The Beekeepers

The Beekeepers

How Humans Changed the World of Bumble Bees

Dana L. Church

SCHOLASTIC
FOCUS
NEW YORK, NY

Library of Congress Cataloging-in-Publication Data

Names: Church, Dana L., author.
Title: The beekeepers : how humans changed the world of bumble bees / Dana L. Church, PhD.
Description: First edition. | New York, NY : Scholastic Focus, 2021. | Includes bibliographical references and index. | Audience: Ages 8–12. | Identifiers: LCCN 2019054410 (print) | LCCN 2019054411 (ebook) | ISBN 9781338565546 (hardback) | ISBN 9781338565553 (paperback) | ISBN 9781338565560 (ebk)
Subjects: LCSH: Bumblebees—Juvenile literature. | Bumblebees—Effect of human beings on—Juvenile literature. | Pollination by bees—Juvenile literature. | Bee culture—Juvenile literature.
Classification: LCC QL568.A6 C48 2021 (print) | LCC QL568.A6 (ebook) | DDC 595.79/9—dc23
10 9 8 7 6 5 4 3 2 1 21 22 23 24 25

Printed in the U.S.A. 23
First edition, March 2021

Book design by Emily Muschinske

For my family

Table of Contents

The Bee Song

The following story and Traditional Knowledge were shared by Dr. Henry Lickers, an Elder of the Seneca Nation, Turtle Clan, Haudenosaunee (also known as the Iroquois).

The Haudenosaunee were the first agricultural peoples to live in what is now northeast Canada and the United States. They continue their agricultural practices today.

"I grew up on the Six Nation Reserve near Brantford, Ontario, Canada. I remember there was an old barn that they used to store hay bales in, for bedding for the cattle. One day I was in the barn and I saw a bumble bee fly out of one of the bales of hay. Then another, then another. Then I saw one fly back in. I watched them for a while as they flew in and out.

"I didn't know anything about bumble bees, but I was curious, so I grabbed a stick and approached the bale of hay. I used the stick to pry it apart little by little. Sure enough,

didn't I come to a great group of [what looked like] . . . I want to call them gray, gray to white grapes, in a little bunch. The bees got a little upset, so I put the hay back and went to see my grandmother, who knew about these things.

"I told my grandmother what I saw, and she asked, 'Did you sing the bee song?' And I said, 'Grandma, I don't know the bee song.'

"'I will teach you the bee song,' she said.

"So, my grandmother followed me out to the barn. I noticed that as I approached the spot where I had seen the bumble bees, my grandmother stayed back. 'You go forward,' she instructed. 'And me as an adult will stay back. That is the proper way.'

"My grandmother told me to sit near the bees and wait and listen. I had to listen very carefully to how the wings of the bees were flapping. Sure enough, after a while I could hear it. It was like a humming sound. Some wings were flapping really, really fast, and others were flapping really, really low. Together, a type of harmony was created, or a chorus of notes. And as the bees worked, some were flapping their wings while others weren't. As I listened really carefully, I could hear what the song was. 'Now hum along,' said my grandmother. And as I hummed along, the bumble bees became very calm. 'Every bumble bee nest has its own song,' explained my grandmother. 'You have to listen for it.'

"As I hummed along with the bees, it was as if to them I

wasn't even there. Or, it was as if I was another bee. I started to slowly take the nest apart, being careful not to just rip it apart. You have to take a really slow time to look. 'You'll see these things that are about the size of a big pea,' my grandmother said. 'When you see those, don't reach in and grab them all. You grab just one. The bees might start flying around a little bit more, but you keep the humming going. The bees are a peaceful tribe. The bee makes that honey for her own kids, and makes it for *any* kids. But unless you treat it with respect and hum to them, they won't give it up easily.'

"'You put that little pill in your mouth,' my grandmother continued, 'hold it, and put the nest back together again. Then you can back away, squash the pill in your mouth, and eat the whole thing.'

"As I backed away from the nest, I squashed the 'pill' in my mouth with my tongue. It felt like . . . I want to say it's like a gelatin coat. You know, how Jell-O goes when it gets hard? It's like that. And of course, when I squashed it, the honey came out. But my grandmother never called it honey, though. She called it something else, like a honeydew, or a dew type of thing. She said that it's sweet, like maple sap, but not overly sweet like honey bee honey. And as I tasted it, I realized she was right.

"After that day I found a number of bumble bee nests. They really interested me. There would have been about

three or four acres of bush and trees, and I usually found them around the edge, where you had thick grass. I found them in there. And there was usually some type of structure with it, like a rock. So, they would be beside the rock but in the grass, and you could see how they were sort of pulling the grass down to it. I remember one nest was at the edge of a marsh, in an old muskrat house. But I never told anyone where I found the bee nests. I kept it a secret. And I always left fresh grass very near to the nest for the bumble bees.

"My grandmother told me other things about bumble bees, too. She said that bumble bees were one of the few animals that when they started out, they had no fur, no clothes on them. And so, they got cold. The Creator said, 'Well, we can't have that.' But the bumble bees didn't want just one set of clothes! They asked the Creator for many different sets. So, when you see a bumble bee going into the ground, she's going in actually to change her clothes. She changes her clothes so she can look pretty. And if you watch the bees carefully, like I did, you'll see they groom themselves. They groom themselves and when their clothes get too dirty, they just go in and change them! And their nests are porous. Even the underground stuff. And my grandmother said that was so the dew and the mist can get into their nest and clean their clothes for them.

"And so, to us as Native People, the bumble bees were all

one family. All they did was change their clothes every once in a while, to confuse everybody.

"My people were farmers, so we needed pollinators. Bumble bees are very important to us. Sometimes bumble bees are confused with honey bees, but honey bees are not *native* to North America. That means they are not naturally from there. They were introduced by Europeans. Bumble bees are native, though, and they are very important for the Three Sisters. There was a tall sister, who was very tall. She was the corn. There was another sister who was not so tall, but she was clingy. That's the beans. And then there was a short, fat sister. Of course, that's the squash. Corn, beans, and squash. They were planted together and so they grow together as the Three Sisters.

"Our fields were vast: two, three, four, five hundred acres of land. And the tradition goes that you plant the Three Sisters in circles with a common center that will all ripen at different times. Each circle is farther from the village. And the last circle is the circle that you leave for the animals. So, the deer and the raccoons and all those will come and eat of that last circle around your field.

"So, anything that helps you get a better crop were considered your helpers. Bumble bees were like, wow, they were good people!"

CHAPTER ONE

New Bees on the Block

Millions of years ago, before the first humans appeared on the planet, bumble bees buzzed from flower to flower. The earliest bumble bee fossil records we have date back to what we call the Oligocene era (34 million to 23 million years ago), millions of years after the dinosaurs roamed the Earth (see Figure 1-1).

FIGURE 1-1. A fossil of *Bombus cerdanyensis*, approximately 23 million to 5 million years old, found in Spain.

We haven't actually found a whole lot of bumble bee fossils. But evidence from the few that we have,

combined with clues from bumble bees that exist today, led scientists to believe that bumble bees probably originally came from somewhere in Asia. They then traveled west through Europe and North America, and finally headed south to South America (see Figure 1-2).

FIGURE 1-2. A world map showing how we think populations of bumble bees spread out through history. MYA stands for millions of years ago. Times are estimates.

Today, bumble bees still live on those same continents. Thanks to their big size and fur-covered bodies, they are well adapted to cooler climates. So, they are naturally found in mild, mountainous, and arctic zones. However, a few species can also be found in more tropical areas in Southeast Asia and Central and South America. Figure 1-3 shows where you can find naturally occurring species of bumble bees around the world.

Once humans came along—specifically, traveling,

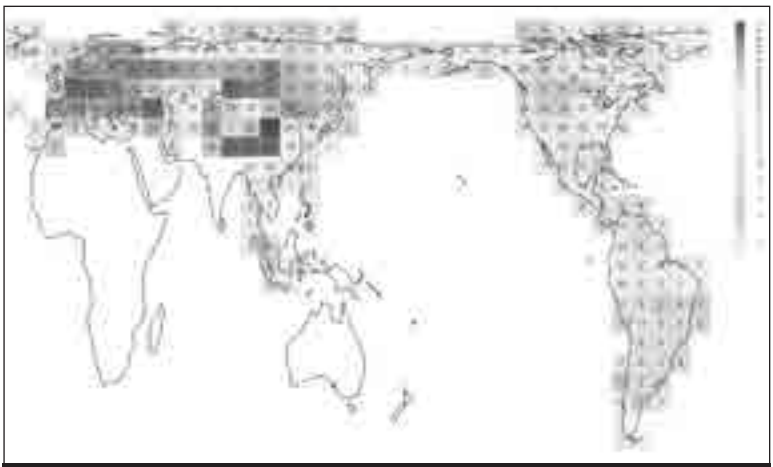

FIGURE 1-3. Where bumble bees are found around the world. Shaded areas are where bumble bees have been found to naturally occur. The number in each cell stands for the number of bumble bee species that have been found in that area. Each grid cell represents an equal area, about 235,908 mi^2. Darker areas have a greater number of bumble bee species, and lighter areas have fewer bumble bee species. One part of China has the most, with seventy-one.

continent-hopping humans—the spread of bumble bees around the world started to look a bit different. Thanks to human influence, there are now species of bumble bees in places where these species have never been before. And probably never would have been, if it wasn't for our helping hands.

BUMBLE BEES IN ICELAND

A hulking Viking ship sliced through the ocean waves. It was a cargo ship, on a long and treacherous journey to a destination we now know as Iceland. The trip would take

months. The ship's storage area was filled to bursting with food and supplies. Tucked deep within one of the many bales of hay, which would eventually be used to feed livestock in the new land, was a tiny, fuzzy, slumbering queen bumble bee.

This bumble bee had fluffy yellow-black-yellow bands down her body, ending in a tuft of white fur on her rear end. Centuries later, this species of bumble bee would be called the heath bumble bee (*Bombus jonellus*).

FIGURE 1-4. The heath bumble bee (*Bombus jonellus*).

How did the queen survive the months-long voyage? Bumble bees need food to eat, which for them means the sugary liquid called nectar that is found in flowers. There were certainly no flowers aboard the Viking ship! Luckily enough for the queen, the ship was traveling at a time of the year when she would normally be in hibernation: the sleeplike state some animals go into during the winter months. So, she just slept the trip away. And little did this queen know, when she woke up, she would be the first of her species to arrive in Iceland.

The earliest Icelandic reference to what were probably

FIGURE 1-5. A map of the world showing where Iceland is located, in black and circled.

bumble bees is dated at about 1640: Writing from that period uses the word *hunangsflugur*, or honeyflies, which is the traditional Icelandic name for bumble bees. Today it is believed that bumble bees arrived in Iceland by "hitchhiking" on Viking ships, just like the queen bumble bee described earlier. However, there is the possibility that someone back in the days of the Vikings intentionally hid that queen bumble bee among the cargo in order to introduce it to the new land. If they did, they kept poor records of their actions, or they made no records at all.

Whether the introduction of bumble bees to Iceland was intentional or not, human actions around the world have impacted where various species of bumble bees are

found. Today there are many more different species of bumble bees in Iceland besides the heath. For instance, there is the tree bumble bee (*Bombus hypnorum*), which, instead of having black-and-yellow fur like many bumble bee species, has a reddish-brown thorax (the bee's middle section behind the head, where the legs and wings are attached), a black abdomen (the last, larger section of the body behind the thorax), and a white tail.

FIGURE 1-6. The tree bumble bee (*Bombus hypnorum*).

FIGURE 1-7. White-tailed bumble bee (*Bombus lucorum*). This bumble bee has large balls of pollen on her back legs.

The white-tailed bumble bee (*Bombus lucorum*) has the more typical black-and-yellow coloring, with a lemon-yellow "collar" near the top of the thorax and another yellow band across the abdomen. Like the heath and tree bumble bees, it, too, has a white rear end, hence its name. Funnily enough, these

FIGURE 1-8. A map of the world showing where the United Kingdom (UK) and New Zealand are located, in black and circled.

and other species of bumble bees in Iceland were often first discovered near shipping ports or airports. Stowaways on human travel, perhaps?

BUMBLE BEES IN NEW ZEALAND

Now let's jump to the late 1800s. A steamship glides across the ocean heading from the United Kingdom to New Zealand. On board is a peculiar type of passenger: bumble bees.

Unlike the case in Iceland where bumble bees were likely furry little stowaways that happened to hide among the cargo, people intentionally imported these bumble bees from their native UK to New Zealand to pollinate a plant called red clover.

At the time, red clover was a hot commodity. People used horses for transportation and working farmland, and these horses needed to eat. Cattle and sheep needed to eat as well. So red clover—which did not naturally grow in New Zealand but is fantastic feed for certain farm animals—was imported from the UK. Folks in New Zealand quickly realized that the red clover was not growing on its own; seeds needed constant planting, and continuously importing red clover seed was expensive. Someone realized what was needed was something to pollinate the red clover. Enter bumble bees.

Bumble bees were excellent candidates to pollinate New Zealand's red clover fields. For one thing, they often buzzed around red clover in the UK. Their furry bodies and their ability to control their internal temperature allowed them to keep warm and forage (collect food) during cloudy, chilly days when other bees or insects would be hiding. Also, red clover is tricky for most pollinators[1] to handle: It requires heavier insects to get at the pollen, and the nectar tubes of the flower are quite long, such that insects with short tongues can't reach the sugary liquid. Clover-loving, furry, warm, heavy, and longer-tongued . . . bumble bees were the winner!

1. A *pollinator* is an animal that moves pollen from one flower to another, allowing the plant to reproduce. Bumble bees are pollinators, along with other bees (such as honey bees), butterflies, moths, beetles, flies, bats, and certain types of birds.

Things weren't so easy at first. A couple of bumble bee nests were dug up (bumble bees often like to make their homes in old, underground rodent nests), and placed on a ship. But by the time the ship made it from the UK to New Zealand (a journey that took at least a month), all the bumble bees were dead.

How could they keep bumble bees alive on a steamship for a month or more? Someone noticed that queen bumble bees hibernate underground during winter. In spring, when the temperature warms, the queens dig themselves out, find a place to make a nest, and start laying eggs. What if the bumble bee queens traveled on the ship when they usually hibernated and were kept cool to fool them into thinking it was winter? That way, when the ship arrived in New Zealand, the queens could be warmed up, they could emerge from hibernation, and they would be ready to start their little families. Plus, just like that first bumble bee traveling to Iceland, the ship's crew didn't have to worry about feeding them during the journey if the bumble bee queens were in hibernation.

So, a reward was offered to anyone who could dig up a plump, hibernating queen bumble bee. The crew collected over two hundred queens! These queens that were shipped to New Zealand were in one of the first ships that was built with a refrigeration unit, so they likely shared the trip with frozen meats and other cargo. Not all of the bumble bee queens survived, but a fair number of them did, and they

were released on New Zealand's South Island. This venture was declared a success, and it was repeated shortly after that with another two hundred or so queen bumble bees. Again, not all of the queens survived, but a number of them did manage to fly off into their new New Zealand turf.

FIGURE 1-9. The ruderal bumble bee (*Bombus ruderatus*).

The folks involved in this bumble bee importation operation forgot to do one important thing, however: write down what kinds of bumble bees and how many they released!

Today we know that four bumble bee species live in New Zealand: the garden bumble bee (*Bombus hortorum*), the buff-tailed bumble bee (*Bombus terrestris*), the short-haired bumble bee (*Bombus subterraneus*), and the ruderal bumble bee (*Bombus ruderatus*).[2] So at least these four species of bumble bee were likely aboard the ships. The buff-tailed and ruderal bumble bees have done particularly well:

2. You might have noticed that some types of bumble bee species look very similar, such as the buff-tailed bumble bee and the white-tailed bumble bee. Sometimes even scientists have a hard time telling them apart! More about this will come in Chapter Two.

They are now found throughout large areas of New Zealand's South Island.

FIGURE 1-10. The buff-tailed bumble bee (*Bombus terrestris*).

BUMBLE BEES IN CHILE

By as recently as the early 1980s, humans were still influencing where bumble bees could be found throughout the world. Let's travel to Chile. Red clover was still in demand, and Chile has a lot of it. The funny thing is that Chile has no native bees that are particularly good at pollinating red clover. Red clover was brought into South America, so there were no natural pollinators for it. Honey bees and some solitary bees were seen feeding from the clover, but they didn't make much of an impact. (We'll learn more about honey bees and solitary bees in

FIGURE 1-11. Map of South America. The country of Chile is found along the lower left-hand side of the continent.

Chapter Two.) Chilean folks looked around and saw the success places such as the UK and New Zealand were having with long-tongued bumble bees. So, Chile decided to import a few ruderal bumble bee queens from New Zealand.

Why bring in bumble bees from New Zealand? There were a couple of reasons. One reason was that Chile and New Zealand are both in the Southern Hemisphere. This means that the life cycle of queen bumble bees from both places are timed such that the queens are flying out and about at the same time that many of the flowers in Chile are in bloom. The queen bumble bees could, therefore, be released directly into their new Chilean home and not have to wait for flowers to blossom in order to get nectar and pollen for food. Another reason was that queen bumble bees from New Zealand did not seem to have any of the diseases or parasites[3] that are found in bumble bees in Europe and America, so they would be less likely to make other bumble bees in Chile sick.

And why import ruderal bumble bee queens versus the other species of bumble bees that were in New Zealand? This particular species was chosen because they are laid-back compared to others (that is, they are less likely to become aggressive and sting), and at the time they were the

3. A *parasite* is a creature that lives on or inside an animal, feeding off that animal, and causing the animal harm.

most common long-tongued bumble bee in New Zealand. Also, unlike the other New Zealand bumble bee species, ruderal bumble bees often nested in areas with few trees, which is the kind of area where red clover grows.

So, in 1982, a couple of scientists collected 199 ruderal bumble bee queens from New Zealand and shipped them to Chile. Compared to the queens that initially traveled to New Zealand in the 1800s, these queens got first-class treatment. For one thing, the trip was a whole lot shorter: seven to ten days of travel compared to more than a month. Each queen had her own tiny screened cage with a plastic bottle cap filled with a sugar water solution (to mimic flower nectar) that was refilled every twenty-four hours. An unlimited, all-you-can-eat buffet! The temperature also stayed on the chilly side to keep the bees calm. (The colder it gets, the less bees move. If it is chilly enough, the bees go into a sort of deep-sleep state called torpor.)

Upon arrival in Chile, the 145 out of 199 ruderal bumble bee queens that survived the trip were released at a site with red clover. The process was repeated a year later in 1983: This time 192 ruderal bumble bee queens were collected, shipped, and 169 of them survived and were released into their new, red-clover-filled home.

A few months later, the scientists returned to the release sites in Chile and found ruderal worker bees, with their yellow-black-yellow thorax, a yellow band on the

abdomen where it meets the thorax, and a white tail. That meant at least some of the queens managed to lay eggs in their new Chilean home and establish their colonies of workers, who would then go on to pollinate the red clover. Success!

Not only did ruderal bumble bees end up pollinating Chilean red clover, but their population began to spread. They even crossed the Andes Mountains and settled into Argentina!

But ruderal bumble bees are not the only type of bumble bee that has been brought into Chile. Chileans have imported buff-tailed bumble bees into their country for years. As we will see in later chapters, the population of buff-tailed bumble bees has exploded across Chile and Argentina, putting a native species of bumble bee at great risk of extinction. In fact, the buff-tailed bumble bee is quite a world traveler! This bee has even made its way into Tasmania.

BUMBLE BEES IN TASMANIA

On a bright summer's day in February 1992, a gentleman by the name of Frank King was strolling through a garden in a place called Battery Point in Tasmania. Tasmania is a state of the country of Australia; it's a triangular island located about 150 miles south of the mainland. The timing of the seasons in Australia is the opposite to that of northern

countries, with summer weather in the months of December, January, and February. And since the winter months of June, July, and August do not get anywhere near as cold as northern countries such as Canada and the northern United States, it is possible for flowers to bloom in Tasmania year-round.

On his stroll, King likely saw a number of native bees buzzing about the garden. These bees would have been quite small, some as small as a grain of rice. They wouldn't have been very colorful, and they wouldn't have been very furry. Then King spotted something striking: a huge, fuzzy black-and-yellow bumble bee. He had probably never seen a bumble bee before, since bumble bees are not originally from Australia. He managed to capture two of them, and he brought them to the Tasmanian Museum and Art Gallery in the nearby city of Hobart to show the experts there. These bumble bees were identified as buff-tailed bumble bees, the same species that is found in the UK—about 10,500 miles away! How did these bumble bees get all the way to Tasmania? There was no way they could have made such a long journey without help!

It just so happens that New Zealand is about 1,500 miles to the east of Tasmania. You'll remember that bumble bees were introduced to New Zealand from the UK in the 1800s. By the 1990s, they were very much established

in their newfound New Zealand home. So, it is likely that the bumble bees that King spotted came from New Zealand. But 1,500 miles is still too far for a bumble bee to fly, especially across a cold ocean! Did they hitchhike on a ship, like the bumble bees that traveled to Iceland? After all, King saw the bumble bees not far from shipping docks. Or perhaps someone intentionally brought them there?

It's likely that someone brought them to Tasmania on purpose. As we will see in later chapters, in the late 1980s and early 1990s, someone discovered that bumble bees are superstar pollinators when it comes to greenhouse tomatoes. And tomatoes are a big business. Walk through any grocery store and you'll see pasta sauce, tomato juice, tomato paste, pizza sauce, canned tomatoes, ketchup, salsa, and a wide variety of frozen or pre-prepared pizzas, pastas, and other meals that contain some form of tomatoes.

When news spread that bumble bees can help produce bigger, tastier tomatoes, people started bumble bee breeding programs. Commercial bumble bee companies began popping up and shipping bumble bees to tomato farmers around the world. Well, except for Australia. Australia has very strict laws against bringing in foreign species. Bumble bees were not allowed. And Australia has no bumble bee species of its own. So, Australian tomato farmers were missing out. Was it just a coincidence that bumble bees started showing

up in Tasmania around the time of the bumble bee boom? We may never know.

In 1996, just four years after King first saw buff-tailed bumble bees, this species was seen about twenty-four miles north of where it was first spotted, as well as about thirty-seven miles south. They seemed to be spreading across the island at about seven to eight miles per year. They were seen mostly in cities, but they were also sighted in the mountains and a national park.

To get a better handle on just how well buff-tailed bumble bees were making a home in Tasmania, in 1999 a team of two scientists from the UK, Dr. Jane Stout and Dr. Dave Goulson, traveled to the island and took an extensive road trip. They drove around the state, stopping whenever they spotted a patch of flowers. They would look for bumble bees, and if they spotted some, they marked the location on a map.[4] Soon they discovered they could easily find bumble bees in people's gardens. And Tasmanians keep lovely gardens, thanks to the relatively nice weather year-round! So, Dr. Stout and Dr. Goulson knocked on people's doors and asked if they could look for bees in their yards. And because bumble bees were easy to spot compared to the smaller native and less furry bee species in Tasmania, often the

4. One tricky aspect of this type of research is that if they didn't see any bumble bees, they couldn't be sure if there were actually none in that area, or if it was because they were unlucky, and didn't happen to see any at that time.

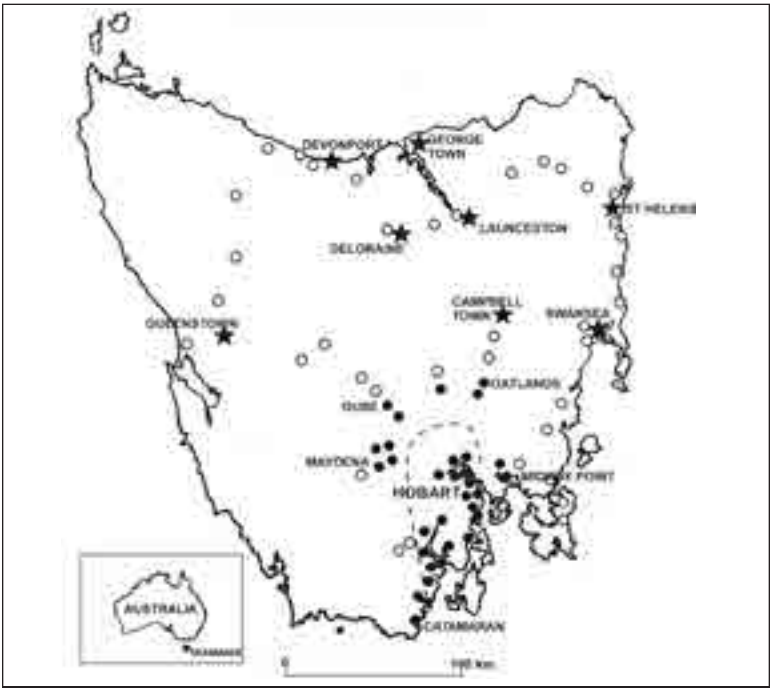

FIGURE 1-12. The map that Dr. Stout and Dr. Goulson produced as a result of their Tasmanian road trip. The dotted line shows how far *Bombus terrestris* had spread between 1992 and 1996. The filled circles show where the bumble bees are common, and the open circles are where Dr. Stout and Dr. Goulson did not find any. The stars show where people claimed to have seen bumble bees, but Dr. Stout and Dr. Goulson were unable to confirm their sightings.

homeowners would tell tales of seeing bumble bees themselves. Eventually Dr. Stout and Dr. Goulson produced a map that gives an idea of how much buff-tailed bumble bees had spread over the years (see Figure 1-12).

Looking at Dr. Stout and Dr. Goulson's map, based on unconfirmed sightings, it seems as though these bees were

spreading across the island. The species was also spreading north. Would they eventually land in mainland Australia and establish populations there? First, they would have to cross the 150-mile divide that separates Tasmania from the mainland. Past research found that bumble bees can fly about nine to nineteen miles over water. So, they couldn't fly the whole distance. However, there are a number of little islands along the way, so in theory bumble bees could reach mainland Australia by island-hopping. Like a cruise for pollinators!

There had been attempts to introduce bumble bees to mainland Australia back in the late 1800s and early 1900s (before strict Australian import laws existed), but they were unsuccessful. One report suggests that predatory Australian birds were to blame. Or, perhaps the newly arrived bumble bees could not find nesting sites, or they couldn't adapt to the warmer climate. If bumble bees ended up island-hopping from Tasmania to the mainland, they would have some challenges to overcome.

Not a lot of details exist about these early introductions to mainland Australia, including which species of bumble bees were released. Was it the buff-tailed bumble bee, or another species? The buff-tailed is known to be pretty hardy and can adapt to new locations quite well. Could this include mainland Australia? Only time would tell.

SOUNDING THE ALARM

Since bumble bees were introduced to Iceland, New Zealand, Chile, and Tasmania, these buzzing teddy bears of the insect world have spread well beyond their original sites of release. And, for the most part, in terms of red clover and greenhouse tomatoes, they have been busy pollinating crops as intended.

So there hasn't been any harm in humans transporting bumble bees to new habitats . . . or has there?

Some scientists are now quite concerned about possible negative consequences of introducing bumble bees to areas far beyond where they are originally found. If you plunk bumble bees down into an area of flowering plants in a foreign land, chances are there are already creatures that depend on those plants for food. A number of different animals collect pollen and nectar from flowers: birds, bats, mammals, and other insects. Plus, bumble bees make up a small number of the twenty-five thousand known species of bee. The new bumble bees would have what is called a niche overlap with the native pollinators. Niche overlap happens when two or more species of plants or animals share the same food, living space, predators, and other things in their day-to-day living. The big question is: Is there enough food and living space for everyone?

Because new bumble bees might have a niche overlap with other animals does not necessarily mean that they

compete for nectar and pollen with those animals. You might think there are enough flowers to go around.

It's difficult for us to figure out whether foreign bumble bees are actually competing with native wildlife. However, scientists know of several bumble bee characteristics that might give them a competitive edge. For one thing, compared to other bee species, bumble bees begin foraging earlier in the morning when the temperature is cooler, thanks to their larger size and hairy body. Bumble bees, therefore, get first dibs on flowers' nectar stores, which, depending on the type of flower, may take a while to refill. Bumble bees also tend to fly farther distances when foraging compared to other bees: Some species of bumble bees fly at least two and a half miles from their nest site to find food, whereas other types of bees don't fly as far. And being a social species of bee might be an advantage: There is evidence that when a worker bumble bee returns to her nest after a foraging trip, the scent of the nectar she carries is a hint to other worker bumble bees in the colony as to where to find good food. She also may give off a unique scent that encourages other worker bumble bees to leave the nest to forage. This means that bumble bees may locate nectar and pollen resources more quickly, compared to solitary species of bee (most species of bee are solitary), which need to find nectar and pollen by themselves on a trial and error basis.

Besides potentially creating competition with native

pollinating animals, some scientists also think imported bumble bees might carry unwanted passengers. One type of potential passenger is parasites. Others could be microscopic, disease-causing creatures called pathogens. These pathogens and parasites might come from other places and infect native species. For instance, bumble bees in New Zealand carry a parasitic nematode (a worm-like creature) and three mite species (which are tiny, parasitic arachnids), and these are all thought to have come from the UK. The tricky thing about parasites and pathogens is that you often can't tell with the naked eye whether a single bumble bee or a whole colony of bumble bees is infected. Parasites and pathogens tend to exist inside the bee's gut or in their feces (poop). So how would you check to see if the bumble bees you want to import are completely healthy? Unfortunately, we haven't completely figured that out yet.

Newly introduced bumble bees might start pollinating weeds, too. These weeds would then multiply and might choke out other, more desirable plants. The increase in weeds could affect the native pollinators of the choked-out plants by leaving them less food. The native pollinators starve and become more susceptible to disease because of lower nutrition.

It is a tangled web that importing bumble bees may weave. As you will see in the following chapters, the introduction of bumble bees to Iceland, New Zealand, Chile, and Tasmania was only the tip of the iceberg.