of bee products -- including honey, gathered pollen, royal jelly and beeswax -- to treat or illnesses or injuries is known as

apitherapy. Apitherapists advocate everything from the use of bee stings to combat arthritis pain to the use of honey to treat cuts and scrapes. Medical science has not confirmed many of the healing abilities attributed to these substances. However, honey does have clear, medically documented antibacterial properties.

Beekeeping

Over hundreds of years, people have developed many types of manmade hives that provide shelter and living space for bees while making it easier to harvest honey. The most commonly-used model today is the Langstroth hive, developed by Lorenzo Lorraine Langstroth in the 1850s. Prior to Langstroth's inventions, people primarily kept bees in basket-, box- or log-like hives. Some of these had removable top bars from which the bees suspended their combs. Others had no convenient way for accessing or removing honey. Top-bar hives are still in use in some parts of the world, and Mayan beekeepers raising stingless bees still use log-like hives.

Image courtesy Herman Hooyschuur/ Stock.xchng
Bee boles, or stone alcoves made to hold traditional beehives called skeps, in Wales

Langstroth discovered that it was possible for people to influence how bees built their combs by adjusting the amount of space between building surfaces. This area, known as bee space, allows bees to move around, care for young, build new honey combs and produce honey. According to Langstroth's theories, the ideal amount of space between honeycomb layers is between ¼ inch and 5/16 inch (64-79 millimeters).

Image courtesy Morguefile
Langstroth bee hives

The Langstroth hive uses a multi-layered structure and removable frames to encourage bees to build their hives in an orderly fashion and to make it easier for beekeepers to harvest honey. From the bottom up, the layers are:

- The bottom board on which the rest of the hive rests
- The hive body, made from a box called a super, where the queen lays her eggs and the workers raise the brood
- The queen excluder, a mesh that the queen cannot fit through, which keeps the queen from laying eggs in the honey cells
- Shallow supers, which are about half the depth of the hive body, in which the bees store their honey
- Top covers

Beekeepers usually use shallow supers rather than full-sized supers for honey storage because honey is relatively heavy. A shallow super weighs about 35 pounds (15.9 kilograms) when full, and a deeper super weighs closer to 80 pounds (36.3 kilograms). This makes it easier for the beekeeper to remove and replace the supers. Bees will continue to make and store honey as long as they have enough storage space, so removing filled combs and replacing

them with empty ones is important to beekeeping. It's also important to make sure the bees have enough food for the winter -- for this reason, many bee keepers perform their last honey harvest in the late summer so that the bees can collect nectar and turn it into honey in the fall.

To harvest honey, beekeepers can remove the framed combs from the shallow supers and spin them in a centrifuge, or honey extractor. This removes the honey from the comb while leaving the structure intact. Since it takes about 20 pounds (9 kilograms) of honey to make a pound (.45 kilograms) of beeswax for the hive, reusing combs generally makes it possible for beekeepers to harvest more honey.

This setup makes it relatively easy for a beekeeper to harvest honey without damaging the hive or hurting any of the bees. The beekeeper does have to be careful, though. Many beekeepers use a veil and gloves to protect their faces and hands from stings while working with their hives. Beekeepers also move very slowly when opening the hive and removing and replacing the frames. This is important since bees release an alarm pheromone when they are crushed or use their stingers.

Image courtesy Morguefile
Beekeepers harvesting honey

This pheromone encourages their sisters in the hive to sting anything nearby. Beekeepers can mask this pheromone with smoke from a bee smoker, which is essentially a set of bellows attached to a fireproof can with a nozzle at the top. The smoke also encourages the bees to stop working and start eating honey in case they have to abandon their hive due to fire. This makes it less likely that the bees will become agitated or defensive as the beekeeper works at the hive.

One colony of bees can include thousands of workers. To make lots of honey, these bees need very large food sources, such as orchards, large vegetable farms or other areas of dense, flowering foliage. But beekeepers, particularly those who have very large-scale operations, do not always live close enough to the right food sources to support all of the bees. Some supplement their bees' natural foods with manmade nectars and purchased pollen. Others rent their bees to farmers, who use them for crop pollination. Without the rented bees, the crops' productivity would be severely compromised.

RECIPE OF THE MONTH

EASY HONEY MUFFINS

-- Makes 12 muffins --

Ingredients

- 1/2 cup milk
- 1/4 cup honey
- 1 egg, beaten
- 2-1/2 cups buttermilk baking mix

Combine milk, honey and egg; mix well. Add baking mix and stir only until moistened. Portion into a greased muffin tin. Bake at 400°F for 18 to 20 minutes or until a wooden toothpick inserted near the center of a muffin comes out clean.

Variation: Cinnamon Apple Muffins: Add 2 cups pared, chopped apples and 1 teaspoon ground cinnamon to the basic recipe. Bake about 5 minutes longer than the basic recipe.

CLASSIFIEDS

Major Branzel has nucs for sale. He can be reached at 707-643-9433.

Judy Casale (510-881-4939) has a four-frame electric extractor and stand she's selling for $250.

Your Editor would like to purchase new or used small and medium supers (frames optional). He can be reached at ersten3@yahoo.com, 510-464-6489 (weekdays), 925-687-7350 (evenings).

MISCELLANEOUS

Lois Kail has kindly offered her renowned seamstress services to repair members' bee suits. Lois will donate the money she collects to the club. The only thing Lois asks is that before giving her your suits for repair, please wash them (wow, shouldn't that be obvious to us all?!). Contact her at 925 356-2602, or lkail@juno.com.

Steve Gentry (925-254-8063) is looking for help to sell his bee products (honey, creams, lotions, candles, etc) at several farmers markets.

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