



# What's the Buzz?

KEEPING BEES IN FLIGHT

**MERRIE-ELLEN WILCOX**





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ORCA BOOK PUBLISHERS

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*A honey bee returning to her hive, laden with pollen.*

ADRIANAM13/DREAMSTIME.COM

*For Christopher, who brought bees into our life, and for Akai,  
whose curiosity about them was the reason for this book.*



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# Introduction



*This is me beside one of the beehives in my garden.* CHRISTOPHER BUTTERFIELD

**E**arly one summer morning a few years ago, I loaded my first beehive into the back of my car near where I live in Victoria, British Columbia. John, the beekeeper who sold it to me, had plugged the entrance, but a few bees that had already left the hive were now coming back with pollen and nectar and trying to get into their home. I got the giggles as I drove home with a car full of honey bees—several thousand of them safely inside the hive, but quite a few that were flying around in the car!

John and I carried the hive to a sunny spot in the garden and opened up the entrance. He gave me an old beekeeper's veil to protect my head, leather gloves for my hands, and a hive tool to use for moving things around in the hive. Then he took off the lid and gave me my first lesson in beekeeping. After that, I was on my own.

Many mistakes and only a few stings later, I now have six hives. And I have learned so much—not just about honey bees, but also about all the wild bees that live with us and how much we depend on them. I've also learned how human activities have harmed them, and how badly they now need our help to survive.

This book will take you into the busy world of bees. You don't need a veil or gloves to be amazed—just come with me!



Connor and Andrew are learning about beekeeping at their school in Portland, Oregon. NADINE FIEDLER/CATLIN GABEL SCHOOL

## All Abuzz

*When I was growing up in Ontario, we always had clover honey in early summer. It was pale and clear, with a mild flavor, and sometimes we got it right in the wax honeycomb, to chew like candy. In the fall, we had buckwheat honey, almost black and very strong tasting, and especially good on pumpkin pie at Thanksgiving! Later, when I started traveling, I noticed that honey from different places looked and tasted different. That's because the color and taste of the honey depend on the flowers that the bees have visited, and every place has different kinds of plants.*



*These jars of honey taste as different as they look. FOREWER/SHUTTERSTOCK.COM*



## CHAPTER ONE

# A World of Bees

## BEES, BEES AND MORE BEES

Lots of people think that anything that buzzes and has black and yellow stripes is a bee, and that all bees sting. Many stinging insects with stripes aren't bees at all—they are wasps. And many bees don't have stripes and don't sting!

There are about 20,000 known species of bees in the world. That's more than all of the species of birds and mammals combined.

Bees live on every continent except Antarctica. Every place has particular kinds of bees that live there. These are called “native” bees. Some species live in a very large area, or range, while others are found only in one small area, like an island.

About 4,000 species of bees are native to North America. On Vancouver Island, where I live, there are about 100 species of native bees. You might be amazed at how many bee species live in your area.

Bees are incredibly diverse. Some are so small—about two millimeters long—that you can't really see them without a magnifying glass. And the world's biggest bee, called Wallace's giant bee, is 39 millimeters (1.5 inches) long and has a wingspan of almost twice that, at 63 millimeters (2.5 inches)!



*A girl examines a bee through a magnifying glass.* BLICKWINKEL/ALAMY



Bees come in many shapes and sizes. The leafcutter bee in the center has cut and rolled up a leaf to use in her nest.

ROB CRUICKSHANK; ROB CRUICKSHANK; CHRISTOPHER BUTTERFIELD

Bees range in color from black to red to metallic green or blue. Some have stripes, and some seem to change color as they move and catch the light, like a jewel.

## BEES ARE NOT WASPS!

Bees evolved from wasps about 100 million years ago, around the time that flowering plants were becoming the most common type of vegetation on Earth. Wasps are hunters and *carnivores*: they kill other insects, including bees, and feed them to their young. (Have you noticed that they will also eat some of your hamburger or fish at a barbecue or picnic?) Bees are vegetarians: they rely on pollen and *nectar* from flowering plants to feed themselves and their young.

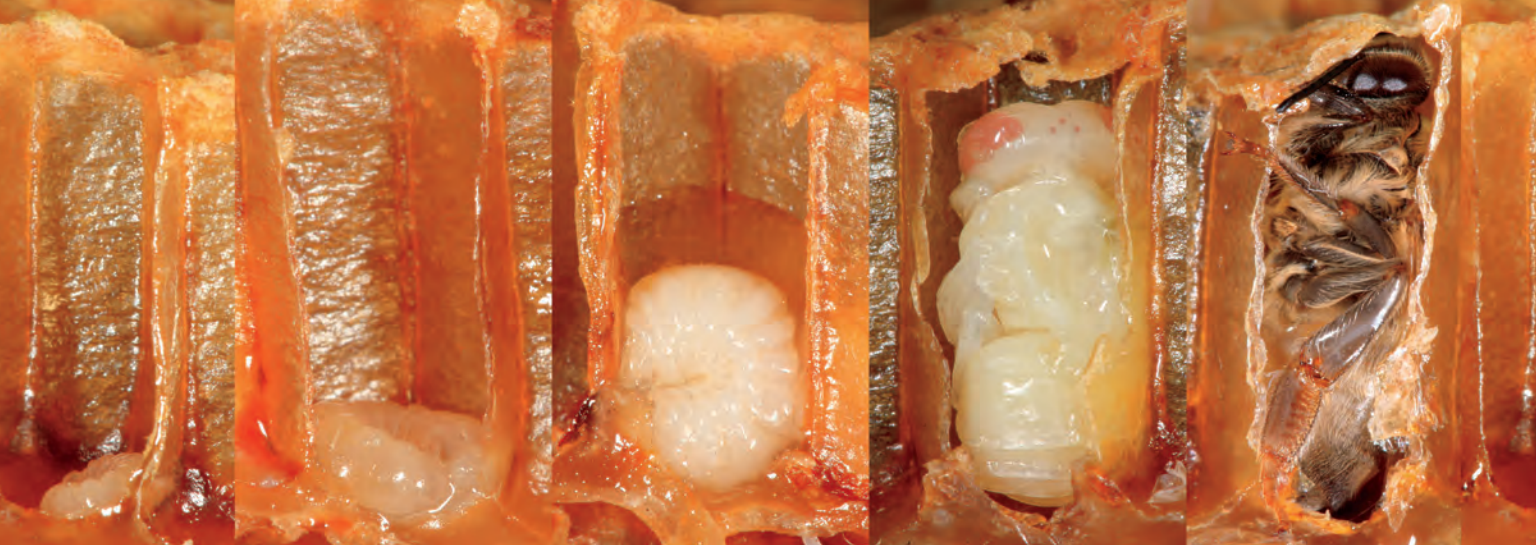
Because of this basic difference in what they do, bees and wasps have some different body parts. For example, bees have hairs that help them gather and carry pollen, so they often look quite furry. Wasps are usually smoother. Many female bees also have a special structure for carrying pollen—either a patch of long, stiff hairs (called a *scopa*) or a pollen basket (a *corbicula*) on their back legs. And bees have long tongues for gathering nectar from flowers.

**BEE FACT:** A few bumble bee species live in the Arctic regions of North America, Europe and Asia, where not many other bees can live. In the Arctic summer it is light twenty-four hours a day, so the bees work around the clock to make up for the short summer and very long winter.



A wasp kills a honey bee. It will carry the bee back to its nest to feed to its young.

KUTSUKS/ISTOCK.COM



A honey bee grows from a tiny egg to larva to pupa to full-grown bee in 21 days. ERIC TOURNERET

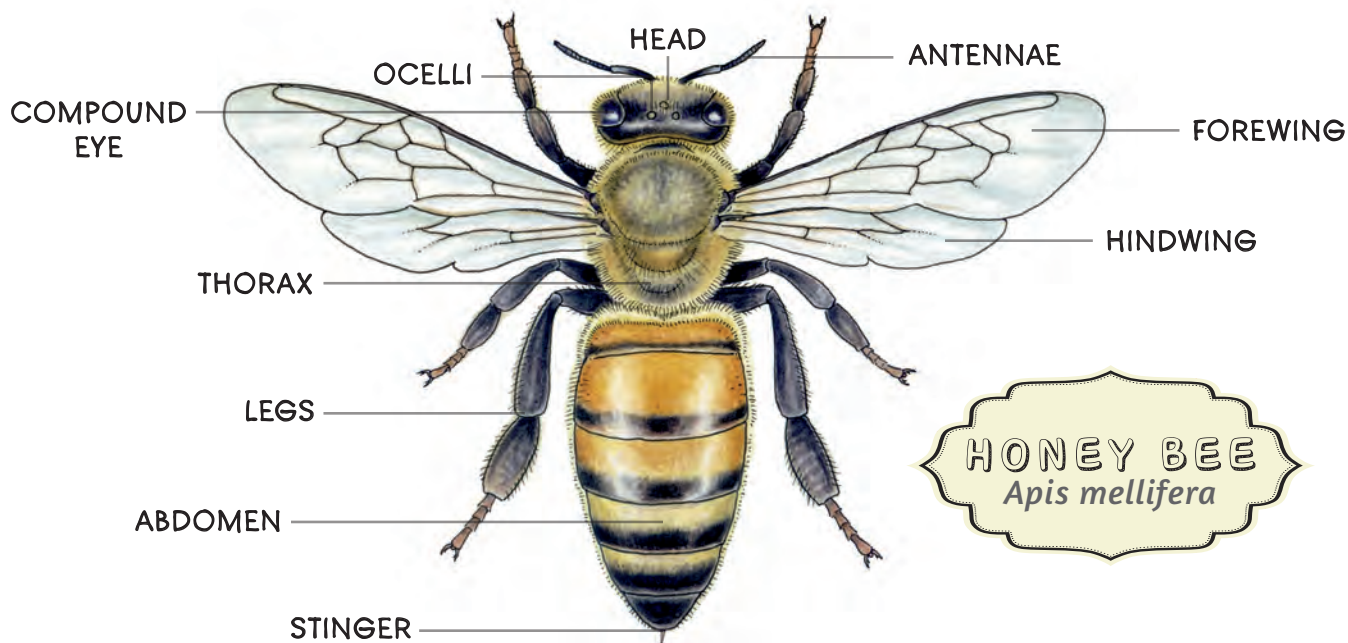
Another important physical difference between bees and wasps is their waists. Bees have a thicker waist than wasps, whose waist can be as thin as a needle. This is an easy way to tell them apart. It's good to know the difference between bees and wasps, especially for people who might be allergic to one or the other.

**BEE FACT:** Are you afraid of bees and wasps? Many people are. But it's important to remember that bees and wasps sting only when they are defending themselves or their nests. And honey bees die after they sting, so they don't sting unless they have to. Few people are allergic to bee or wasp stings—less than 1 percent of children and 3 percent of adults—and it's very unusual to be allergic to both. For most people, a sting only hurts for a few minutes and might be a bit itchy later.

## A BUG'S LIFE

Like all insects, a bee has a head, a *thorax* and an *abdomen*. On its head are five eyes—two big *compound eyes*, each consisting of many separate lenses, and three simple eyes, called *ocelli*—and two very sensitive *antennae*, as well as that long tongue for gathering nectar and strong jaws for chewing. Its six legs and two pairs of wings are attached to its thorax, the middle section. The abdomen is where things like the special glands for making wax are, and, in stinging bees, the stinger.

Bees also have the same life cycle as other insects, called *metamorphosis*. They start as an egg. A *larva* hatches from the egg. It looks like a grub and feeds on food in the nest. The larva then spins a *cocoon* around itself and becomes a *pupa*. Inside the cocoon, the pupa gradually develops all the body parts of a bee. What emerges from the cocoon is an adult bee.



*Bees usually don't stay still long enough to be examined. Here you can see the important parts of a worker honey bee.*

NOEL BADGES PUGH FROM *FIELD GUIDE TO THE BEES OF CALIFORNIA*, BY GRETCHEN LEBUHN (UNIVERSITY OF CALIFORNIA PRESS)

## SOCIAL OR SOLITARY?

Some bees live in groups or colonies. A colony might consist of as few as two adult females or, in the case of honey bees, as many as 60,000 bees living together and sharing the work of preparing the nest and providing food for the young. *Entomologists* (people who study insects) call these bees “social bees.”

But by far the majority of bees—about 90 percent of the native bees in North America—are solitary bees. Each female bee makes a nest and provides a store of food for her eggs without any help from others. Some solitary bees build their nests in groups, but each nest still contains only one female and her offspring, which might number just a few for some species to a few dozen for others.

## HOME SWEET HOME

Both solitary and social bees also live in different kinds of homes.

For example, mining bees make their nests in holes that they dig in the ground. Some dig in sandy soils, others in clay;



*A solitary native bee peers out of her home.*

ROB CRUICKSHANK



**BEE FACT:** Some bees are called cuckoo bees. Like cuckoo birds, they lay their eggs in other bees' nests, so they don't have to do all the work of building a nest and feeding their young. There are almost 450 species of cuckoo bees in North America.

some in light, powdery soil and others in hard, compacted soil. Still others dig their nests in steep banks or cliff faces, rather than on flat ground. To protect her nest from moisture, the bee lines it with a waterproof substance produced by the Dufour's gland in her abdomen. The nests usually have a main tunnel and several side branches, with a single egg laid at the end of each branch.

Other bees make their homes in spaces or tunnels that either were made by others, like beetles, or occur naturally, like plant stems and hollow trees. Leafcutter bees line their nests with pieces of leaves that they cut and then glue together to form a cylinder or sphere. Mason bees use mud, small pebbles and sand, resin or chewed-up leaves to line and seal their nests. Some mason bees nest only in empty snail shells! Carder bees gather fluff from certain plants and animals, chewing it to make a kind of felt to line their nests. Carpenter bees dig holes in wood and plant stems, using bits of the plant for lining and sealing the nests.

## MAPPING THE WORLD

Bees have very small brains. For example, a honey bee's brain is about the size of a sesame seed and contains about one million *neurons*—compared to the 100 billion neurons in a human brain. But they sure are smart! All bees have to leave the nest at some point to find flowers that will provide them with nectar and pollen. Some bees only travel a short distance from the nest, but some, like honey bees, can travel several kilometers (or miles). So how do they find their way back?

First, bees memorize important landmarks (a particular plant or a twig) near the nest. The bee does this by flying in a figure-eight pattern in front of the nest entrance. Gradually, the bee flies in a bigger pattern, going farther from the nest and higher, memorizing larger landmarks. Every afternoon in



*When bees go out searching for food, they have to remember how to get back to their nest—as many as several kilometers away.*

ANATOLICH/SHUTTERSTOCK.COM

spring and summer, you can see honey bees doing this in front of every healthy hive. *Beekeepers* call it the *orientation flight*.

Next, the bee uses the position of the sun in relation to the nest entrance. Even when the sun is hidden by clouds and its position changes in the sky over the course of the day and the seasons, bees are able to use it as a compass. Don't you wish you could do that?

## ANYTHING BUT BUMBLING

When you think of a bee, what kind of bee do you picture? Many people think of bumble bees, the fat, furry, colorful bees that you've probably seen buzzing from flower to flower in spring and summer.

There are only about 250 species of bumble bees around the world, and only forty-six in North America. But native bumble bees are found from deserts and tropical forests to Arctic tundra, in urban areas and at the tops of high mountains.



*If a bumble bee doesn't eat pollen or nectar for more than 40 minutes, she will run out of energy to fly.* ATAREL/DREAMSTIME.COM



## All Abuzz

*After I got my first hive of honey bees, I began to be much more aware of bees, not just in my garden but everywhere. I was amazed at how many different kinds there are! I especially love the little bumble bees with the orange bums. Now I keep a small pile of brush in a back corner of the garden, and leave some soil bare rather than covering it in mulch, to provide nesting sites for native bees. I also have two bumble bee boxes, although no bees have used them yet.*



*Every spring I watch to see if anyone has taken up residence in this luxury bumble bee house.* CHRISTOPHER BUTTERFIELD

**BEE FACT:** The oldest known fossilized bee was found in the 1980s in a piece of amber (hardened tree resin) from New Jersey. It is a stingless bee, very similar to a modern stingless bee, but it is more than 83 million years old! This means that there were bees in the last 23 million years of the dinosaurs.

Bumble bees are social bees. Queens, female workers and males have different jobs in the colony, cooperating with each other to *forage* for food, look after the young and protect the nest.

Bumble bee colonies die at the end of the summer, with the exception of mated females, called *queens*, who hibernate for the winter. In spring, they emerge from *hibernation* and begin to search for a nest. Bumble bees do not make their own nests, but look for abandoned mouse dens, hollow logs, tall grass and even holes in people's houses and other buildings.

When the queen has found a nest, she uses her jaws and legs to shape wax produced by glands in her abdomen into a honeypot for storing nectar. Then she lays her eggs on a ball of pollen moistened with nectar. When the eggs hatch, the larvae feed on the pollen, and the queen has to work hard to take care of them, somehow keeping them warm and finding more food at the same time. After two weeks, the larvae spin silk cocoons and become pupae. Another two weeks later, adult bees emerge and begin to forage for food. Then the queen can stay in the nest and take care of the next bunch of youngsters.

Later in the summer, the queen starts laying special eggs that will become either new queens or males that will mate with them. At the end of the summer, all but the newly mated females die, and the cycle begins again.

## SWEET BEES

The honey that we humans love to eat is made by honey bees. There are only eleven honey bee species in the world. None are native to North or South America. The species that is used most for producing honey came from Europe and North Africa, and has been taken to many other parts of the world by humans with a sweet tooth.



Akai scrapes the wax cappings before we extract the honey. CHRISTOPHER BUTTERFIELD

Sugar as we know it, made from sugar cane, didn't reach Europe until about 700 years ago. Until then, honey was the only sweetener available. People often kept a hive in their garden so that they would have their own supply of honey. When the Europeans began to settle in North America, they brought honey bee hives with them on ships. Most people believe that honey was introduced to North America by settlers in about 1638. But others think that Irish or Viking travelers brought bees with them as early as AD 800 or 900.

Did you know that other bees make honey too? About 300 species of bees called stingless bees make and store honey in wax, not unlike honey bees. They are found in the tropics, especially in Central and South America. The indigenous peoples of Central America keep Mayan stingless bees in traditional hives made from hollow logs or clay. When Christopher Columbus landed in Cuba, he was presented with gifts of honey—from stingless bees.

We'll find out more about honey bees in Chapter 3.



*A Mexican woman opens the end of a hollow log to get honey from a hive of stingless bees.* ERIC TOURNERET



## All Abuzz

*When we got our first honey bee hive, John wanted to show me what a sting feels like. I was scared. But when he put a bee on my hand and forced her to sting me, it barely hurt at all. John showed me how to scrape the stinger off my skin, rather than pulling it out and squeezing more venom in. I still wear a veil and gloves to work with my hives though!*



*A honey bee's stinger has a sac of venom attached. Scrape the stinger off with your fingernail, rather than pulling it out.*

LADISLAV VOZELJ/DREAMSTIME.COM